2. CHAPTER

THE IMPACT ASSESSMENT OF PDS REFORMS ON THE PURCHASE OF PDS RICE IN THE STATES OF INDIA

A new phase has evolved with reforms in the functioning of Targeted Public Distribution System (TPDS) intertwined with the enactment of National Food Security Act, 2013. The evolution of PDS in the introductory chapter has given an outline of the PDS reforms up to the recent period. The period from 2004-05 to 2011-12 has experienced a sufficient improvement in PDS with a striking rise in PDS usage by an increase in the purchase of cereals, decline in poverty from 38.4 percent to 21.3 percent which is evident from the evaluation study by NITI Aayog (GOI, 2016). The present research has focused on the impact of Public Distribution System policy on the states which have accomplished the identification of beneficiaries, preparedness in logistics and TPDS reforms. This chapter intends to analyse the change in the average rice purchased from PDS during the period from 2004-05 to 2011-12 in which TPDS has undergone considerable changes with reforms. The focus of this chapter is to make an impact assessment of the PDS reforms on the purchase of PDS rice in the treatment group of states.

2.1 The PDS in the Phase of National Food Security Act, 2013

India's Public Distribution System (PDS) has achieved its targets during the past ten years. The National Food Security Act (NFSA), enacted in 2013, is an important initiative to ensure the food grains to the needed and targeted population (Dreze, 2016). National Food Security Act 2013 (NFSA) is a remarkable stride initiated by the government of India for the elimination of hunger and protection of the rights of the people for food. Since it is going to modify the food security approach, it will have more broad ramifications (Tanksale and Jha, 2015). From food grain distribution obligations and population coverage, PDS stands as the significant part of NFSA, 2013 (Gulati and Saini, 2014).
Under the NFSA, the Above Poverty Line households are eliminated, and the eligible households are revised. The categories include; the priority households, with an entitlement of five kg of food grains per head per month at subsidised prices, and Antyodaya families (the poorest of the poor) who are entitled to get 35 kg per household per month (Dreze, 2016). Based on the requirements of NFSA, the PDS distribution is classified among the households as “priority,” “general” and “excluded” households (Dreze, 2011). Priority households, consisting on an average 46 percent of the rural population at the all-India level, are to get 35 kg of grain monthly at 'Antyodaya prices” (Rs.3 per Kg for rice, Rs.2 for wheat and Rs.1 for millets). Non-priority households will get 20 Kg at hardly more than half of the Minimum Support Price. Excluded households, which consists of 10 percent of the rural population, will be given nothing (Dreze, 2011). The Act is internationally relevant as the major initiative in the series of welfare schemes that have focused on the provision of food (Gulati and Saini, 2014). By assuring the entitled quantity of food at subsidised prices, the Act can play a significant role in addressing the crucial issues of food and nutritional security of the targeted section in India (Gulati and Saini, 2014).

A year after the enactment NFSA, 2013, its implementation started in 11 states or Union Territories. Since then, additionally, 14 States or Union Territories have joined the Act, and at present, 25 States or Union Territories are implementing the Act (GOI, 2016). Based on the evaluation of the implementation by the Ministry of Consumer Affairs, Food and Public Distribution in April 2016 the Act was (GOI, 2016) officially implemented in 9 states and 2 UTs (Food grain bulletin, 2015).

Khera (2013) has given a coherent response to the misconceptions regarding NFSA. According to Khera, these limited interventions act as essential factors for the following reasons; firstly, this includes a maternity entitlement of approximately Rs.1000 per month which is a nutritional support for mother and the infant from the womb. Secondly, it ensures supplementary nutrition to the children under the age of six through the Integrated Child Development Services (ICDS) scheme (Khera, 2013). The bright picture of the states of Andhra Pradesh, Tamil Nadu, Himachal Pradesh and Chattisgarh which ensures the
commodities in addition to food grains assuring nutrition like pulses and oil provides a model for the other states to adopt. But the affordability of the bill ultimately depends on the political commitment and administrative efforts of the state set up (Khera, 2013). The states of India have been fast implementing the NFSA.

The states of India have been fast implementing the NFSA. Even before the endorsement of the Act, the states have taken up the initiative to enforce the reforms prescribed in the NFSA. In states like Tamil Nadu, that has universal coverage, and Chhattisgarh with 90 percent coverage of their populations, thus extended their coverage more than the center's TPDS (Gulati and Saini, 2015).

These states have been providing rice even less than that is prescribed in NFSA, 2013 and their excess gain is considered as the tide-over allocation (Gulati and Saini, 2015). It is interesting to evaluate the experience of these states who have taken the challenge and administrative efforts for PDS reforms with the implementation of this Act and the impact of PDS policy in these states. Also, some states are in the course of initiating these changes.

2.2 Impact of PDS Reforms: a review from the states of India

The analysis of some recent studies on the PDS reforms initiated extensively sheds light on the dimensions of recent PDS reforms undertaken in the states of India.

The PDS revival has been witnessed in three aspects of targeting, access, and reliance on some states having initiated reforms better than Tamil Nadu where the PDS is efficient and working well. The study has also found that the proportion of PDS in total household consumption of rice and wheat is going up over the years. For the households in poor expenditure classes, the state governments have taken up measures right from end-to-end computerization to a more significant commission to Fair price shops owners (Rahman, 2014).

In the context of the revival of PDS, its impact on the anthropometric indicators of the children in the 7-19 age groups has been analysed for 2004-05 and 2011-12 (Thampi, 2017). The results of the study showed that PDS had had a significant impact on the longer-term
nutritional indicator in three of the four functioning states and on the short-term indicator in two reviving states (Thampi, 2017).

The assessment of the belief that the magnitude of the food subsidy required to generate a substantial improvement in calorie intake is large, by evaluating the probability of participation by the poor in the program showed a positive effect of the program on the caloric intake of poor households (Kochar, 2005).

Using NSSO consumer expenditure surveys 1999/2000, 2004/05 and 2009/10 Economic Research Service Researchers (ERS) estimated PDS consumption and overall calorie consumption in Chattisgarh and its neighboring states. They also investigated the effect of the post-2004 reforms on food security and even the role of improvements in the turnaround of the PDS (Krishnamurthy et al., 2014). A difference-in-difference estimate showed how much more PDS consumption grew in Chattisgarh than its neighbouring states (Krishnamurthy et al., 2014). The analysis indicates that the comparison of Chattisgarh’s growth to that of the states is essential to help to capture national and regional trends in PDS consumption that are unrelated to the reforms in Chattisgarh (Krishnamurthy et al., 2014).

A study had been conducted in Andhra Pradesh to investigate whether a sudden increase in the price of rice supplied by the PDS had a negative impact on child nutrition (Tarozzi, 2003). Using a range of difference-in-difference estimates they analysed that a subsidy reduction estimated to be equivalent to about 5 percent of the most deprived households’ total budget did not affect child nutrition, as measured by weight-for-age (Tarozzi, 2003). The reduction in implicit subsidy had a negative impact only on girl weight, which was small and not statistically significant and this suggests an essential possibility that comparatively large variations in food subsidies can have some or no effect on child nutrition (Tarozzi, 2003).

The success of NFSA lies in the appropriate identification of the real beneficiaries by expanding the coverage up to 75 percent of rural and 50 percent of the urban population as priority households for entitlement of benefits (Tanksale and Jha, 2015). One of the paths breaking objectives of NFSA is to leverage the AADHAR (an identity card issued by unique
identification authority of India) for identification and distribution of foodgrains to the individuals as well as for gaining food subsidies (Tanksale and Jha, 2015). The set of suggestions evolved from the NFSA shows that food security through direct cash transfer may be a cost-effective option for the safety net program (Tanksale and Jha, 2015). It can benefit in exploring more options to the consumers, reduce the risk of distortions and boost investment in agricultural and nonagricultural activities due to improved access to the credit (Tanksale and Jha, 2015). Mexico, Brazil and Bangladesh are the few countries who have been successfully implementing the safety net programs through cash transfer (Tanksale and Jha, 2015).

The NFSA, viewed from a human rights and ethics perspective stands as a significant initiative that reflects the responsibility of the government for the upkeep of food security (Banik, 2016). Thus, the primary duty of the central government is to distribute foodgrains (or adequate funds) to state governments at subsidised prices (Banik, 2016). The state governments, however, have the primary duty to execute the provisions of the Act together with local government institutions and may extend the level of benefits with additional resources from their coffers (Banik, 2016). The main advantage of the legislation is that it will ensure that foodgrains that are procured by the government are distributed to the poor instead rotting in official storage houses (Banik, 2016).

The study by Kaul (2013) found that the NFSA implementation can lead to the improvement in the consumption of calories of food by the beneficiaries and the provisions of the Act show that the expansion in the coverage and the subsidies distributed through PDS is essential (Kaul, 2013). But the costs to be incurred in the bill are also a major cause of concern. However, it is more important to evaluate the outcome of the nutritional indicators to the entitled households and when it is implemented it intends to distribute 5 Kg of food grains, monthly, per head, at prices ranging from Rs. 3 per Kg to Rs 1 per Kg, by expanding the coverage to 67 percent of the country’s population which will become an added advantage to a more extensive population (Kaul, 2013). Under the NFSB, the BPL population on an average will be entitled from 4 to 5 kg of foodgrains per head, which does not lead to a more substantial increase in
the quantum of foodgrains as per the bill. However, at the given prices, the quantum of subsidy will rise from Rs.13.5 to Rs. 16.58. So on a monthly basis, the subsidy will increase from approximately Rs. 67.5 to Rs. 82.5 per person. NSSO has estimated the caloric intake per day for the duration from 2009 to 2010 to be 2260 Kcal and 2076 Kcal for rural and urban regions respectively (Kaul, 2013). The study also found that with NFSA implementation the caloric intake per head can increase by 66 kcal in urban and 72 Kcal in rural regions (Kaul, 2013).

The best alternative to distributing the food more efficiently is by shifting from the present system of physical handling of rice and wheat and other commodities to the conditional cash transfers as enacted in the NFSA, on the basis credentials ensured by the Aadhaar Unique Identity scheme (Gulati and Saini, 2014). The distribution of foodgrains requires the finger identification by the beneficiaries through which the subsidy amount can be directly credited to the bank accounts of the beneficiaries by reducing the leakages through PDS (Gulati and Saini, 2014).

The findings of the previous studies present the impact of reforms in individual states. This chapter attempts to compare the PDS coverage and price in a group of states which have initiated PDS reforms and the states which are yet to complete the PDS reforms in India.

2.3 Data description and Methods
The data source for the present study is adapted from the 50th round of NSSO (1993-94) on Household Consumer Expenditure, 61st (2004 to June 2005) and the 68th (2011-12) rounds on PDS and other sources of household consumption. The data is also collected from various issues of Food Grain bulletins.

Based on the provisions of NFSA, the states/Union territories have to identify the eligible households within 365 days. The provision of the Act also tells that the state government will continue to receive the allocation of food grains from the central government under the TPDS until the identification of the beneficiary households. It is also important to note that among
36 states/UTs only 11 states/UTs reported the identification of household within the stipulated period of 1 year and these states/UTs were receiving foodgrains under NFSA during September 2013-March 2014 (CAG report, 2015). From these 11 states/UTs, the treatment group for the present study consists of the eight states which are also the major states in the NSSO reports comprised of Bihar, Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, and Rajasthan. The control group of states in the study consists of states which are yet to complete the PDS reforms, which includes Andhra Pradesh, Assam, Gujarat, Jharkhand, Kerala, Madhya Pradesh, Odisha, Tamil Nadu, U.P and West Bengal (control group).

The actual difference-in-difference impact is calculated as; first the difference in the outcome (Y) is calculated between before and after situations for the treatment group (B - A). Then the difference in the outcome (Y) between before and after situations for the comparison group (D - C) is calculated and finally the difference between the difference in outcomes for the treatment group (B - A) and the difference for the comparison group (D - C), or DD = (B - A) - (D - C) and this “difference-in-differences” is the actual impact estimate (Gertler, et al., 2011). The same is estimated through the regression set up to get the estimated DID impact in Tables (Gertler, et al., 2011).

The regression equation estimated:

\[ Y_{hst} = \beta_0 + \beta_1 A_{hst} + \beta_2 T_{hst} + \beta_3 A_{hst} T_{hst} + X_{hst} + \epsilon \]

Where \( Y_{hst} \) = Outcome of households in states in a particular time period (here quantity of PDS rice purchased).

\( A_{hst} = 1 \) if impact after 2011-12; \( A_{hst} = 0 \) if impact before 2011-12

\( T_{hst} = 1 \) if state is in treatment group; \( T_{hst} = 0 \) if state is in control group

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15 They consist of Bihar, Chandigarh, Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan.

16 The major states consist of the states of India which had a population of 20 million or higher than that based on the Census 2001. The States include: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal (NSSO).
A\$h T\$h: Interaction between two dummies (product of the 2) $\beta_3 =$ Interaction coefficient gives the DID estimate.

$X_{hst}$ = Control variable, here it is total land possessed

The equation can be written as follows;

$Y = \text{Post treatment year} + \text{Treatment area} + \text{Post treatment year} \times \text{treatment area}.$

The interaction term is the diff-in-diff coefficient.

By running a diff-in-diff manually and using a regression to test for differences, the DID impact can be estimated. The regression set up allows testing coefficients after adjusting for covariates.

Difference-in-Difference method for impact evaluation is used to assess the impact of reforms on PDS purchase on the treatment states during 2004-05 to 2011-12. Testing the parallel trend assumption is essential to carry out this impact evaluation method. The DD-estimate is a balanced estimate of the effect of the policy change. If the policy change is not present, the average changes in $Y_1-Y_0$ would have been the same for treatment and controls. It is called the “parallel trend” assumption (Duflo, 2002). To put it differently, if the policy change is present the average change in $Y_1-Y_0$ would not have been the same for treatment and controls. And there will be a deviation from the parallel trend. The method is broadly described in the next section.

2.3.1 Difference-in-Difference method for impact evaluation

The difference-in-differences method distinguishes the variation in outcomes in due course between a population that is joined in a program (the treatment group) and a population that is not (the control group) (Gertler and et al., 2016). At their intuitive core, differences-in-differences models identify program impact as the difference in the changes in an outcome experienced between partaker and non-partaker across an interval of time over which a program was introduced (Lance, et al., 2014). To put it in a different path this unique method identifies the program impact as the difference in outcome trend between the two groupings across an interval of time during which the program was introduced (Lance, et al.,
Several researchers have used this method for impact evaluation of various economic policies.

The impact estimated through Difference-in-Difference must be precisely equal to the actual impact. For this, a large assumption must be verified. It is referred to as the parallel trend assumption. It states that if the subsidized rice policy had not been implemented, the trend line for treatment group and the trend line for control group would have followed parallel paths as shown in pre-treatment period.

The presence of any difference in time trends in the pre-treatment period between the treatment and control group would raise significant concerns about the validity of the difference-in-differences results, and if the parallel trends assumption is applicable, the estimated coefficient must be close to zero and statistically insignificant (Talosaga and Vink, 2014).

Card and Kruger (1992) used a dramatic change in the New Jersey subsistence wage to see whether the higher minimums reduce employment, perhaps hurting the very workers minimum-wage policies (Card and Kruger, 1992). Another important study which has taken up the same method is by Pischke, who looks at the effect of school term length on student performance using variation generated by a concrete policy change in Germany (Angrist and Pischke 2009).

The National Food Security Act, 2013 introduced, “the New PDS” model providing cheaper grains to a bigger population. A careful evaluation of the improvement of PDS in various states can provide a sense of the effect of this model on the PDS purchase of foodgrains.

The main goal of the proposed study is to estimate the impact of reduction in the price of rice to Rs.3/- (or less) on coverage, quantity purchased and value of purchase of PDS in 2 groups of states; states which have initiated and completed PDS reforms to the recent period (treatment group) and states which have to complete the PDS reforms (control group of states). This will be examined using Difference-in-Difference method (Card and Krueger, 1992), which compares the outcome of reforms in treatment group with non-treatment group of states between 2004-05 and 2011-12.
A way to improve on the simple difference method is to compare outcomes before and after a policy change for a group affected by the change (Treatment Group) to a group not affected by the change (Control Group) (quoted in Duflo, 2002). The regression set up gives the same answer but allows testing coefficients after adjusting for covariates.

2.4. Empirical Results

Table 2.1 shows the PDS coverage and price during 2004-05 and 2011-12. PDS coverage is indicated in terms of Households that bought PDS rice (household size\(^1\)). The table also gives an account of the monthly per capita consumption per individual and household. In 2004/2005, no states in India sold rice (or wheat) at less than Rs 3/kg (in 2004/2005 current prices) even to families in bottom three MPCE deciles (Kishore and Chakraborti, 2015).

In table 2.1 below Monthly per capita consumption (Kg) per household is the product of Monthly per capita consumption (Kg) per individual and the Households that bought PDS rice (household size).

Table 2.1 PDS Coverage and Price

<table>
<thead>
<tr>
<th>All India PDS rice</th>
<th>2004-05</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price and Coverage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Household size has significant impact on PDS consumption. On the supply side if the household size is large it will increase the PDS entitlement while on the demand side more number of members in a house means more requirements for food. Also there is chance of someone from the family going to purchase from fair price shops, which in turn will affect the purchase of foodgrains (Basu &Das, 2014).
<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Households that bought PDS rice</td>
<td>24.4</td>
<td>13.1</td>
<td>45.9</td>
<td>23.3</td>
</tr>
<tr>
<td>Percentage share of PDS in quantity consumed of rice</td>
<td>13.2</td>
<td>11.3</td>
<td>27.9</td>
<td>19.6</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per individual**</td>
<td>0.839</td>
<td>0.530</td>
<td>1.670</td>
<td>0.882</td>
</tr>
<tr>
<td>Households that bought PDS rice (household size)(mean)*</td>
<td>5.55</td>
<td>5.56</td>
<td>4.42</td>
<td>4.39</td>
</tr>
<tr>
<td>Average Price of PDS rice***</td>
<td>.6563</td>
<td>.6869</td>
<td>.0047</td>
<td>.0061</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per household**</td>
<td>4.9399</td>
<td>5.4775</td>
<td>4.3145</td>
<td>3.9475</td>
</tr>
</tbody>
</table>

Note: *Household size is expressed as an average, **Monthly per capita consumption is expressed in terms of Kg and ***Average price is expressed in terms of Rs/Kg
Source: Estimated from NSSO unit level data and reported in NSSO report 61st and 68th rounds

Food prices in fair-price shops had no much difference with the central issue price, as set by the Indian government, in most of the states in India except in Tamil Nadu and Gujarat in 2004/2005, where rice was sold for less than Rs 4 per kilogram (Kishore and Chakraborti, 2015).

Table 2.2 PDS Coverage and Price in Treatment States and Non-treatment States

<table>
<thead>
<tr>
<th>Treatment States</th>
<th>2004-05</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>Households (household size) that bought PDS rice*</td>
<td>5.05</td>
<td>4.52</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per household**</td>
<td>2.7669</td>
<td>1.1499</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per individual**</td>
<td>0.5479</td>
<td>0.254</td>
</tr>
<tr>
<td>Average Price of PDS rice bought (Rs/Kg)**</td>
<td>.9019</td>
<td>.4287</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non Treatment States</th>
<th>2004-05</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households that bought PDS rice*</td>
<td>4.94</td>
<td>4.44</td>
</tr>
<tr>
<td></td>
<td>2011-12 (Kg)</td>
<td>2010-11 (Kg)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per household**</td>
<td>4.6017</td>
<td>4.0102</td>
</tr>
<tr>
<td>Monthly per capita consumption (Kg) per individual**</td>
<td>0.932</td>
<td>0.9031</td>
</tr>
<tr>
<td>Average Price of PDS rice bought (Rs/Kg)***</td>
<td>1.2970</td>
<td>1.0493</td>
</tr>
</tbody>
</table>

**Note:** Household size is expressed as an average, **Monthly per capita consumption is expressed in terms of Kg and ***Average price is expressed in terms of Rs/Kg.

Source: Estimated from NSSO unit level data and reported in NSSO report 61st and 68th rounds on PDS and other sources of Household Consumption

Table 2.2 shows a comparison of PDS price and coverage in treatment states and Non-treatment states. It asserts that the coverage of PDS rice given in terms of household size is more significant in treatment states compared to the non-treatment states. Findings from the table 2.2 show that given the present situation, in the states that have introduced PDS reforms, (treatment states) have achieved expanded coverage and increased subsidy with the decline in the PDS price.

### 2.4.1 Testing For Parallel Trends

The data for three time periods are inevitable for testing the parallel trends. So the study has adopted three periods 1993-94, 2004-05 and 2011-12 using NSSO 50th round, 61st round and 68th the round respectively to test for parallel trends. Since the identifying assumption (parallel trends) is more likely to be correct over a short time-window, the DD estimates are more reliable while comparing the outcomes just before and just after the policy change. With a long time window, many other things are possible and confound the policy change effect (Duflo, 2002).

**Figure 2.1 Graphical Representation of the Parallel Trend**
Source: Estimated from NSSO 50th, 61st and 68th rounds on PDS and other sources of Household Consumption

The pretreatment period was taken as 1993-94 using the 50th round of NSSO because the design of the 55th Round was different from that in previous rounds and the comparability of these new estimates has been difficult (Deaton, 2003). It is not possible to compare the 55th round to other series, before or after it due to a change in recall period that led to increase in estimates of consumption expenditure in this round (Kishore and Chakraborti, 2015).

A deviation from the parallel trend indicates that there is an impact for the PDS policy on the treatment states under consideration during the period from 2004-05 to 2011-12. The trend line also shows that there was an impact on the purchase of PDS rice for both treatment groups and control group as a result of PDS reforms implemented but the effect was more for the treatment group of states. The regression estimates for the parallel trends are shown in the table below.

**Table 2.3 Regression Estimates for Parallel Trends**

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Regression estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_1$</td>
<td>.258 (.684)</td>
</tr>
</tbody>
</table>
The parallel trend is a DID with an insignificant interaction term. In the table, $\beta_1$ is the Difference between the average purchase of PDS rice by treatment group in pre-treatment period (1993-94) and average purchase of PDS rice by control group in pretreatment period (1993-94). $\beta_2$ shows the Difference between the average purchase of PDS rice for the control group in post-treatment period (2011-12) and average purchase of PDS rice for the control group in pretreatment period (1993-94). $\beta_3$ is the product between $\beta_1$ and $\beta_2$ and $\beta_0$ intercept represents the PDS purchase of rice for the control group in pre-treatment period, and the outcome variable is the average quantity of PDS rice from 1993 to 1994.

While carrying out difference-in-difference method it is important to assume that, in the absence of the program, the outcome in the treatment group would have moved in tandem with the outcome in the comparison group and if outcome trends are different for the treatment and comparison groups, then the estimated treatment effect obtained by difference-in-differences methods would be invalid, or biased (Gertler, et al., 2011). The outcome can be analysed through the parallel trends assumption.

The parallel trends assumption requires that the trend in the outcome variable for both treatment and control groups during the pre-treatment era are similar and the t-test for this should be insignificant if the parallel trends assumption is valid (Roberts, 2012). Similarly, the regression in the present study has failed to reject the null hypothesis with interaction term $\beta_3$ being not statistically significant which shows that during the pretreatment period the average change in the PDS purchase of rice is same for treatment and control group. Also, $\beta_1$and $\beta_2$

| $\beta_2$  | .145 (.437) |
| $\beta_3$  | .108 (.198) |
| $\beta_0$ (intercept) | 3.685 (1.441) |

Source: Estimated from 50th and 68th rounds of NSSO, Figures in parentheses represent standard errors.
coefficients are insignificant which shows that the outcome trends between the treatment and
control group are the same in the pretreatment period. So the difference in difference estimate
is not significantly different between the two groups in the pre-treatment period.

2.4.2 The Difference in Difference impact of PDS policy in states with PDS Reforms

The actual DID impact is estimated either by estimating the difference between the first
difference of control group and treatment group or by determining the difference between the
control group during each year in 2004-05 and 2011-12 and finding the difference of these
two estimates.

<table>
<thead>
<tr>
<th>States</th>
<th>2004-05</th>
<th>2011-12</th>
<th>First difference</th>
<th>DID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.926756</td>
<td>4.676811</td>
<td>0.750055</td>
<td>0.154195</td>
</tr>
<tr>
<td>Treatment</td>
<td>2.470888</td>
<td>3.375138</td>
<td>0.90425</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.455868</td>
<td>1.301673</td>
<td></td>
<td>0.154195</td>
</tr>
</tbody>
</table>

**Source:** Estimated from NSSO 61st and 68th rounds on PDS and other sources of Household Consumption.

Table 2.5 Conditional DID impact with Covariates

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Quantity of PDS rice consumed with 1 covariate</th>
<th>Quantity of PDS rice consumed with 2 covariates</th>
</tr>
</thead>
<tbody>
<tr>
<td>DID impact</td>
<td>.870 (2.197)</td>
<td>1.150 (2.452)</td>
</tr>
<tr>
<td>Treatment state</td>
<td>.631 (1.973)</td>
<td>.522 (2.081)</td>
</tr>
<tr>
<td>After treatment</td>
<td>-7.438 (1.241)</td>
<td>-7.557 (1.345)</td>
</tr>
</tbody>
</table>
Source: Estimated from NSSO 61st and 68th rounds on PDS and other sources of Household Consumption, Figures in parentheses represent standard errors.

Positive coefficients on the Difference-in-Difference dummy and treatment dummy in Table 2.7 show that TPDS was functioning well in the treatment states during 2004-05 and 2011-12. After treatment dummy is negative due to the fact that there is some of the control group of states like Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, where the average quantity of PDS rice did not increase in 2011-12. But in treatment states there was a notable increase in the average amount of PDS rice in 2011-12. Similar to the recent study by Kishore and Chakraborti, 2015, the interaction term labeled DID impact is statistically insignificant while estimating DID impact.

The reason for adopting NSSO data for the present study for assessing the states with PDS reforms in the background of NFSA, 2013 has relevance, since the State level coverage for NFSA has been examined by the Planning Commission by 68th round NSSO report (2011-12) on consumption expenditure. Since the coverage norm under NFSA has been disintegrated from the data on poverty, the APL and BPL beneficiaries categorisation up to the period will be revised to include nearly two by third of the population by establishing the right to food a legal entitlement, ensuring food grains at nominal prices (GOI, 2015). Under the NFSA, 75 percent of the rural and 50 percent of the urban population is envisaged to be included, and the states will be distributed with food grains on the basis of this coverage of the population (GOI, 2015).

The Coverage, entitlements, and execution of the PDS at the state level differ so much that it now makes little sense to analyse it only at the national level (Khera, 2011). The PDS performance depends on foodgrains management of the central government as well as the distribution of subsidized grain by state governments. As a result, regional diversity in PDS performance can be expected. Hence grouping the treatment states alone as a group will not suffice to learn the real impact of PDS policy on each of the states that have completed the
PDS reforms. So disaggregating the impact of the states as in Table 2.6 is essential to assess the real PDS policy impact of subsidized rice on these states. A large number of states have undertaken extensive reforms. One useful model is Chhattisgarh, which is in the process of revival of the PDS system with the help of improved practices, governance including technology. There are also initiatives most recently by some of the states for computerizing the PDS operations which range from application of smart cards for beneficiaries experimentally in Haryana and Chandigarh, use of the Global Positioning System in Tamil Nadu, Chattisgarh, and Delhi, bar-coded bags in Gujarat and SMS alerts on grain availability in Uttar Pradesh and Madhya Pradesh. But each of these initiatives targets a part of the system and is not comprehensive and replicable at the all India level (Report NFSB, 2010).

The states differ considerably in the functioning of PDS before the reforms started and also regarding the degree of reforms implemented there, as determined by the size of expansion in the number of beneficiary households and the price at which rice was sold to targeted households after changes (Kishore and Chakraborti, 2015).

Based on the universal coverage as envisaged by NFSA the better-off households will be avoided and thus with strict scrutinisation of offtake of grains, over time it will be possible to reduce leakage of foodgrains. As the coverage put forward by the National Advisory Council (NAC) cannot cover 100 percent of the population, there is precise categorisation among the beneficiaries, and hence it is essential to classify the recipients more appropriately.

Besides the Public Distribution System (PDS) with its network consisting of half a million ration shops, is the most obvious choice for the provision of the entitled foodgrain under the proposed NFSB. On the classification of households, the Expert Committee (EC) has recommended that the entitled population is described as the proportion of population below the official poverty line adding ten percent of the BPL population. Using the Tendulkar poverty line, this works out to 46 percent rural and 28 percent urban population (Report NFSB, 2010). These percentages are the same as those recommended by the NAC for categorization as the ‘priority’ households (Report NFSB, 2010). Aforementioned captures not only the poor
but also some at the margin, which is desirable given the objectives of the NFSB (Report NFSB, 2010).

However, the actual contribution and cost-effectiveness of the NFSA, 2013 will depend on the extent to which its implementation can overcome the deficiencies of the current PDS (Kishore, Joshi and Hoddinot, 2014). The National Food Security Act (NFSA) is a remarkable initiative to assure that the significant quantum of India’s population has right to sufficient amount of food at affordable prices (Mishra, 2013). The Chhattisgarh experience offers ample proof for the argument that the NFSA can expand PDS consumption, while it is hard to foresee how the NFSA can affect the provision of subsidised food grains in states where supply channel is weak. The post-2004 initiatives in Chhattisgarh which come under the NFSA may have improved the availability of subsidised food grains, but they were apparently operating in conjunction with earlier reforms that enlarged the number of FPSs and rice procurement with the political commitment to make efficient the deliverance of food assistance a priority. Hence the NFSA may not improve the availability of subsidised food grains in states where beneficiaries lack smooth access to shops distributing food aid (Krishnamoorthy et al. 2015).

However the research study carried out in Chattisgarh strongly recommends that if states are driven by both the NFSA and country broad interest on the initiative to improve the distribution of subsidised food grains, then millions of beneficiaries will receive an extra level of income support and will use the savings on food grains to improve their dietary status (Krishnamoorthy et al. 2015).

Similar to the present study, the analysis by Paul (2016) also asserts that the situation is somewhat better in states of Chattisgarh, Bihar, and Karnataka that have implemented the NFSA. The proportion of leakage is lowest in Chhattisgarh among the six states under the study, and it stands as the best-performing state for PDS, where the reason for its achievement is the establishment of an active supply channel along with the outreach of higher consciousness among the households about their PDS entitlement (Paul, 2016).

Bihar has become a prosperous reformed state with a modest level of leakage estimates. The state also had experimented with a significant revival in the operation of the PDS after it
initiated the coupon system of distribution in 2007 to curb corruption. But in Karnataka, one among the better functioning states in the PDS has implemented numerous reforms, although the extent of leakage is large relative to the other two states that have implemented the NFSA (Paul, 2016). In sum, there exists a considerable impact for the PDS policy in 2011-12.

So when reforms are implemented in full length, it can redefine and strengthen the existing system of PDS within these states.

2.5 Conclusion
The chapter has broadly discussed on the impact of Public Distribution System policy on the states which have accomplished the tasks of PDS reforms. The experience of the states which have completed PDS reforms provides a qualified support for the fact that the whole PDS policy can improve the PDS rice consumption.

There is a considerable impact on the PDS policy with subsidized PDS rice in 2011-12 on the states which initiated the PDS reforms in the early phase of 2011-12. The group of treatment states has expanded the coverage and subsidy based on PDS compared to the control group of states. The difference-in-difference interaction dummy shows that there was a notable impact on the purchase of PDS rice in the treatment group of states compared to the control group of states due to the initiation of PDS reforms. The experience of a positive impact on these states provides a model for an inclusive PDS which can be replicated across the country. The crucial changes noted in the study are the increase in coverage of PDS in rural India from 24.4 percent in 2004-05 to 45.9 percent in 2011-12 and in urban India from 13.1 percent in 2004-05 to 23.3 percent in 2011-12 (table 5.1). The positive DID interaction dummy and treatment dummy (table 2.5) show the true impact of the rise in PDS purchase of rice due to the reforms introduced.

The findings similar to the present study but with a different set of treatment group of states have been established in previous studies. These studies have analysed the impact of less targeted and more inclusive PDS in a treatment group of states in which the average price of PDS rice was less than Rs.3 per Kg based on the 61st and 66th rounds of NSSO report on
PDS and other Sources of Household Consumption (Kishore and Chakraborti, 2015). Similarly, the impact of post-2004 reforms on food self-sufficiency and PDS consumption was estimated for Chattisgarh. The findings showed an increase in the average number of calories consumed from PDS food grains and also an increase in the number of calories obtained per rupee spent on PDS grains which suggested that there was an improvement of PDS consumption for the poorest households in the state (Krishnamurthy et al., 2015).

The present study having comprehended an increase in PDS coverage and a notable impact on the purchase of PDS rice, as a result of PDS reforms implemented from 2004-05 to 2011-12, have reflected the provisions in NFSA, 2013 and provides new insights for the implementation of the Act in full length across the country.