

Public Distribution System Reforms and Consumption in Chhattisgarh: An Empirical Analysis^{1,2}

Prasad Krishnamurthy³, Vikram Pathania⁴, and Sharad Tandon⁵

Abstract: This article investigates the effect of Public Distribution System (PDS) reforms in Chhattisgarh on household consumption of PDS rice. We find that the proportion of households consuming PDS rice and PDS rice calories per household grew dramatically between 1999 and 2010, a period during which the Raman Singh government instituted a number of major reforms. This growth in Chhattisgarh is large when viewed relative to districts that border Chhattisgarh or to all other parts of India. We also find that these measures of PDS rice consumption increased in Chhattisgarh before these reforms began in late 2004 and before the election of Raman Singh's (BJP) government in 2003. This pattern of growth in Chhattisgarh is not shared by other small, newly formed states such as Jharkhand and Uttarakhand. Our findings suggest that other factors—including reforms made prior to the Singh government and a willingness to target the PDS by state actors and civil society—increased PDS consumption prior to the more publicized reforms. Whether the subsequent PDS consumption growth in Chhattisgarh would have been as large without these other factors and whether other states will be able to replicate Chhattisgarh's success remain open questions.

Keywords: PDS reforms, National Food Security Bill, Nutrition, Chhattisgarh

Introduction

The National Food Security Bill (NFSB) will not end the larger policy debate over how best to expand India's Public Distribution System (PDS). Proponents of cash transfers will continue to press for a fundamental overhaul of public distribution, and advocates of

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³ University of California - Berkeley Law School, Boalt Hall, Berkeley, CA 94720 - 7200, USA, prasad@law.berkeley.edu, +1-510-642-1741.

⁴ London School of Economics and Political Science, Houghton Street, London, WC2A 2AE, UK, vikram.pathania@gmail.com, +44 7503705918.

⁵ United States Department of Agriculture- Economic Research Service, 355 E St. SW, Washington, D.C. 20024, USA, standon@ers.usda.gov, +1-202-694-5291

positive rights will advance their case for in-kind transfers. The NFSB does signal the government's present commitment to expanding and possibly improving the delivery of food grains to households. In its present form, it would expand the number of eligible households and increase their monthly entitlement of food grain.¹

The NFSB also recommends a series of reforms to improve the functioning of the present system. These reforms call for preferences for public bodies and women's collectives in administering fair price shops, doorstep delivery of food grains, public availability and computerization of records, periodic social audits, and vigilance committees from the state to the fair price shop level to supervise each step of the distribution process.

There can be little doubt that policy experimentation at the state level informs the NFSB's reform provisions. PDS performance in terms of coverage and diversion has varied significantly across states (Khera 2011a). Over the past decade, several states have attempted to increase PDS consumption by lowering prices and expand coverage by making the program nearly universal in target areas (Khera 2011b).² An empirical account of state-level reforms is therefore useful in assessing the likely effects of the NFSB and, more generally, of reforms to the public sector delivery of basic goods and services.

Chhattisgarh's experience makes it an especially salient case study. Under Raman Singh's (BJP) government, Chhattisgarh introduced reforms to the delivery and procurement of food grains that have been credited with improving its PDS (Puri 2012). This effort included two major reforms³ affecting PDS delivery: (i) the 2004 Public Distribution (Control) Order, which transferred fair price shop (FPS) management to local bodies, and (ii) the 2007 Mukhyamantri Khadyann Sahayata Yojana (MKSY) scheme, which expanded the availability of below-poverty-line (BPL) rations to more households. Chhattisgarh also introduced auditing and transparency mechanisms for the delivery and receipt of PDS goods.

While these reforms have received the most public attention were reforms, other PDS reforms took place prior to the election of the Raman Singh government. In 2001, the Ajit Jogi (Congress) government began to issue licenses to private merchants to operate Fair Price Shops (FPSs) in 2001. This process of privatization was reversed by Raman Singh government's 2004 Order. In 2002, the Ajit Jogi government began to implement a Decentralized Procurement (DCP) Scheme to directly purchase PDS food grain from state farmers. The Raman Singh government continued to operate this scheme.

Chhattisgarh's PDS efforts have not gone unnoticed. Government officials, scholars, and commentators have lauded Chhattisgarh's PDS coverage, consumption, and diversion, and called on less successful states to emulate its major reforms.⁴ Haryana and Punjab have implemented pilot programs based on Chhattisgarh's experience.⁵ The Supreme Court has questioned why Chhattisgarh cannot serve as a model for the rest of the country, which led BJP spokesperson Prakash Javadekar to follow suit and call on Congress to make the NFSB more like the Chhattisgarh Food Security Act by increasing coverage and rations, and lowering price.⁶

In this article we empirically assess whether Chhattisgarh's major reforms had a causal impact on PDS consumption. Using consumer expenditure data collected by the National Sample Survey Organization (NSSO), we assess the effect of these reforms by measuring the change in PDS rice consumption in Chhattisgarh relative to bordering districts in other states.⁷ We cautiously conclude that the major reforms had a positive impact on the PDS. These reforms likely increased the fraction of households with access to PDS rice, the quantity of PDS rice consumed per household, and the calories obtained per rupee of expenditure on PDS rice. However, the increase in PDS consumption in Chhattisgarh also predates the passage of the reforms of 2004 and 2007 as well as the late 2003 election of the Raman Singh government that initiated them.

The existence of a prior, upward trend in PDS rice consumption does not imply that the major delivery reforms were ineffective. In fact, PDS consumption continued to grow more in Chhattisgarh than in border districts from 2004-05 to 2009-10. This finding is

consistent with survey evidence attributing improved PDS access to the major reforms (Khera 2011b, Puri 2012). However, our findings also suggest that other factors—the willingness of politicians, administrators and civil society groups to target the PDS, the increase in the procurement of PDS rice through the DCP Scheme, and the expansion of FPSs under the Ajit Jogi government from 2000-03—also contributed to the increase in PDS consumption. The question remains whether the post-2003 reforms under the Raman Singh government would be as successful in Chhattisgarh if they were not accompanied by the factors responsible for the prior increase. This is an important consideration in assessing the likely impact of similar reforms in other states or of reforms adopted under the aegis of the NFSB.

Reforms in Chhattisgarh and Bordering States

Changes to PDS delivery in Chhattisgarh began shortly after its formation in 2000. In June 2001, the Ajit Jogi government began to grant licenses to own and operate FPSs to private parties under the Sarvajanic Nagrik Poorti Vitran (SNPV) Scheme. The number of FPSs in the state doubled between 2001 and 2004. By 2004, there were 8637 total FPSs of which nearly 60 percent were privately owned and operated. There was a corresponding increase in complaints against the practices of PDS shops. Of the 1,525 cases registered against FPSs in this period, approximately 1,200 were against private dealers.⁸ The State Advisor for the Supreme Court investigated these complaints and issued a report indicting the role of private dealers in the PDS.

Chhattisgarh also restructured its system of procurement for PDS rice. In 2002, Chhattisgarh began to participate in the decentralized procurement scheme (DCP), in which state governments procure rice and wheat directly from local farmers at a minimum support price (MSP) and obtain reimbursements from the central government. From 2002 to 2010, rice procurement rose from 1.5 million metric tons to 5.1 million metric tons, an increase of 340%.⁹

By 2004, the political tides had turned against privatization. A committee led by the Principal Secretary of Food and Civil Supplies investigated food security issues for vulnerable communities in tribal districts in Chhattisgarh.¹⁰ The committee's investigation led it to cancel private FPS licenses in six tribal districts in the state and to turn private FPSs over to community groups to operate.¹¹ The Raman Singh government then promulgated the 2004 Public Distribution (Control) Order, which discontinued the operation of Fair Price Shops (FPSs) by private dealers everywhere in the state and permitted operation only by Gram Panchayats, cooperative societies, self-help groups, and forest protection committees.

The Order contained a number of other reform provisions: delivery to FPSs should take place by the first week of the month, specific allocations to FPSs should be disclosed to Gram Panchayats and other local bodies, and inspections and social audits should take place within specified intervals. The government subsequently introduced measures to increase the financial viability of FPSs by providing an interest free loan of Rs. 75,000 for each FPS and increasing the commission on items sold from Rs. 8 to Rs. 45 per quintal. By 2009, the number of FPSs in Chhattisgarh had grown to 10,400.¹²

Chhattisgarh also increased the coverage of the PDS. The Mukhyamantri Khadyann Sahayata Yojana (MKSY) scheme, launched in April 2007, provided ration cards to households that were below the poverty line (BPL) in either the 1991 or 1997 BPL surveys, but had been excluded from the 2002 survey. This increased the number of households who were eligible to receive rations by nearly 20 lakhs. Finally, there were a number of smaller reforms that occurred after 2004, including sending "SMS alerts" to report grain movements to citizens who registered to receive them, using electronic weighing machines for rations, visibly marking households to indicate the rations they were receiving, and publicly displaying a list of all ration card holders at the FPS.

Stakeholders in Chhattisgarh credit the reforms implemented after 2004 with improving the PDS over the past decade (Puri 2012). Approximately 95% of survey respondents in 2009-10 reported receiving their full grain ration, and the vast majority of respondents

reported that they did not receive poor quality grains, the FPSs followed a fixed operating schedule, and they were overwhelmingly happy with the operation of the PDS (Khera 2011b). The process of reform in Chhattisgarh continues. The Food Security Act of 2012 further expands PDS eligibility and rations, and it continues other reform features such as “door step delivery” to FPSs, Gram Panchayat and SHG operation of FPSs, and social audits.

To the best of our knowledge, states with districts that share a border with Chhattisgarh did not undertake comparably comprehensive PDS reform from 2000 to 2010. The one exception to this observation is that Uttar Pradesh, Madhya Pradesh, and Orissa all participated in the DCP scheme prior to 2004.¹³ Although there could be smaller changes affecting the efficiency of the PDS in neighboring districts, during the time period under analysis there were far fewer large, observable changes to the PDS in neighboring states than in Chhattisgarh. A search of news stories in the *Times of India* and the *Hindu* from 1998 to 2004 reveals little evidence of large-scale reforms in neighboring states. Although there were some reforms in neighboring states—Madhya Pradesh and Orissa¹⁴ lowered PDS prices in 2008—these reforms were less sweeping than the Chhattisgarh reforms and occurred well after 2004.

Data and Estimation

We utilize data from the 55th, 61st, and 66th rounds of the Consumer Expenditure survey conducted by the NSSO. Each survey tracks household consumption of rice obtained from the PDS over the previous thirty days. Table 1 summarizes the number of households in each survey.

Table 1. Number of Households Sampled by Region

	Chhattisgarh	Bordering Districts ¹⁵	Rest of India
1999-2000 (55th Round)	2292	3316	113,711
2004-05 (61st Round)	2796	3994	116,939
2009-10 (66th Round)	2232	3295	95,328

Notes: We use the Type-1 66th Round of the survey, which keeps the recall period consistent with previous rounds. The observations for Chhattisgarh in the 55th round represent the number of observations in the districts that would later become Chhattisgarh.

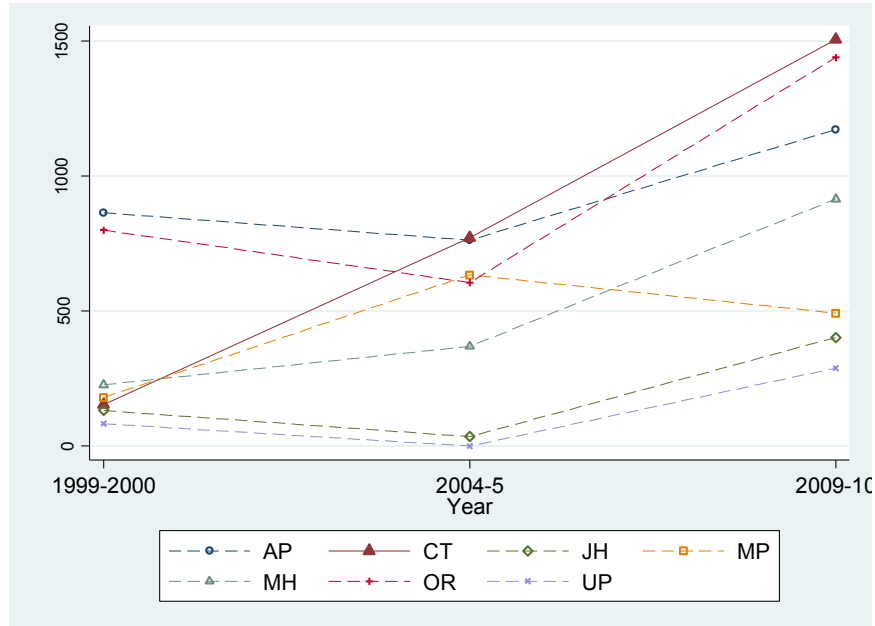
For our analysis, we calculate two different measures of PDS consumption:

- (1) “PDS Rice Utilization” - the share of households reporting any PDS rice consumption
- (2) “PDS Rice Calories” - the total PDS rice calorie consumption per household per day¹⁶

We compare PDS consumption in Chhattisgarh after the reforms beginning in 2004 to PDS consumption in Chhattisgarh prior to those reforms. While this comparison provides suggestive evidence for the contribution of those reforms, some of the measured change in PDS consumption might be due to an underlying trend or to shocks that were common to the entire region or the country as a whole. Therefore, we also compare the change in PDS consumption in Chhattisgarh to changes in neighboring districts. This helps to ensure that policy changes or other shocks to the entire region or country are not driving the results. To be valid, this comparison assumes that absent the reforms, the forces driving PDS rice consumption are similar across state boundaries.

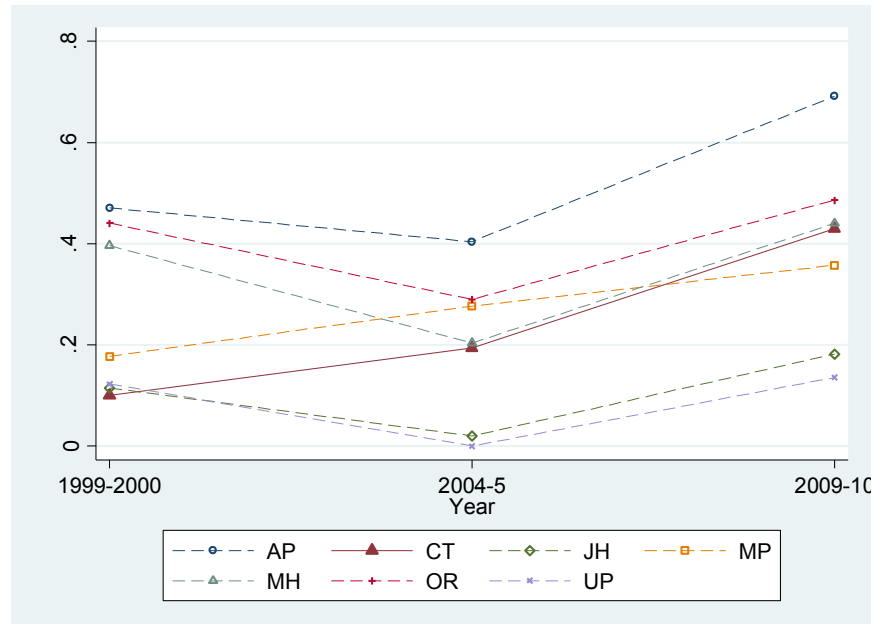
Consistent with this assumption, our search of the government, media, and academic sources reveals little evidence of systematic PDS reforms in neighboring states for most of the time period we study. Figures 1 and 2 demonstrate that trends in PDS consumption across time in districts bordering Chhattisgarh—grouped by individual states—are nearly identical. This similarity across bordering districts is consistent with the assumption that none of these states systematically altered their PDS relative to the others. In contrast, Chhattisgarh is a clear outlier in PDS consumption in both of those figures.

Figure 1. Average PDS Rice Calories in Chhattisgarh and Border Districts



Notes: This figure presents average daily household rice consumption in Chhattisgarh (CT) and border districts over time. The average of border districts are grouped by state- Andhra Pradesh (AP), Jharkhand (JH), Madhya Pradesh (MP), Maharashtra (MH), Orissa (OR), and Uttar Pradesh (UP).

Figure 2. Average PDS Rice Utilization in Chhattisgarh and Border Districts



Notes: This figure presents average daily household rice utilization in Chhattisgarh (CT) and border districts over time. The average of border districts are grouped by state- Andhra Pradesh (AP), Jharkhand (JH), Madhya Pradesh (MP), Maharashtra (MH), Orissa (OR), and Uttar Pradesh (UP).

In the main text of the paper, we present an analysis of simple differences in means. We compare changes in PDS consumption in Chhattisgarh to changes in bordering districts and in the rest of India.¹⁷ In the Methodology section contained in the Appendix, we discuss estimation issues that relate to stratified sampling in the NSSO surveys, omitted household determinants of PDS consumption, and heterogeneity in the effect of PDS reforms on households. Each of the findings presented below remains qualitatively similar when we condition our analyses on household characteristics available in the NSSO survey and district fixed effects. These characteristics include monthly per capita expenditure, religion, whether a household belongs to a Scheduled Caste, Scheduled Tribe, or an Other Backward Class, whether a household receives any public benefit besides PDS food grains, and other household-level characteristics.

PDS Rice Consumption from 1999-2000 to 2009-10

Households in Chhattisgarh increased their consumption of PDS rice dramatically between 1999-2000 and 2009-10. This increase is substantial relative to bordering districts and to the rest of India. Table 2 illustrates these changes.

Three features of the data stand out.¹⁸ First, prior to the formation of the state, PDS Rice Utilization (.100) and Rice Calories (153.7) in districts that later became Chhattisgarh were far lower than in neighboring districts and the rest of India.¹⁹ Second, both PDS measures increased in Chhattisgarh over this time period. From 1999-2000 to 2009-10 Rice Utilization increased from .10 to .33, and Rice Calories rose by about 1200 calories per day. By 2009-10 Chhattisgarh catches up with border districts and overtakes the rest of India.

Third, these changes in Chhattisgarh are much larger than the changes in both border districts and the rest of India over this same period. PDS Rice Participation increased by .206 more than in bordering districts (.33 less .124). Households in Chhattisgarh also increased PDS Rice Calories by 848.3 per day more than households in bordering

districts (1352.2 – 503.9). These patterns are even more pronounced when comparing the growth in Chhattisgarh to the rest of India.

Table 2. PDS Rice Utilization and Calories

PDS Rice Utilization:	(1)	(2)	(3)	(4)
	1999-2000	2009-10	Difference: (Column (2) - Column (1))	Observations
Chhattisgarh	.100 (.006)	.430 (.010)	.330 ^{***} (.025)	4524
Border Districts	.342 (.008)	.466 (.009)	.124 ^{***} (.031)	6611
Rest of India	.275 (.014)	.316 (.016)	.041 ^{***} (.001)	209,039
PDS Rice Cal:				
Chhattisgarh	153.7 (14.7)	1505.9 (87.4)	1352.2 ^{***} (77.9)	4524
Border Districts	519.6 (90.7)	1023.5 (103.7)	503.9 ^{***} (70.7)	6611
Rest of India	579.5 (56.2)	709.0 (53.6)	129.5 ^{***} (43.4)	209,039

Notes: Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, where ***/**/* denoting statistical significance at the 1% / 5% / 10% level.

These figures demonstrate that PDS rice consumption grew substantially in Chhattisgarh, both on its own and in comparison to bordering states and the rest of India. This growth is consistent with the explanation that reforms in Chhattisgarh had a large and positive causal effect on PDS rice consumption. Although the patterns are similar, the growth of PDS rice consumption in Chhattisgarh was far larger than the growth of PDS wheat consumption. Rice is the staple food grain in the region, and other studies have found that that PDS rice consumption is a better proxy for overall PDS consumption (Puri 2012). As a result, we focus on differences in PDS rice consumption.²⁰

Decomposing the Effect of PDS Reforms

We should be cautious in attributing the growth in PDS rice consumption in Chhattisgarh to reforms that took place after 2004. The increase in both PDS utilization and rice calories consumed began *prior* to 2004. Table 3, Column 2 includes figures for 1,394 households surveyed in Chhattisgarh during the first half of the 61st Round in 2004, but before the enactment of the major reforms.²¹

Table 3. PDS Rice Utilization and Calories Before and After 2004

PDS Rice Utilization:	(1)	(2)	(3)	(4)	(5)	(6)
	1999-2000	2004	2005	2009-2010	Difference 1: Col. (2)- Col. (1)	Difference 2: Col. (4)-Col. (2)
Chhattisgarh	.100 (.006)	.194 (.046)	.148 (.031)	.430 (.028)	.094 (.057)	.236*** (.057)
Border Districts	.342 (.008)	.251 (.010)	.262 (.040)	.466 (.048)	-.091*** (.031)	.216*** (.026)
Rest of India	.275 (.014)	.202 (.012)	.215 (.014)	.316 (.016)	-.073*** (.008)	.114*** (.008)
PDS Rice Cal:						
Chhattisgarh	153.7 (14.7)	772.4 (51.1)	508.4 (100.3)	1505.9 (87.4)	618.7*** (40.9)	733.5*** (175.7)
Border Districts	519.6 (90.7)	511.6 (22.1)	534.3 (79.9)	1023.5 (103.7)	7.99 (68.8)	511.9*** (91.0)
Rest of India	579.5 (56.2)	487.4 (42.2)	530.6 (49.5)	709.0 (53.6)	-92.1*** (31.6)	221.6*** (29.0)

Notes: Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, where ***/**/* denoting statistical significance at the 1% / 5% / 10% level.

Between 1999-2000 and 2004, PDS Rice Utilization in Chhattisgarh increased by .094, and PDS Rice Calories increased by 618.7 calories.²² These represent 28% and 46%, respectively, of the total increase in PDS Rice Utilization and PDS Rice Calories in Chhattisgarh from 1999-2000 to 2009-10.

In the period leading up to the major reforms, households in Chhattisgarh also increased their consumption of PDS rice relative to households in bordering districts. From 1999-2000 to 2004, PDS Rice Utilization actually fell from .342 to .251 in bordering districts and from .275 to .202 in the rest of India.²³ PDS Rice Calories were roughly constant in bordering districts and declined in the rest of India. It is likely that the social and political forces behind the absolute and relative expansion of PDS in Chhattisgarh were in place prior to the major delivery reforms of 2004 and 2007.

After the reforms of 2004, the increase in PDS consumption in Chhattisgarh is not as impressive when compared to bordering districts and the rest of India. Although PDS Rice Utilization in Chhattisgarh rose from .194 to .430 from 2004 to 2009-10, it also increased from .251 to .466 in bordering districts over the same time period. The increase in Chhattisgarh is not statistically different from the contemporaneous increase in bordering districts.²⁴ A similar pattern holds for PDS Rice Calories. The increase in Chhattisgarh from 2004 to 2009-10 (733.5) is of similar magnitude to the increase in bordering districts (511.9), even though the difference is statistically significant.

This pattern of change over time in Chhattisgarh and in neighboring districts makes it difficult to estimate the causal effect of the major reforms on PDS consumption. First, the pre-existing trend in PDS consumption in Chhattisgarh suggests that other social and political factors also played a role in the growth of PDS rice consumption. These factors would have operated both alongside and in conjunction with the major reforms as well as other changes to the PDS from 2004 to 2009-10. In the absence of these factors, it is possible that Chhattisgarh would not have witnessed such a large increase in PDS consumption. Reforms undertaken from 2000 to 2003 may also have played a role. PDS rice procurement grew over this period under the DCP, as did the number of FPSs under the SNPV Scheme.

Second, from 2004 onward PDS consumption growth was similar in Chhattisgarh and bordering districts. This indicates the presence of common regional forces that were distinct from Chhattisgarh's particular reforms. In particular, it is likely that the rise in

the market price of rice across the entire country is responsible for part of the increase in PDS rice consumption from 2004 to 2010 that is common to Chhattisgarh, neighboring districts, and the rest of India. Taken together, these findings present a cautionary tale for the NFSB and for states seeking to duplicate Chhattisgarh's success by adopting similar reforms.

Finally, the pattern of PDS Rice Utilization and Rice Calories in Chhattisgarh just after the passage of the 2004 reforms highlights the difficulties of policy implementation in this area. Suppose we compare households surveyed in 2004 and 2005 as part of the 61st Round (Columns (2) and (3) of Table 3). PDS Rice Utilization fell slightly by .046, and PDS Rice Calories fell by 264. In contrast, the 2004 and 2005 figures were roughly constant in bordering districts and in the rest of India. Even though the figures for Chhattisgarh more than rebounded by 2009-10, this short-term pattern is consistent with difficulties in implementing PDS reforms. The 2004 Public Distribution (Control) Order required that all FPSs managed by private dealers change their ownership within a few months. It is plausible that this transition resulted in a temporary interruption of PDS access to households. If even Chhattisgarh, which had the political will to initiate and implement reforms on its own, experienced a short run fall in PDS consumption in this process, then we might expect this fall to be of greater size and duration in states that lack such will but adopt similar reforms.

PDS Rice Consumption Prior to 2004

What is driving the growth in PDS rice consumption in Chhattisgarh prior to the first set of reforms in 2004? Given the available data, it is difficult to precisely identify the forces behind this improvement. Nevertheless, we are able to test two plausible hypotheses. First, the PDS could be easier to operate in a smaller and newer state. For example, transaction costs and monitoring costs might be lower in a smaller state. There also may be fewer entrenched interests to resist policy change. We test this hypothesis by examining PDS rice consumption in two new states—Jharkhand and Uttarakhand—from 1999-2000 to 2004. We find no comparable growth in Jharkhand or Uttarakhand in the

fraction of households consuming PDS rice or in the amount of PDS rice calories consumed per household. We conclude that a small state effect is an unlikely explanation for PDS rice consumption growth in Chhattisgarh over this period.

Table 4. PDS Consumption in Newly Formed States

PDS Rice Utilization:	(1)	(2)	(3)	(4)
	1999/2000	2004	Difference: Col. (2) - Col. (1)	Observations
Chhattisgarh	.100 (.013)	.194 (.046)	.094 (.057)	3685
Jharkhand	.066 (.014)	.019 (.003)	-.047*** (.013)	4586
Uttarakhand	.312 (.081)	.170 (.01)	-.142* (.055)	1877
PDS Rice Cal:				
Chhattisgarh	153.7 (14.7)	772.4 (135.9)	618.7*** (40.9)	3685
Jharkhand	52.8 (11.5)	35.1 (6.96)	-17.7 (11.9)	4586
Uttarakhand	770.7 (240.6)	477.2 (37.2)	-293.5 (175.4)	1877

Notes: Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, where ***/**/* denoting statistical significance at the 1% / 5% / 10% level.

Second, the Raman Singh government may have already identified the PDS as an area where improvement was a priority. Even before 2004 and 2007 reforms were implemented, the government may have been able to improve the operation of the existing PDS system. This explanation also features prominently in the academic literature. Dreze and Khera (2010) conclude, “Ultimately, however, it is political will that seems to matter most. Somehow, the PDS became a political priority in CT and a decision was made to turn it around. When political bosses firmly direct the bureaucracy to fix a dysfunctional system, things begin to change.”

We test this hypothesis indirectly by examining whether there was an increase in PDS rice consumption from 1999-2000 to 2003, prior to the election of the Raman Singh government. We find no increase in PDS Rice Utilization, but we find an increase from

153.7 to 447.3 in PDS Rice Calories.²⁵ We interpret this mean difference cautiously because the 2003 data comes from the 59th Round of the NSS, which differs in its sampling methodology than the 55th Round (1999-2000). The two surveys differ in terms of how they stratify households by income and by rural/urban status. However, our results are similar when we compare PDS consumption by rural/urban and income strata separately, and when we condition on these differences on household characteristics. We conclude that the growth in PDS rice consumption prior to the end of 2004 cannot be attributed to the political will of the Raman Singh government.

What factors are behind PDS consumption growth in Chhattisgarh prior to 2004 remains an open question. The demand for improvements to the PDS by grass-roots organizations and other civil society groups, which was later taken up the Right to Food Campaign, played an important role in focusing public attention on this issue. Reforms may also have played a role. The government took steps to increase the number of FPSs through the SNPV Scheme and to increase the amount of rice it procured from local farmers through the DCP Scheme.

PDS Rice Calories per Rupee

We further investigate the effects of reforms in Chhattisgarh by analyzing changes in the number of PDS rice calories obtained per rupee. Depending on their socio-economic status, households are entitled to different prices for PDS food grains. The 2007 MKSY scheme in Chhattisgarh increased the number of households eligible to receive PDS rice at BPL rates by around 20 lakhs. If the MKSY scheme either (i) increased the proportion of households receiving PDS rice at the lower rates or (ii) increased the amount of rice consumed by households with the lowest rate, then the number of PDS rice calories obtained per rupee should rise.

Consistent with this hypothesis, we find substantial growth in PDS rice calories obtained per rupee spent in Chhattisgarh, both overall and relative to border districts and the rest of India. Table 5 presents the average calories received per rupee spent on PDS rice for

households that consumed any PDS rice. Households in Chhattisgarh received 1,170 more calories per rupee spent on PDS rice in 2009-10 than in 1999-2000, an increase of 175%. The increase in Chhattisgarh was much larger than in bordering districts and in the rest of India. As with PDS rice consumption (Table 3), the districts that would later become Chhattisgarh lagged behind bordering districts in calories obtained per rupee in 1999-2000, but overtook them by 2009-10.

Table 5. Calories per Rupee Spent on PDS Rice

PDS Rice Cal per Rupee:	(1)	(2)	(3)	(4)	(5)
	1999- 2000	2004- 2005	2009- 2010	Difference 1: Col (2)–Col. (1)	Difference 2: Col (3)–Col. (1)
Chhattisgarh	668.2 (43.8)	684.3 (11.5)	1838.1 (67.0)	16.1 (37.5)	1169.9 ^{***} (99.4)
Border Districts	1096.1 (76.2)	682.6 (99.4)	1469.7 (99.4)	-413.5 ^{**} (136.2)	373.6 ^{**} (136.2)
Rest of India	703.3 (21.8)	728.9 (23.4)	1339.9 (96.8)	25.6 (19.1)	636.7 ^{***} (83.1)

Notes: Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, where ^{***}/^{**}/^{*} denoting statistical significance at the 1% / 5% / 10% level.

Almost all of this growth in Chhattisgarh took place after 2004-2005. It is likely that a substantial part of this growth is due to the 2007 MKSY scheme. But we must again be cautious about this attribution because neighboring districts also saw a similar increase over this period, albeit of a smaller magnitude.

There was essentially no change in calories obtained per rupee spent in districts that would become Chhattisgarh or in the rest of India from 1999-2000 to 2004-05. In contrast, this measure fell substantially in bordering districts. This decrease was strikingly uniform across the different states with districts that border Chhattisgarh. This pattern is similar to that of PDS Rice Utilization across Chhattisgarh and bordering districts over this same period (Table 3). It suggests the presence of an unobserved, regional effect that lowered PDS consumption for BPL households that Chhattisgarh was in a better position to withstand.

Conclusion

This article investigates the response of PDS consumption to a series of major reforms in Chhattisgarh from 2004 to 2010. These reforms included transferring FPS management to local bodies, expanding the availability of BPL rations to more households, and introducing auditing and transparency mechanisms for the delivery and receipt of PDS goods. Over this time period, we find large gains in Chhattisgarh in the share of households consuming PDS rice and the average calories of PDS rice consumed per household. These gains are also large relative to districts that border Chhattisgarh. We conclude, with some caveats, that these reforms likely had a substantial, positive effect on PDS rice consumption in Chhattisgarh.

We also find that this increase in PDS rice consumption in Chhattisgarh began before 2004. This pre-existing trend exists whether we consider the growth of PDS rice consumption only in Chhattisgarh or we consider it relative to that of bordering districts. This trend does not appear to be a common pattern for smaller and newly-formed states such as Jharkhand and Uttarakhand. Neither can it be fully explained by unobserved administrative actions taken by the Raman Singh government after coming to power in 2003. Regardless of the causal impact of the major reforms beginning in 2004, the presence of such large increases in PDS rice consumption in Chhattisgarh provides an excellent opportunity to further analyze the effects of in-kind food aid on rates of food insecurity and malnutrition.²⁶ In ongoing work, we investigate the effect of Chhattisgarh's reforms on diet diversity and nutrition.

We also find an increase in the number of PDS rice calories obtained per rupee of expenditure in Chhattisgarh after 2004. We attribute part of this increase to the 2007 MKSY scheme's expansion of access to PDS rice at BPL prices, which likely increased the fraction of households receiving PDS rice at the lowest price. Consistent with this interpretation, we do not find a pre-existing trend for PDS rice calories obtained per rupee in Chhattisgarh. It remained constant prior to 2004, and rose only thereafter.

However, there is also evidence that Chhattisgarh began its improvement on this dimension—relative to bordering districts—before 2004 and that common factors across both Chhattisgarh and bordering districts drove some of the increase after 2004.

Taken together, these results indicate that the increase in PDS consumption in Chhattisgarh was driven both by major reforms undertaken by the Raman Singh government, and by changes to the PDS and other diffuse political and social factors that were present prior to 2004. They also advise caution in extrapolating Chhattisgarh's experience to other reforms at the state or central level. Our findings provide some empirical support for the claim that the NFSB's reforms can increase PDS consumption. They also imply such increases might not be as substantial or as sustained in the absence of comparable political and social effort.

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Appendix: Methodological Issues

There are a number of issues that arise as a result of data limitations and our empirical strategy. First, we rely on surveys of actual PDS consumption rather than purchases. This poses an issue if households over or under-report, or change their actual usage of PDS rice in a way that is systematically associated with the timing of reforms in Chhattisgarh. However, there is no compelling explanation for why these factors would change only in Chhattisgarh and not in bordering districts. Moreover, all other studies

using NSSO consumption data are forced to rely on similar measures (Deaton and Dreze 2008, NSSO 2007).

Second, although our units of treatment are districts, we do not have access to a random sample of households within each district. The NSS consumer expenditure surveys are stratified by whether a household resides in rural or urban area, and further stratified by relative affluence. We are therefore not able to construct population estimates of PDS rice consumption for districts that would later form the state of Chhattisgarh or for border districts in any of the rounds.

This limitation does not invalidate our research design because our goal is to detect *changes* in PDS rice consumption over time, and what matters are changes in sampling procedure. However, the relative size of the rural/urban sample is determined by the share of the population that is rural in the 1991 Census for the 55th round, but by the 2001 Census for the 61st and 66th rounds. Thus, differential trends in growth of urban areas could potentially drive differences in average PDS consumption across a pooled sample of rural and urban households. Furthermore, the stratification on relative affluence is slightly different between the 55th round, and the other two surveys.

Nevertheless, by conditioning on flexible functions of these factors, we are able to estimate the average change in PDS rice consumption in Chhattisgarh that cannot be predicted by these factors. All results presented above are identical in these more complete specifications.²⁷ Furthermore, all trends being discussed are identical when divided up by rural and urban areas, and all patterns discussed are identical if we restrict the analysis to particular second-stage strata within which there is random sampling of households (i.e., non-affluent households in the rural sector, non-affluent households in the urban sector, affluent households in the rural sector, etc.). Thus, for simplicity we present means for the pooled sample throughout.²⁸

¹ In its present form, the NFSB would increase the monthly entitlement of food grain to 5 kg per person for “priority” households and 35 kg per household for Antyodaya Anna Yojana (AAY) households. It would expand the fraction of eligible households to include up to 75% of the rural population and 50% of the urban population (accessed June 2013)

http://www.thehindu.com/multimedia/archive/01404/Summary_of_the_Nat_1404267a.pdf

² In particular, Andhra Pradesh (2008), Chhattisgarh (2007-2008), Jharkhand (2010), Madhya Pradesh (2008), Orissa (2008), Rajasthan (2010), and Tamil Nadu (2008) reduced prices for PDS grains and Chhattisgarh (2007), Rajasthan (2010), and Tamil Nadu (2006) expanded coverage. (Khera 2011a)

³ Because of the attention these two provisions have received in academic and policy discussions, we refer to them as the “major reforms.”

⁴ For one example, see an example from the Economist (accessed March 2013)

<http://www.economist.com/blogs/feastandfamine/2012/10/rural-india>

⁵ Accessed March 2013, http://articles.economictimes.indiatimes.com/2010-07-12/news/27568498_1_pds-food-law-food-subsidy-bill

⁶ Accessed March 2013, <http://timesofindia.indiatimes.com/india/supreme-court-seeks-centres-response-on-chhattisgarh-pds-model/articleshow/118804758.cms>

⁷ While these figures are not state-level estimates of PDS growth in Chhattisgarh, as we explain below they can be used to assess the effect of reforms on PDS consumption.

⁸ 9 Government of India, Department of Food and Public Distribution (2006) Best Practices Adopted and New Initiatives Taken in Strengthening of Targeted Public Distribution System in Some States/UTs of India, March 29, 2006, pp. 13.

⁹ Accessed June 2013, <http://www.ipc-undp.org/conference/south-south-learning-event/presentations/Samir%20Garg.pdf>

¹⁰ Accessed June 2013, http://planningcommission.nic.in/reports/genrep/health/SSS_goodprac.pdf

¹¹ The districts were Surguja, Koriya, Jashpur, Kanker, Dantewada, and Bastar.

¹² Accessed June 2013, <http://pib.nic.in/newsite/erelease.aspx?relid=74180>

¹³ Strengthening TPDS, Hindustan Times, Dec. 11 2004.

¹⁴ In Orissa, the state government took over the system of storage and distribution of food grains in 2011.

¹⁵ The districts that border Chhattisgarh are listed as follows. From Andhra Pradesh- Karimnagar, Khammam, Warangal; from Jharkhand- Garhwa, Gumla, Simdega; from Madhya Pradesh- Anuppur, Balaghat, Dindori, Shahdol, Sidhi, Singrauli; from Orissa- Bargarh, Jharsuguda, Kalahandi, Koraput, Malkangiri, Nabarangpur, Naupada, Sundargarh; and from Uttar Pradesh- Sonbhadra.

¹⁶ We calculate the calories consumed from PDS food grains by multiplying total kilograms consumed by the average calories per kilogram, as given by the *Nutritive Values of Indian Foods* (Gopalan et al. 1989).

¹⁷ The results are robust to the use of other regions as a comparison region as well. In particular, the results are robust to using Madhya Pradesh as the comparison region.

¹⁸ The mean differences discussed below continue to be economically and statistically significant when we condition on household characteristics available in the NSSO survey and district fixed effects. These results are available from the authors on request.

¹⁹ Each of these differences are statistically significant at the 1% level. Although we do not report the associated standard error of each of the estimates comparing the increases in PDS in one region to another, all differences highlighted in the main text are either statistically significant, or at least border conventional levels in these simple estimates and are statistically significant in more complete specifications. Standard errors are available from the authors upon request.

²⁰ Estimates for PDS wheat utilization and wheat calories are available from the authors on request.

²¹ The survey was conducted between June 2004 and June 2005, with 1393 households in Chhattisgarh surveyed in 2004 and 1403 surveyed in 2005. The survey included all districts, as well as all income and sector strata, in both 2004 and 2005.

²² Although the change in the share of households consuming any PDS rice only borders conventional levels of statistical significance, the estimate becomes much more precise when adding control variables and fixed effects to help absorb omitted factors.

²³ Both the growth in the share of households consuming PDS rice and growth in the number of calories obtained from PDS rice in Chhattisgarh are statistically different from the growth figures for bordering districts and for the rest of India at the 1% level.

²⁴ The increase in Chhattisgarh is not statistically different from the increase in bordering districts even when we condition on household characteristics and district fixed effects.

²⁵ These estimates are available from the authors upon request.

²⁶ We are currently in the process of constructing these estimates, and extending results presented in Kochar (2005), Tarozzi (2005), Jensen and Miller (2011), etc.

²⁷ All results using such flexible regression specifications are available from the authors on request, as is the econometric model of the population estimand.

²⁸ All results broken up by rural/urban and by second stage strata are available from the authors upon request.