Reforming Food Subsidy Schemes: Estimating the Gains from Self-targeting in India

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Abstract

1. Introduction

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self-targeted

voluntarily

welfare-improving *revenue-neutral*

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magnitude

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2. Theoretical Framework

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marginal

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$$\Delta W = -\left(\frac{dp}{dr}\right)\sum_h \eta_h q_{\ h} - \left(\frac{\partial p}{\partial r}\right)\left(\frac{dr}{dr}\right)\sum_h \eta_h q_{\ h} - \left(\frac{dp}{dr}\right)\left(\frac{dr}{dr}\right)\sum_h \eta_h q_{\ h} \qquad (\ )$$

$dr\ dr$

$(\ -r\ )^-(\ -r\ )$ $\qquad w_{ih} = (p_i q_{ih}\ x_h)$ $\qquad p\ p$ $\qquad dr\ dr =$

h $\qquad\qquad i$ $\qquad\qquad\qquad i$

$$-\left(\frac{dp_i}{dr_i}\right)\sum_h \eta_h q_{ih} = \sum_h \eta_h q_{ih} c_i = \frac{1}{(\ -r_i)}\sum \eta_h p_i q_{ih} = (\ -r_i)^-\sum \eta_h w_{ih} x_h$$

$$w_i^{\varepsilon} = \frac{\sum_h \eta_h w_{ih} x_h}{\sum_h x_h}$$

w_i^{ε} $\qquad\qquad \eta_h w_{ih}\ (\qquad\qquad\qquad\qquad\qquad)$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad w_i^{\varepsilon}$

$$x = \sum_h x_h \big/ H$$

$$-\left(\frac{dp_i}{dr_i}\right)\sum \eta_h q_{ih} = (\ -r_i)^-\sum \eta_h w_{ih} x_h = (\ -r_i)^-\ H w_i^{\varepsilon}\ x$$

$$\eta_h = (x_h\ n_h)^{-\varepsilon}$$

$$w_i^{\varepsilon} = \sum_h \left(\frac{x_h}{n_h}\right)^{-\varepsilon} w_{ih}\frac{x_h}{\sum_h x_h}$$

$\varepsilon = \quad w_i^{\varepsilon}$ $\qquad\qquad\qquad\qquad (\qquad\qquad\qquad\qquad\qquad\qquad)$

i $\qquad\qquad\qquad\qquad\qquad\qquad\qquad \varepsilon \neq \quad w_i^{\varepsilon} \qquad\qquad \varepsilon$

$dr\ dr$

$$\Delta W = Hx\left[\frac{w^{\varepsilon}}{(\ -r)} + \frac{w^{\varepsilon}}{(\ -r)} + \left(\frac{dr}{dr}\right)\frac{w^{\varepsilon}}{(\ -r)}\right] \qquad (\ )$$

ε

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$(\quad dr\ dr\ )$

k

$$w_k = a_k = \beta_k \quad x + \sum_i \theta_{ki} \quad p_k \qquad (\ )$$

$(\ )$ $\qquad dr\ dr$

$$S_i = \sum_h (c_i - p_i) q_{ih} \qquad S_i \qquad\qquad\qquad i$$

$$S_i = \sum_h (\ - r_i)^- r_i p_i q_{ih} = \sum_h (\ - r_i)^- r_i w_{ih} x_h$$

$$S = \sum_i \sum_h (\ - r_i)^- r_i w_{ih} x_h \qquad (\ )$$

$$\Delta S = \sum_{i=} \frac{\partial S_i}{\partial r} + \sum_{j=} \sum_{i=} \frac{\partial S_i}{\partial r_j} \frac{dr_j}{dr} \qquad (\ )$$

$$\Delta S =$$

$$\frac{dr}{dr} = -\frac{\sum_{i=}\left[\dfrac{\partial S_i}{\partial r} + \dfrac{\partial S_i}{\partial r}\dfrac{dr}{dr}\right]}{\sum_{i=}\dfrac{\partial S_i}{\partial r}} \qquad (\ )$$

$r =$ $\qquad\qquad$ $(\ )$

$\partial S\ \partial r\ +\ (\partial S\ \partial r\ )(dr\ dr\ )$ $\qquad r =$ $\qquad \partial S\ \partial r = (\ - r\ )^- r \sum_h$

$x_h(\partial w_{\ h}\ \partial r\ )$ $\quad \partial S\ \partial r = (\ - r\ )^- r \sum_h x_h(\partial w_{\ h}\ \partial r\ )$

$(\ )$ ΔS $\quad \Delta S$

$$\Delta S = \frac{\partial S}{\partial r} + \frac{\partial S}{\partial r}\frac{dr}{dr}$$

$$= (\ - r\ )^- \sum_h w_{\ h} x_h + r(\ - r\ )^- \sum_h x_h\left(\frac{\partial w_{\ h}}{\partial r}\right)$$

$$+ r(\ - r\ )^- \sum_h x_h\left(\frac{\partial w_{\ h}}{\partial r}\right)\left(\frac{dr}{dr}\right)$$

$(\ )$

$$\frac{\partial w_{ih}}{\partial r_j} = \frac{\partial w_{ih}}{\partial\ p_j}\frac{\partial\ p_j}{\partial r_j} = \frac{-\theta_{ij}}{- r_j} \qquad (\ )$$

$(\quad)$ $\qquad\qquad (dr\ dr\ )$

$$\Delta S = (\ - r\ )^- \sum_h w_{\ h} x_h - r(\ - r\ )^- \sum_h x_h(\theta\ + \theta\ )$$

$$w_i = \sum_h w_{ih} x_h \ \sum_h x_h \qquad\qquad x$$
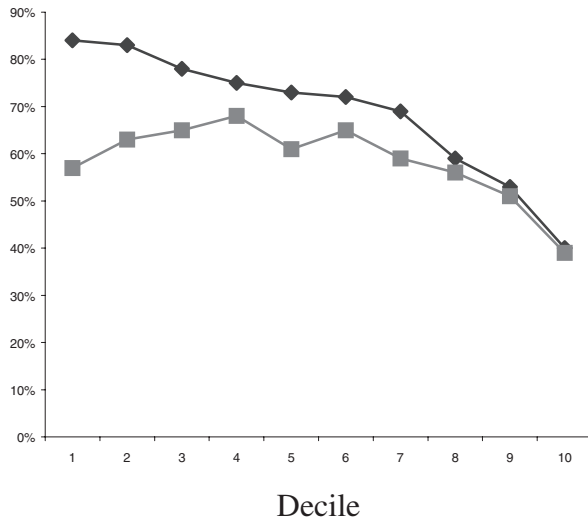
$$\Delta S = (-r)^- Hw\, x[\ +(r/w)(\theta\ +\theta\ )] \qquad (\quad)$$

$$(\quad)$$

$$\Delta S = (-r)^-(-r)^- Hw\, x[\ +(r/w)(\theta\ +\theta\ )] \qquad (\quad)$$

$$(\quad)\ C \qquad D$$

$$D=\sum_{i=}\frac{\partial S_i}{\partial r}=\left[\sum_{h} W_h x_h(-r)^- + r(-r)^- \sum_{h} x_h\left(\frac{\partial W_h}{\partial r}\right)\right]$$
$$+\left[r(-r)^- \sum_{h} x_h\left(\frac{\partial W_h}{\partial r}\right)+r(-r)^- \sum_{h} x_h\left(\frac{\partial W_h}{\partial r}\right)\right]$$

$$(\quad) \qquad\qquad r =$$

$$D=\left[\sum_{h} W_h x_h - s(-s)^- \sum_{h} x_h\theta\ (-s)^- - s(-s)^- \sum_{h} x_h\theta\ (-s)^-\right]$$

$$D= Hw\, x\left[\ -s(-s)^- (\theta\ /w)-s(-s)^- (\theta\ /w)\right] \qquad (\quad)$$

$$(\ )(\ ) \qquad (\ ) \qquad\qquad dr\ dr \quad (\ )$$
$$(\ )\ C \qquad\qquad (\ )(\ ) \qquad (\ )$$

3. The PDS in Andhra Pradesh and Maharashtra

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$$(\qquad\qquad)$$

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C

Decile

Figure 1. PDS Use by Decile Group in Rural Sectors (diamonds: Andhra Pradesh; squares: Maharashtra)

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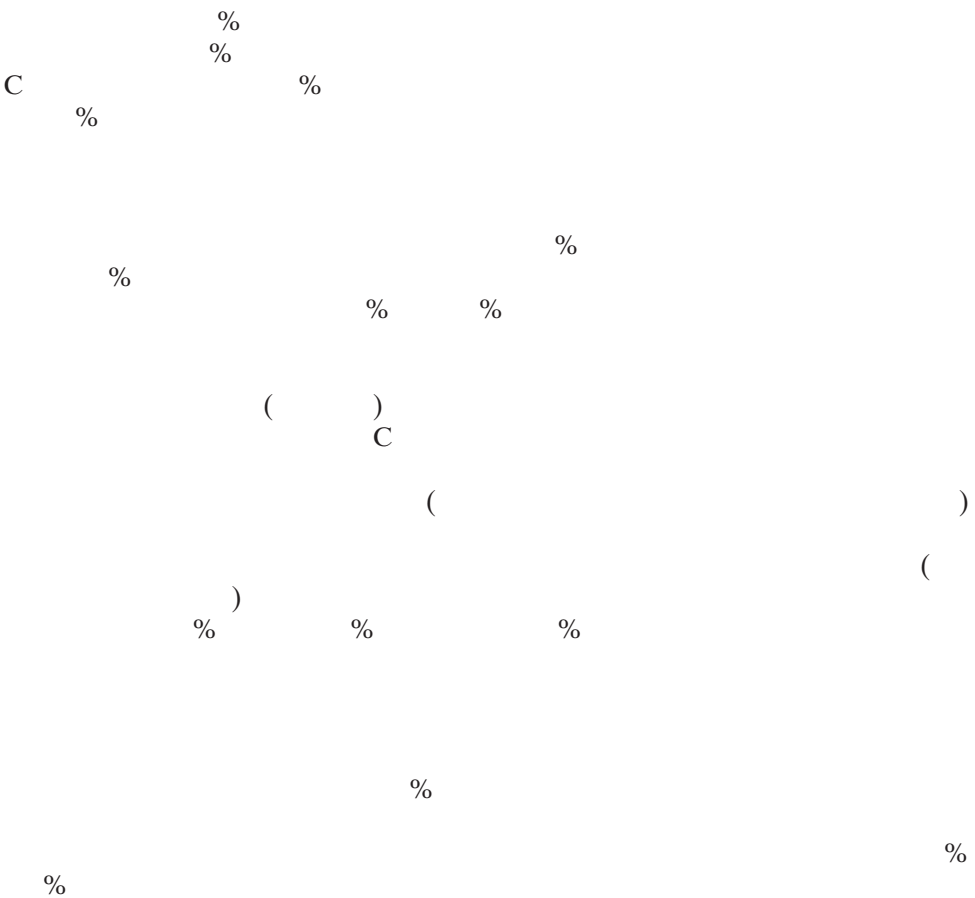(   )

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Table 3. Average Household Budget Shares by Decile Groups in Maharashtra (percentages)

Decile group	Rural			Urban		
	Subsidized rice	*Subsidized wheat*	*Coarse cereals*	*Subsidized rice*	*Subsidized wheat*	*Coarse cereals*

Source   ,

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4. Measuring Demand Res onses

k

$$w_k = a_k = \beta_k \quad x + \sum_i \theta_{ki} \quad p_k \qquad\qquad (\ )$$

(   )

(   )

C ( )

$$\theta \ + \theta$$

k

$$\sum_{l} \theta_{kl} + \beta_k =$$ ( )

( ) $\theta \ + \theta \ = \sum_{l \neq} \ \theta_{l} + \beta$ ( )

$$\theta \ + \theta$$

$$\sum_{l \neq} \ \theta_{l} + \beta$$

( )

( ) ( )

unit value *price*

( )

$$w_{khc} = a_k + \beta_k \quad x_{hc} + \gamma_k z_{hc} + \sum_{i} \theta_{ki} \quad p_{kc} + (f_{kc} + \varepsilon_{khc})$$ ( )

k h c z_{hc}

f_{kc} ε_{khc}

$$v_{khc} = \ p_{kc} + \eta_{khc}$$ ( )

v η

( ) ( )

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,

$\theta_{ki} = \qquad i \neq k$

$\beta_k \qquad \gamma_k$

$y_{khc} \equiv w_{khc} - \beta_k \quad x_{hc} - \gamma_k z_{hc}$

( ) $\qquad\qquad$ ( )

( )

h

( ) $\qquad\qquad\qquad$ (

) $\qquad\qquad\qquad\qquad\qquad \delta$

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$\delta \qquad\qquad\qquad$ ( )

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C $\qquad\qquad$ ( ) $\qquad\qquad\qquad\qquad$,

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f_c

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$\beta_k \qquad \gamma_k \qquad\qquad\qquad\qquad kc \qquad\qquad e_{khc}$

( ) $\qquad\qquad\qquad\qquad\qquad\qquad\qquad n_{khc}$

(kc

5. Results

$$\frac{\Delta W}{Hx} = \left[\frac{w^{\varepsilon}}{(\ -r)} + \frac{w^{\varepsilon}}{(\ -r)} + \left(\frac{\partial r}{\partial r} \right) \frac{w^{\varepsilon}}{(\ -r)} \right] \qquad (\ \ )$$

( )

r_i p_i c_i

$r =$ p_i

p_i *median*

c_i

economic costs   C

c_i

%

C

%

(w_i^{ε})

ε w_i^{ε}

w_i^{ε}

Table 4. *Subsidy Rates on Rice and Wheat*

	p_i	c_i	c_i	Subsidy rate 1	Subsidy rate 2
( )				%	%
( )				%	%
( )				%	%
( )				%	%

Table 5. *Socially Representative Budget Shares: Maharashtra*

	Rural			Urban		
ε	Subsidized rice	Subsidized wheat	Coarse cereals	Subsidized rice	Subsidized wheat	Coarse cereals
_						
_						
_						

Table 6. Socially Representative Budget Shares: Andhra Pradesh

ε	Rural			Urban		
	Subsidized rice	Subsidized wheat	Coarse cereals	Subsidized rice	Subsidized wheat	Coarse cereals
_						
_						
_						

Table 7. Subsidy Rate Change in Coarse Cereals due to a Marginal Decrease in Subsidy Rates on Rice and Wheat

	dr dr (subsidy rate 1)	*dr dr (subsidy rate 2)*
	_ ( )	_ ( )
	_ ( )	_ ( )
	( )	_ ( )
	( )	( )

Note

ε

dr dr

dr dr

(%)

ε

Table 8. Estimated Welfare Effects: Maharashtra

Sector	ε	DW (subsidy rate 1)	DW (subsidy rate 2)
		– ( )	– ( )
	–	– ( )	– ( )
	–	– ( )	– ( )
	–	– ( )	– ( )
		– ( )	– ( )
	–	– ( )	– ( )
	–	– ( )	– ( )
	–	– ( )	– ( )

Note

Table 9. Welfare Effects in Andhra Pradesh

dr dr	AP urban (ε =)	AP urban (ε =)	AP rural (ε =)	AP rural (ε =)
–				
–				
–			–	–
–	–	–	–	–

unambiguously

dr dr

dr dr

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6. Conclusions

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Notes

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Economic Survey
Economic Survey (   )