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Macro-Economic Policy Outcomes and Agriculture Relation between Fiscal Deficits and Investment in Agriculture

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Abstract:

In an earlier paper (Alagh, Munish, 2011) it was shown that macro economics matters in agriculture. The relevance of understanding the impact of macro-economic policy on agriculture was outlined, A forecasting exercise detailed the structure and response of supply to prices in the non foodgrain sector of the economy. The market and more generally macroeconomic policy impacts on agriculture needed to be understood. This is reviewed in this paper and it proceeds onwards from there to show that within macroeconomic policy specific policies such as an appropriate fiscal-monetary policy mix is relevant for the economy, and that fiscal policy should be seen as a process. It is shown that fiscal overspending outside agriculture should be curbed. The composition of fiscal policy relating to agriculture particularly public investment and subsidies is studied. It is seen that periods of sustainable deficits are periods of rising public investment in agriculture. ICOR's are rising but less in the public sector suggesting externalities. Crowding in of private investment seems likely. Following this the political economy of fiscal policy in agriculture is briefly reviewed.

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Introduction

In this paper we examine the following assertions

- *Deficit outside agriculture leads to an increase in unproductive investment (give aways) vis-à-vis productive investment in agriculture. The paper analyses the arguments of Chambers and Just (1987) with an Indian perspective in order to examine this macroeconomic proposition.*
- *Decline in Economy-wide Deficits can be seen to be correlated with increase in agricultural investment. Experience in the post liberalization phase is examined to test this hypothesis.*
- *Epochs of high and sustainable deficits are delineated and the effect on capital formation in agriculture estimated*
- *Public Investment in Agriculture can be crowding in. We relook Errol D'Souza (2008) with a sectoral perspective (agriculture) to examine this assertion.*

The Link with Earlier Work

In the earlier paper (Alagh, M., 2011c), macroeconomic linkages with agriculture were focused on. Alternative ways of looking at Indian agriculture were differentiated. The question that emerged is: Is there a structural constraint in Indian agriculture or does Indian agriculture work in a system in which as demand rises and prices rise, on account of macro economic reasons, supply responds. The constraints could be institutional or policy determined in the food grains part of the economy, with the non food grain economy being responsive to market and non price factors mattering particularly in that part of agriculture not responding to prices.

These kinds of general hypotheses required an analysis of macroeconomic policy particularly of trends and impacts of government expenditure and money supply. What are the impacts of such policies on agricultural prices and interest rates for agriculture? How do they impact on agricultural demand, supplies and investment? Do monetary shocks and budget deficits affect farm output and the farm-non farm price ratio? It was noted that these kind of questions have gained urgency in recent discussions both of agricultural and macro policies. In evaluating the impact of macroeconomic policy changes, the mix of monetary and fiscal policies has to be evaluated. Does monetary policy at the national level have an influence on farm credit programs, does fiscal irresponsibility outside agriculture lead to budget excesses in agriculture, so should fiscal overspending outside agriculture be the target variable to be controlled? The impact which macroeconomic policies have on the nature and range of agricultural policy options was well documented in American and international literature.

The relevance of the approach was illustrated in a macroeconomic partial equilibrium framework of an important agricultural outcome. If expansionary/contractionary macro policy (Monetary-Fiscal policy mix) led to rise/fall in money income, it would impact significantly on agricultural demand. Did this then lead to fluctuations in agricultural supply? There were many ways to analyze this kind of question. We used a partial economy framework using lags to help the specifications of our model.

The question of the farm nonfarm price ratio as determined by macro features came up consistently and was a central issue in our literature review. Purapre Balakrishnan had an erudite refutation of the farm non farm price ratio determining agricultural supplies for an early period. We showed that the picture changed for the period since 1980. Prices and in turn the macro factors which drive them mattered. These results were used to argue that we can use them for forecasting purposes in the remaining part of this decade, the analysis of which would be critical for policy say in the Twelfth Plan (See, M.Alagh, 2011b). Structural estimates and the causal chain system were used to do a forecasting exercise.

The forecasting model took the actual acreage and output numbers in each year and predicted the next years. The model could have been used to give smooth forecasts for a number of years. But that was not the motivation since this was not a model of long term growth. It was intended to predict the consequences of macro policies on agricultural output in the sense in which the major studies in the literature review do (Belongia, Just and Chambers, etc.). What it said was that if the economy is contracted or expanded, that will have an impact on farm/non farm price ratios and in turn determine output in the next year given the lags in acreage response. It would be also possible in this structure to work out the farm-non farm price ratio with which food inflation was avoided in the next year.

The direction of change was largely predicted correctly by the graphs. They also predicted downturns and upswings or the direction of the cycle. In many years the numbers were close to the actuals. This was demonstration that macro policies impact agriculture in a significant manner. The work had possibilities for further understanding of macro policy impacts on agriculture. These are outlined in this paper.

Specific Macroeconomic Policies and the Fiscal Monetary Mix

Using a closed economy macro economic framework consider a debt, interest rate and growth formulation (D'souza, 2008, pp.329-30):

If $b_t = B_t/Y_t$, the debt-GDP ratio.

$d_t = D_t/Y_t$, the primary deficit/gdp ratio.

and the one period growth rate of GDP is $g = Y_t - Y_{t-1} / Y_{t-1} = Y_t / Y_{t-1} - 1$

Or $1 + g = Y_t / Y_{t-1}$

Then we can rewrite the Government Budget Constraint as $B_t = (1+r) B_{t-1} + D$

Where r =interest rate, B_t =Debt and D_t =Primary Deficit, as

$$b_t = (1+r/1+g)b_{t-1} + d_t \quad (\text{Equation 1})$$

If $g > r$, the debt/GDP ratio will not increase and in that sense the debt/GDP ratio is sustainable.

One can ask at any point in time that (D'Souza, p. 337), if the historically given debt at that time is to be continued at that constant level forever, and if there is no change in interest rates and the growth of GDP, (the current configuration of the economy continues to prevail) what is the primary deficit that can sustain this time path of the economy?

An application of this perspective to government deficits and debt begins by noting that the budget constraint of the government implies that new debt is issued for either if primary expenditures (net of non-debt finance related expenditures such as interest payments and transfer payments such as subsidies) exceed current revenues, i.e., there is a primary deficit or if the government must pay interest on existing debt.

This answer is derived from equation 1

$$\text{as } b_t = (1+r/1+g)b_{t-1} + d_t \quad (\text{Equation 1})$$

$$\text{Or, } 1 - (1+r/1+g) b_{t-1} = d_t, \text{ when: } b_t = b_{t-1}$$

$$d_t = (g-r/1+g) b_{t-1} (\text{Equation 2})$$

This gives the primary-deficit/GDP ratio that is required in order to sustain the existing level of debt in the economy. This is a long run concept, derived for a steady state where interest rates and GDP growth do not change. There is in practice no necessity that the growth rate in a period is the steady state growth rate of the economy. This expression makes it clear that the debt-GDP ratio increases because government issues debt to cover a primary deficit and to pay interest on existing debt. If interest rates increase, the government must increase debt by a factor $(1+r)$ to pay the interest on existing debt, which causes a rise in the debt-GDP ratio. But if GDP growth improves $(1+g)$ increases, this increases the tax revenues of the government as taxes increase with GDP resulting in a reduction in the debt-GDP ratio.

Those who believe in the power of fiscal expansions would argue that as the growth rate of the economy picks up and with $g > r$ in the above expression, the debt-GDP ratio will in fact decline and in that sense the current debt- GDP ratio is sustainable. Their belief in the room for fiscal maneuver in the face of a cyclical downturn is based on the

presumption that the debt is sustainable. This was true in the years 2006-2008 when the actual primary deficit/GDP ratio was below the sustainable deficit/GDP ratio (Table 1)

Table 1
Macro Variables 2005/06 to 2009/10

Year	2005-06	2006-07	2007-08	2008-09	2009-10
Debt/GDP	77.44	74.10	71.43	72.11	69.13
Primary Deficit/GDP	.96	-0.01	-1.12	3.39	4.59
Real Interest rate on Central Government Securities (Nominal minus Inflation)	-----	7.89- 6.6=1.89	8.12- 4.7=3.42	7.69- 8.1=-.41	7.23- 3.8=3.53
Growth rate of GDP	-----	9.6	9.3	6.8	8
Sustainable Primary-Deficit/GDP ratio	.56	.42	.66	.36	

- Note:** 1. Debt/GDP Data for 2009-10 are Revised Estimates and Debt/GDP data for 2010-11 are Budget Estimates
2. Debt/GDP-the percentages are calculated based on the data for GDP at current market prices with base year 2004-05
3. Debt/GDP data are from Table 237, R.B.I., Handbook of Statistics, 2011.
4. Primary Deficit/GDP Data for 2009-10 are Revised Estimates and data for 2010-11 are Budget Estimates.
5. Negative (-) sign for Deficit indicates surplus
6. Percentages are calculated based on the data for GDP at current market prices with base year 2004-2005
7. Deficit/GDP is from Table 236, R.B.I., Handbook of Statistics, 2011.
8. Interest Rate on Central Government Securities is from Table 119, Handbook of Statistics, 2011. Wholesale Price Index (Average of Weeks) - Annual Variation is from Table 232, Handbook of Statistics, 2011.
9. Growth Rate of GDP-TABLE 224: Select Macro-Economic Aggregates - Growth Rates and Investment Rates (At Constant Prices) Handbook of Statistics on the Indian Economy 2011 Data for the last three years are provisional, quick and revised estimates respectively.

The primary deficit/GDP ratio was sustainable in these years (2006-08) because the primary deficit in these years was low

Clearly this analysis for a period after the illustrations in De Souza itself, the conclusion can be reached that “policy should not be seen as an event but rather as a process.” (Errol D’Souza, 2005, p.1488). The real issue for this paper is the relation of all this with agriculture.

Getting back to the main theme, the place to attack fiscal deficits may be outside agriculture rather than focus on lowering public investment in agriculture which may harm agriculture. (Chambers and Just, 87). Like in the US in India too some have recognized that fiscal deficits can have severe consequences for agriculture (Storm, 1992), but there has been little analysis of the way in which deficits impinge on agriculture. In this paper we first adapt Chamber and Just to the Indian agricultural economy. Fiscal irresponsibility in a nonagricultural sector of the economy can lead to increased spending on government expenditure on agriculture when Minimum Support Prices are fixed in nominal terms. The chain of reasoning is simple. Overspending in a nonagricultural sector of the economy raises a deficit that must be financed and financing the deficit requires higher interest rates and exchange rates both of which depress prices for exportable agricultural commodities. Falling market prices thus cause higher expenditure from government for farmers (Compensatory Government Support Expenditure) and probably higher expenditures on farm programs because the decreasing market prices for the farmer are accompanied by fixed minimum support prices. The place to attack budget excesses in agriculture might be outside of agriculture rather than in instituting drastic cuts in government support to agriculture which may help the budget but ultimately damage long-run competitiveness in world markets.

This analysis Chambers and Just (87) assumes that the budget is intertemporally constrained so that any current flow deficit must be made up in a later period. This is done using a three period model where the case of a flow deficit in the first period is compared to the case of a period-by-period balanced budget. Relatively more spending in the first period than in the balanced budget case is referred to as "overspending" or "fiscal irresponsibility." Here the macro economic analysis of deficits as specified in D’Souza

done above is in a sense carried forward for its consequences for the agricultural economy.

In a slight adjustment of Chamber's model we consider two periods instead of three. In our version conceptually, for example, the first period corresponds to the 1991-2004 period in India during which deficits were high. The second period represents the remainder of the 2000-2010 decade during which actions to repay some of the cumulative budget deficit were necessary. Analytically these necessary future adjustments are integrated into the model by requiring an intertemporally balanced budget. In other words, the analysis constrains the ending cumulative deficit level.

Specifically, the intertemporal budget constraint is

$B_t=0$, $t=1, 2$, given $t=1=1991-2004$, $t=2=2004-2010$

$$G_t = \hat{G}(M_t, r_t, s_{2t}, \bar{B}_t)$$

G_t is government expenditure in time period t .

s_{it} is the producer price in sector i at time t ,

r_t is the current interest rate.

M_t is the money supply

\bar{B}_t is the preexisting cumulative government deficit in period t

Government expenditures required to balance the current budget depends on the preexisting government deficit, the money supply which determines interest and exchange rates, government revenues raised by the income tax, and expenditures on agricultural subsidies. Because the government possesses several instruments for controlling the deficit, the following three possibilities can be examined for next-period adjustment:

- (a) A reduction in government spending
- (b) An increase in the money supply and
- (c) An increase in the tax rate.

Theoretical Investment and Subsidy Policies

Fiscal and Monetary Policy can play an output and productivity enhancing role. In the discussion on crowding out of investment (Dornbusch, 2004), public investment can also play a crowding in role of investment in the agricultural sector. Errol D' Souza (Errol D' Souza, 2011) has also outlined conditions in which government expenditures can play an output enhancing and productivity expansion role, under specified conditions.

In times of recession deficit financing helps to boost aggregate demand and to reduce unemployment when agents respond slowly to information that enables them to update expectations or when wages or prices are rigid. Aggregate expenditures that result from the debt financing of the deficit can affect the growth rate of the aggregate output of the economy. In national accounts, government expenditure is the sum of consumption and investment expenditure. The link between government expenditures and macroeconomic outcomes when government spending includes public investment also needs working out. Government expenditures on roads, ports, railways, airports, power, irrigation projects and canals, and on public education and health improve the productivity of private factors of production. When the productivity of agriculture improves due to such public investments, agricultural farms are able to produce more output per unit of input. This results in an upward shift of the production function. In turn this results in a shift outwards of the aggregate supply curve for agriculture.

If some portion of the additional government spending be public investment expenditure that enhances the productivity of business enterprises, there are two impacts of the increase in public investment expenditure to consider:

- On the supply side the increase in public investment improves the productivity of business enterprises and increases the potential output of the economy with a rightward shift of the AS (aggregate Supply) curve.
- On the demand side the deficit financed increase in public expenditure shifts the standard IS curve rightward and the aggregate demand curve corresponding to IS is then shifted to the right.

Some private investment and consumption expenditure will have been crowded out due to the rise in the interest rate resulting from this expansionary fiscal policy as in the case of pure government consumption expenditure. The reduction in the stock of private capital as private investment is adversely affected reduces the potential capacity of the output of the economy and will shift the AS curve leftwards. This is because public investment has crowded out and substituted some private investment through raising the cost of capital.

If, however, public investment is complementary to private investment, then, the increase in public investment by virtue of increasing the productivity of private firms induces them to increase their investment expenditure. According to De Souza, the empirical evidence for India is that public investment is complementary to and crowds in private investment. An increase in productivity also increases the marginal product of capital, and induces greater private investment. This will cause the IS curve to shift further to the right.

Let us suppose that the increase in productivity and the increase in the wage rate and incomes from the increased public investment in agriculture induce an increase in interest sensitive private expenditures in agriculture. If this occurs in the net there will be no decline in private investment spending and consequently no decline in the stock of private capital. The leftward shift of the AS curve due to crowding out will be exactly offset by a rightward shift of the AS curve due to crowding in. The general conclusion, however, can be stated in two parts:

(1) As long as the decline in private investment is smaller than the increase in public investment and the marginal product of public capital equals the marginal product of private capital the potential output of the economy as given by the AS curve shifts to the right.

(2) If the decline in private investment is larger than the increase in public investment but the marginal product of public capital is sufficiently larger than the marginal product of private capital, the potential output of the economy as given by the

AS curve still shifts to the right.

The composition of government expenditures is therefore important to the macroeconomic outcome of a deficit financed increase in public expenditure. Debt financed government expenditure is not necessarily a burden on the economy in the sense of crowding out private investment and reducing the potential output producing capacity of the economy. To the extent that the financing of the deficit is for public investment expenditure there are two avenues through which this impacts favorably on agriculture. First, the increase in public investment improves the productivity of agriculture and induces or crowds in private investment spending that offsets some of the crowding out caused by the deficit financing. Second, the increased public investment adds to the public capital stock and this independently of the effect on private investment enlarges the potential output of the economy. A government may then run a deficit and not harm long run economic performance if it devotes a sufficiently large part of its expenditure to public investment and infrastructure spending. The conclusion that deficit financing is associated with crowding out is tempered to the extent that public expenditure is public investment expenditure that improves the productivity and enhances the output of the economy.

Investment, Subsidies and Deficits: Adjustment Difficulties

Hope was placed by scholars like Rao and Gulati and Ahluwalia in the mid-nineties on the fact that required resources for setting up investment in agriculture and rural infrastructure would become available through reduction in large input subsidies. This view proved erroneous as it regarded total investible funds for agriculture as something fixed and ignored the political economy factors which made adoption of a policy of subsidy reduction difficult, it also overlooked the likely impact of the fiscal constraints imposed by rigid targets of reducing gross fiscal deficit which was a major focus of economic reforms. (Richa Singh and AK Singh, 2009).

Declining public investment in agriculture was one of the major factors underlying the deceleration in agricultural growth observed in the post-reform period. It may be seen that in recent years i.e. since 2003-04, public investment in agriculture sector has accelerated leading to a higher share of public sector gross capital formation. It has increased from 17 per cent to 28 per cent; Gross Capital Formation in agriculture has also increased as a proportion of agricultural GDP after 2003-04. Private Investment as a percentage of agricultural GDP also went up (latest CSO estimates private gross capital formation in agriculture as percentage of agricultural gross domestic product greater than twenty percent).

According to Chand and Misra (1995), a number of economists had expressed grave concern about the decline in public sector capital formation in Indian Agriculture during the 1990's. They said that this decline, it has been argued, is not only bad in itself; it also leads to a decline in private capital formation. According to them, it has been contended that the reason for such a thing to have happened lies in the existence of high complementarities between public and private capital formation in agriculture. Chand and Misra take issue with these claims and contentions in particular with the hypothesis of complementarity. In the same vein Purohit and Reddy (2000) argue:

“While it is convincingly argued by Misra and Chand (1995) that the complementarity cannot be determined by a simple causal relationship (positive) between private and public investment. In the same vein we argue that the substitutability of public investment with private investment cannot also be determined by a simple causal relationship (negative in this case) or by looking at the compensatory impact of private investment on the total capital formation in agriculture. In other words, it is not right to say that private capital can replace public investment as long as the total investment continues to grow. One has to understand the implications of public vis-à-vis private investment i.e., the accrual of benefits from these investments. A cursory look at the type of investment by public and private agencies makes it clear that the benefit flows are more equitable, inter and intra regionally, in the case of public investment when compared to private investment. As long as equity aspects continue to dominate our policy agenda, the issue

of complementarity and substitutability between public and private investment in agriculture remain secondary.”

An interesting argument By Chand and Misra (1995) is conclusive:

“The thesis of neglect of agriculture, often voiced in the literature, is in fact baseless. Furthermore, there is nothing disastrous about the fall in the share of a sector in total investment of the economy when its share in the GDP falls. What is relevant is the sectors own rate of investment, which in the case of Indian agriculture has been rising.” And again- “Finally, our argument in the present study has not been against public sector capital formation in agriculture. Our attempt instead has been to examine the problem of its decline during the 1980s in the broader context rather than accept the case based upon the false premise of complementarity with private capital formation.

Public investment in and for agriculture in the form of infrastructure will continue to be important on its own for agricultural growth. Just as public investment in major and minor irrigation systems is necessary and desirable so is public investment in rural roads, power supply systems, input delivery depots and market yards, the former counted as investment in agriculture and the latter for agriculture.”

Levels, Deficits and Efficiency

There is the more general question of a high agricultural capital formation not leading to an adequate growth rate. There has been an increase in ICOR in recent years and the agricultural growth rate has not gone up although investment is growing in agriculture. It can be seen that since 2003 as the primary deficit has gone down more money has gone into investment in agriculture. This confirms Chambers argument above. However, whether efficiency in agriculture has increased or only investment has increased is the question begged to be asked.

This empirical question needs an answer. The spliced (for 99-00) time series of Private, Public and Total gross capital formation is examined together with Agricultural Gross Domestic Product between 90-91 to 2008-09 (Table 2).

Table 2
Gross Capital Formation Overall, Private Sector and Public Sector 1990-91 to 2008-09, three year averages (in Rs Crores at 99-00 prices)

<u>Three Yr average period</u>	<u>Gross Capital Formation Overall different series spliced for 99-2000 prices</u>	<u>Gross Capital Formation in Private Sector different series spliced for 99-2000 prices</u>	<u>Gross Capital Formation in Public Sector different series spliced for 99-2000 prices</u>
90-91 to 92-93	39673	30442	8450
94-95 to 96-97	44079	33470	9625
97-98 to 99-00	46574	38113	8326
2002-03 to 2004-05	55656	44803	10853
2006-07 to 2008-09	86244	66771	19128

Source: Agricultural Statistics at a Glance, different years.

Table 2 shows that the break is in the year 2002 onwards. The levels of public, private and total capital formation in agriculture rise sharply. It is also possible to estimate the relationship between agricultural capital formation and agricultural GDP statistically.

$$\ln Y = -10.81 + 1.557 \ln X$$

$$R \text{ square} = 0.62$$

Where Y = Public Sector Fixed Capital Formation in the Agricultural Sector
X = GDP from Agriculture

Ln is the exponential log and all variables are in 99-00 constant prices (spliced wherever necessary).

The Incremental Capital Output Ratio of public investment in the agricultural sector for the period 1990/91 to 08/09 is 1.56.

So, we get an Incremental Capital Output relation of 1.55 for 1990-91 to 2008-09.

It has been seen earlier that the break in the capital formation series comes in 2002. This relation is therefore estimated for the period 2001-02 to 2008-09. The estimate now is

$$\text{LnY} = -37.22 + 3.58\text{LnX}$$

$$\text{R square} = 0.90$$

The Incremental Capital Output ratio is now estimated at 3.58 for period 2001-02 to 2008-09. The argument that the ICOR is rising in Indian agriculture is validated, as the public sector ICOR goes up from 1.565 to 3.58.

A similar relation is estimated for total capital formation in agriculture. Total capital formation in agriculture is related with agricultural gross domestic product in a double log regression, in the time period 1990-91 to 2008-09. The following relationship is estimated:

$$\text{LnY} = -9.25 + 1.55\text{LnX}$$

$$\text{R square} = 0.90$$

Where Y = Fixed Capital Formation in the Agricultural Sector
X = GDP from Agriculture

The Incremental Capital Output Ratio is 1.55 for 1990-91 to 2008-09.

For the time period 2001-02 to 2008-09, the following relationship is estimated:

$$\text{LnY} = -19.98 + 2.38\text{LnX}$$

$$\text{R square} = 0.77$$

The Incremental Capital Output Ratio is 2.38 for period 2001-02 to 2008-09, whereas for the period 1990-91 to 2001 the same variable is only 0.69.

Similarly private capital formation in agriculture can be related with agricultural gross domestic product. For the time period 1990-91 to 2008-09, we get the following estimate:

$$\text{LnY} = -49.41 + 4.62\text{LnX}$$
$$\text{R square} = 0.83$$

Where Y = Private Sector Fixed Capital Formation in the Agricultural Sector
X = GDP from Agriculture

The ICOR of private capital formation in the agricultural sector is now as high as 4.62 for the period 1990-91 to 2008-09. The same relationship estimated for the time period 2001-02 to 2008-09, gives the following estimates:

$$\text{LnY} = -32.32 + 3.31\text{LnX}$$
$$\text{R square} = 0.63$$

The ICOR is now 3.31 which is high but is not rising.

Analyzing public and private investment ICOR's these estimates tend to suggest that there are externalities in public investment in agriculture and public investment ICOR's are lower.

The main story however is the relationship between deficits and agricultural capital formation and that comes out sharply in Table 3.

Table 3
Deficit/GDP % and Gross Capital Formation agriculture /Agricultural GDP%

Year	Gross Capital Formation agriculture /agricultural gross domestic product in %	Sustainable deficit/GDP ratio	Gross Primary deficit as % of GDP
99-00	12.2	-----	3.81
00-01	11.1	-----	3.57
01-02	13.1	-----	3.69
02-03	13.96	-----	3.09
03-04	12.11	-----	2.07
04-05	13.09	-----	1.31
05-06	13.84	.56	0.96
06-07	14.71	.42	-0.01
07-08	16.3	.66	-1.12
08-09	20.35	.36	3.39

Source: RBI, Handbook of Statistics 2011; Agricultural Statistics at a Glance, different years; CSO website.

Since, 2005-06 as primary deficit has gone down as % of GDP more investment in agriculture is clearly seen.

Farm Size and Policies

When public investment increases larger farmers benefit more (in the debate on farm size

and productivity it is concluded that per capita productivity of large farms is more even though per unit productivity of small farmers is more (Chand, 2011)), so this leads to inequality with increasing expenditure and hence electoral compulsion towards subsidies even though public investment crowds in private investment.:

Below we consider an article (D'Souza, 2008), it is to be noted that we have replaced the term "farmer" for "individual" and added the term "agriculture" instead of "economy" in certain places, of course the relevant questions that this addition leads to have been raised and attempt to answer them has been made. "Though public investment raises the productivity of private factor endowments, those with higher factor endowments benefit more from an increase in public investment than those with lower factor endowments. The wealth creating assets that (agricultural) households are endowed with unequally are various forms of capital-physical capital, financial capital and human capital. Physical capital encompasses land, housing, livestock, implements and other production durables that constitute tangible assets which allow production and have the potential of begetting income. Financial assets constitute assets with higher liquidity and lower carrying costs that allow (agricultural) households to make intertemporal adjustments of income that can be used for consumption, production and investment. Human capital includes health, education and nutrition that are embodied in individuals (farmers) and which translate into skills and abilities that are potential sources of labor, managerial and entrepreneurial incomes. (Agricultural) Households have endowments of the various forms of capital identified at their disposal-their opportunities-which can be transformed into different forms of income that can be thought of as returns to these types of capital. In what follows we do not distinguish between these various forms of endowments and refer to the capital endowment quality in the aggregate. Public investment as we demonstrate increases the returns to private capital endowments differentially and raises its productivity.

By disproportionately benefiting those with higher factor endowments public investment creates an incentive for such individuals to influence the government's expenditure policy. This influence effect increases public investment expenditure but at the same time

since those with large factor endowments benefit more, inequality increases. The rise in inequality makes redistribution more attractive to the median voter and a government attentive to such preferences reallocates expenditures towards transfers and away from public investment. Public investment expenditure then declines when inequality has risen sufficiently.”(D’Souza, 2008).

In the next section Errol shows how an unequal distribution of factor endowments creates an incentive to support public expenditures that are investment expenditures or transfer expenditures. He shows how inequality increases from the pursuit of influence activities that induce government to orient its expenditure policy towards investment expenditure. In the following part he shows that increasing inequality results endogenously in a greater emphasis of (agricultural) transfers over investment expenditures (in agriculture).

He gives the first proposition (which we suitably modify for agriculture) as:

An increase in public capital expenditure (for agriculture) increases the income of a capital abundant individual (farmer) more than an individual (farmer) who has a capital poor endowment.

Hence, capital abundant individuals(farmers)prefer a higher level of public capital expenditure than a capital poor individual(farmer).Thus we have contending citizen(agriculturist) preferences for the appropriate level of public capital expenditure (in agriculture) by the government. This provides incentives to individuals (farmers) to expend resources on influencing the expenditure policies (on agriculture) by the government. The government responds to this influence activity and chooses its level of public expenditure.

Thus the second proposition suitably modified for agriculture would be:

The influence expenditure of a group of individuals (farmers) is higher,

1. The larger the size of the group.

2. The larger is the responsiveness of the government in terms of the weight given to the interests of a group as a result of influence activities undertaken by the group (of farmers).
3. The larger is the difference in capital endowment between the abundantly endowed and the poorly endowed group, and
4. The larger the impact of public capital on factor productivity (of agriculture).

Public Investment in agriculture fell in the 90's despite deficits increasing because Errol says cuts in Public expenditure were seen as costly to electoral support. Redistribution and transfers which attract political support became important in the 90's.

Errol's take on this is that increased public investment (in agriculture) of the 80's by raising the productivity of those with abundant factor endowments more than those with poorer endowments raised inequality in the economy.

“The increased concentration of income at the top makes redistribution more attractive for the median (farmer) voter rather than public capital expenditure. This is the direct result of Proposition 1 where a rise in inequality (interpreted standardly as a decline in median income relative to mean income) increases the preference of the median income voter towards transfers and redistributive expenditures and away from public capital expenditure. As inequality increases the government becomes more attentive to increasingly distressed median voter preferences that are decisive in electoral outcomes. Such governments reallocate towards (agricultural) transfers and away from public investment (in agriculture).

Thus we conclude: “With economic growth as a priority goal of the state it is a puzzle as to why public investment declined since the mid 1990's despite no reduction in fiscal deficits. This paper advances the proposition that public investment affects the returns to the distribution of factor endowments differentially. The rise in inequality then turns the attention of the state towards redistribution. Even when expenditures are financed by

borrowing rather than taxation, increased inequality that creates pressure for redistributive transfer's crowds out public investment."(Errol D'Souza, 2008)

Farm Size Productivity and Investment

It is clear then that the proposition we are moving towards is that large farmers tend to be more biased towards public investment, in order to test this hypothesis we need to find out what are the factors empirically determining the efficiency of large farmers. (Sadhu and Singh, 2002) If the efficiency of large size farms stem from production, technical, financial and marketing and infrastructure economies then it is inferred that large farmers tend to be attracted by public investment. Similarly we need to see whether farmers of different size classes tend to be influenced by inputs at cheaper prices; if this is the case then these farmers will prefer subsidies.

It is clear that production economies will be reaped by the large-sized firm and this will lead to an urge by the large farmer to go in for public investment. Apart from Production economies, technical and managerial economies also lead to an inclination for public investment. How does this happen? As size increases there is a higher proportion of capital and of land available for use, so direct overhead costs per unit of product reduce, as costs reduce with increasing size the farmer benefits with higher returns to the public investment and thus a greater demand for public investment is generated with larger size. Advantages to the farmer both as a buyer and seller occur due to marketing economies because of size; this leads to again higher returns to the farmer of public investment and thus generates greater demand for public investment by the farmer.

Similar financial economies of scale lead to more demand for public investment with larger size of farms.

So what we need to consider is the hypothesis that a larger firm will have greater preference for public investment. This reasoning is based on a highly positive relationship between productivity and farm size, if farms which are larger have greater

productivity then that will lead to greater returns for these farms and thus higher returns on public investment. However the relation of farm size with productivity is by no means an established fact.

Are there any relevant studies in the contemporary literature explaining the phenomenon of size class and productivity? The most contemporary and current account of the relationship between farm-size and productivity is given by Chand, Prasanna and Singh in 2011.

What is the controversy? What was felt in the 60's and 70's was that the observed relation between farm size and per hectare productivity in India was open to debate. Infact it was felt that this inverse relation leading to the higher productivity of small holdings would disappear with the increased use and adoption of superior technology, modernization and growth in general.

What is the current position? The authors conclude that with data from the National Sample Survey from the initial years of the 21'st century it can be seen that the inverse relation between farm size and productivity still holds that is, it is still true that small holdings have larger productivity than large holdings. However in a comparative measure per capita productivity is lower in small holdings.

Conclusion

It follows that

- *Macro-Economics matters in Agriculture:* The forecasting model shows, if the economy is contracted or expanded, that will have an impact on farm/non farm price ratios and in turn determine output in the next year given the lags in acreage response. It will be also possible in this structure to work out the farm-non farm price ratio with which food inflation is avoided in the next year. There is demonstration that macro policies impact agriculture in a significant manner.
- *Specific Macroeconomic policies matter, including the relevant fiscal-monetary policy mix.* Those who believe in the power of fiscal expansions would argue that

as the growth rate of the economy picks up and with $g > r$, the debt-GDP ratio will in fact decline and in that sense the current debt- GDP ratio is sustainable. Their belief in the room for fiscal maneuver in the face of a cyclical downturn is based on the presumption that the debt is sustainable. Which is true in the years 2006-2008 as shown above where the actual primary deficit/GDP ratio is below the sustainable deficit/GDP ratio.

- *The place to attack Fiscal Deficits may be outside agriculture rather than focus on lowering public investment in agriculture which may harm agriculture. (Chambers and Just, 87)* This analysis Chambers and Just (87) assumes that the budget is intertemporally constrained so that any current flow deficit must be made up in a later period. Relatively more spending in the first period than in the balanced budget case is referred to as "overspending" or "fiscal irresponsibility." Conceptually, for example, the first period corresponds to the 1991-2004 period in India during which deficits were high. The second period represents the remainder of the 2000-2010 decade during which actions to repay some of the cumulative budget deficit were necessary. The second period led to higher capital formation when the deficit became sustainable.
- *Fiscal and Monetary Policy can also play a output and productivity enhancing role, public investment can also play a crowding in role of investment in the agricultural sector.* The conclusion that deficit financing is associated with crowding out is tempered to the extent that public expenditure is public investment expenditure that improves the productivity and enhances the output of the economy and is to an extent empirically validated in this study with the lower ICORs of public investment.
- *Shift from Subsidies to Public Investment may not be so easy because of fixed targets of fiscal deficit* the political economy factors which make adoption of a policy of subsidy reduction difficult need to be looked at, also the likely impact of the fiscal constraints imposed by rigid targets of reducing gross fiscal deficit which was a major focus of economic reforms.

- *Although public investment may be said to crowd in private investment, the objectives in both are different: the complementarity can not be determined by a simple causal relationship (positive) between private and public investment. In the same vein the substitutability of public investment with private investment can not also be determined by a simple causal relationship (negative in this case) or by looking at the compensatory impact of private investment on the total capital formation in agriculture. In fact in India ICORs suggest the externality role of public investment.*
- *There is the more general question of high agricultural capital formation not leading to an adequate growth rate. There has been an increase in ICOR in recent years but the agricultural growth rate has not gone up although investment is growing in agriculture it can be seen that since 2005-6 as the fiscal deficit has improved more money has gone into investment in agriculture, (Since, 2005-06 as primary deficit has gone down as % of GDP more investment in agriculture is seen.), this confirms Chambers argument above. However whether efficiency in agriculture has increased or only investment has increased is the question begged to be asked.*
- *When public investment increases larger farmers benefit more (in the debate on farm size and productivity it is concluded that per capita productivity of large farms is more even though per unit productivity of small farmers is more (Chand, 2011)), so this leads to inequality with increasing expenditure and hence electoral compulsion towards subsidies even though public investment crowds in private investment. We advance the proposition (converting Errol's (2008) argument for public investment in the economy to public investment in agriculture). Public investment affects the returns to the distribution of factor endowments (in agriculture) differentially. The rise in inequality then turns the attention of the state towards redistribution. Even when expenditures are financed by borrowing rather than taxation, increased inequality that creates pressure for redistributive transfer's crowds out public investment in agriculture.*

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