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Abstract

This note shows that in a developing economy, agriculture and Special Economic Zones (SEZ) can grow simultaneously without affecting one another if an appropriate subsidy policy is designed by the government. We consider increasing returns brought about by external economies of scale in the SEZ-led industrial sector with a Dixit-Stiglitz production function where resource used to produce each variety of the SEZ-good is itself produced using constant returns to scale (CRS) technology and CRS is also present in the agricultural sector.

JEL Classification: C65; F12; F13; F16; J33; J43; Q17.

Keywords: Special Economic Zones; Increasing Returns; External Economies of Scale; Dixit-Stiglitz type Production Function.

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Outline

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1. Introduction

> We must recognize that today skilled labour as well as capital is internationally fully mobile. Therefore our system of incentive has to be competitive enough to attract more capital both domestic and foreign. (Dr. Manmohan Singh)

Special Economic Zones (SEZs) are specifically defined duty free enclaves and are considered to be foreign territory for the purposes of trade operations and duties and tariffs. Formation of SEZs is an important constituent of the new industrial and export policies of India during the liberalized regime. Undoubtedly, the success of the Chinese SEZs in the 1980s has attracted the attention of the policymakers in the developing countries[1] like India. The Union government policy on SEZ in India came into effect in April 2000. It is the latest thinking so far on India's export policy and may even represent the future of industrial development strategy. In 2005, the Special Economic Zones Act was passed in the parliament with the purpose of establishing, developing and managing SEZs in the country. By June 2006, there were eight functional Special Economic Zones located at Santa Cruz (Maharashtra), Cochin (Kerala), Kandla and Surat (Gujarat), Chennai (Tamil Nadu), Visakhapatnam (Andhra Pradesh), Falta (West Bengal) and Noida (Uttar Pradesh) in India and eighteen more were approved, waiting to become functional. By May 2007, the number of notified SEZs in the country after the passing of the SEZ Act of 2005 had reached one hundred. The main objectives of the SEZ Act are:

(1) generation of additional economic activity

(2) promotion of exports of goods and services;

(3) promotion of investment from domestic and foreign sources;

[1] According to World Bank estimates, as of 2007 there are more than 3,000 projects taking place in SEZs in 120 countries worldwide.

(4) creation of employment opportunities'

(5) development of infrastructural facilities;

In addition to exemption from import and export duties, establishments in SEZs get sufficient incentives in terms of benefits in income tax, service tax and other obligations to the central and state governments. So it is not at all surprising that a large number of enterprises have queued up either to develop an SEZ or to enter an already established SEZ in India.

It is argued that well-implemented and designed SEZ can bring about many desired benefits for a host-country: increases in employment, FDI attraction, general economic growth, foreign exchange earnings, international exposure, and the transfer of new technologies and skills. But the pertinent question remains: whether this procedure of industrialization would affect agriculture seriously. Such a dilemma has been observed in many predominantly agricultural countries that intend to industrialize using agricultural land. One can see for example: Bhaduri (2007), Fernandes (2007), Chaudhuri and Yabuuchi (2010) and Yabuuchi (2001) etc. The major question in this context is: can industry (SEZs) and agriculture grow simultaneously without hurting one another? Chaudhuri and Yabuuchi (2010) addressed this question in terms of a three-sector Harris-Todaro type general equilibrium model, but did not consider increasing returns brought about by positive externalities arising out of localization of similar industries in one region facilitated by SEZs. To consider this we incorporate increasing returns brought about by external economies of scale.

2. The model

Assume that X_1 is the agricultural product produced in sector 1 with labour and capital. This is the final commodity being imported from the rest of the world. The production function is:

$$X_1 = X_1(L, \bar{T}) \tag{1}$$

where $\bar{T}$ is the given endowment of labour. Sector 2 is the industrial sector aided by SEZ producing X_2 with increasing returns to scale following a Dixit-Stiglitz (1977) pattern:

$$X_2 = \left(\sum_{i=1}^{n} x_i^{\rho} \right)^{1/\rho}, 0 < \rho < 1 \tag{2}$$

The x_i are non-traded varieties produced by monopolistically competitive producers. However, the final commodity X_2 is also imported by this small open developing economy from the rest of the world at the internationally given price $\bar{P}_2$. The monopolistically competitive variety producers have to use a resource 'm' spending 'a' units of 'm' to set up plants and machineries (fixed cost); then each successive unit of x_i uses 'b' units of 'm' resources.

$$m = m\left(h\bar{L}, K\right) \tag{3}$$

This has all usual properties of CRS production function. Therefore, at the level of 'm' and X_1 it is the usual 2×2 CRS Jones (1965) structure. Without any loss of generality, we can assume 'm' is more capital-intensive than X_1. IRS sector 2 is imposed on Jones (1965) CRS structure. This is quite legitimate assumption as SEZs facilitate similar industries to be located together which creates positive externalities leading to consequent increasing returns (Yabuuchi, 2001). So, IRS is brought about external

economies of scale. This '*m*' resource is imported by this labour-abundant, small open developing economy from the rest of the world at the prevailing world price p_m^*.

3. Subsidy and Protection

Note that's' is the rate of price subsidy given to encourage formation of the SEZ.

$$\beta S = s\bar{P}_2 X_2 \Rightarrow \hat{S} = \hat{s} + \hat{X}_2 \qquad (4)$$

We assume that subsidy is given to both the agricultural sector and the SEZ. A part of the subsidy is gone to agriculture on the use of modern technology for improving the efficiency of agricultural labourers to improve their productivity. Simultaneously, in line with its new industrial policy sizeable amount of fiscal concessions are given on several occasions for encouraging formation of the SEZ. If *S* be the aggregate government expenditure or subsidy, the fraction β of it is given to the SEZ while the remaining (1−β) fraction is spent on the use of modern technology for productivity improvement of agricultural workers.

$$h = h((1-\beta)S, W);\ h = \bar{h} \text{ for } (1-\beta)S = 0 \text{ i.e. } \beta = 1; \text{ and, } h^1, h^2 > 0 \qquad (5)$$

When the government spends nothing for agricultural development i.e. when β =1, $h = \bar{h}$ (given exogenously). However, if the government's expenditure on agriculture is positive i.e., if β<1, then $h' > 0$; and, $h > \bar{h}$.

Now government may impose an import-tariff, which will increase demand for domestically produced importable and hence domestic price of the importable from p_m^* to $p_m = p_m^*(1+t)$, where '*t*' is an ad-valorem rate of tariff. To bring equilibrium in domestic market for the importable, domestic production of '*m*' will also increase.

$\therefore$ We assume $\hat{m} = A\hat{p}_m, A > 0.$ (6)

Where $\hat{p}_m = t$.

We assume price of the i^{th} brand is q_i. From the equality of marginal revenue and marginal cost for the i^{th} monopolistically competitive producer,

$$q_i = \frac{bp_m}{\rho} \quad = q \text{ (symmetric across all } i\text{)} \tag{7}$$

or, $\hat{q} = \hat{p}_m$ (7.1)

For each unit sold, the total surplus generated over and above the marginal cost, assuming zero profit, must be equated with fixed cost; which gives us the amount of the i^{th} variety sold $(y_i) = \frac{a}{b}\rho\sigma$, where $\sigma = \frac{1}{1-\rho}$

$$= y \text{ (constant } \forall\, i\text{)} \tag{8}$$

Since, varieties are non-traded, domestic demand = domestic supply

$$x_i = y \quad \text{or } x = y \tag{9}$$

$\therefore x$ are also symmetrically entering the production function (2), all varieties have same prices.

$$\therefore X_2 = \left(nx^{\rho}\right)^{1/\rho} = n^{1/\rho}x = n^{\alpha}x, \text{ where } \alpha = \left(1/\rho\right) > 1 \tag{10}$$

A) Change in SEZ Output

$\hat{X}_2 = \alpha\hat{n}$ ($\because$ $x = y$ constant)

$= \alpha\hat{m}$ (from the demand-supply equality of the 'm' resource) (11)

Revenue earned by X_2 producers, $\bar{P}_2(1+s)X_2 = nxq$

$$\bar{P}_2(1+s)n^{\alpha}x = nxq$$
$$\Rightarrow \bar{P}_2(1+s) = n^{1-\alpha}q \ \ (x \neq 0) \tag{12}$$
$$\text{or, } \left(\frac{s}{1+s}\right)\hat{s} = (1-\alpha)\hat{m} + \hat{p}_m (\because \hat{n} = \hat{m}; \hat{q} = \hat{p}_m)$$

IRS brought about by increase in '*n*' (external economies of scale) which is transmitted into rise in '*m*' leads to fall in unit cost as observable from the 1st term in the RHS of equation (11) since $\alpha > 1$.

$$\left(\frac{s}{1+s}\right)\hat{s} = (1-\alpha)\frac{\hat{X}_2}{\alpha} + \frac{\hat{X}_2}{A\alpha} = \hat{X}_2\frac{[1-(\alpha-1)A]}{A\alpha}$$

Using (4) we can write, (13)

$$\frac{\hat{X}_2}{\hat{S}} = \frac{A\alpha}{A\alpha + S'[1-(\alpha-1)A]} \text{ ;where } S' = \frac{\beta S / \bar{P}_2 X_2}{1+\left(\beta S / \bar{P}_2 X_2\right)} > 0$$

$\frac{\hat{X}_2}{\hat{S}} > 0$ under the sufficient condition $[1-(\alpha-1)A] \geq 0$. This leads to the following proposition:

Proposition 1: *Subsidy increases output of the SEZ if* $[1-(\alpha-1)A] \geq 0$.

B) Change in Agricultural Output

Jones (1965) allows us to write:

$$\hat{X}_1 = -B\hat{p}_m + C\hat{h} \text{ (Since } K = \bar{K} \text{ given, L} = \bar{L} \text{ given) while } B>0, C>0 \tag{14}$$

Using (11) and (13), we can rewrite (14) as

$$\hat{X}_1 = -B\left[\hat{X}_2\frac{[1-(\alpha-1)A]}{A\alpha} + (\alpha-1)\frac{\hat{X}_2}{\alpha}\right] + C\hat{h} \tag{15}$$

Under the sufficient condition $[1-(\alpha-1)A] \geq 0$, the first term in the RHS of (15) tends to reduce X_1. This is due to shifting of resources away from sector 1 to the SEZ aided sector 2. The 2nd term gives the rise in agricultural output resulting from increase in productivity of the workers brought about by increase in efficiency of the agricultural workforce:

$$\hat{h} = \frac{\partial h}{\partial S} dS + \frac{\partial h}{\partial W} dW \tag{16}$$

Since more and more people shift to the higher wage paying industrial and service sectors, the money wage received by the remaining people in agriculture will increase, leading to increase in *h*. Now, there is increased government spending (assuming $\beta<1$) on modern advanced technology which will further improve workers' efficiency. So, as a combined effect of these two, *h* will increase more than the increase in *W*; so wage rate per efficiency unit $\left(\frac{W}{h}\right)$ will fall.

In the RHS of (15), if the second term i.e., $\hat{h}$ is stronger than the 1st term (which can be possible if government would spend a sizable amount of subsidy to enhance productivity of the remaining agricultural workforce when there is large scale exodus from the agricultural sector), sector 1 will also be able to expand. We state this in the following proposition.

Proposition 2: *SEZ and agriculture can go hand in hand even though there is large scale exodus from agriculture if the government spends sufficient amount on modern technology to foster productivity of agricultural workers.*

So, industrialization aided by SEZs is likely to have a favourable effect on agricultural productivity. With industrialization, as more and more people shift to the industrial and the services sectors, pressure on agricultural land will fall and average landholding will increase as some of the emigrants going away from the rural sector will sell off their land to the people who would stay back. An increase in average landholding in the agricultural sector would, in turn, help consolidate fragmented pieces of landholding, which again would make possible the use of modern technology. Indeed, excessive fragmentation of land in India is one of the main constraints to the introduction of advanced methods of production. If land is consolidated, this constraint would be relaxed. It may be mentioned that in the advanced countries 2% to 4% of the population is engaged in agriculture. But this small fraction of people is able to feed the entire country. This is made possible by the very high levels of productivity of labour in the agricultural sector, which again is the result of advanced technology. If a similar pattern can emerge in India, the increase in the productivity of labour in the agricultural sector can indeed compensate for the loss of production due to shifting of resources away from agriculture to the industrial sectors aided by SEZ.

4. Conclusion

This paper shows that it is possible for both SEZ and agriculture to grow simultaneously if the subsidy policy is designed in an appropriate way. We have considered increasing returns brought about by external scale economies due to localization of similar industries in the industrial sector aided by SEZ and have taken Dixit-Stiglitz (1977) type production function absolutely tenable with IRS; while the resource used to produce each variety is

produced itself using CRS technology. CRS also prevails in agricultural sector. In this model, we have seen that a significant part of the subsidy must be spent on the use of modern technology in agriculture to improve the productivity of the remaining sections of the workforce in the agricultural sector to achieve expansion in agriculture along with SEZ-led industrialization. The final outcomes, of course rely much on the political will of the government.

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