THREE ASPECTS OF INDUSTRIAL DUALISM IN A DEVELOPING ECONOMY

MALABIKA ROY

Thesis submitted to the Indian Statistical Institute, in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy.

-- Calcutta : 1993 --

ACKNOWLEDGEMENT

At the very outset, I wish to express my heartfelt thanks in acknowledgement of the guidence and support that I have received from Dr Abhirup Sarkar, my supervisor. Over and above providing me with a general direction for my thesis, he deligently went through every word I wrote, giving me more than ample conceptual back-up all through.

Professors Robin Mukherjee and Nirmala Banerjee not only made their valuable comments available for the improvement of my thesis, but also supplied me with certain key reference materials, some of them from their own collections. Dr Hiren Sarkar also provided certain important references to which ordinarily I could not have gained an access. I wish to expeess my indebtedness for their efforts.

Comments from Professors Mihir Rakshit, Amitava Bose and Amit Bhaduri during different seminars and discussions went a long way in improving the standard of the present work. When the first two chapters were sent for publication, comments from three unknown referres provided me with some new insights. I wish to record my thanks for their valuable suggestions. For all the surviving defeciencies, the author alone stands responsible.

While using computer for typing out the thesis, I received useful suggestions from Smt.Tandra Rao, Shri Chiranjib Neogi and Shri Nachiketa Chattopadhyay, which made my work much less problematic. Shri Dibyendu Bose extended his help while taking laser print outs of the thesis. I thank them all for their contributions.

On a personal level, I wish to thank all my friends in and outside Economic Research Unit, in ISI, Calcutta, who made my time here a pleasureable experince. The name of R.Kavita stands out among them. In her I have found a treasured friend, always ready to stretch a helping hand in times of stress.

I have always been encouraged by my aunt Smt Renuka Mitra in all my academic efforts. I take this opportunity to exprss my gratitude to her. I am also grateful to my parents and parents-in-law who very understandingly overlooked my numerous lapses as a daughter and a daughter-in-law during this period.

Finally, I must own that without the unwavering support of my husband Shri Joydeep Roy my work would have been many times more difficult.

CONTENTS

INTRODUCTION

The concept of dualism which has remained central to the study of the process of economic development, was first developed by Lewis(1954) and then further extended by Fei and Ranis(1966). Lewis conceived of a developing economy as one typically consisting of two sectors: a modern sector identified with industry, and a traditional sector identified with agriculture. Resources flow from the traditional to the modern sector while the process of development continues. As a consequence, the modern sector grows and the traditional sector shrinks. Some of the other development economists used other facets of dualism. Harris-Todaro(1970) explained the process of migration using the dualistic structure. Taylor(1979) and Rakshit(1982) incorporated the problem of sluggish demand in this framework. The idea of informal sector primarily added an additional dimension to the standard dualistic analysis.

As the scope of empirical investigation widened, it was observed that in most developing countries the industrial sector itself had a dualistic structure. A large section of population was found to be employed outside the organized industrial sector. The wage structure, characteristics of labour, mode of operation of the production units etc were drastically different across the two classes of organizations. Of the various names this residual sector was vested with, the name informal sector provided by Hart(1973) stayed.

The analysts of the informal sector found an interested audience among economists and policy makers. Interest was kindled mainly because the pace of economic growth in some developing countries was found to be insuffficent to provide employment to the growing population within the organized sector. It was also inadequate to percolate the benefits of economic growth down to the poverty stricken mass. The informal sector became important because of its employment generating capacity and its supposed potential to alleviate poverty. It also dispelled the misconception that whoever is not employed in the organized sector, is necessarily unemployed or underemployed. However, the precise role played by the informal sector in the process of development is still a matter of controversy. The controversy arises because the activities of the informal sector are viewed in two different ways. According to one of the views, the very presence of the informal sector itself is an indicator of insufficient development. Its existence shows inability of the organized sector to absorb the existing labour force. With economic progress and consequent growth of the organized sector, the informal sector will disappear. The other view considers the informal sector as a more long run feature on the economic profile of the LDCs, which can be and should be utilized for the purposes of economic development. Accordingly, the view demands that proper policies should be adopted to promote the growth and employment potential of this sector. The proponents of the second view point have gained ground, so much so that governments of several LDCs including India have started taking active interest in the informal sector . We will come back to this point later again. For the moment, let us examine how far the understanding regarding the nature of the informal sector activities and their place in the economic scenario have progressed.

There has been a profusion of empirical literature on the informal sector. ILO carried out a series of studies in selected third world countries to investigate its various possibilities. These studies supplied the initial building blocks upon which the concept was further developed. Plenty of independent studies in different countries also followed. However, the concept as it stands now, is faced with an identification problem. There are difficulties with demarcating the sector by well defined characteristics for empirical research. The ILO studies have described the informal sector by the following characteristics: (refer Mehta, 1985)

i) Ease of entry.
ii) Reliance on indigeneous sources of inputs;
iii) Family ownership of enterprises;
iv) Small scale of production and low productivity;
v) Labour intensive and adopted technology;
vi) Skills acquired outside the formal school system:
vii) Unregulated and competitive markets, and
viii) Lack of support and recognition from the government.

But the amorphous nature of the informal sector does not lend itself to such definite characterization very easily. Diverse activities go under this name, some of which are not even legal as has been pointed out by Breman(1976) and Joshi(1980). Breman(1976) and Papola(1980) have discussed in great details the problem associated with precisely defining the boundaries of the informal sector and the inappropriateness of using a unique set of characteristics for this purpose. However, most of the studies agree that wage cost is lower within the informal sector and capital costs are higher, specially the cost of financial capital.

As a result, most of the theoretical studies which are few in number, depict the informal sector as a homogeneous entity, primarily distinguished from the formal sector by a lower wage rate/income level. One of the earliest theoretical studies is by Fields(1975). He brings in the informal sector to explain its role in the process of rural-urban migration. Of the four extensions effected by him on Harris-Todaro migration model, introduction of an informal sector called murky sector is but one. The purpose of these extensions is to show that the actual rate of unemployment will be much lower than that predicted by the Harris-Todaro model. The murky sector is considered to be a part of the urban sector with lower income opportunities. The individuals may choose to get employed in this sector after migrating to the urban sector, rather than remain unemployed while searching for a formal sector job. This way they earn a positive income. At the same time, their probability of getting a highly paid formal sector job becomes lower, when they are not looking for such a job wholetime. The higher is the probability of getting a job in the formal sector while working in the informal sector, the lower is the unemployment rate in the urban sector.

Dutta Choudhuri(1989) adopts a frame work similar to Fields. But in his set up no unemployment is allowed for. All those who migrate from the agricultural sector get absorbed either in the formal or in the informal sector. The aim of his analysis is different from that of Fields. In his model, the process of migration endogeneously determines the relative size of the formal and the informal sector through the distribution of labour. Then he goes on to explain the impact of policy induced changes within such a frame work.

Gang and Gangopadhyay(1990) also demarcate the informal sector from the formal sector solely in terms of wage differential. Both the sectors are treated as a part of the modern urban sector. Formal sector is identified as the high wage sector and informal sector as the low wage sector. The idea is to relate the existence and the size of the informal sector with the level of development of an economy. The reasons behind the wage differential is exogenous to the model. The authors accept the wage differential as datum and recognize the fact that development will take place within the context of this existing dualism. The process of development is identified with the growth of capital stock. Both the formal and the informal sector have a claim over this capital stock. Labourers move to the modern urban sector from the traditional agricultural sector through migration, and either get distributed between the formal and the informal sector or remain unemployed. In the paper it has been established that the two urban subsectors' capital stock and employment grow with the growth of aggregate capital stock. The relative rates of growth of the sectors in terms of these variables will depend upon the respective elasticities of their marginal product curves. The employment in the modern sector may either rise or fall. The analysis provides an answer to the dispute regarding the role of the informal sector in the process of economic development.

Rauch(1991) in his paper, captures dualism through wage differential as well as size differential, where the size differential itself depends on wage differential. The minimum wage legislation is enforceable for firms above a certain size. Firm size on the other hand is endogenously determined through entrepreneural talent. Individuals choose between formal or informal sector entrepreneurship, as well as between wage employment or managerial employment in either sector, on the basis of remuneration. Consequently, there appears a size differential between the formal sector and the informal sector firms which is directly proportional to the wage gaps between the two sectors. This wage gap in its turn, is the result of minimum wage legislation. The higher is the minimum wage above the market clearing wage, the bigger is the size gap.

None of the above theoretical studies take into account the linkages that exist between the formal and the informal sector. In their studies, Basu(1977b), Banerjee(1981), and Benefield(1975) have focused on the exploitative relationship between the formal and the informal sector where linkages exist. Banerjee(1981) has discussed at length about how any policies adopted to benefit the informal units can end up in benefiting the large formal sector producers. The present thesis concentrates on some of these linkages not necessarily exploitative, and on the effect of governmental policy intervention in the presence of such linkages within a theoretical frame work. Also wage differential is considered to be one of the distinguishing features between the two sectors along with other aspects.

As the thesis considers certain specific types of linkages, it is necessary to examine the array of linkages that can exist between the two sectors, for the sake of proper perspectives. Accurate focusing of the problem becomes important also, to get rid of the identification problem already mentioned.

In order to enumerate all the possible linkages between the two sectors, we look at them in a more disaggregated form. Clark(1951) and Kuznets(1966) had divided the organized economy into three subsectors, primary (agriculture and related activities), secondary (industry and related activities), and tertiary (trade and services). We propose to classify the informal sector activities on similar lines, since almost all of them can be categorized under these three headings. The linkages are presented in the form of a table. The formal sector is assumed to consist of the production and services units as well as their employees, similarly, for the informal sector. We leave out the primary subsector of both the sectors, since that is not within the purview of our study. We also leave out the illegal activities that take place within them for obvious reasons. Thus, they are subdivided into secondary and tertiary subsectors only. Supply and demand linkages can be direct or indirect. The direct linkages, as explained by Mehta(1985) include the linkage through inputs and other resources, as well as technological linkages. The indirect linkages refer to the demand for goods and services, generated in a particular sector by clientele whose income is dependent upon the other sector.

There is another complication pointed out by Papola(1980). Urban labour market is also dualistic in nature. There are those with regular employment in the formal sector organizations protected by labour legislation, and unionization. Outside, there is the unprotected informal labour market with free entry. While informal sector almost exclusively uses unoraganized labour force, a sizeable portion of unorganized labour is also utilized by formal industrial sector through the practice of employing casual labourers. However in our classification, the services provided by such casual workers to the formal sector industries are considered to be part of the informal tertiary subsector, while the income generated by such services will be considered part of the income generated within the formal sector.

TABLE

INFORMAL SECTOR

FORMAL SECTOR		SECONDARY SUBSECTOR: SUPPLIES TO	SECONDARY SUBSECTOR: DEMANDS FROM	TERTIARY SUBSECTOR: SUPPLIES TO	TERTIARY SUBSECTOR: DEMANDS FROM
SECONDARY	DIRECTLY	1. Intermediate inputs, sometimes through market sometimes through subcontracting. 2. Final goods-subcontracting.	1. Inputs 2. Capital goods by rent or gets under subcontracting arrangement 3. Financial capital. 4. Technological help. The last two are usually obtained under contractual relationship.	1. Casual labour services, e.g. casual labour employed in factory/construction sites. 2. Ambulatory workers.	Very little linkage if any. Sometime capital goods are purchased from the formal sector/service unit established as a subsidiary formal sector parent firms
SUBSECTOR	INDIRECTLY	1. Some luxury commodities like handicraft items, custom built furniture to high income employees of formal sector. 2. Low priced consumer goods to poorer section of the employees.	Mass consumer goods produced within the formal sector are purchased by the people working in the informal sector.	A lot of informal sector services like domestic help are purchased by formal sector employees.	Linkage exists in form of purchase of mass consumer goods produced by formal sector.

table contd........

INFORMAL SECTOR

FORMAL SECTOR		SECONDARY SUBSECTOR: SUPPLIES TO	SECONDARY SUBSECTOR: DEMANDS FROM	TERTIARY SUBSECTOR: SUPPLIES TO	TERTIARY SUBSECTOR: DEMANDS FROM
TERTIARY	DIRECTLY	Commodities are purchased/procured through ordered production from informal sector by traders/their agents who specialise trading such commodities.	Finance/inputs from traders or their agents.		
SUBSECTOR	INDIRECTLY	Some luxury commodities to the high income employees and some low priced commodities to the poorer section.	Very little linkage. Some of those working within the informal sector are likely to take recourse to banking/insurance etc. But there is nothing very distinctive about this linkage.	A lot of informal sector services like domestic help are purchased by the formal sector employees.	Very little linkage. Some of those working within informal sector may take recourse to banking/insuranc But there is nothing very distinctive about the linkage.

Clarificatory Notes:

1. The column 'supply to' refers to goods/services supplied by informal sector to formal sector. Similarly, 'demands from' refers to goods/services demanded by informal sector from formal sector.

2. The goods/services supplied by informal sector are those demanded by formal sector and vice-versa; the supply and demand are ex-post supply and demand. For example, informal secondary subsector indirectly supplying to formal secondary subsector, also implies the demand for the goods produced within the informal secondary subsector, from the purchasers, whose incomes originate from employment in the formal secondary subsector. (indirect linkage as defined.).

Each element of the table gives the possible sources through which such linkages can operate. The list of linkages provided for in the table are by no means exhaustive. However, other linkages that has been left out will fit into one of the categories.

The present thesis is only concerned with the direct linkage bnetween secondary subsector of the informal sector and secondary subsector of the formal sector. Both Papola(1981a,1981b) and Standing(1987) hold the view that, the industrial segment of the informal sector has maximum potential for growth. Papola further narrows down the growth prone area to that part of the informal industrial sector which is vertically linked with the formal industrial sector. The other reason for streamlining our attention is that due to their diverse nature of activities, it is extremely difficult to establish the extent of benefit reaped by the informal units from governmental policies adopted for their welfare, if the sector is considered in its totality.

The linkage considered in the first chapter is input linkage through market. The cost structure of the two sectors is shown to generate a production structure where the informal sector specializes in the production of intermediate inputs, and the formal sector in final goods. In the second and third chapters informal units are in a subordinate position and formal sector farms out production orders to them, a procedure which is known as subcontracting. In the second chapter, the informal units are totally dependent on the formal sector producer for marketing their outputs. In the third chapter they are allowed their own independent marketing outlets, but their product is considered inferior in quality compared to the formal sector's product by the consumers. Hemmer and Mannel(1989) have also studied interlinkage between the formal and the informal sector theoretically. Their study is aggregative and in general terms of supply and demand, whereas the present study is intended to be disaggregative and more specific to capture the interlinkage. However the first chapter considers the two sectors in a more aggregative form than the later two chapters where the welfare of individual informal units is considered.

It has already been mentioned that there is a difference of opinion regarding the role of the informal sector in the process of development. In the face of such controversy, the impact of government policies on the informal sector becomes important. Inadequate access to financial capital is perceived to be one of the major handicaps for the informal units. Ironically, modernising the informal units technologically and/or extending protection to the labour force employed there-in may destroy the very advantages that they have in terms of lower cost structure, and higher employment potential. This may lead to their total extinction as they lose competitive edge over the formal sector. Providing them with subsidized finance/subsidized input is a neutral policy in that respect. Perhaps for this reason, empirically it is one of the most widely used policies in case of Indian small scale industries. So while discussing the impact of government policies, we have selected the policy of credit subsidy and cost subsidy as representative policies.

Examples from small scale industries have widely been used in the thesis. The policies adopted in India at least are in the name of small-scale industries rather than for the informal sector as a whole. Governmental interventions have in fact discouraged a lot of informal sector activities on the ground of their undesirable side effects. Also other than a lack of access to government favours, all the characteristics attributed to the informal sector are attributable to the small scale industries as well. The size and structure attributed to the small scale units officially, have been widely used in empirical research to identify the informal units. Thus, the difference between the two concepts are diffused. Gang and Gangopadhyay(1990) and Banerjee(1987) use the terms interchangeably in their studies. Here too, their examples has been followed.

One final word of caution. In the thesis wherever the term informal sector is used, it signifies that specific subsector on which we concentrate and not the nebulous idea with which it is sometimes associated in the relevant literature.

CHAPTER-1

1. INTRODUCTION

The purpose of the present chapter is to build up a theoretical frame work, in terms of which the functioning of the informal sector can be analyzed. In particular, we try to determine the effect of an attempted policy induced expansion of the informal sector on industrial output and employment. In our model, we determine the size of the informal sector endogenously. This is in contrast with earlier theoretical models on the informal sector like Fields(1975) and Datta Choudhuri (1989).[1]

Modelling of the informal sector begs at least two important questions at the very outset. First, the question arises as to how the informal sector is to be distinguished from the formal sector. The identification problem has already been mentioned in the introduction. There are, however, at least two characteristics which are generally observable. The first is the absence of organized labour and the second is the heavy dependence of the informal sector on unorganized or informal credit sources. The result is that the informal sector faces a lower wage cost and a higher interest cost as compared to the formal sector. In this chapter, we use these two features to make a distinction between the formal and the informal sector.

Secondly, one has to settle the question as to what is the possible link between the two sectors. The link can either be competitive or complementary. Thus in some instances, the informal sector produces final outputs which are cheaper substitutes of the outputs produced

---

[1]The other points of departure have already been mentioned in the introductory chapter.

by the formal sector. In other cases, the informal sector supplies intermediate goods to the formal sector and it is only the formal sector which produces the final output. In this chapter, we go by the later characterization and concentrate on a complementary relationship between the formal and the informal sectors. This latter phenomenon, sometimes referred to as vertical specialization in the international trade literature, has been analyzed in some details in models of trade in intermediate goods, (see, for instance, Findlay(1978), Sanyal and Jones(1982), Dixit and Grossman(1982), Sarkar(1985) and Marjit(1987). In these models, production is carried on through different stages in equilibrium. Our present model is similar to these trade models, specially to one in Sarkar(1985).

The chapter is organized in the following way. In section 2 we develop the basic partial equilibrium model of a formal and an informal sector. In sections 3, 4 and 5, we use three alternative closing rules to determine the general equilibrium of the economy. Section 3 assumes that industrial output and employment are constrained by the supply of credit. In section 4, the supply of labour to the industrial sector as determined by rural-urban migration determines the level of industrial output and employment. In section 5, industrial output and employment are assumed to be constrained by demand. Under all these alternative closing rules, it is shown that a policy induced relative expansion of the informal sector leads to an unambiguous fall in industrial output and employment. Finally section 6 contains some concluding remarks.

2. THE BASIC MODEL

The basic model is concerned with characterization of industrial sector of a less developed economy. The industrial sector produces a single commodity using an Austrian flow-input-point-output technology. In particular, to produce the industrial good, labour has to be applied for T consecutive periods. At the end of each intermediate period, some goods in process are obtained. More labour is applied to these goods in process and at the end of period T the output that comes out is ready for final consumption. We assume that the intermediate periods are small and the process of production can be represented by a continuum of stages (0,T).

Industry consists of a formal and an informal sector. Perfect competition is assumed to prevail in each sector. Moreover, both sectors are capable of producing the industrial good and both are assumed to have flow-input-point-output technology[2]; in particular, we assume that at each stage only one unit of labour goes into the unit process of production. The difference between the two sectors lies in their costs of production. Producers in each sector have to incur wage costs for a number of periods before the output is sold in the market. The costs in the intermediate periods are financed by loans. There are therefore, two types of costs: wage costs and interest costs. Let unstarred variables refer to those related to the informal sector and let starred variables refer to those related to the formal sector. Let w, w^*, r, r^* denote real wage rates and rates of interest respectively in the two sectors. In this section, we consider a partial equilibrium set up where w, w^*, r, r^* are all given. In particular, we assume that $w < w^*$ and $r > r^*$. In other words the informal sector has a lower wage rate and a higher rate of interest as compared to the formal sector.

From the description of technology, it follows that the value of a t period old process, if all the t stages are produced by the informal sector, is given by

$$P(t) = \int_0^t we^{r\tau}d\tau \qquad (1a)$$

---

[2]Even if we assume different technology, the qualitative results of this chapter do not change.

Similarly, if all the the first t stages are produced by the formal sector, the value of a t period old process becomes

$$P^{*}(t) = \int_{0}^{t} w^{*} e^{r^{*}\tau}\, d\tau \qquad (1b)$$

Though each sector is technologically capable of producing all the stages, we shall now show that there is a unique distribution of stages between the two sectors which minimizes the final cost of production; and indeed forces of competition will drive the economy to such a cost minimizing distribution of stages.

Suppose each stage up to t has been produced by that sector which has the lower cost of producing that particular stage and let $\tilde{P}(t)$ (to be determined) be the value of a t period old goods in process, when all stages upto t have been produced optimally. Given $\tilde{P}(t)$, the cost of producing an additional stage in the informal sector is $w + r\tilde{P}(t)$ where w is the wage cost and $r\tilde{P}(t)$ is the interest cost on the already produced goods in process. Similarly, the cost of producing an additional stage in the formal sector is $w^{*} + r^{*}\tilde{P}(t)$. Competition will ensure that this additional stage will be produced by that sector which has lower costs. Thus $\tilde{P}(t)$ must satisfy the condition:

$$\frac{d\tilde{P}(t)}{dt} = \min \{ (w + r\tilde{P}(t)),\ (w^{*} + r^{*}\tilde{P}(t)) \} \qquad (2)$$

Therefore, at a cross-over stage $\tilde{t}$, assuming that it exists, we must have:

$$w + r\tilde{P}(\tilde{t}) = w^{*} + r^{*}\tilde{P}(\tilde{t})$$

which yields :

$$\tilde{P}(\tilde{t}) = \frac{w^{*} - w}{r - r^{*}} \qquad (3)$$

Since the right hand side of equation (3) is a given positive number and since from equation (2), $\tilde{P}(t)$ is strictly increasing in t, the cross-over stage $\tilde{t}$ is unique. Moreover, from equation (2) it follows that at t=0, $d\tilde{P}(t)/dt = \min\{w, w^*\} = w$. So at least the first stage is produced by the informal sector. This, along with the fact that the cross over stage is unique, would imply that all stages upto $\tilde{t}$ are produced by the informal sector and all stages from $\tilde{t}$ to T are produced by the formal sector. The intuition behind the optimal distribution of stages is straight forward. From the structure of production it follows that the later stages of production are "capital" intensive compared to the earlier stages in the sense that they require holding of goods in process of higher value. Thus the later stages involve higher interest cost and the formal sector having the lower rate of interest *spec*ializes in the later stages of production. The earlier stages being *more* labour intensive are produced by the informal sector which has the lower wage cost.[3] Given the cross-over stage $\tilde{t}$, the final per unit cost of production can be written as:

$$\tilde{P}(T) = \tilde{P}(\tilde{t})e^{r^*(T-\tilde{t})} + \int_0^{T-\tilde{t}} w^* e^{r^* t} dt \qquad (4)$$

We are now in a position to characterize the optimal price function $\tilde{P}(t)$. Let

$$\phi(t) = P^*(t) - \{P^*(\tilde{t}) - P(\tilde{t})\}e^{r^*(t-\tilde{t})} \qquad (5)$$

We assert that the optimal price function is characterized by

$$\begin{aligned} \tilde{P}(t) &= P(t) \text{ for } 0 \le t \le \tilde{t} \\ &= \phi(t) \text{ for } \tilde{t} \le t \le T \end{aligned} \qquad (6)$$

It is clear from our previous argument that $\tilde{P}(t) = P(t)$ for $0 \le t \le \tilde{t}$. As for $\tilde{t} \le t \le T$ it can be easily checked from equations (4) and (5) that $\phi(t)$ represents the optimal cost of production upto stage t for

---

[3]Of course w, w^*, r, r^*, could be such that $\tilde{t} > T$. We however assume, the existence of an interior solution $0 < \tilde{t} < T$.

$t \geq \tilde{t}$ and in particular, $\phi(T)$ is equal to the right hand side of equation (4). The interpretation of the $\phi(t)$ function is as follows. If *all stages were produced* by the formal sector, the final cost of *production would* be given by $P^*(T)$. On the other hand, by allowing the informal sector to produce upto stage $\tilde{t}$, the formal sector can reduce costs by $P^*(\tilde{t}) - P(\tilde{t})$[4]. This gain (in terms of interest costs) grows for $T-\tilde{t}$ periods at the formal sector rate of interest r^* and the entire amount is deducted from $P^*(T)$ to obtain the final cost of production.

For future use, we represent the optimal price function $\tilde{P}(t)$ geometrically in fig.1.1. It can easily be checked that $P^*(t) > 0$ for all t. It can also be checked that the expression $[\phi(t) - P(t)]$ attains a maximum value zero at $\tilde{t}$ and hence $P(t) > \phi(t)$ for all t except at $t = \tilde{t}$. At $t = \tilde{t}$, $\phi(\tilde{t}) = P(\tilde{t})$ and $\phi'(\tilde{t}) = P'(\tilde{t})$. Thus $\phi(t)$ is tangent to $P(t)$ at $t = \tilde{t}$. Given all these informations, we can draw the function $P(t)$, $P^*(t)$ and $\phi(t)$ in fig.1.1. The cross over stage $\tilde{t}$ is obtained by the intersection of $P(t)$ and the horizontal line passing through $(w^* - w)/(r - r^*)$. Those parts of $P(t)$ and $\phi(t)$ that constitute the optimal price function, are represented by deep lines. The optimal price function is strictly convex because both $P(t)$ and $\phi(t)$ are strictly convex. Finally, the optimal cost of production is less than $P(T)$ and $P^*(T)$. The above findings can be summarized in the following proposition:

<u>Proposition 2.1</u>. In the above set up, the informal sector specializes in the earlier stages of production and the formal sector specializes in the later stages of production. This specialization leads to a lower cost of production compared to the situation where all stages are produced by either sector alone.

---

[4]It can easily be verified that $P^*(\tilde{t})-P(\tilde{t})$ is positive.

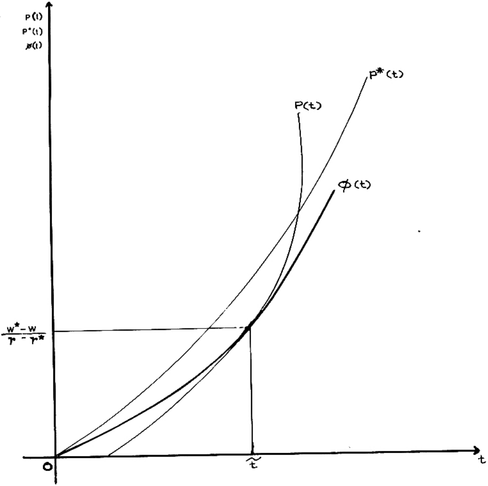


Fig 1.1

3.GENERAL EQUILIBRIUM WITH CREDIT CONSTRAINTS.

Our next next task is to fit in the above partial eqilibrium analysis to a general equilibrium set up. We consider three alternative closing rules giving rise to three alternative general equilibrium models. In the present section we close the model by assuming that, the supply of loanable funds is fixed both for the formal and the informal sector.

In the next two sections we consider rural-urban migration and demand constraint respectively. Our purpose is to analyze the effect of a policy induced expansion of the informal sector on macro variables like output and employment in each of these models.

In the general equilibrium set up, the real wage rate in the informal sector is assumed to be flexible and endogenously determined by market clearing conditions.[5] The formal sector real wage on the other hand is assumed to be fixed and this fixity is explained by the existence of a trade union. As for interest costs, there are two types of credit markets from which a loan can be taken: an organized credit market and an informal credit market. The rate of interest in the organized credit market is assumed to be fixed and the formal sector is assumed to take loans only from the organized credit market. The rate of interest in the informal credit market is determined by demand for and supply of loans and the informal sector is assumed to meet part of its loan requirement from the informal credit market. The organized credit market meets the remaining part of its loan requirement. Finally, we assume that the amount of loan obtained by the informal sector from the informal credit market, the amount of loan obtained by the ionformal sector from the formal credit market and the amount of loan obtained

---

[5]We however assume, that the money wage rate in the informal sector remains rigid even in the face of unemployment. In equilibrium, this money wage rate determines the money price of the industrial good and the money wage rate in the formal sector.

by the formal sector from the organized credit market are all individually fixed.[6]

Let M_f^* and M_f denote the amount of loans obtained by the formal and the informal sector respectively from the organized credit market. Let M_I be the amount of loan obtained by the informal sector from the informal credit market. Let r_I and r^* be the rates of interest charged on loans taken from the informal credit market and the organized credit market respectively. The effective rate of interest paid by the informal sector on its loans is given by r where r is a weighted average of r_I and r^*, i.e.,

$$r = \frac{M_I}{M_I + M_f} r_I + \frac{M_f}{M_I + M_f} r^* \qquad (7)$$

We assume that the economy is in a stationary state. Thus, at any point in time, there are processes of different vintages and the number of processes of each vintage is the same for all vintages. Let the number of processes of each vintage be denoted by X; then X is also the level of output at any point in time. Let k and k^* be the fund requirements per unit of output in the informal and the formal sector respectively. We have

$$k = \int_0^{\tilde{t}} \tilde{P}(t)\, dt \quad \text{and} \quad k^* = \int_{\tilde{t}}^{T} \tilde{P}(t)\, dt$$

Consequently. Xk and Xk^* denote the demand for funds in the two sectors. Demand-supply equilibrium in the credit market imply that:

$$Xk = M_I + M_f \qquad (8a)$$

---

[6]This also fixes the distribution of organized credit market loans between the formal and the informal sectors.

and

$$Xk^{*} = M_{f}^{*} \qquad (8b)$$

Finally, the level of employment L is given by:

$$L=TX \qquad (9)$$

The Model is completed by adding equations (3) and (4) to the above structure, i.e.,

$$\tilde{P}(\tilde{t}) = \frac{w^{*}-w}{r-r^{*}} \qquad (3)$$

$$1 = \tilde{P}(\tilde{t})e^{r^{*}(T-\tilde{t})} + \int_{0}^{T-\tilde{t}} w^{*}e^{r^{*}t}\,dt \qquad (4)$$

where the left hand side of equation (4) becomes unity by choosing the final output as the numeraire. We also assume that $P^{*}(T) > 1$.[7] The model consists of equations (3), (4), (7), (8a), (8b) and (9) and solves the six variables w, r, r_I, $\tilde{t}$, X and L.

Let us now proceed to determine equilibrium in the above model. We start with a given level of r_I such that the corresponding value of r, as determined from equation (7), satisfies $r > r^{*} + w^{*}$. Given r, we determine w and $\tilde{t}$ simultaneously from equations (3) and (4). The solutions for w and $\tilde{t}$ are unique. To see why the solutions are unique, consider two wage rates, w_1 and w_2, with $w_1 > w_2$. Let t_1 and t_2, be the corresponding cross-over stages. Given r, r^{*} and w^{*}, the right hand side of equation (4) can be represented as a function $C(w,\tilde{t})$. We have

$$C(w_2, \tilde{t}_2) < C(w_2, \tilde{t}_1) < C(w_1, \tilde{t}_1)$$

Where the first inequality follows from the fact that $\tilde{t}_2$ is cost minimizing with respect to w_2, and the second inequality follows from the fact that for any given cross-over stage, cost of production is

---

[7] It is clear that without this assumption the informal sector cannot exist in equilibrium.

higher if w is higher. Thus the right hand side of equation (4) is a strictly increasing function of w with $\tilde{t}$ adjusting optimally; and it is only for a unique w (and $\tilde{t}$) that the right hand side of (4) is equal to unity. Since we have chosen $r > r^* + w^*$, we have $w + r > w^* + r^*$ and hence at least the last stage will be produced by the formal sector. On the other hand, from equation (3) it follows that $w < w^*$ and therefore the first stage is produced by the informal sector. Thus $\tilde{t}$ will have an interior solution.

It is to be noted that given w and $\tilde{t}$, we determine k and k^* and hence from equation (8b) we determine X. Finally, given X and k, we determine Xk, the demand for loans by the informal sector. Of course, at the arbitrarily given r_I, there is no guarantee that the demand for loans is equal to the supply of loans.

Consider a fall in r_I and a consequent fall in r. Let us denote the new rate of interest by $\bar{r}$, the new wage rate by $\bar{w}$, the new optimal cross over stage by $\bar{t}$ and the new optimal price function by $\bar{P}(t)$. It is clear from equation (4) that with $\bar{r} < r$, the corresponding $\bar{w} > w$. But the effect of a fall in r on the optimal cross over stage is not immediately obvious. There are two opposing pulls: the fall in r will tend to increase the cross over stage and the rise in w will tend to reduce it. However, the effect of a fall in r (the initial effect). will dominate as we show in the following lemma.

<u>Lemma3.1</u>. If $\bar{r} < r$ then the consequent $\bar{t} > \tilde{t}$.

Proof: Suppose not. Then $\bar{t} \le \tilde{t}$. Since w^*, r^*, and the final price are all remaining unchanged and since in both situations from $\tilde{t}$ onwards all stages are produced by the formal sector, we must have $\bar{P}(t) = \tilde{P}(t)$ for $t \ge \tilde{t}$ and in particular, $\bar{P}(\tilde{t}) = \tilde{P}(\tilde{t})$. We first claim that $\tilde{P}'(t) < \bar{P}'(t)$ for $t < \tilde{t}$. Note that $\tilde{P}'(\tilde{t}) = w^* + r^*\tilde{P}(\tilde{t}) = w^* + r^*\bar{P}(\tilde{t}) = \bar{P}'(\tilde{t})$. Now, if our claim is not true, then at some $t' < \tilde{t}$, $\tilde{P}'(t') \geq \bar{P}'(t')$. This implies that $\frac{d\tilde{P}'(t')}{dt} > \frac{d\bar{P}'(t')}{dt}$ and hence at all $t > t'$, $\tilde{P}'(t) > \bar{P}'(t)$ which is impossible because $\tilde{P}'(\tilde{t}) = \bar{P}'(\tilde{t})$. But if $\tilde{P}'(t) < \bar{P}'(t)$ for $t < \tilde{t}$, then summing over t upto $\tilde{t}$, $\tilde{P}(\tilde{t}) < \bar{P}(\tilde{t})$ which is again impossible. Hence $\bar{t} > \tilde{t}$.

The next question is what happens to k and k^* following a fall in r. To answer this question, we have to prove another intermediate result.

<u>Lemma</u> 3.2 If $\bar{r} < r$, then $\bar{P}(t) > \tilde{P}(t)$ for $0 < t < \bar{t}$.

<u>Proof</u>: We have $\bar{P}(t) = \tilde{P}(t)$ for $t \geq \bar{t}$ because w^*, r^* and the final prices are all remaining unchanged . We first show that for $\tilde{t} \leq t < \bar{t}$, $\bar{P}(t) > \tilde{P}(t)$. Suppose not. Then at some t', $\tilde{t} \leq t' < \bar{t}$, $\bar{P}(t') \leq \tilde{P}(t')$. Therefore, $\bar{P}'(t') = \bar{w} + \bar{r}\bar{P}(t') < w^* + r^*\bar{P}(t') \leq w^* + r^*\tilde{P}(t') = \tilde{P}'(t')$. Hence for all t satisfying $\bar{t} \geq t > t'$, $\bar{P}(t) < \tilde{P}(t)$, which is impossible because $\tilde{P}(\bar{t}) = \bar{P}(\bar{t})$. Next we show that for $0 < t < \tilde{t}$, $\bar{P}(t) > \tilde{P}(t)$. Since $\bar{w} > w$, for t sufficiently close to zero, $\bar{P}(t) > \tilde{P}(t)$. Hence if at some t^*, $0 < t^* < \tilde{t}$, $\bar{P}(t^*) = \tilde{P}(t^*)$. for the first time, then $\tilde{P}'(t^*) > \bar{P}'(t^*)$. But this implies that for $\tilde{t} \geq t > t^*$, $\tilde{P}(t) > \bar{P}(t)$ and in particular $\tilde{P}(\tilde{t}) > \bar{P}(\tilde{t})$ which we have already proved is impossible.

Using lemma 3.2 we represent $\tilde{P}(t)$ and $\bar{P}(t)$ in fig.1.2. From the diagram and from the definition of k and k^* it immediately follows that as r falls to $\bar{r}$, k increases and k^* falls. From equation (8b), a fall in k^* leads to a rise in X. Hence kX, the demand for funds by the formal sector, rises as r_I, and hence r goes down. We thus have a downward sloping demand curve for funds for the informal sector as a function of

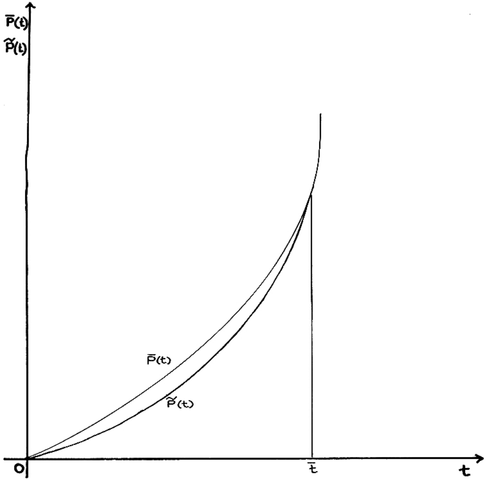


Fig 1.2

r_I. In order to specify the exact nature of the demand curve, we need to prove the following result.

Lemma 3.3 There exists $r^o > r^*$ such the for $r = r^o$ the formal sector is just able to produce the last stage of production.

Proof: Let w^o be the value of w corresponding to r^o. Then w^o and r^o are solutions to $w + r = w^* + r^*$ and $1 = \int_0^T we^{rt}dt$. The two equations are represented diagrammatically in fig.1.3. Since $P^*(T) > 1$ (see footnote 7), the second equation lies below the first equation. On the other hand, in the second equation as w goes to zero, r becomes arbitrarily large. Thus the two equations intersect at $r^o > r^*$ and $w^o < w^*$.

We now specify the nature of the demand curve. Let r_I^o be the value of r corresponding to r^o. As r_I approaches r_I^o from above, number of stages produced by the formal sector becomes very small and hence k^* approaches zero. From equation (8b) this implies that X becomes arbitrarily large and since k remains finite, Xk also becomes arbitrarily large. On the other hand, k becomes arbitrarily small (with X remaining finite) as r_I becomes arbitrarily large. Thus the demand curve becomes asymptotic to the r_I axis on the one hand and to the horizontal line passing thorough r_I^o on the other. This is shown in fig.1.4. Bringing in the supply of funds $M_I + M_f$ we determine the equilibrium r_I and hence all other variables including the level of employment L. It is clear from the above argument that we have an interior equilibrium i.e., in equilibrium $0 < \tilde{t} < T$.

We now consider a couple of comparative statics exercises. Our analysis remains confined to comparisons between stationary states. First, consider a reallocation of organized credit market funds from the formal to the informal sector. The government in many less developed countries control the organized credit market and therefore can induce such a reallocation in order to make more easy credit available to the

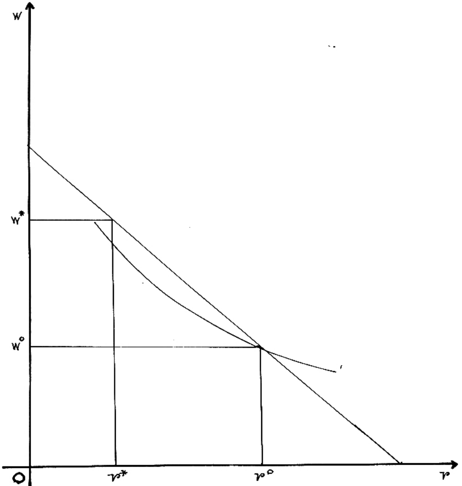


Fig 1.3

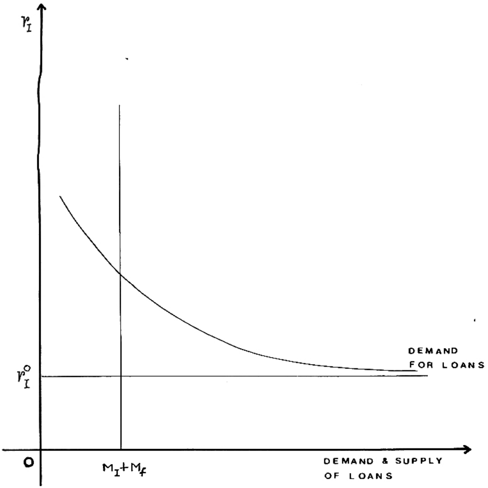


Fig 1.4

informal sector. Let M_f' and $M_f^{*'}$ be the new allocation of funds with $M_f' > M_f$ and $M_f^{*'} < M_f^*$ such that $M_f' + M_f^{*'} = M_f + M_f^*$. Let k', $k^{*'}$ be the per unit capital requirements and X' the level of output in the new situation.

<u>Proposition.3.1.</u> If there is a rellocation of organized credit market funds from the formal sector to the informal sector, then output and employment will fall unambiguously.

<u>Proof:</u> Suppose not. Then $X' \geq X$. Since $(k + k^*)X = M_I + M_f + M_f^{*'}$ $=(k' + k^{*'})X'$, $X' \geq X$ implies that $(k'+k^{*'}) \leq (k + k^*)$. On the other hand, from (8b), $X' \geq X$ and $M_f^* > M_f^{*'}$ implies that $k^{*'} < k^*$. But from lemma 3.2, k^* can fall only if r goes down in equilibrium. But a fall in r, again from lemma 3.2, implies that $k + k^* < k' + k^{*'}$ which is not possible.

Similarly, one can consider the effect of a fall in the rate of interest charged by the organized credit market on loans advanced to the informal sector.

<u>Proposition 3.2.</u> If the organized credit market lowers the rate of interest charged on loans advanced to the informal sector, there is no effect on output and employment.
The proof is analogous to that of proposition 3.1

4. RURAL-URBAN MIGRATION

In this section, we consider an alternative way of closing the model. Thus instead of assuming that the supply of loanable funds is limited, we assume that the level of industrial output is constrained by the supply of labour to the urban sector which in turn is determined by rural-urban migration.

We consider an economy consisting of an industrial and an agricultural sector. The industrial sector is like the one described in section 2. We assume that the informal sector wage rate is flexible and endogeneously determined; informal sector rate of interest, however is assumed to be given. This basically means that the rates of interest at which the informal sector takes loan from the organized and informal credit markets are fixed and the proportion of the total loan taken from each source is also given. Thus $r = \alpha r_I + (1-\alpha)r^*$ where r_I, r^* and α (the proportion of loan taken from the informal credit market) are all fixed.[8] As before, the formal sector wage rate and the rate of interest are also assumed to be given with $r^* < r$. We continue to assume that the industrial good is the numeraire so that equilibrium in the industrial sector is described by equations (3) and (4).

In the agricultural sector the level of output is assumed to be fixed. Production is carried on through family based farms and the agricultural wage rate is equal to the average productivity of labour. There exists surplus labour in the agricultural sector, so that even if labour migrates from the agricultural to the industrial sector the agricultural output does not fall. Finally, we assume that the economy is small and open so that the relative price of the agricultural good is given. Thus we have

$$w_A = \frac{PY}{L_A} \qquad (10)$$

where w_A is the agricultural wage, P is the relative price of the agricultural good, Y is the fixed level of agricultural output and L_A is the level of agricultural employment. We have

$$L_A + L = \bar{L} \qquad (11)$$

---

[8]The idea is that the informal sector can get a fraction $(1-\alpha)$ of its loan requirment from the organized credit market, only if it can show that it has obtained the remaining part of its loan from other sources. We treat α as a policy parameter.

i.e., agricultural employment and industrial employment taken together is equal to the total labour force in the economy L. There is no open unemployment in this model.

We allow rural-urban migration. Workers migrate from agriculture to industry to equate the agricultural wage rate with the expected industrial wage rate in equilibrium. Thus in equilibrium:

$$w_A = \frac{\tilde{t}}{T} w + \frac{T-\tilde{t}}{T} w^* \qquad (12)$$

where the right hand side of equation (12) represents expected urban wage rate. The model is determined in the following way. Given r, r^* and w^* we determine w and $\tilde{t}$ simultaneously from equations (3) and (4). Given w and $\tilde{t}$, w_A is determined from (12) which in turn determines L_A from (10). Finally, given L_A we determine L from (11) and hence X from (9). By assuming that $r > r^0$ (r^0 being defined as in lemma 3.3) we can guarantee an interior equilibrium.

We wish to find out the effect of a fall in r on industrial output and employment in terms of the above model. Suppose due to a policy change the informal sector can get a greater proportion of its loan requirement from the organized credit market. This obviously leads to a fall in the informal sector rate of interest. Clearly from lemma 3.1 a fall in r leads to a rise in w and $\tilde{t}$. From equation (12) a rise in w tends to increase the expected urban wage rate while a rise in $\tilde{t}$ tends to reduce it. Hence the effect of a fall in r on urban migration and hence on urban output is not immediately ovious. Therefore, we make the following assumption which guarantees a unique relationship between the expected wage rate in the industrial sector and r.

Assumption *A*: Corresponding to each level of urban employment there is a unique informal sector rate of interest.

We now represent equilibrium in the above model diagramatically. From equation (12) we get combinations of w and $\tilde{t}$ for a given level of w_A. This is represented by NN in fig.1.5. Along NN, the level of urban employment is fixed. For a higher level of urban employment w_A goes up and hence NN shifts to the left to N′N′. On the other hand, using lemma 3.1 we plot combinations of w and $\tilde{t}$ solving equations (3) and (4) for a given r on the EE curve. As we move up along the EE curve, r falls and the equilibrium w and $\tilde{t}$ go up. An equilibrium is represented by the intersection of the EE and NN curves. The above assumption rules out the possibility of a double intersection between EE and NN. The following lemma proves that NN can not intersect EE from above

<u>Lemma 4.1</u>. The NN curve intersects the EE curve from below.

<u>Proof:</u> Suppose the NN curve intersects the EE curve from above as shown in fig.1.6. Since by assumption $P^{*}(T) > 1$. We have $\bar{t} > 0$ such that $\int_{\bar{t}}^{T} w^{*}e^{r^{*}t}dt = 1$. Thus in equilibrium, $\tilde{t}$ cannot fall below $\bar{t}$ and the EE curve lies to the right of the vertical line passing through $\bar{t}$. Let t_0 be defined by $t_0 = T(1 - \frac{w_A}{w^{*}})$. The NN curve hits the horizontal axis at t_0. By hypothesis, $t_0 \le \bar{t}$ which implies that $w_A \ge (1 - \frac{\bar{t}}{T})w^{*}$. On the other hand, as r approaches r^0 (as defined by lemma 3.3), $\tilde{t}$ approaches T and w approaches w^0. By hypothesis $w^0 \ge w_A$. Thus as r approaches r^0 the cost of production approaches:

$$\int_0^T w^0 e^{r^0 t}dt \ge \int_0^T w_A e^{r^{*}t}dt > \int_{\bar{t}}^{T} w^{*}e^{r^{*}t}dt = 1.$$

Therefore by making r sufficiently close to r^0, the cost of production can be made greater than unity which contradicts the fact that we are on EE.

Combining assumption *A* and lemma 4.1 we conclude that NN interests EE from below. It is now straight forward to find out the effect of a fall in r on industrial output and employment. As r goes down we move up

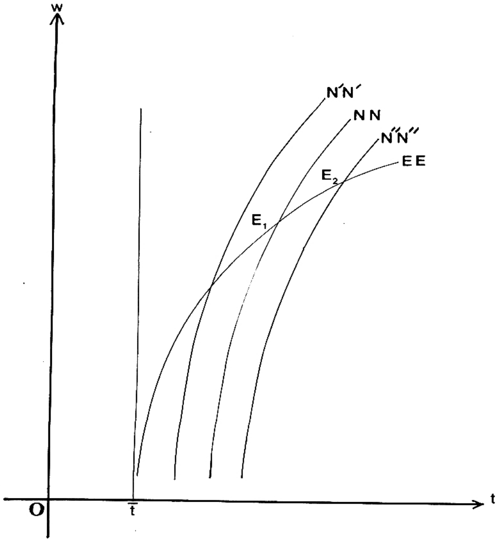


Fig 1.5

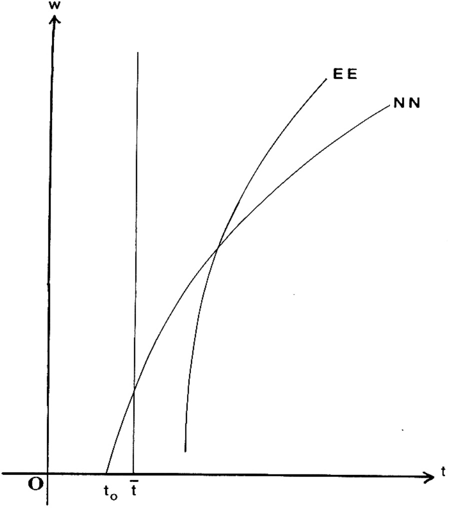


Fig 1.6

along EE from E_1 to E_2 in fig.1.5 where EE intersects N"N". Clearly N"N" represents a lower level of industrial output and employment. Thus we have:

Proposition 4.1. In the model with rural-urban migration, a fall in the informal sector rate of interest leads to an unambiguous fall in industrial output and employment.

5. DEMAND CONSTRAINT.

In this final section we consider a third alternative way of closing the model. As in section 4, we continue to assume that r, r^* and w^* are given while w is determined endogenously and that there is no credit constraint. However, instead of rural-urban migration, we close the model by demand constraint and concentrate only on the industrial *sector*. Let W be the total wage bill and R be the total interest cost per unit of output. We assume that consumption demand consists of the entire wage bill, a fraction β of interest income and an autonomous element $\bar{A}$. Thus we have:

$$X = \bar{A} + WX + \beta RX$$

which implies that

$$X = \frac{\bar{A}}{(1 - W - \beta R)} \qquad (13)$$

We determine W and R from equations (3) and (4) hence X from equation (13).

It is now straight forward to determine the effect of a fall in r on the level of output and employment. From section 4 it is clear that under assumption *A*, fall in r leads to a fall in $W = \tilde{t}w + (T-\tilde{t})w^*$. Since W + R = 1, this implies a rise in R. A redistribution of income in favour of the interest earners who have the lower propensity to consume, in turn, reduces total demand and hence total output as is clear from equation (13). Thus we have the following proposition:

Proposition 5.1. In the demand constraint model a fall in the informal sector rate of interest unambiguously reduces industrial output and *employment.*

6. CONCLUSION.

The above propositions suggest that the government can hardly stimulate employment and output by subsidizing the informal sector through the organized credit market. The other possibility is to subsidize the wage rate in the informal sector. But this is not a realistic option because often it is difficult to keep track of the actual wage paid in the informal sector. Our propositions are of course drived from extremely simplifying assumptions. One of them is the assumption that technology is identical in the two sectors. On the other hand, a strong argument in favour of the informal sector is that the informal sector uses labour intensive techniques and hence is capable of generating more employment. But much of this advantage is removed when we consider the fact that the techniques of production in the informal sector are usually backward and inefficient. Thus in this case a policy induced expansion of the informal sector might increase employment but could actually reduce the level of output.

Another strong assumption is the unique relationship between expected wage rate in the industiral sector and the interst rate faced by the informal sector, introduced in section 4. The results of section 4 and section 5 are crucially dependent upon this assumption. Its removal results in an ambiguity in the impact of interest rate subsidy on output and employment.

There is one last point to be clarified. We have been discussing the impact of a cost subsidy in a general equilibrium framework without bringing into the picture consequent adjustments in the government budget. However, in case of both credit constraint and constrained supply of labour the constraint operates from supply side, while budgetary adjustments primarily affect the demand side. So, we have ignored it. In section 5, where we consider a demand constraint economy, the changes in government budget is more likely to have an impact. If the exogenous demand component ($\bar{A}$) is identified to be the government expenditure, and the government always maintains a balanced budget, then an increase in interest rate subsidy will imply a reduced government expenditure on other heads. That is, there will be a fall in $\bar{A}$ which reinforces the fall in output.

CHAPTER-2

1. INTRODUCTION:

In the previous chapter we considered backward linkage between the formal and the informal sector which operates exclusively through the market mechanism. Difference in production costs between the two sectors was assumed to be the sole source of difference. While the formal sector was assumed to have access to relatively cheaper sources of working capital, the informal units enjoyed the advantages of a cheaper labour force. The cost differential resulted in the informal units' specializing in the manufacturing of the intermediate goods, and the formal producers' specializing in the manufacturing of the final commodities. Both the sectors faced competitive markets. In this simplified setting, the impact of a cost subsidy has been studied in a general equilibrium frame work.

The present chapter considers a different aspect of the linkage between the two sectors. The possibility of such a linkage arises from the fact that if the different cost advantages of the two sectors can be combined, the production cost will be minimized. So, the two types of producers can come to a mutually satisfactory aggrement. The bargaining power of the two sets, however, need not be the same. Who reaps maximum benefit from such an arrangement will depend on their relative strengths. Subcontracting is one such extra market linkage.

Before going into the contents of the present chapter, let us explain briefly the process of subcontracting. Subcontracting alludes to the practice of farming out a part or whole of the production of a commodity by a larger firm to a smaller firm on a contractual basis.

According to both Watanabe(1971), and Nagraj(1984) the impetus for forming such a relationship comes from the differential cost advantages between the two sectors. It has been an widely accepted fact that labour cost is substantially lower within the informal sector as compared to the formal sector. Due to the existence of vast unemployment, informal labour market is extremely competitive and wage rate there is very low. The formal sector producers face a unionized labour force with restricted entry, and protected by various governmental legislations regarding minimum wage, social security, proper working conditions etc. The small units can bypass these laws by virtue of their small sizes. The overhead costs of operation of small units is also very low. All these factors lead to a lower cost for the informal units. But these units also suffer from lack of access to capital/credit market, and sometimes input market as well. The demand they face as independent sellers is highly uncertain and extremely small. Given the scenario, the nexus between the formal and the informal sector can be conceptualized in the following way: the formal sector provides finance and/or input as well as an assured market. In return, they get the advantage of having access to unorganized labour market. Nagraj(1984) gives an additional reason behind the development of subcontracting. There are governmental policies encouraging the small scale sector together with preventive measures to restrict the large firms. The larger producers can enjoy the special previlages provided to these units by producing through their subcontractors. For instance, in India when the big mills in cotton textile industry were not allowed to expand their loomage, they got their fabric woven in the decentralized power loom sector, and in this way they also enjoyed the advantages of the lower wage costs in that sector.

The evidence regarding subcontracting is scanty as well as scattered. However, a few studies which have considered this aspect, gives evidence that subcontracting relationship exists between the formal and the informal sector to a substantial extent. Both Bose(1978) and Romatate(1983), who studied the industries situated in the bustee areas of Calcutta support this view. Sarkar and Mukherjee(1987), while investigating some small scale industries in Calcutta and Howrah, have found that 62% of the units depended wholly or partly on the large scale sector for marketing their outputs. One fourth of the enterprises, serving as subcontractors are tied to one customer. Hariss(1982), in his study of Coimbatore, found that 52% of the workshops were engaged in some form of subcontracting. Beedi industry is one which heavily depends on subcontracting. Evidence to this effect is provided by Basu(1977a) and Mohandas(1980).

The present chapter is a theoretical analysis of the impact of a credit subsidy policy on the level of output, as well as on informal units' income, in the presence of subcontracting. As pointed out by Banerjee(1981), various governmental supports are provided to the informal units with the aim of making them more competitive viz-a-viz the formal sector. Policies are formed ignoring the linkages such as subcontracting that exist between the two sectors. The subcontractors may depend on the parent firms for more than one kind of help. While the government removes their handicaps in one front, in the other fronts the dependence still remains. As a result, the impact of such supports may not be as expected. In this chapter, an example is constructed where the informal units are not only dependent on the formal sector for finance but also their output is marketed by him. They have no alternative source of marketing. In such a situation, the impact of an easy credit policy may be counter productive in the sense that output may fall. It is also possible that such a subsidy may not have any impact on the level of output at all. Even when it improves the level of output, it leaves the income of the informal units unaltered, and its impact in most cases is identical to that of providing the credit to the formal sector producer.

The model of subcontracting that is developed in this section, utilizes the idea of dual pricing. The concept of dual pricing was originally indroduced in a pioneering work by Oi(1971). The intuition behind dual pricing is that if an agent can divide the price he is going to charge his customer into two parts, then by varying these two parts suitably, he can ensure that the customer does not get anything more than his next best alternative. The idea has later been extensively used in the theory of interlinked contracts to explain the operations of rural credit markets in developing countries. Some important papers in this area are by Bardhan(1980), Basu(1983), Bhaduri(1973,1977), Breverman and Srinivasan(1981), Gangopadhyay and Sengupta(1987), Ray and Sengupta(1987). As the parent firm is the supplier of credit/input as well as buyer of output, subcontractor is ideally suited for exploitation through dual pricing. The arguments used in the present chapter are in the same line as that adopted by Gangopadhyay and Sengupta(1987), and Braverman and Srinivasan(1981). However both of the papers study the various forms of contracts between a land lord and his labourers/tenants, that will emerge in different circumstances, while the present work emphasizes the impact of a particular form of change on the level of output and informal units' income.

The chapter is arranged in the following way. The second section developes the basic model. In the third section, the effect of soft credit policy is analyzed without considering any credit constraint. Section 4 considers the same problem with credit constraint. Section 5 gives the conclusions.

2 THE FRAME WORK OF ANALYSIS

In this section we develop the basic frame work. Let us consider an industry which can be subdivided into a formal sector and an informal sector. A production unit, belonging to either one of the two sectors is capable of manufacturing the particular commodity produced within this industry. Without going into the details of the comparative cost advantages, we assume that the production cost is lower in the informal sector compared to the formal sector. The possible reasons for such a discripancy has already been provided. However, we make the extreme assumption, that the informal units do not have any access to the final goods market. They operate exclusively as subcontractors. It is the formal sector producer who markets the output. The formal sector producer (call him producer F) is assumed to be a monopolist,[1] who concentrates all his resources in marketing activities only, so far as this particular good is concerned.

Initially, the number of subcontractors is assumed to be fixed. This can be justified on the ground that producer F is in contact with only a few dependable subcontractors. Since we do not allow the number of subcontractors to vary in this section, we make a further simplifying assumption that there is only one subcontractor under the monopolist formal sector producer. The analysis can easily be generalized to a situation where there is more than one subcontractor.

Producer F can offer two types of contracts to his subcontractor.

Contract I: Producer F borrows the fund required for production and advances the fund to his subcontractor at a certain rate of interest. He also buys the final output at a certain price. The interest rate to be paid and the price to be charged are both determined by producer F. The informal unit operates as a price taker and just decides how much to supply at each price, interest rate combination.[2]

Contract II: The informal unit borrows from some outside source and produces the commodity. Then the commodity is sold to producer F at a certain price, which is determined by producer F himself. Under this alternative contract also, the informal unit operates as a price taker. The only difference is that producer F can no longer control the

---

[1]A.N.Bose(1978), Romatate(1983) and T. Basu(1977b) emphasize the fact that the formal firms operate in a monopolistic/oligopolistic market. Sometimes they can be big multinationals also. They subcontract the production, and sell the output at a very high margin of profit. The present analysis can easily be generalized to oligopolistic situtations.

[2]In their studies, Nagraj(1984), Romatate(1983), T.Basu(1977a,1977b), and Mohandas(1980) point out the existence of this type of contract.

interest rate.

Both producer F and his subcontractor are profit maximizers. Producer F can choose any one of the above contracts subject to the constraint that it be acceptable to the subcontractor.

Let us now describe the equilibrium configuration of prices and output under each type of contract, one by one.

Given the above assumptions, the profit function of the informal unit under contract I is

$$\pi_I = p_I x_I - (1+r_I)C(x_I) \qquad (1)$$

where, p_I: the price offered by producer F to the informal unit.

r_I: the interest rate charged by producer F from the informal unit.

$C(x_I)$: the cost of producing x_I units of output. The cost function has got the following properties: $C'(x_I) > 0$, $C''(x_I) \geq 0$ with all the higher order derivatives positive or zero, $C'(0) \simeq 0$.

The amount of x_I that the subcontractor is ready to supply at each price is given by:

$$p_I = (1+r_I)C'(x_I) \qquad (2)$$

There is also the additional requirement that:

$$\pi_I \geq W_r \qquad (3)$$

where W_r: is the reservation income that the informal unit can earn from alternative employment. It is his opportunity cost.

The inverse demand function facing producer F is given by:

$$P = P(X_F),\ P'(X_F) < 0,\ P''(X_F) \leq 0 \qquad (4)$$

where, X_F is the total output sold by the firm.

As there is only one subcontractor by assumption, and the entire output is produced through subcontracting, $X_F = x_I$. The profit function for the formal sector producer can be written as:

$$\Pi^m_F = P(X_F)X_F - (1+r^*)C(X_F) - [p_I X_F - (1+r_I)C(X_F)] \quad (5)$$

Here, r^* : is the rate of interest prevailing in the organized credit market.

The following proposition reduces the inequality relation in equation (3) to one of strict equality.

Proposition 2.1.: If $(1+r^*_I, p^*_I)$ is the optimal contract, then, $p^*_I x^*_I - (1+r^*_I)C(X^*_F) = W_r$.[3]

If $p_I x_F - (1+r_I)C(x_F) > W_r$ then producer F will be able to do better by reducing π_I, thereby increasing Π^m_F as is clear from equation (5). As long as producer F has control over both price and the rate of interest, borrowing the terminology from Basu(1984,1986), we can say that he will act as an all or nothing monopsonist. By appropriately choosing $(p_I, 1+r_I)$ producer F can confine the informal producer to his reservation income. He can reduce π_I for instance, by proportionately reducing both p_I and $1+r_I$. From equation (2) it is clear that, proportional reduction of $(p_I, 1+r_I)$ will not affect the level of supply. Thus, he can ensure that the informal units will always get their reservation incomes only, without disturbing the supply of output.[4] Hence, we can write,

$$p_I X_F - (1+r_I)C(X_F) = W_r \quad (6)$$

---

[3]The formal proof of this proposition can be found in Gangopadhyay and Sengupta(1987).

[4]As long as the informal units operate as price takers, the same results will be obtained if producer F determines the size of the order and the rate of interest on the fund advanced, while the informal units decide the price they will want per unit of output.

Producer F's profit function then takes the form:

$$\Pi_F^m = P(X_F)\, X_F - (1+r^*)C(X_F) - W_r \qquad (5)'$$

The profit maximizing choice of X_F for producer F is obtained from the condition.

$$MR_F = P(X_F) + X_F P'(X_F) = (1+r^*)C'(X_F) \qquad (7)$$

Let the equilibrium values under contract I be $(\bar{X}_F^m, \bar{p}_m, \bar{r}_m)$. We now turn our attention to contract II. In this contract, producer F can only dictate the price he is going to pay, and the subcontractor decides how much he is going to supply at each price. The profit function of the informal producer becomes:

$$\pi_I = p_I x_I - C(x_I)(1+\tilde{r}) \qquad (1)'$$

where $\tilde{r}$ is the rate of interest on loans taken from outside.

The supply at each price is then :

$$p_I = (1+\tilde{r})C'(x_I) \qquad (2)'$$

Producer F's profit function then takes the form:

$$\tilde{\Pi}_F = P(X_F)X_F - p_I X_F \qquad (8)$$

He maximizes his profit taking into account equation (2)$'$. This exercise yields the following condition:

$$MR_F = P(X_F) + X_F P'(X_F) = (1+\tilde{r})[C'(X_F) + X_F C''(X_F)] \qquad (7)'$$ [5]

For $\tilde{r} \geq r^*$, the output will obviously fall below $\bar{X}_F^m$. Comparing (7) with (7)$'$ we can see that the curve $(1+\tilde{r})[C'(X_F)+X_F C''(X_F)]$ lies above the marginal cost curve $(1+r^*)C'(X_F)$, whereas the marginal revenue curve remains unaltered (see fig.2.1).

---

[5]The assumption about the nature of demand and cost function gurantees that the second order conditions for profit maximization are satisfied in all the cases considered.

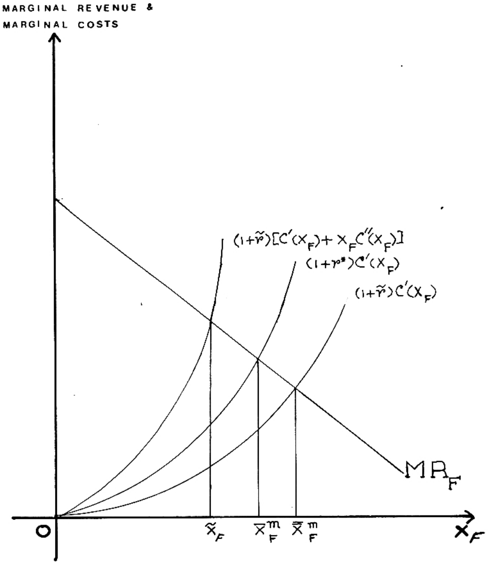

MARGINAL REVENUE &
MARGINAL COSTS
$(1+\tilde{r})[C'(X_F)+X_F C''(X_F)]$
$(1+r^*)C'(X_F)$
$(1+\tilde{r})C'(X_F)$
MR_F
O
$\tilde{x}_F$
$\bar{X}^m_F$
$\bar{\bar{X}}^m_F$
X_F

Fig 2.1

For $\tilde{r} < r^*$, we prove the following proposition which provides the sufficient condition for the profit maximizing output under contract II to be lower than $\bar{X}_F^m$.

Proposition .2.2 If $r^* \leq 1$, and $\tilde{r} > 0$, then the output will always be lower.

Proof: Let us construct a function:

$$L = (1+r^*)C''(X_F) - (1+\tilde{r})\,[2C''(X_F) + X_F C^3(X_F)]$$

where, $(1+r^*)C''(X_F)$: slope of the function $(1+r^*)C'(X_F)$

$(1+\tilde{r})[2C''(X_F) + X_F C^3(X_F)]$: slope of the function

$(1+\tilde{r})[C'(X_F) + X_F C''(X_F)]$

Rearranging the terms :

$$L = (1+\tilde{r})\left[\frac{\tilde{r}-r^*}{1+\tilde{r}} - 1\right]C''(X_F) - (1+\tilde{r})X_F C^3(X_F).$$

Given $r^* \leq 1$, $\tilde{r} > 0$, $L < 0$ for all $X_F \geq 0$. In other words, the curve $(1+r^*)C'(X_F)$ will lie above $(1+\tilde{r})[C'(X_F) + X_F C''(X_F)]$, if the conditions mentioned above are satisfied. Given the same revenue function, output will always fall.

Let the equilibrium solution under contract II be denoted by $(\tilde{p}, \tilde{X}_F)$. There is a fall in output whenever producer F switches from contract I to contract II. The reason behind the fall lies in the changing role of producer F. When he is acting as an all or nothing monopsonist, he can make sure that none of the surplus goes to the informal producer, through his control over both price and the rate of interest. The condition $\frac{{}_IP_I}{(1+r_I)} = C'(X_F)$ implies that the price he pays for the proceeds from one unit of loan is exactly equal to the return in terms of the rate of interest on advance plus the advance itself. The cost of producing an extra unit is then just $(1+r^*)C'(X_F)$, so the producer gives an order of size $\bar{X}_F^m$, such that $MR_F = (1+r^*)C'(X_F)$.

When the informal producer borrows from some outside agency, producer F can no longer prevent the informal unit from getting a part of the surplus as he can no longer confine him to the level of reservation income. He has lost control over one variable, namely, the rate of interest. Now, $p(X_F) = (1+r^*)C'(X_F)$ and the marginal cost of buying an extra unit is $p(X_F) + X_F p'(X_F) > (1+\tilde{r})C'(X_F)$ for $\tilde{r} \geq r^*$. For $\tilde{r} < r^*$ there are two effects: $p(X_F) < (1+r^*)C'(X_F)$ but $p(X_F) + X_F p'(X_F)$ may or may not be greater than $(1+r^*)C'(X_F)$. Lower rate of interest reduces per unit purchase price below the previous marginal cost $(1+r^*)C'(X_F)$, thus tending to increase the equilibrium level of output. The monopsonistic element on the other hand tends to reduce the size of the order. $r^* \leq 1$ and $\tilde{r} > 0$ gives the sufficient limits within which second effect is necessarily stronger than the first effect, so that the cost of acquiring an extra unit is higher than under contract I and the size of the order is lower, resulting in a lower output.

The formal sector produer F will select between the two contracts on the basis of the profit level that he can realize under each contract subject to the constraint stated already. As long as $\tilde{r} \geq r^*$, contract I will always give him higher profit. He will prefer contact II for some $\tilde{r}$ sufficiently lower than r^* to ensure him a higher profit. The ground is now ready to examine the impact of a cost subsidy, which we proceed to do in section 3.

3. SUBCONTRACTING WITH UNLIMITED SUPPLY OF LOANS.

Initially it is assumed that the informal producer does not have access to the organized credit market. The rate at which he can borrow from outside is so high that producer F finds it more profitable to offer his subcontractor contract I(the sufficient condition for this is $\tilde{r} > r^*$). Once the subsidized loan facilities are made available to the informal unit, there is a fall in the outside borrowing rate $\tilde{r}$. However, whether producer F will switch to contract II or not depends on respective profitabilities of the two contracts. We restrict the domain of the values that $\tilde{r}$ and r^* can take to $\infty > \tilde{r} > 0$, and $0 \le r^* \le 1$. This is a reasonable restriction. Next, we partly prove and partly show with an example that there exist values of $\tilde{r}$ and r^* within these domains for which producer F will prefer contract II to contract I.

To this end, we first prove the following proposition:

Proposition.3.1. For each level of $\tilde{r} > 0$ $\exists$ an r^* such that contrat II is preferable to contract I.

Proof. First note that, for any one of the contracts to be acceptable to the subcontractor, his income from contract I should be at least as great as his income from the alternative contract. Producer F can control the subcontractor's income under contract I subject to reservation income constraint. Thus, the reservation income under contract I should be the same as his income under contract II. That is:

$$W_r = \pi_I = \tilde{p}\,\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F) \qquad (9)$$

The condition under which producer F will prefer contract II to contract I is:

$$P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F) - W_r < P(\tilde{X}_F)\tilde{X}_F - p(\tilde{X}_F)\tilde{X}_F.$$

Then, substituting for W_r from condition (1) and rearranging the terms of the above expression, we get:

$$P(\tilde{X}_F)\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F) - [P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F)] > 0$$

For $r^* \le \tilde{r}$ the expression is strictly negative. Now, as $\tilde{r}$ declines $P(\tilde{X}_F)-(1+\tilde{r})C(\tilde{X}_F)$ increases. (With unchanged $\tilde{X}_F$, as $\tilde{r}$ falls, $P(\tilde{X}_F)\tilde{X}_F-(1+\tilde{r})C(\tilde{X}_F)$ will be higher. As $\tilde{X}_F$ itself adjusts to the profit maximizing level, the above expression will be even higher). At the same time, $P(\bar{X}^m_F)\bar{X}^m_F-(1+r^*)C(\bar{X}^m_F)$ remains unchanged. If we can now show that there exists an r^* at which for $\tilde{r} = 0$, on respective profitabilities of the two contracts. We restrict the domain of the values that $\tilde{r}$ and r^* can take to $\infty > \tilde{r} > 0$, and $0 \le r^* \le 1$. This is a reasonable restriction. Next, we partly prove and partly show with an example that there exist values of $\tilde{r}$ and r^* within these domains for which producer F will prefer contract II to contract I.

To this end, we first prove the following proposition:

Proposition.3.1. For each level of $\tilde{r} > 0$ $\exists$ an r^* such that contrat II is preferable to contract I.

Proof. First note that, for any one of the contracts to be acceptable to the subcontractor, his income from contract I should be at least as great as his income from the alternative contract. Producer F can control the subcontractor's income under contract I subject to reservation income constraint. Thus, the reservation income under contract I should be the same as his income under contract II. That is:

$$W_r = \pi_I = \tilde{p}\,\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F) \qquad (9)$$

The condition under which producer F will prefer contract II to contract I is:

$$P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F) - W_r < P(\tilde{X}_F)\tilde{X}_F - p(\tilde{X}_F)\tilde{X}_F.$$

Then, substituting for W_r from condition (1) and rearranging the terms of the above expression, we get:

$$P(\tilde{X}_F)\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F) - [P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F)] > 0$$

For $r^* \le \tilde{r}$ the expression is strictly negative. Now, as $\tilde{r}$ declines $P(\tilde{X}_F) - (1+\tilde{r})C(\tilde{X}_F)$ increases. (With unchanged $\tilde{X}_F$, as $\tilde{r}$ falls, $P(\tilde{X}_F)\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F)$ will be higher. As $\tilde{X}_F$ itself adjusts to the profit maximizing level, the above expression will be even higher). At the same time, $P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F)$ remains unchanged. If we can now show that there exists an r^* at which for $\tilde{r} = 0$,

$P(\tilde{X}_F)\tilde{X}_F - C(\tilde{X}_F) > P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F)$, then we can determine an $\tilde{r}_0 > 0$, s.t. with $\tilde{r} < \tilde{r}_0$ contract II is preferred to contract I for all r^* greater than that particular r^*, as is clear from fig.2.2. In the figure, II′ represents the function $P(\tilde{X}_F)\tilde{X}_F - (1+\tilde{r})C(\tilde{X}_F)$ as a function of $\tilde{r}$ (which is monotonic and continuous) and AA′ represents the function $P(\bar{X}^m_F)\bar{X}^m_F - (1+r\ )C(\bar{X}^m_F)$. Then for $\tilde{r} > r_0$ contract I is preferred and for $\tilde{r} < \tilde{r}_0$, contract II is preferred. Here, the underlying assumption is that $\exists\ r^* > 0$ s.t., the intersection between the two curves takes place in the positive quadrant of $\tilde{r}$. That is what we show next.

As r^* increases, $P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F)$ (which is also monotomic and continuous in r^*) declines, whereas $P(\tilde{X}_F)\tilde{X}_F - C(\tilde{X}_F)$ remains unchanged. Also, for $r^* = 0$, $P(\bar{X}^m_F)\bar{X}^m_F - C(\bar{X}^m_F) < P(\tilde{X}_F)\tilde{X}_F - C(\tilde{X}_F)$. In terms of fig.2.2. given $\tilde{r}$ we get a particular II′curve. Now we start with an $r^* \geq 0$, so small that the intersection between II′ and AA_1 takes place in the negative quadrant. As r^* is increased, AA_1 curve shifts down to $AA_2, AA_3, \ldots\ldots AA'$ where the intersection is taking place in the positive quadrant. So $\exists$ an $\tilde{r}_0 > 0$, for which:

$$P(\bar{X}^m_F)\bar{X}^m_F - (1+r^*)C(\bar{X}^m_F) < P(\tilde{X}_F)\tilde{X}_F - (1+\tilde{r}_0)C(\tilde{X}_F).$$

Now, it remains to be shown that this r^* will also satisfy the condition $r^* \leq 1$. Since the conditions $\tilde{r} > 0$ and $r^* \leq 1$ constitute a sufficient condition, instead of giving a direct proof we construct an example and show that the condition $r^* \leq 1$ is satisfied at least in this particular example.

In constructing the example we take, $C'(X_F) = c.X_F$ (linear marginal cost). This is the marginal cost function for the informal units. The demand function for the monopolist producer F is $P = a - bX_F$. Then we, can solve for $\tilde{X}_F$ directly from the conditions (2)′ and (7)′ as:

$$\tilde{X}_F = \frac{a}{2(b+\tilde{R}c)} \quad \text{where } \tilde{R} = (1+\tilde{r})$$

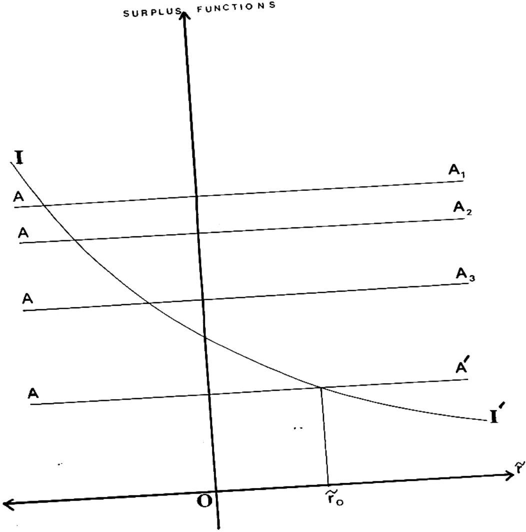


Fig 2.2

42 A

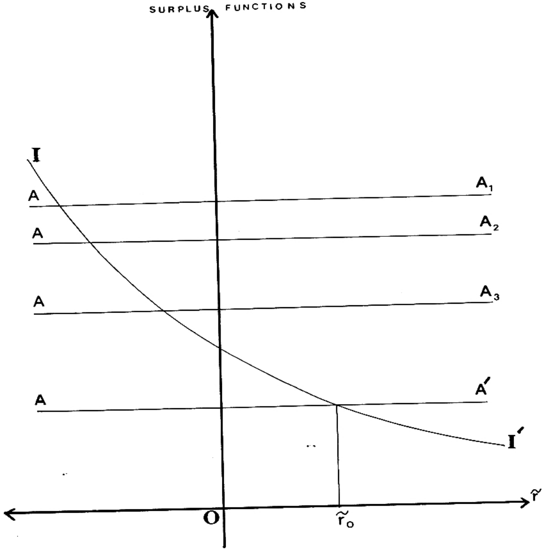


Fig 2.2

Similarly $\bar{X}_F^m$ can also be explicitly sloved for from equation (7) as:

$$\bar{X}_F^m = \frac{a}{2b+R^*c} \text{ where } R^* = 1+r^*$$

Then, $$P(\tilde{X}_F)\tilde{X}_F - \tilde{R}C(\tilde{X}_F) = \frac{a^2(2b+3\tilde{R}c)}{8(b+\tilde{R}c)^2}$$

and, $$P(\bar{X}_F^m)\bar{X}_F^m - R^*C(\bar{X}_F^m) = \frac{a^2}{2(2b+R^*c)}.$$

Let us now determine that value of r^* for which

$$P(\tilde{X}_F)\tilde{X}_F - C(\tilde{X}_F) - [P(\bar{X}_F^m)\bar{X}_F^m - R^*C(\bar{X}_F^m)] > 0$$

i.e., $$\frac{a^2(2b+3\tilde{R}c)}{8(b+\tilde{R}c)^2} - \frac{a^2}{2(2b+R^*c)} > 0$$

Solving, we get $r^* > \frac{c}{2b+3c} < 1$.

So for $r^* = \frac{c}{2b+3c} + \varepsilon < 1$ (where ε is very small) we can get an $\tilde{r}_0 > 0$, such that for $\tilde{r} < \tilde{r}_0$ contract II is preferred to contract I by producer F.

As long as $\tilde{r} > \tilde{r}_0$ any decrease in $\tilde{r}$ will have no effect on the level of output as producer F will stick to contract I. When $\tilde{r}$ changes from values greater than $\tilde{r}_0$ to values less than $\tilde{r}_0$ there is a clear fall in output. This is because producer F switches from contract I to contract II. Thereafter, if there are further reductions in the rate of interest, output will increase, but, as long as $\tilde{r} > 0$, $\tilde{X}_F$ will remain below $\bar{X}_F^m$.

It should be noted that even with $r^* > \tilde{r}$ producer F may not find it profitable to switch to contract II as long as $\tilde{r} > \tilde{r}_0$. So, a reduction of $\tilde{r}$ below r^* may not have any effect on output. If on the other hand, the subsidized loan was supplied directly to producer F output would have increased to $\bar{\bar{X}}_F^m$ as shown in fig.2.1.

The effect of a subsidized credit on informal unit's income is ambiguous. However, it can be proved that if the fall in the rate of interest is large enough (to be precisely defined below), then the income of the informal unit will fall.

Let us start with an $\tilde{r} > r^{*}$. Producer F is offering the informal sector producer contract I which is accepted. As $W_r = \tilde{\pi}_I$ always, the condition can be expressed as:

$$(1+\bar{r}^m_I)[C'(\bar{X}^m_F)-C(\bar{X}^m_F)/\bar{X}^m_F]\bar{X}^m_F = (1+\tilde{r})[C(\tilde{X}_F)-C(\tilde{X}_F)/\tilde{X}_F]\tilde{X}_F$$

As $\tilde{X}_F < \bar{X}^m_F$, $\bar{r}^m_I < \tilde{r}$. That is the interest rate charged by producer F is lower than the market rate of interest at which the informal units can borrow from outside, and hence borrowing from the parent firm is acceptable to the subcontractors.

Now suppose subsidized loans are introduced, and there is a consequent fall in the rate of interest. Let the new $\tilde{r}$ be $\tilde{r}'$.

<u>Proposition.3.2.</u> If $\tilde{r}' < \bar{r}^m_I$, the income of the informal units will definitely fall.

<u>Proof.</u> The output level $\bar{X}^m_F$ remains unaffected by changes in $\tilde{r}$. It is $\bar{p}^m_I$ and $\bar{r}^m_I$ that absorbes the impact of changes in $W_r = \tilde{\pi}_I$. Now, $\tilde{X}'_F$ which corresponds to $\tilde{r}'$ is less than $\bar{X}^m_F$ as has already been proved. Also, $\tilde{r}' < \bar{r}^m_I$. Therefore,

$$(1+\tilde{r}')[C'(\tilde{X}'_F)-C(\tilde{X}'_F)/\tilde{X}'_F]\tilde{X}'_F < (1+\bar{r}^m_I)[C'(\bar{X}^m_F)-C(\bar{X}^m_F)/\bar{X}^m_F]\bar{X}^m_F$$
$$= (1+\tilde{r})[C'(\tilde{X}_F)-C(\tilde{X}_F)/\tilde{X}_F]\tilde{X}_F$$

That is the reservation income corresponding to $\tilde{r}'$ must be lower compared to the reservation income corresponding to $\tilde{r}$.

However, as long as variation in $\tilde{r}$ is such that $\tilde{r}' > \bar{r}^m_I$, the effect of interest subsidy on informal unit's income is ambiguous. Also the above is the result of an one shot change. Once producer F starts offering contract II to his subcontractor, income of the subcontractor may rise or fall as a result of further cuts in the interest rate. While the higher volume of output tends to increase the income, the lower price at each level of output tends to lower it. The net effect is uncertain.

The other possible situation is where the intersection between $P(\tilde{X}_F)\tilde{X}_F-(1+\tilde{r})C(\tilde{X}_F)$ and $P(\bar{X}^m_F)\bar{X}^m_F-(1+r^*)C(\bar{X}^m_F)$ does not take place in the postive quadrant at all. Then the loan will never be effective as long as $\tilde{r} > 0$ in the sense that the informal unit will never take advantage of it. Output will also remain unaffected. The income of the informal unit may change in either direction.

4. SUBCONTRACTING WITH A VARIABLE NUMBER OF SUBCONTRACTORS.

So far, the number of subcontractors has been assumed to be fixed at one. But, empirical evidence suggests that formal sector producers sometimes do have control over the number of subcontractors to be employed. By varying the number of subcontractors the burden of market fluctuations can be shifted on to them by the parent firms.

In this section, we will consider a situation where the number is endogeneously chosen by producer F.

Let us start with contract I. The informal units are assumed to be identical in every respect. Also, there is a perfectly elastic supply of subcontractors at an exogenously fixed reservation income W_r.

An individual informal unit behaves in the same way as in section 2. Producer F however has n as well as X_F as his choice variable. His profit function now takes the form:

$$\Pi^m_F = P(X_F)X_F-(1+r^*)C(X_F/n)n-nW_r \qquad (10)$$

where n is the number of subcontractors producer F employs.

Since all the units are indentical, the share of each unit in total output is X_F/n. The conditions for profit maximization now become:

$$MR_F=P(X_F)+X_F P'(X_F)=(1+r^*)C'(X_F/n) \quad (11a)$$

$$(X_F/n)(1+r^*)C'(X_F/n)=(1+r^*)C(X_F/n)+W_r \quad (11b)$$

By employing an additional subcontractor producer F distributes the same size of output more thinly over a larger number of subcontractors. So, there is a saving in terms of marginal cost as the order going to individual suncontractor goes down. At the same time there is the additional cost of employing one more subcontractor, which is given by the right hand side of equation (11b). When these two match, equilibrium level of n is obtained.

Combining the condition (11a) and (11b) we can write:

$$MR_F = P(X_F)+X_F P'(X_F) = \frac{(1+r^*)C(X_F/n)+W_r}{X_F/n}$$

This reformulation gives rise to an alternative explanation of the condition. The gain is the marginal revenue from sales as each additional subcontractor is employed. The corresponding increase in cost is given by the right hand side of the above expression.

The condition can be interpreted in another way also, which makes it amenable to graphical representation. When n is chosen optimally the size of the order supplied by each subcontractor is such that the average cost per subcontractor (given by the right hand side expression of equation (11b) divided by X_F/n) is at its minimum. Assuming the existence of an optimal solution in this set of equations, let us denote them by (X_F^m, n_m). The solution is shown in fig 2.3.

A few comments are in order here. First if we solve for the optimal size of the order going to each individual informal unit for each level of n, i.e. $X_F^m/n = x_m = x_m(n)$, from equation (11a), then $dx_m/dn < 0$. If n goes up, this increases the total volume of output for given size of the order x_m. Consequently, the marginal revenue goes down, while

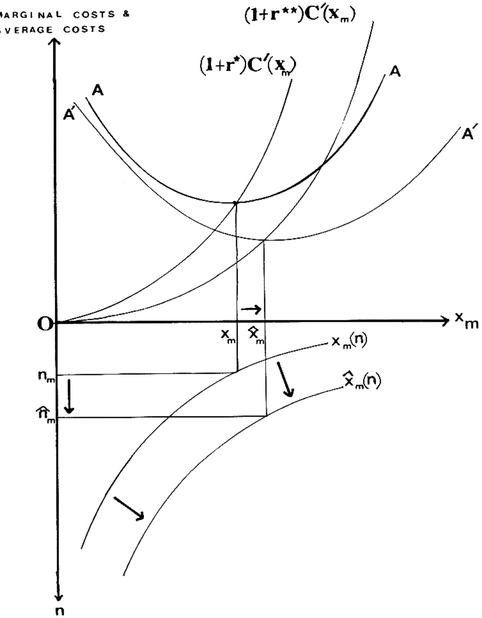

MARGINAL COSTS &
AVERAGE COSTS
(1+r**)C′(x_m)
(1+r*)C′(x_m)
A
A′
A
A′
O
x_m
x_m
x̂_m
x_m(n)
x̂_m(n)
n_m
n̂_m
n

Fig 2.3

marginal cost remains unaltered. As a result, MR < MC. So, the size of the order x_m going to individual units have to fall to bring back MR = MC equality.

Secondly, when $n = \bar{n}$ (fixed) $d\Pi^m_F/dn \geq 0$. Otherwise by reducing n producer F would have been able to make a profit. It is also clear that the profit from free maximization is higher than that under constrained maximization.

Thirdly when $n = n_m$ $\bar{r}^m_I = r^*$. For $\bar{n} < n_m$, $\bar{x}_m > x_m$ ($\bar{x}_m = \bar{X}^m_F/\bar{n}$, i.e., the optimal size of the order corresponding to $\bar{n}$). So $\bar{r}^m_I < r^*$. When the number of informal units is less than optimum, at the rate of interest r^* they will earn more than W_r due to higher size of order. So by proportionally reducing $(p_I, 1+r_I)$ below $1+r^*$ producer F takes away this surplus. Optimal n is exactly that level of n which ensures W_r to each individual unit at the rate of interest r^*.

The total output $X^m_F = n_m x_m$ will be higher than $\bar{X}^m_F = \bar{n}\bar{x}_m$. It is proved in proposition (4.1).

<u>**Proposition.4.1.**</u> $nx_m(n)$ is an increasing function of n for all relevant values of n.

<u>**Proof:**</u> $P[nx_m(n)]+nx_m(n)P'[nx_m(n)] \equiv (1+r^*)C'[x_m(n)]$
for all relevant values of n. Let us take $n = n_1 \leq n_m$ then,
$P[n_1x_m(n_1)]+n_1x_m(n_1)P'[n_1x_m(n_1)] \equiv (1+r^*)C'[x_m(n_1)]$
Take $n_2 > n_1$ and x_2 such that, $n_2x_2 = n_1x_m(n_1)$
As $n_2 > n_1, x_2 < x_m(n_1)$
Then ,

$$P[n_2x_2]+n_2x_2P'[n_2x_2]=n_1x_m(n_1)P'[n_1x_m(n_1)]+P[n_1x_m(n_1)]=(1+r^*)C'[x_m(n_1)]$$

But as $x_2 < x_m(n_1)$, $(1+r^*)C'(x_2)<(1+r^*)C'\{x_m(n_1)\}$
So, $P[n_2x_2]+n_2x_2P'[n_2x_2] > (1+r^*)C'[x_2]$.
Thus if at $x_m(n_2)$

$P[n_2x_m(n_2)]+n_2x_m(n_2)P'[n_2x_m(n_2)] \equiv (1+r^*)C'[x_m(n_2)]$
$x_m(n_2) > x_2$. That is $n_1x_m(n_1) = n_2x_2 < n_2x_m(n_2)$. This implies $nx_m(n)$ is an increasing function in n.

Once we allow producer F to choose the number of subcontractors, he no longer needs a control over the interest rate to push the informal units down to their reservation incomes.[6] Let W_r be the reservation income which the informal units earn outside the sector considered. So even under contract II also, they must be guaranteed at least as much as W_r. That is $\pi_I = p.(X_F/n)-(1+\tilde{r})C(X_F/n) \geq W_r$. Then, by his control over p and n, the formal sector producer can now ensure that his subcontractors get just W_r under contract II as well, and produce exactly as he has ordered. In other words corresponding to each p, he can choose n such that the subcontractors get just W_r, even when they are borrowing the fund from outside sources. It will be profit maximizing decision for him to push subcontractors down to W_r as has already been proved. His profit function is the same as (10). Only r^* gets substituted by $\tilde{r}$ [7]. With Producer F controlling both price and the number of subcontractors there is virtually no difference between contract I and contract II except for the interest rate at which funds are borrowed. The optimal solutions for (X_F, n), can thus be obtained under contract II from equations (11a) and (11b), simply by replacing r^* by $\tilde{r}$. As the subcontractors are indifferent between the two contracts, producer F chooses that contract which offers him the advantage of lowest rate of interest.

We now proceed to compare $(x_m, n_m)$with the solution that emerges if the

---

[6]Similar results have been established independently by Braverman and Srinivasan(1981) but in a different context.

[7] This we can easily establish. Under contract II, the profit function is given by: $\Pi_F=P(X_F)X_F-np.(X_F/n)$. Now, $p.(X_F/n)-(1+\tilde{r})C(X_F/n)=W_r$. Replacing for $p.(X_F/n)$in equation for Π_F, we get the same profit function (10) as under contract I.

informal units are allowed to borrow from the organized credit market at a rate of interest $r^{**} < r^{*}$. There is no loan constraint operating either on the formal or on the informal producers.

Here, all the benefits of a low rate of interest are passed out of the hands of the informal units to producer F. The profit function for the informal units remains the same as in (1) with $\tilde{r} = r^{**}$. Their supply functions are given by (2), with n variable, $x_I = X_F/n$. Reservation income constraint will also hold.

When subsidized credit is available to the informal units, the formal sector producer F shifts to contract II as $\tilde{r} = r^{**} < r^{*}$. Producer F's profit function is the same as (10) replacing r^{*} by r^{**}. Equilibirium values of (n,x) are solved from equations (11a), (11b) again by substituting r^{**} for r^{*}.

In terms of fig.2.3 the average cost curve is moving down to $A'A'$ from its earlier position AA. Since the corresponding marginal cost curve $(1+r^{**})C'(X_F/n)$ shifts down, the minimum point of the average cost curve shifts to the right as well. The curve representing $x_m(n)$ function also shifts up as the optimal size of order is now larger corresponding to each n. Let the new solutions be $(\hat{n}_m, \hat{X}^m_F)$.

Using proposition 4.1, it can easily be shown that, $\hat{n}_m > n_m$ and $\hat{X}^m_F > X^m_F$. Also, at $(\hat{n}_m, \hat{X}^m_F)$, $(1+r^{**})[C'(\hat{x}_m)-C(\hat{x}_m)/\hat{x}_m]\hat{x}_m = W_r$ where $\hat{x}_m = \dfrac{\hat{X}^m_F}{\hat{n}^m}$. That is, at $(\hat{n}_m, \hat{x}_m)$ informal units are just guaranteed of their reservation incomes at the rate of interest r^{**}. Profit of producer F at $(\hat{n}^m_F, \hat{X}^m_F)$ is also higher compared to (n_m, X^m_F).

So provision of subsidized credit to the informal units here becomes equivalent to giving subsidized loans to the formal sector producer. It increases production and the number of subcontractors employed by producer F. The individual informal sector units do not make any gain out of the loans. Their incomes stay restricted to W_r. Producer F extracts all the surplus that should have incurred to the informal producing units.

5. LOAN CONSTRAINT.

In this section we consider the situation, where the formal sector producer F faces a credit constraint coming from the organized credit market. He can not borrow more than $\bar{L}$ amount of loans from the *organized credit market. In the analysis of this section n is treated* as a variable.

We do not bring in here contract I and contract II explicitly, because it has already been established that the two are equivalent for the informal units. The formal sector producer chooses that contract which gives him maximum loans with lowest interest. As in section 4, initially producer F is assumed to be the only source of credit to the informal units. That is he offers them contract I. The credit constraint $\bar{L}$ will only be effective if $n_m C(x_m) > \bar{L}$. The profit function facing the informal units will again be given by equation (1) and, their supply functions by equation (2)′with $x_I = \frac{X_F}{n}$. Using proposition (2.1) and condition 5 it can be shown that condition (6) will hold. Since the optimal order given to each subcontractor will be the same, the informal units being identical in every respect, the problem facing producer F will be:

$$\text{Maxmize } \Pi_F^m = P(nx)nx-(1+r^*)nC(x)-nW_r$$

$$\text{s.t. } nC(x) \le \bar{L} \text{ , where, } n.x = X_F$$ [8]

---

[8] It is the same thing to say that producer F chooses X_F (total output) and n as to say that he chooses x (i.e. the size of the order to each

Proposition 5.1. At $(\bar{n},\bar{x})$, $nC(x)=\bar{L}$ if $(\bar{n},\bar{x})$ is to be the optimal solution.

Proof: Suppose not. Then $\bar{n}C(\bar{x}) < \bar{L} < n_m C(x_m)$. For $\bar{n}C(\bar{x}) < \bar{L}$ producer F's profit function is: $\Pi_F^m = P(nx)nx-n(1+r^*)C(x)-nW_r$, with $\delta\Pi_F^m/\delta n \geq 0$ for $n \leq n_m$, $\delta\Pi_F^m/\delta n \leq 0$ for $n \geq n_m$, $\delta\Pi_F^m/\delta x \geq 0$, for $x \leq x_m$ $\delta\Pi_F^m/\delta x \leq 0$ for $x \geq x_m$. Then there will always exist some (n_a, x_a) s.t. $n_a C(x_a) = \bar{L}$ and $\Pi_F^m(n_a, x_a) > \Pi_F^m(\bar{n},\bar{x})$. Hence, there is a contradiction. So $\bar{n}C(\bar{x}) = \bar{L}$.

The maximization problem then takes the form:

$$\underset{\{x,n,\lambda\}}{\text{Maximize}} : \Pi_F^m = P(nx)nx-(1+r^*)nC(x)-nW_r-\lambda\{n(Cx)-\bar{L}\}$$

where λ is the Lagrangian multiplier.
The solutions to the problem yields the following conditions:

$$MR_F(n,x) = (1+r^*+\lambda)C'(x) \tag{12a}$$

$$xMR_F(n,x) = (1+r^*+\lambda)C(x)+W_r \tag{12b}$$

$$C(x) = \bar{L} \tag{12c}$$

Let the solution to the system be given by $(\bar{n},\bar{x},\bar{\lambda},)$, and assume that the solution exists and is unique. For comparable values of n, $\bar{x}(n) < x_m(n)$ from equation (12a). However, the effect of a loan constraint on n is not so obvious. Proposition (5.2) and proposition (5.3) states that $\bar{n} < n_m$, and $\bar{x}(\bar{n}) < x_m(n_m)$.

Proposition 5.2. $\bar{n} < n_m$ where $\bar{n}$ is the optimal solution in the constrained case.

Proof: Suppose not. Then $\bar{n} \geq n_m$. Uniqueness of $(n_m, x_m)$and $(\bar{n},\bar{x})$ rules

---

subcontractor) and n, as $X_F/n = x$

out $\bar{n} = n_m$. So $\bar{n} > n_m$. From equation (12c), $\bar{n}C(\bar{x}) = \bar{L}$. So $n_m C(\bar{x}) < \bar{L} < n_m C(x_m)$. Then $\exists$ some $x_k > \bar{x}$ for which $n_m C(x_k) = \bar{L}$. This implies (n_m, x_m) belongs to the feasible set of solutions. Also $x_k < x_m$. Now $\delta\Pi^m_F/\delta x \geq 0$ for $x \leq x_m$, and $\delta\Pi^m_F/\delta n \leq 0$ for $n \geq n_m$, i.e. $\Pi^m_F(\bar{n},\bar{x}) < \Pi^m_F(n_m,\bar{x}) < \Pi^m_F(n_m,x_k)$. Then $(\bar{n},\bar{x})$ cannot be the optimum. Here is a contradiction. Hence $\bar{n} < n_m$.

Proposition 5.3. $\bar{x}(\bar{n}) < x_m(n_m)$.

Proof: Suppose not. Then $\bar{x}(\bar{n}) \geq x_m(n_m)$. This implies : $(1+r^*+\lambda)[C'(\bar{x})-C(\bar{x})/\bar{x}]\bar{x} > (1+r^*)[C'(x_m)-C(x_m)/x_m]x_m = W_r$. But this violates condition (4.1b). So $\bar{x}(\bar{n}) < x_m(n_m)$.

As is expected, both the size of the order and the number of subcontractors employed go down compared to (n_m, x_m). It follows that the total output will go down along with the profit of the formal sector producer F.

Here $(1+r_I) = (1+r^*+\lambda) = \dfrac{MR_F}{C'(x)}$ which implies $p_I = MR_F$.

Let us now check how the results get altered if the informal units are allowed to borow from the organized credit market directly, at an interest rate $r^{**} \leq r^*$. If there is no credit constraint for the informal units, then producer F will operate exactly as in section 4. He would switch to contract II and choose $\hat{x}_m > x_m > \bar{x}$, and $\hat{n}_m > n_m > \bar{n}$. Profits of the informal units exactly guarantee them their reservation incomes. Total output will increase. The effect of providing subsidized loans to the informal units is equivalent in effect to giving the same amount of subsidized credit to producer F. He completely substitutes his high cost loan by the low cost loan available to the informal units, and also circumvents the credit rationing he faces in the organised credit market. The informal units do not benefit from the subsidized loans, all the benefits accrue to producer F.

If the individual informal units face a loan constraint as well of amount l^*, the constraint will only be operative if $C(\hat{x}_m) > l^*$. Then part of the funds has to be provided by producer F. That is a combination of contract I and contract II is offered. Hence he cannot completely substitute the more expensive loan by the cheaper loan. He can operate either as a primary lender or as a residual lender. But if he acts as a primary lender, he will have to give loans at $r \le r^{**} \le r^*$. If $r^{**} = r^*$, he will be indifferent. If however $r^{**} < r^*$, then he will have to incur a loss. Also, it will be profitable for him to encourage the informal units to exhaust the cheaper loans first. We will only consider the case when producer F acts as a residual lender, since for $r^{**} = r^*$, the two cases will yield the same result.

If producer F is to be the residual lender, the effective rate of interest facing the informal units will be

$$r' = r^*\{C(x)-l^*\}/C(x)+r^{**}\{l^*/C(x)\} \text{ for } C(x) \ge l^* \quad (13)$$

The subscripts are dropped here for convenience.

The profit function facing the informal unit will be given by:

$$\pi = px-(1+r^*)\{C(x)-l^*\}-(1+r^{**})l^* \quad (14)$$

The supply function will be the same as in (2). The formal sector's profit function is:

$$\Pi_F'' = P(nx)nx-(1+r^*)nC(x)-n[px-(1+r^*)\{C(x)-l^*\}] \quad (15)$$

Proposition 3.1 will hold good here also, so that $\pi = W_r$. Then profit function for the formal sector reduces to :

$$\Pi_F'' = P(nx)nx-(1+r^*)nC(x)+nl^*(r^*-r^{**})-nW_r \quad (16)$$

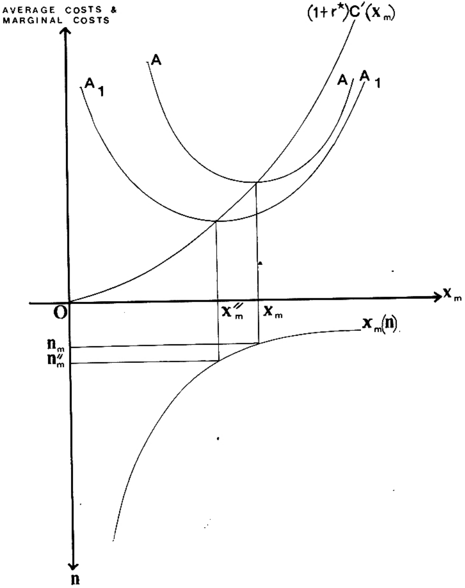
Profit maximizing choice of (n,x) is obtained from the following two conditions :

$$MR_F(n,x) = (1+r^*)C'(x) \quad (17a)$$

$$xMR_F(n,x) = (1+r^*)C(x)+W_r-(r^*-r^{**})l^* \quad (17b)$$

Let the solution be $(x_m^{//}, n_m^{//})$. For $r^{**} = r^{*}$ solution will coincide with (x_m, n_m). *If* $r^{**} < r^{*}$ *then an additional gain is coming in by employing* each additional subcontractor, as it enables producer F to substitute l^{*} units of dearer loans by the same amount of cheaper loans. Producer F will find it to his interest to employ a larger number of subcontractors than n_m. Since the marginal cost is the same as in section 4.2, increasing n beyond n_m would mean $MR_F(n_m^{//}, x_m) < (1+r^{*})C(x_m)$. This is because given the marginal cost, increase in n beyond n_m with x unchanged at x_m implies expanding the total output beyond the profit maximizing level. To maintain the output at the profit maximizing level, x must go down. In terms of fig.2.4 the average cost curve shifts down to A_1A_1, while the marginal cost curve and the $x_m(n)$ function remains unaltered. Hence we get the new solution such that $\bar{x} < x_m^{//} < x_m$. Here, the rate of interest at which producer F lends to the informal units will coincide with r^{*}, the reason being the same as given before. Also the effect of providing each of the n informal units l^{*} amount of loans at the rate of interest r^{**} is equivalent in effect to that of providing the formal sector producer with $n_m^{//}l^{*}$ amount of additional loans over and above $\bar{L}$ at the subsidized interest rate r^{**}, making the availability of additional loans contingent upon the number of subcontractors employed.

This solution can only be realised when $n_m^{//}C(x_m^{//}) - n_m^{//}l^{*} \le \bar{L}$. However, if $n_m^{//}C(x_m^{//}) - n_m^{//}l^{*} > \bar{L}$ then, formal sector's loan constraint will not allow him to give an order $x_m^{//}$, to each of the $n_m^{//}$ subcontractors, because he can not provide the excess fund required to support that particular order. Then, the formal sector producer will choose that (n,x) for which the total fund $L+nl^{*}$ gets exhausted. Again, as the informal units are borrowing from two sources, their effective rate of interest will be given by equation (13), and their profit function will be the same as equation (14). Following identical arguments, producer F's profit function will be given by equation (16). But the problem for producer F now becomes: Maximize $\Pi_F^{//}$ s.t. $nC(x) - nl^{*} = \bar{L}$ which is equivalent to maximizing:



AVERAGE COSTS &
MARGINAL COSTS
(1+r*)C'(X_m)
A
A_1
A
A_1
X_m
O
X''_m
X_m
X_m(n)
n_m
n''_m
n

Fig 2.4

$$Z = P(nx)nx-(1+r^{*})nC(x)-nW_r+(r^{*}-r^{**})nl^{*}-\gamma[\{nC(x)-nl^{*}\}-\bar{L}]$$

where, γ is the Lagrangian multiplier.

Optimum levels of (n,x)are obtained from the conditions :

$$MR_F(n,x) = (1+r^{*}+\gamma)C'(x). \qquad (18a)$$

$$xMR_F(n,x) = (1+r^{*}+\gamma)C(x)+W_r-(r^{*}-r^{**}+\gamma)l^{*}. \qquad (18b)$$

$$nC(x) = nl^{*}+\bar{L}. \qquad (18c)$$

Let the solution be $(\bar{\bar{n}},\bar{\bar{x}})$.

The loans given to the informal units have the effect of alleviating the loan constraint faced by producer F. Consider the case $r^{*} = r^{**}$, i.e no subsidy is given to the informal units. Then it is obvious that (n,x) will increase as additional loans of amount nl^{**} becomes available, and loan constraint is relaxed.

For $r^{**} < r^{*}$, there is an additional advantage of substituting the more expensive loan by the cheaper loan. The relevant profit function is $\Pi_F^{//}$ instead of Π_F^{m} . As a result, n increases by more and x by less compared to the situation $r^{**} = r^{*}$. But, as at $(\bar{n},\bar{x})$ $\bar{n}C(\bar{x})-nl^{*} < \bar{L}$ and $\delta\Pi_F^{//}/\delta n > 0$, $\delta\Pi_F^{//}/\delta x > 0$, at $(\bar{n},\bar{x})$ $\bar{\bar{n}} > \bar{n}$, $\bar{\bar{x}} > \bar{x}$ will still hold. Here also the loans provided to the informal units produce the same effect that they would have produced, if they were provided to producer F, conditional upon employing additional subcontractors.

SUMMARY OF RESULTS : IMPACT OF CREDIT SUBSIDY

	Without Loan Constraint		With Loan Constraint
	n Fixed	n Variable	
Level of Output	Unchanged for $\tilde{r} > \tilde{r}$ Falls for $\tilde{r} < \tilde{r}_0$ When producer F switches from Contract I to Contract II increases thereafter	Increases	Increases(*)
Level of informal unit's income	Ambiguous as long as producer F sticks to contract I or contract II. Falls when producer F switches from Contract I to Contract II	Unchanged	Unchanged(*)
No. of Subcontractors	X	Increases	Increases(*)

* Provision of subsidized credit to the informal units has the effect of alleviating the loan constraint.

6. CONCLUSION

Subsidized credit is provided to the informal sector units with a view to help them grow and to make them self sufficient. The present analysis suggests that, providing subsidized credit directly to the individual informal units may not be of very great help to them, and even less to the above objective. The effect of such a policy may be counter productive also. The linkage between the formal sector units and the informal sector units plays a very important role in determining the effect of a specific policy, because the informal units may face constraints in more than one front. So, rather than implementing a generalized policy in order to promote the small informal units, it would be better to make a detailed study of the informal sector and use situation specific policies. It is also true that often the growth of the formal industrial sector and the informal sector are linked together. For example, in the present chapter, growth in the profit and output of the formal sector has resulted in an increase in the number of subcontractors employed. In such situations, policy mix to promote the organised industrial sector (formal sector) on one hand and improving the bargaining position of the informal units on the other may be sufficient to ensure the expansion of the latter.

CHAPTER -3.

1. INTRODUCTION.

In chapter two, we considered the informal sector-formal sector relationship in a restrictive form. The formal sector producer has been represented as the sole purchaser of informal sector's output. But Bose(1978) in his study of Calcutta's informal sector found that a section of the informal producers sell directly to the final consumers also. This claim has been substantiated by the studies of Joshi and Joshi(1976), and Little, Majumdar and Page(1987) as well. So, the possibility of informal units having the option of independent production is considered in this chapter.

Given that the informal units can have independent marketing outlets, their products may be complementary to, independent of, or substitute for the formal sector's product. If the two products are complementary, then not only the informal sector, but also the formal sector stands to gain from an extrenal assistance provided to the informal units only. Similary, any concession given to the formal sector helps the informal sector. The extent of gain going to the individual informal units will depend mainly upon the extent of competition within the informal sector and the elasticity of demand. Similarly when the two products are independent, then also it is the number of units sharing the market and the extent of demand responsiveness, that determine the gain of an individual unit from a specific assistance. As ease of entry frequently characterizes the informal sector, therefore, the gains from external assistance are not likely to be much for individual units in the face of severe competition.

The informal units have a better prospect of reaping benefits from such external assistance, when their product is competitive to the formal sector's product. There already exists a ready market for the product where they can compete with the formal sector. However in the consumer's perception, formal sector's product is deemed to be of superior quality compared to the informal sector's product. The lower price of the informal sector's product on the other hand, works in its favour. For those at the lower end of income distribution, the advantage of a lower price may outweigh the disadvantages of a lower quality. This dichotomy in the commodity market has been repeatedly observed. According to Bose(1978) as well as the Joshis(1976), demand for the informal units' output comes predominantly from the poorer section of the population. Little, Majumder and Page(1987) also support this view.

The informal units therefore, can get a market share if they charge a *price strictly less than the price fixed for the formal sector's* output. Moreover the larger the quality differential between the products of the two sectors, the larger has to be the price differential. It should also be mentioned here that the quality difference that generates this divergence in prices, is often a perceived difference created by the consumer psyche. Advertisements and other sales promoting activities undertaken by the formal sector producers exaggerate the impression of better quality. It is not a very rare incident that the high profile formal sector products are actually produced by the informal units through subcontracting. Evidence to this effect has already been provided in the second chapter.

The present chapter is a natural extension from the previous chapter. Here a model of formal sector-informal sector linkage is developed, where the products of the two sectors are competitive from the demand side. On the supply side, they can be independent. At the same time some of the informal units may operate as subcontractors for the formal sector.

The chapter is organized in the following way: In section 2 of the chapter the basic frame work of analysis is developed. In section 3 the effect of cost subsidy is evaluated without allowing the possibility of a portion of the informal units being employed as subcontractors to the formal sector producer. It is then compared with the optimal policy of a social planner. Section 4 carries out the same exercise in cost subsidy, while activities of the informal units are dispersed over independent production and subcontracting. However, once they are alloted a particular occuption, individual units are not allowed to change occupation in the face of altered economic situations. Consequently, the formal sector producer also, can not increase or decrease the existing number of subcontractors. Finally in section 5, individual informal units are allowed the freedom to switch between the two occupations with any policy induced change that takes place. Formal sector producer is also allowed to choose the number of subcontractors he wants to employ. Then the impact of a cost subsidy is again established and contrasted with the equilibrium that would be socially optimal. A summary of the results is provided with concluding comments in section 6.

2. THE FRAME WORK.

In the present section, the basic frame work of analysis is introduced. We consider a market which is supplied by two types of producers. There is a single big producer identified as the formal sector producer who is producing the better quality of a commodity. The other set consisting of a large number of producers, identified as the informal sector, produce the lower quality of the same commodity. Each of them is individually too small to influence the market price, even when free entry and exit are not allowed. These two characteristics distinguish the formal sector producer from the informal units. In this basic model subcontracting is not introduced.

In order to capture the effect of income dispersion and quality difference we use the utility function developed by Gabszewicz and

Thisse(1979,1980). Stated below are the basic assumptions regarding the utility function.

The income of the consumers is uniformly distributed over the range $[\underline{M}, \bar{M}]$. Each consumer is buying at most one unit of the commodity. So he can either buy from the formal sector producer or from one of the informal units. The rest of his income is spent on buying other goods which is represented by a composite commodity with price equal to one.

Let i be the sector from which the commodity is purchased. Then, the utility derived by a consumer with income M from one unit of commodity is:

$U_i = \alpha_i (M-p_i), \; i=I,F$

$\quad = 0$ Otherwise.

Where, α_i: the index of quality.

p_i: the price charged by the ith sector

I : index for the informal sector.

F : index for the formal sector.

If the individual consumer buys from the formal sector, he pays a prices p_F for one unit. Hence the amount left to him is $(M - p_F)$ which he can spend on other goods. He gets $\alpha_F(M-p_F)$ units of utility by buying the formal sector's product. On the other hand, if he purchases the informal sector's product, he pays a price p_I, and his utility is $\alpha_I(M-p_I)$. The assumption that the formal sector's product is perceived to be of a higher quality compared to the informal sector's product implies that $\alpha_F > \alpha_I$.

An individual who is an utility maximizer, will buy the informal sector's product as long as $\alpha_I(M-p_I) > \alpha_F(M-p_F)$. Once $\alpha_I(M-p_I) < \alpha_F(M-p_F)$, he will start buying the formal sector's product. It is clear that if $p_F \le p_I$, then $\alpha_I(M-p_I) < \alpha_F(M-p_F)$ for all M, and the lower quality product never gets a market. Thus, for the informal units to be able to sell anything at all, the necessary condition is

$p_I < p_F$.

For given prices p_I and p_F, an individual with income M^* will be indifferent between buying from the informal sector and buying from the formal sector if $\alpha_I(M^*-p_I) = \alpha_F(M^*-p_F)$. Consumers with incomes higher than M^* will buy the formal sector's product and everybody with incomes lower than M^* will buy the informal sector's product. M^* gives a cut-off point in the income distribution, defining distinctly the market share going to each sector.

M^* can be expressed as a function of p_I and p_F :

$$M^* = \frac{\alpha_F p_F - \alpha_I p_I}{\alpha_F - \alpha_I}. \qquad (1)$$

It is further assumed at this point, that the income distribution is sufficiently dispersed to ensure a positive market share to both the suppliers in equlibrium. Also, the price will be such that every consumer buys one unit of the commodity. That is the entire market is served. Then the demand function for the formal sector producer becomes:

$$Q_F = \bar{M} - M^* = \bar{M} - \frac{\alpha_F}{\Delta\alpha} p_F + \frac{\alpha_I}{\Delta\alpha} p_I \ . \qquad (2a)$$

Where, Q_F: the quantity demanded for the formal sector producer.

$\Delta\alpha = \alpha_F - \alpha_I$

Similarly, the demand function faced by the informal sector as a whole is:

$$Q_I = M^* - \underline{M} = \frac{\alpha_F}{\Delta\alpha} p_F - \frac{\alpha_I}{\Delta\alpha} p_I - \underline{M}. \qquad (2b)$$

Where, Q_I: the quantity demanded for the informal sector.

As has been mentioned already, the suppliers in the informal sector are perfectly competitive. But free entry and exit are not allowed. Since the size of the informal sector(i.e. number of units within it) is not permitted to vary, and all the units are identical, we ignore the individual units. Instead we treat the sector as if there is only one producer who operates like a perfectly competitive supplier. In other words, we look at the aggregate supply rather than at individual supply.

With competitive conditions prevailing in the market, the supply function obtained from profit maximization will take the from:

$p_I = C_I Q_I$

Where $C_I Q_I$: marginal cost function.

Equilibrium in the informal sector will exist at that price and quantity for which supply equals demand. Equation (2b) and the supply function together solve for these equilibrium values. The solutions are:

$$Q_I = \frac{(\alpha_F/\alpha_I)p_F-(\Delta\alpha/\alpha_I)\underline{M}}{C_I+(\Delta\alpha/\alpha_I)} \tag{3a}$$

$$p_I = R_I(p_F) = \frac{C_I\{(\alpha_F/\alpha_I)p_F-(\Delta\alpha/\alpha_I)\underline{M}\}}{C_I+(\Delta\alpha/\alpha_I)} \tag{3b}$$

The solutions depend upon the price charged by the formal sector producer, i.e. p_F. To each p_F, there corresponds an optimal solution for (p_I, Q_I). The reason for such dependence is that the two sectors are linked through demand. For instance, with an increase in p_F, some of the consumers previously buying the better quality of the commodity will shift to the poorer quality. The demand for the lower quality product increases as a consequence. Hence, both the price charged and quantity purchased and sold will be higher in equilibrium. By the same logic, just the opposite happens when the formal sector's price goes down.

While the lower quality is manufactured by a large number of producers, the better quality is produced by a single producer by assumption. He determines the equilibrium price and quantity of the better quality product as a monopolist. The demand function relevant for him is given by equation (2a). It is downward sloping and linear in his own price (i.e. p_F) for each price prevailing in the lower quality market (i.e. for each p_I)

The profit maximizing equilibrium for the formal producer requires that $MR_F = C_F Q_F$, where MR_F stands for the marginal revenue of the formal sector producer, and $C_F Q_F$ is the linear marginal cost function. We make the assumption that $C_F \geq C_I$ i.e. the marginal cost of the formal sector producer is greater than or equal to the margnal cost of the informal sector units.

Substituting for the marginal revenue, the equilibrium price and output for the formal sector producer can be solved for. The solutions are:

$$Q_F = \frac{p_I(\alpha_I/\alpha_F) + \bar{M}(\Delta\alpha/\alpha_F)}{C_F + (2\Delta\alpha/\alpha_F)} \qquad (4a)$$

$$p_F = R_F(p_I) = \frac{\{\bar{M}(\Delta\alpha/\alpha_F) + p_I(\alpha_I/\alpha_F)\}\{C_F + (\Delta\alpha/\alpha_F)\}}{C_F + (2\Delta\alpha/\alpha_F)} \qquad (4b)$$

Again these solutions are dependent upon p_I, the price of the informal sector's product. For each p_I, equilibrium price and quantity can be solved for in the formal market . A change in p_I changes the demand for the formal sector product. Hence the equilibrium values of (p_F, Q_F) are sensitive to changes in p_I.[1]

It remains to be explained how the prices and quantities are determined

---

[1]In terms of our model, a small value of α_I/α_F implies that the impact of a change in p_I on p_F is also very small, as can be checked from equation (4b).

simultaneously in both the markets in equilibrium. In order to get the market clearing solutions, we use equations (3b) and (4b). Equation (3b) gives the equilibrium values of p_I as a function of p_F. Similarly, equation (4b) yields equilibrium values of p_F for each p_I. The two price equations are plotted in fig.3.1 in the (p_F, p_I) plane. From equation (3b) and (4b), $R_I(p_F)$ and $R_F(p_I)$ are both linear in p_F and p_I. respectively. Also, differentiating equation (3b) we get:

$$\frac{dp_F}{dp_I} = \frac{C_I+(\Delta\alpha/\alpha_I)\ \alpha_I}{C_I \qquad \alpha_F}$$ and from equation (4b),

$$\frac{dp_F}{dp_I} = \frac{C_F+(\Delta\alpha/\alpha_F)}{C_F+(2\Delta\alpha/\alpha_F)}\ \frac{\alpha_I}{\alpha_F}$$ .Cleary, $\left.\frac{dp_F}{dp_I}\right|_{R_I} > \left.\frac{dp_F}{dp_I}\right|_{R_F}$

Moreover, setting $p_I = 0$, from $R_F(p_I)$, $p_F'' = \dfrac{C_F\alpha_F+\Delta\alpha}{C_F\alpha_F+2\Delta\alpha} \cdot \bar{M}\dfrac{\Delta\alpha}{\alpha_F}$

and from $R_I(p_F)$, we get $p_F' = \dfrac{\Delta\alpha}{\alpha_F}\ \underline{M}$. Given $\dfrac{\bar{M}}{\underline{M}} > \dfrac{C_F\alpha_F+2\Delta\alpha}{C_F\alpha_F+\Delta\alpha}$ (the condition will be explained shortly), $p_F'' > p_F'$.

Equlibrium is attained at point E, where both equations are simultaneously satisfied. The values of (p_F, p_I) at E, i.e., (p_F^*, p_I^*) gives the equilibrium of the system. When explicitly solved for, p_I^* and p_F^*, can be expressed in terms of the parameters as follows:

$$p_F^* = \frac{C_I\alpha_I(C_F\alpha_F+\Delta\alpha)}{\alpha_F(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)}\left(\bar{M}\ \frac{C_I\alpha_I+\Delta\alpha}{C_I\alpha_I} - \underline{M}\right) \tag{5a}$$

$$p_I^* = \frac{C_I\alpha_I(C_F\alpha_F+\Delta\alpha)}{\alpha_I(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)}\left(\bar{M} - \underline{M}\ \frac{C_F\alpha_F+2\Delta\alpha}{C_F\alpha_F+\Delta\alpha}\right) \tag{5b}$$

From equilibrium prices it is but one step to solve for the equilibrium market shares of the two sectors:

$$M^* = \frac{\bar{M}\ (C_F\alpha_F+\Delta\alpha)+\underline{M}C_I\alpha_I}{C_I\alpha_I+C_F\alpha_F+2\Delta\alpha}$$

Hence,

simultaneously in both the markets in equilibrium. In order to get the market clearing solutions, we use equations (3b) and (4b). Equation (3b) gives the equilibrium values of p_I as a function of p_F. Similarly, equation (4b) yields equilibrium values of p_F for each p_I. The two price equations are plotted in fig.3.1 in the (p_F, p_I) plane. From equation (3b) and (4b), $R_I(p_F)$ and $R_F(p_I)$ are both linear in p_F and p_I respectively. Also, differentiating equation (3b) we get:

$$\frac{dp_F}{dp_I} = \frac{C_I+(\Delta\alpha/\alpha_I)}{C_I}\frac{\alpha_I}{\alpha_F}$$ and from equation (4b), $$\frac{dp_F}{dp_I} = \frac{C_F+(\Delta\alpha/\alpha_F)}{C_F+(2\Delta\alpha/\alpha_F)}\frac{\alpha_I}{\alpha_F}$$. Cleary, $\left.\frac{dp_F}{dp_I}\right|_{R_I} > \left.\frac{dp_F}{dp_I}\right|_{R_F}$

Moreover, setting $p_I = 0$, from $R_F(p_I)$, $p_F'' = \frac{C_F\alpha_F+\Delta\alpha}{C_F\alpha_F+2\Delta\alpha}.\bar{M}\frac{\Delta\alpha}{\alpha_F}$

and from $R_I(p_F)$, we get $p_F' = \frac{\Delta\alpha}{\alpha_F}\underline{M}$. Given $\frac{\bar{M}}{\underline{M}} > \frac{C_F\alpha_F+2\Delta\alpha}{C_F\alpha_F+\Delta\alpha}$ (the condition will be explained shortly), $p_F'' > p_F'$.

Equlibrium is attained at point E, where both equations are simultaneously satisfied. The values of (p_F, p_I) at E, i.e., (p_F^*, p_I^*) gives the equilibrium of the system. When explicitly solved for, p_I^* and p_F^*, can be expressed in terms of the parameters as follows:

$$p_F^* = \frac{C_I\alpha_I(C_F\alpha_F+\Delta\alpha)}{\alpha_F(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)}\left(\bar{M}\frac{C_I\alpha_I+\Delta\alpha}{C_I\alpha_I} - \underline{M}\right) \qquad (5a)$$

$$p_I^* = \frac{C_I\alpha_I(C_F\alpha_F+\Delta\alpha)}{\alpha_I(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)}\left(\bar{M} - \underline{M}\frac{C_F\alpha_F+2\Delta\alpha}{C_F\alpha_F+\Delta\alpha}\right) \qquad (5b)$$

From equilibrium prices it is but one step to solve for the equilibrium market shares of the two sectors:

$$M^* = \frac{\bar{M}(C_F\alpha_F+\Delta\alpha)+\underline{M}C_I\alpha_I}{C_I\alpha_I+C_F\alpha_F+2\Delta\alpha}$$

Hence,

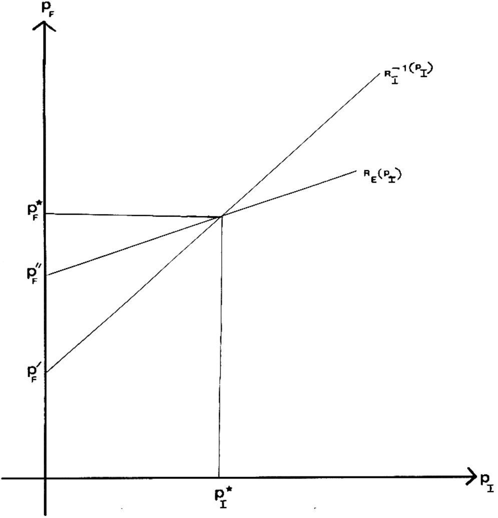


Fig 3.1

$$Q_F^* = \bar{M} - M^* = \frac{C_I\alpha_I+\Delta\alpha}{C_F\alpha_F+C_I\alpha_I+2\Delta\alpha}\left(\bar{M} - \underline{M}\,\frac{C_I\alpha_I}{C_I\alpha_I+\Delta\alpha}\right) \qquad (6a)$$

$$Q_I^* = M^* - \underline{M} = \frac{C_F\alpha_F+\Delta\alpha}{C_F\alpha_F+C_I\alpha_I+2\Delta\alpha}\left(\bar{M} - \underline{M}\,\frac{C_F\alpha_F+\Delta\alpha}{C_F\alpha_F+2\Delta\alpha}\right) \qquad (6b)$$

A couple of observations are now in order. First, one of the assumptions requires that the dispersion in income is large enough to allow both types of producers a positive market share in equilibrium. Equation (6b) makes it clear that for the informal sector to be able to have a positive market share, the necessary condition is:

$$\frac{\bar{M}}{\underline{M}} > \frac{C_F\alpha_F+2\Delta\alpha}{C_F\alpha_F+\Delta\alpha}.$$

However, $\bar{M} > 2\underline{M}$ gives a sufficiently large income dispersion, to ensure that $Q_I^* > 0$. So we impose this restriction on income distribution to satisfy the assumption mentioned above.

Secondly it is also claimed that every consumer belonging to the income range $[\underline{M}, \bar{M}]$ buys one unit of the commodity. This means that no part of the market is left unserved. This in turn will be true if the individual with lowest income $\underline{M}$ also gets a positive utility from buying the informal sector's product, i.e. $\alpha_I(\underline{M} - p_I^*) > 0$. In terms of the parameters of the system this requires

$$\frac{\alpha_I+(C_F\alpha_F+2\Delta\alpha)(1+1/C_I)}{C_F\alpha_F+\Delta\alpha} > \frac{\bar{M}}{\underline{M}}$$

The equilibrium values thus obtained are sensitive to the changes in the dispersion of income, quality difference manifested through the difference between α_F and α_I and the cost parameters. In the next section, the effect of cost subsidy provided to the informal units is considered. It is then contrasted with some other policy measures, including the socially optimal policy.

3. THE EFFECT OF COST SUBSIDY IN ABSENCE OF SUBCONTRACTING

Cost subsidy can be provided in a number of ways. It can take the form of inputs supplied at a lower price, or subsidizing the interest rate at which the informal units procure funds to carry out production. In the given framework, both types of subsidy imply a fall in C_I (the coefficient of marginal cost function). In other words, cost subsidy is assumed to affect both marginal and total costs.

The very initial impact of a cost subsidy is to reduce the prices in the competitive informal sector. In terms of fig. 3.1. the curve $R_I^{-1}(p_F)$ shifts up as p_I is now lower for each value of p_F. So, prices of both the sectors fall in equilibrium.

Also, $$\frac{dQ_I^*}{dC_I} = \frac{\alpha_I[\bar{M}\ (C_F\alpha_F+\Delta\alpha)-\underline{M}(C_F\alpha_F+2\Delta\alpha)]\ -}{-(C_F\alpha_F+C_I\alpha_I+2\Delta\alpha)^2} < 0.$$

That is share of the market going to the informal sector increases as a result of such a cost subsidy. Therefore, p_I^* must have fallen by less than C_I, so that $p_I^*/C_I = Q_I^*$ is higher.

Since the aggregate market size is fixed at $(\bar{M}-\underline{M}) = Q_I+Q_F$ an increase in informal sector's market share implies a fall in formal sector producer's market share. A larger proportion of the consumers are now buying the informal sector's product.

The impact of such a subsidy on informal unit's income remains to be ascertained.

<u>Lemma: 3.1.</u> Given the assumption of linear marginal cost and perfect competition profit varies directly with total revenue.

<u>Proof:</u> Informal unit's income in equilibrium can be expressed as $\pi_I^* = p_I^*Q_I^*-C_I(Q_I^*)$

Where $C_I(Q_I)$: the total cost function. The above expression can be rewritten as :

$$p_I^* Q_I^* - \frac{C_I(Q_I^*)}{Q_I^* C_I'(Q_I^*)} \cdot C_I'(Q_I^*)Q_I^* \text{ .where } C_I'(Q_I^*) = C_I Q_I^* \text{(marginal cost).}$$

Now, $\dfrac{C_I'(Q_I^*)Q_I^*}{C_I(Q_I^*)} = e_c$ (elasticity of cost), and $C_I'(Q_I^*)Q_I^* = p_I^* Q_I^*$.

Therefore, the informal units's profit can be expressed as:

$$\pi_I^* = p_I^* Q_I^* (1 - \frac{1}{e_c})$$

As $C_I'(Q_I^*) = C_I Q_I^*$, $e_c = 2$ (constant). Therefore, $\pi_I^* \propto p_I^* Q_I^*$.

Therefore, if the effect of cost subsidy on total revenue can be determined, its effect on total profit will also be in the same direction.

Proposition 3.1. The profit of the informal units will fall as a result of cost subsidy.

Proof: Substituting the profit maximizing equilibrium relation $p_I^* = C_I Q_I^*$ in the total revenue function we get:

$$TR_I^* = p_I^* Q_I^* = \frac{p_I^{*2}}{C_I}. \text{ Then } \frac{dTR_I}{dC_I} = \frac{1}{2}\left[\frac{p_I^*}{C_I}\right]^2 \left[\frac{C_I}{p_I^*}\frac{dp_I^*}{dC_I} - \frac{1}{2}\right]$$

$$\frac{dp_I^*}{dC_I} = \{\bar{M}\ (C_F\alpha_F + \Delta\alpha) - \underline{M}\ (C_F\alpha_F + 2\Delta\alpha)\} \frac{C_F\alpha_F + 2\Delta\alpha}{(C_F\alpha_F + C_I\alpha_I + 2\Delta\alpha)^2}$$

$$\frac{C_I}{p_I^*}\frac{dp_I^*}{dC_I} = \frac{C_F\alpha_F + 2\Delta\alpha}{C_F\alpha_F + C_I\alpha_I + 2\Delta\alpha} < 1.$$

$$\frac{C_I}{p_I^*}\frac{dp_I^*}{dC_I} - \frac{1}{2} = \frac{C_F\alpha_F - C_I\alpha_I + 2\Delta\alpha}{C_F\alpha_F + C_I\alpha_I + 2\Delta\alpha} > 0,$$ as $C_F \geq C_I$ and $\alpha_F > \alpha_I$ by assumption. As the profit and total revenue varies directly the profit is also falling as a result of cost subsidy going to the informal unit.

Let us note here that $C_F/C_I \geq \alpha_I/\alpha_F$ gives the sufficient condition for which $C_F\alpha_F - C_I\alpha_I + 2\Delta\alpha > 0$. So, $C_F/C_I \geq \alpha_I/\alpha_F$ is sufficient for the profit to be a falling function of subsidy.

The intuition behind the result can be easily explained in terms of demand elasticity. If the optimal price function $p_F = R_F(p_I)$ is substituted in the demand function, we get Q_I as a function of p_I alone:

$$Q_I^a = \frac{\alpha_F}{\Delta\alpha} R_F(p_I) - \frac{\alpha_I}{\Delta\alpha} p_I - \underline{M}$$

We call this demand function Q_I^a the adjusted demand function for the informal sector. The elasticity of this adjusted demand function is given by, $e_{da}^I = -\frac{p_I^*}{Q_I^*}\frac{dQ_I^a}{dp_I} = \frac{C_I\alpha_I}{C_F\alpha_F+2\Delta\alpha}$. The condition for $e_{da}^I < 1$ is $C_F\alpha_F - C_I\alpha_I + 2\Delta\alpha > 0$ (which is satisfied as $C_F \geq C_I$ by assumption). That is, given that the condition is satisfied the adjusted demand function is inelastic at (p_I^*, Q_I^*) in own price p_I. Consequently any fall in p_I brings about a less than proportionate response in quantity. Hence the fall in total revenue.

It has already been mentioned that for the formal sector producer, both price (p_F) and quantity (Q_F) would fall in equilibrium. This, with unaltered cost conditions would mean a lower profit level for him. Informal unit's profit is also falling. So all the benefits of a cost subsidy gets passed into the hands of the cosumers. The beneficiaries include the consumers who are purchasing the formal sector product as well as those who are buying the informal sector's product. So the whole set of consumers gain at the producers' expense from such a cost subsidy.

Next, we compare the policy of cost subsidy with the socially optimal policy. Let there be a social planner who is choosing that optimal distribution of demand between the two sectors for which the society's welfare is maximized. It is as if the commodities are provided free of charge to the consumers, while the society as a whole bears the costs.

Then the social planner's problem is to choose $\tilde{M}$ such that the difference between total utility and the cost of producing that utility is maximized. Under this particular specification of the problem the social welfare function takes the form:

$$W = \int_{\underline{M}}^{\tilde{M}} \alpha_I M dM - \alpha_I C_I \frac{(\tilde{M}-\underline{M})^2}{2} + \int_{\tilde{M}}^{\bar{M}} \alpha_F M dM - \alpha_F C_F \frac{(\bar{M}-\tilde{M})^2}{2}$$

Here, $\tilde{M}$ is that socially optimal level of income, below which everybody buys informal sector's product, and those belonging to the income range above $\tilde{M}$ buy the formal sector's product. Thus $(\tilde{M} - \underline{M})$ is the demand going to the former while $(\bar{M} - \tilde{M})$ is the demand going to the latter. α_I and α_F can be interpreted to be the marginal utilities of money within the informal sector and the formal sector respectively and $C_I\{(\tilde{M}-\underline{M})^2/2\}$ and $C_F\{(\bar{M}-\tilde{M})^2/2\}$ are the corresponding costs of production in terms of the numeraire commodity. Hence $\alpha_I C_I\{(\tilde{M}-\underline{M}^2)/2\}$ and $\alpha_F C_F\{(\bar{M}-\tilde{M})^2/2\}$ give the utility foregone in order to carry out production of X. In other words, these two terms express the cost of production in utility terms.

The following proposition compares the socially optimal equilibrium with the monopoly equilibrium.

Proposition.3.2. The socially optimal choice is characterized by a larger market share going to the formal sector and a smaller market share going to the informal sector, compared to the situation where there is monopoly within the formal sector and perfect competition within the informal sector. That is $\tilde{M} < M^{*}$

Proof: The socially optimal level of $\tilde{M}$ is given by the welfare maximizing condition:

$\alpha_F[\tilde{M} - C_F(\bar{M}-\tilde{M})] = \alpha_I[\tilde{M}-C_I(\tilde{M}-\underline{M})]$

Solving for $\tilde{M}$ we get :

$$\tilde{M} = \frac{C_F\alpha_F\overline{M}+C_I\alpha_I\underline{M}}{C_F\alpha_F+C_I\alpha_I+\Delta\alpha}$$

We have already obtained $M^{*} = \dfrac{\overline{M}C_F\alpha_F+\underline{M}C_I\alpha_I+\Delta\alpha\overline{M}}{C_F\alpha_F+C_I\alpha_I+ +2\Delta\alpha}$

Since M^{*} has got a higher denominator as well as a higher numerator compared to $\tilde{M}$, it will not be possible to tell off-hand, which one of the two will be larger. We prove below that M^{*} is larger than $\tilde{M}$

Let us note that ,

$C_I\alpha_I\underline{M} < \overline{M}(C_I\alpha_I+\Delta\alpha)$,

i.e. $C_F\alpha_F\overline{M} +C_I\alpha_I\underline{M} < \overline{M}(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)$.

$\Rightarrow (C_F\alpha_F\overline{M} +C_I\alpha_I\underline{M})\Delta\alpha < \Delta\alpha\overline{M}(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)$

$\Rightarrow (C_F\alpha_F\overline{M}+C_I\alpha_I\underline{M})[C_F\alpha_F+C_I\alpha_I+2\Delta\alpha-(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)] < \Delta\alpha\overline{M}(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)$

$\Rightarrow (C_F\alpha_F\overline{M}+C_I\alpha_I\underline{M})(C_F\alpha_F+C_I\alpha_I+2\Delta\alpha)[\{1/(C_F\alpha_F+C_I\alpha_I+\Delta\alpha)\}-\{1/(C_F\alpha_F+C_I\alpha_I+2\Delta\alpha)\}]$

$< \Delta\alpha\overline{M}$

$$\Rightarrow \frac{C_F\alpha_F\overline{M} +C_I\alpha_I\underline{M}}{C_F\alpha_F+C_I\alpha_I+\Delta\alpha} - \frac{C_F\alpha_F\overline{M}+C_I\alpha_I\underline{M}}{C_F\alpha_F+C_I\alpha_I+2\Delta\alpha} < \frac{\Delta\alpha\overline{M}}{C_F\alpha_F+ C_I\alpha_I+2\Delta\alpha}$$

$$\Rightarrow \frac{C_F\alpha_F\overline{M} +C_I\alpha_I\underline{M}}{C_F\alpha_F+C_I\alpha_I+\Delta\alpha} < \frac{C_F\alpha_F\overline{M}+ C_I\alpha_I\underline{M} +\Delta\alpha\overline{M}}{C_F\alpha_F+C_I\alpha_I+2\Delta\alpha}$$

$\Rightarrow \tilde{M} < M^{*}$(QED).

As. $\tilde{M} < M^{*}$ implies $\overline{M}-\tilde{M} > \overline{M}-M^{*}$, the optimal solution requires a larger market share for the formal sector producer. Therefore, the cost subsidy will result in a movement away from the optimal solution by reducing the formal sector producer's market share. To move towards the socially optimal level of M, it is necessary to subsidize the formal sector rather than the informal sector.

If the social planner wants to effectuate the socially optimal outcome through the pricing mechanism, the appropriate prices will be: $p_F = C_F(\overline{M}-\tilde{M})$, $p_I = C_I(\tilde{M}-\underline{M})$. That is, if the competitive prices are charged in both the markets, then the corresponding optimal choice (M^*) will also give the socially optimal choice. As competition already exists within the informal sector, only the formal sector's pricing mechanism requires intervention.

It is possible that the policy makers are aiming at improving the informal units income. Maximization of social welfare is not their primary concern. If that is the case, it is better to impose a sales tax or an input tax on the formal sector. Giving price subsidy to informal product also serves the purpose. These policies increase the level of demand going to the informal units, which results in a sure improvement in informal units profit as required. However, the trade-off between socially optimal choice and improvement of the informal unit's income is always there.

4. THE EFFECT OF COST SUBSIDY IN THE PRESENCE OF SUBCONTRACTING.

So far, the only link between the formal sector and the informal sector has been through demand. However, it has been widely observed that a substantial proportion of the products that are marketed by the formal sector producers are actually produced within the informal sector through subcontracting. This is specially true in consumer goods production. The established brand names make marketing easier for the formal sector producers. Similarly informal organization of production and consequent lowering of costs makes production cheaper within the informal sector. The details of this practice has already been furnished.

As has been mentioned previously, the quality difference that exists between the formal sector's product and the informal sector's product does not arise solely from the differences in production techniques. Rather, it is a result of advertising and other sales promoting activities designed to influence the consumer's choice. Larger scale of operation makes it feasible for the formal sector producers to incur those costs. When there is no substantial difference in production techniques across the two sectors, formal sector producers often take recourse to subcontracting.

In this section, we consider a simple situation where the formal sector producer's entire output is produced through subcontracting. It is a simplification that can easily be generalized. In the presence of subcontracting, the production cost across the two sectors is likely to be the same. So we make an additional assumption $C_F = C_I$, i.e. the marginal cost across the two sectors is identical.

Secondly, it is assumed that individual informal units can not operate simultaneously as a subcontractor as well as an independent producer. Small scale of operation prevents double occupation. So, the two types of informal units (viz. independent producers and subcontractors) form mutually exclusive sets.

Thridly, in the present section, switching between independent production and subcontracting is not allowed. A subcontractor remains a subcontractor even when there is a change of circumstances. Same applies to an independent producer. That is here we are considering a strictly short run equilibrium. This assumption will hold in the long run also, if there is some uncertainty regarding the quality and skill of the subcontractors. This may make their formal sector employer reluctant to change the existing composition. In other words, the number of independent suppliers as well as that of subcontractors are given. Consequently, both are suppressed in the following analysis.

The fourth assumption is that there is a reservation income W_r for individual subcontractor, which is the same for all of them. It may or may not be equal to the profit earned by the independent producers. However, this income being in the nature of a fixed cost does not affect the formal sector producer's equilibrium choices. Initially, the funds necessary to cover the production cost are assumed to be procured by the formal sector producer and advanced by him to his subcontractors.[2]

All the other assumption of the previous section are retained.

The assumptions stated above imply that the optimal solutions can be obtained from (5a), (5b), (6a) and (6b), simply by rerplacing C_F and C_I by C.

$$p_F^{*} = \frac{C\alpha_I(C\alpha_F+\Delta\alpha)}{\alpha_F(C\alpha_F+C\alpha_I+2\Delta\alpha)}\,[\bar{M}\,\{(C\alpha_I+\Delta\alpha)/C\alpha_I\}-\underline{M}] \qquad (7a)$$

$$p_I^{*} = \frac{C\alpha_I(C\alpha_F+\Delta\alpha)}{\alpha_I(C\alpha_F+C\alpha_I+2\Delta\alpha)}\,[\bar{M} - \underline{M}\{(C\alpha_F+2\Delta\alpha)/(C\alpha_F+\Delta\alpha)\}] \qquad (7b)$$

$$Q_F^{*} = \frac{C\alpha_I+\Delta\alpha}{C\alpha_F+C\alpha_I+2\Delta\alpha}\,[\bar{M} - \underline{M}\{C\alpha_I/(C\alpha_I+\Delta\alpha)\}] \qquad (8a)$$

$$Q_I^{*} = \frac{C\alpha_F+\Delta\alpha}{C\alpha_F+C\alpha_I+2\Delta\alpha}\,[\bar{M} - \underline{M}\{(C\alpha_F+2\Delta\alpha)/C\alpha_F+\Delta\alpha)\}] \qquad (8b)$$

The coverage of the subsidy may take one of the two forms. It may be reserved for the independent informal units only, to make them more competitive viz-a-viz the formal sector. Then, its impact will be identical to that explained in section 3.

The other possibility is that the subsidy is provided to all the informal units indiscriminately. Then, the formal sector producer will be induced to use his subcontractors to take advantage of the cost subsidy. In the previous chapter, the subcontractors were choosing the

---

[2]In fact the funds can be obtained either by the formal sector producer or by his subcontractors. Since the formal sector producer has to ensure his subcontractors at least as much as their reservation incomes, costs are always borne by him. Subcontractors can shift the cost burdens on to him.

quantity they would be producing at each price offered to them. That is why the formal sector producer needed control on price as well as on the rate of interest/number of subcontractors to push the informal units down to their reservation incomes. Unlike the second chapter, here it is assumed that the mode of subcontracting is such that the reservation income constraint is the only binding constraint. As long as the subcontractors get that, they are ready to produce any amount at any price. This assumption is imposed in order to rule out the problem of double marginalization, (which is already discussed) so as to keep the analysis simple. The formal sector producer will then choose a price p_f per unit of output to be paid to his subcontractors such that $\pi_s = p_f Q_F - C(Q_F) = W_r$, where π_s is the profit of the subcontractors, and $C(Q_F)$ the subsidized cost of the informal units. Formal sector producer's profit then takes the form:

$$\Pi_F = p_F Q_F - p_f Q_F = p_F Q_F - C(Q_F) - W_r$$

In the second situation, subsidizing the subcontracors becomes equivalent to subsidizing the formal sector producer. The effect of such an overall subsidy is even more damaging to the interest of the informal units. As subsidizing cost will be equivalent to a fall in C, from equation (8b)

$$\frac{dQ_I^*}{dC} = \frac{\Delta\alpha(\bar{M}\Delta\alpha + 2\underline{M}\alpha_I)}{(C\alpha_F + C\alpha_I + 2\Delta\alpha)^2} > 0, \frac{dp_I^*}{dC} = Q^* + C\frac{dQ_I^*}{dC} > 0$$

It also implies, $dQ_F^*/dC < 0$, $dp_F^*/dC > 0$, $d\Pi_F^*/dC < 0$, $d\pi_I^*/dC > 0$

A cost subsidy intended to benefit all the informal sector producers will end up in reducing not only the income of the individual informal units but also their aggregate share in the market in equilibrium.

In order to give an intuitive explanation, let us start with an initial $M^* = (\alpha_F p_F^* - \alpha_I p_I^*)/\Delta\alpha$. As a result of cost subsidy, let p_F^* fall by Δp_F^* and p_I^* fall by Δp_I^*. Therefore, if the informal sector's market share is to increase, M^* must be higher. The condition for that becomes:

$$\alpha_F(p_F^* - \Delta p_F^*) - \alpha_I(p_I^* - \Delta p_I^*) = (\alpha_F p_F^* - \alpha_I p_I^*) - (\alpha_F \Delta p_F^* - \alpha_I \Delta p_I^*) > \alpha_F p_F^* - \alpha_I p_I^*$$

i.e. $\alpha_F \Delta p_F^* - \alpha_I \Delta p_I^* < 0, \Rightarrow \alpha_F \Delta p_F^* < \alpha_I \Delta p_I^*$. Given $\alpha_F > \alpha_I$, $\Delta p_F^* < \Delta p_I^*$.

Price of the informal sector's output has to fall by more than the reduction in formal sector's price. The larger the quality difference, the bigger has to be Δp_I^* compared to Δp_F^*. But both sectors enjoy the same benefits from subsidy. Hence, the informal units find it infeasible to reduce the price to such a large extent. We have to consider the possibility of a production cost difference also, i.e. difference between C_F and C_I. With the existence of such a difference, the effect of an overall subsidy is not so clear cut. The income of the independent informal units will of course fall. However, the impact on the market shares of the two sectors is ambiguous. Given that $dC_F = dC_I = dC$, from equation (6b),

$$\frac{dQ_I^*}{dC} = \frac{\Delta\alpha\,[\bar{M}\Delta\alpha + 2\alpha_I \underline{M}] - \alpha_I \alpha_F (C_F - C_I)(\bar{M} - \underline{M})}{(C_F \alpha_F + C_I \alpha_I + 2\Delta\alpha)^2}$$

Therefore, $dQ_I^*/dC > 0 \iff \dfrac{\Delta\alpha[\bar{M}\Delta\alpha + 2\alpha_I \underline{M}]}{\alpha_F \alpha_I (\bar{M} - \underline{M})} > C_F - C_I$

Similarly, $dQ_I^*/dC < 0 \iff \dfrac{\Delta\alpha[\bar{M}\Delta\alpha + 2\alpha_I \underline{M}]}{\alpha_F \alpha_I (\bar{M} - \underline{M})} < C_F - C_I$

The expression $\dfrac{\Delta\alpha[\bar{M}\Delta\alpha + 2\alpha_I \underline{M}]}{\alpha_F \alpha_I (M - \underline{M})}$ is rising in α_F and $\underline{M}$. So, a high enough value of α_F will ensure $dQ_I^*/dC > 0$ Similarly, a low enough level of income differential (either through high $\underline{M}$ or through low $\bar{M}$) will again ensure $dQ_I^*/dC > 0$. Also, if $C_F \le C_I$, again $dQ_I^*/dC > 0$. It is only when $C_F > C_I$ and C_F is substantially larger than C_I that $dQ_I^*/dC < 0$. This is because the formal sector is at an initial disadvantage with larger cost and hence is less competitive.

When the cost subsidy is provided to all the informal units, they stand to loose both in terms of individual income as well as aggregate market share. The gains from subsidy gets distributed between the formal sector producer and buyers in both the markets.

5. EFFECT OF COST SUBSIDY WITH SUBCONTRACTING AND FREE CHOICE OF OCCUPATION.

In order to complete the analysis, the individual informal units must be allowed free choice of occupation. This aspect is introduced in the present section. Two alternatives are available to them, namely independent production and subcontracting. They choose the one that gives them maximum income. At the same time, the number of subcontractors is to be chosen by the formal sector producer, who also chooses the level of output.

It is assumed that there are N units within the informal sector and N is given. That is, even though changing of occupation is allowed, free entry to and exit from the informal sector is not allowed. We are assuming away the competitive pressure on the existing units from fresh entry in the informal sector.

Out of the N units n_F are employed as subcontractors and $N-n_F$ units work as independent producers. n_F is optimally chosen by the formal sector producer. The mode of subcontracting is again considered to be the same as in the second chapter. Also, we reinstate the assumption $C_F \geq C_I$. That is, even when it is produced through subcontracting, higher quality of the formal sector product may entail a higher marginal cost.

Let us first consider how the optimal choices of the independent producers get affected with a change in the number of units sharing the market. Since all the informal units are identical, the market is equally divided among the indpendent units. The supply relation of a representative informal unit becomes:

$p_I = C_I Q_I / n_I$, where $n_I = N - n_F$.
The demand function for the informal sector is still given by (2b).

Bringing together the aggregate demand and supply we get solutions for the equilibrium levels of output and market price:

$$Q_I = \frac{(\alpha_F/\alpha_I)p_F - \underline{M}\ (\Delta\alpha/\alpha_I)}{(C_I/n_I) + (\Delta\alpha/\alpha_I)} \tag{9a}$$

$$p_I = \frac{C_I\{(\alpha_F/\alpha_I)p_F - \underline{M}(\Delta\alpha/\alpha_I)\}}{C_I + n_I(\Delta\alpha/\alpha_I)} \tag{9b}$$

The share of individual informal units in aggregate output is:

$$q_I = Q_I/n_I \tag{9c}$$

The optimal solutions now become functions of n_I as well as p_F. It can be easily checked from the above expressions that $\delta Q_I/\delta n_I > 0$, $\delta p_I/\delta n_I < 0$, $\delta q_I/\delta n_I < 0$. If the impact of a change in n_I on p_F is ignored and p_F is treated as a parameter, then as one person moves away from independent production to become subcontractor, the aggregate supply of informal product gets reduced. There is a consequent increase in price and fall in aggregate output, while the share of individual units (i.e. q_I) increases.

The formal sector producer's profit function is:

$$\Pi_F = p_F Q_F - n_F C_F (Q_F/n_F) - n_F W_r.$$

It has already been assumed that the formal firm produces only through subcontracting. At this stage, we ignore the possibility that W_r may be related to the independent informal units' profits.[3] The formal

---

[3]The mode of subcontracting is really unimportant. The formal sector producer has control over the number of subcontractors as well as over the price per unit to be paid to the subcontractors. It has already been demonstrated in the previous chapter, that even if subcontractors are profit maximizers, the formal sector employer will be able to push them down to their reservation incomes. The production costs will always be borne by him as a consequence.

sector producer chooses Q_F and n_F such that Π_F is maximized. The conditions for that are :

$$MR_F = MC_F = C_F \frac{Q_F}{n_F} \tag{10a}$$

$$MC_F = \frac{C_F(Q_F/n_F)+W_r}{(Q_F/n_F)} \tag{10b}$$

The linearity assumption of the marginal cost function is still retained.

Condition (10a) is the familiar equality condition between marginal revenue (MR_F) and marginal cost (MC_F), that determines the optimal level of output. Condition (10b) solves for the optimal number of subcontractors. Even though the condition has already been explained once, here we repeat the explanation. If an additional subcontractor is employed, total cost goes up by $C_F(Q_F/n_F)+W_r$. At the same time, the level of output is spread thinner among a larger number of subcontractors. Order going to each subcontractor then goes down. Hence the marginal cost of each subcontractor is lower. The magnititude of saving in terms of marginal cost is of the order $(Q_F/n_F)MC_F$. When the increase in cost and saving in marginal cost exactly balance each other we get the equilibrium level of n_F.

Let us for the time being ignore the optimal choice of n_F and concentrate on that of Q_F. From the equilibrium condition (10a), we can solve for Q_F and p_F as follows:

$$Q_F = \frac{\bar{M}\ (\Delta\alpha/\alpha_F)+(\alpha_I/\alpha_F)p_I}{(C_F/n_F)+(2\Delta\alpha/\alpha_F)} \tag{11a}$$

$$p_F = \frac{\{\bar{M}\ (\Delta\alpha/\alpha_F)+(\alpha_I/\alpha_F)\ p_I\}\{C_F+n_F(\Delta\alpha/\alpha_F)\}}{C_F+(2\Delta\alpha/\alpha_F)n_F} \tag{11b}$$

Again, the optimal Q_F and p_F are functions of n_F as well as p_I. It can easily be checked from the above equations that $\delta Q_F/\delta n_F > 0$, and $\delta p_F/\delta n_F < 0$.

The effect of a change in n_F on p_I is ignored and p_I is treated as a parameter. Then, by engaging an additional subcontractor, the formal sector producer increases the level of output. Price has to be reduced to enable the market to absorbe the additional output.

In the above analysis while ascertaining the effect of a change in n_I on p_I, its effect on p_F has been ignored. Similarly, the effect of a change in n_F on p_F has been considered without taking into account its impact on p_I. But $n_I = N - n_F$ and any change in any one of them will imply a change in the other. So change in n_I/n_F will affect both p_I and p_F in equilibrium. The following proposition gives the direction of change in p_I^* and hence $\pi_I^* = (p_I^{*2}/C_I)(1-1/e_c)$, as n_F changes.

Proposition 5.1. If $\dfrac{C_I\alpha_I}{C_F\alpha_F} + \dfrac{\bar{M}}{\bar{M}-\underline{M}} \dfrac{N\Delta\alpha}{C_F\alpha_F} > 1$ there exists an $\bar{n}_F$ such that for all $n_F > \bar{n}_F$, p_I in equilibrium will be an increasing function of n_F, and, for all $n_F < \bar{n}_F$, it will be a decreasing function. On the other hand, if the given expression is less than 1, p_I is monotonically increasing in n_F.

Proof: The two price functions (9b) and (11b) can be written as:

$$\tilde{p}_I = \tilde{R}_I\,(p_F, n_F) \qquad \tilde{p}_F = \tilde{R}_F\,(p_I, n_F)$$

After substituting the equilibrium values $(\tilde{p}_F, \tilde{p}_I)$ the two functions become functions of n_F alone. Then differentiating them, w.r.t. n_F and solving for $d\tilde{p}_F/dn_F$, $d\tilde{p}_I/dn_F$ we get:

$$\frac{d\tilde{p}_F}{dn_F} = \frac{(\delta\tilde{R}_F/\delta n_F)+(\delta\tilde{R}_I/\delta n_F)(\delta\tilde{R}_F/\delta p_I)}{1-(\delta\tilde{R}_F/\delta p_I)(\delta\tilde{R}_I/\delta p_F)}$$

$$\frac{d\tilde{p}_I}{dn_F} = \frac{(\delta\tilde{R}_I/\delta n_F)+(\delta\tilde{R}_I/\delta p_F)(\delta\tilde{R}_F/\delta n_F)}{1-(\delta\tilde{R}_F/\delta p_I)(\delta\tilde{R}_I/\delta p_F)}$$

$$1-(\delta\tilde{R}_I/\delta p_F)(\delta\tilde{R}_F/\delta p_I) = 1- \frac{C_I}{C_I+n_I(\Delta\alpha/\alpha_I)} \cdot \frac{C_F+n_F(\Delta\alpha/\alpha_F)}{C_F+2n_F(\Delta\alpha/\alpha_F)} > 0$$

Therefore, $(\delta\tilde{R}_I/\delta n_F)+(\delta\tilde{R}_I/\delta p_F)(\delta\tilde{R}_F/\delta n_F) >/=/< 0 \Rightarrow d\tilde{p}_I/dn_F >/=/< 0$.
Rewriting the expression in terms of elasticity the condition becomes:

$$\frac{n_F}{\tilde{p}_I}\frac{\delta\tilde{R}_I}{\delta n_F} > -\left(\frac{\tilde{p}_F}{\tilde{p}_I}\frac{\delta\tilde{R}_I}{\delta\tilde{p}_F}\right)\left(\frac{n_F}{\tilde{p}_F}\frac{\delta\tilde{R}_F}{\delta n_F}\right) \qquad (12)$$

There are two opposite forces working on p_I. As n_F increases, i.e n_I falls, p_I also tends to increase. At the same time, an increase in n_F results in a fall in p_F which tends to reduce p_I. The above condition implies that the price in the informal sector will increase in equilibrium, when the proportional direct increase in p_I due to increase in n_F dominates over the proportional decrease due to a fall in p_F resulting from an increase in n_F. It can easily be established that:

$$\tilde{p}_I = \frac{C_I\alpha_I(C_F\alpha_F+n_F\Delta\alpha)[\bar{M}-\underline{M}\{(C_F\alpha_F+2n_F\Delta\alpha)/(C_F\alpha_F+n_F\Delta\alpha)\}]}{\alpha_I(n_FC_I\alpha_I+n_IC_F\alpha_F+2n_In_F\Delta\alpha)}$$

$$\tilde{p}_F = \frac{C_I\alpha_I(C_F\alpha_F+n_F\Delta\alpha)[\bar{M}\{(C_I\alpha_I+n_I\Delta\alpha)/(C_I\alpha_I)\}-\underline{M}]}{\alpha_F(n_FC_I\alpha_I+n_IC_F\alpha_F+2n_In_F\Delta\alpha)}$$

Substituting the values for $\delta\tilde{R}_F/\delta n_F$, $\delta\tilde{R}_I/\delta p_F$, $\delta\tilde{R}_I/\delta n_F$, $\tilde{p}_I$, and $\tilde{p}_F$ and then rearranging the terms of condition (12) we get:

$$1 >/=/< \frac{C_F\alpha_F[(\bar{M}-\underline{M})C_I\alpha_I+\bar{M}(N-n_F)\Delta\alpha]}{(C_F\alpha_F+2n_F\Delta\alpha)[(\bar{M}-\underline{M})C_F\alpha_F+n_F\Delta\alpha(\bar{M}-2\underline{M})]}$$

$\Leftrightarrow d\tilde{p}_I/dn_F > / = / < 0$

Let us denote the right hand side of the above inequality condition as: $A(n_F)$. It is clear that $A'(n_F) < 0$. Also,

$$\lim_{n_F \to 0} A(n_F) = \frac{C_I\alpha_I}{C_F\alpha_F} + \frac{\bar{M}}{\bar{M}-\underline{M}}\,\frac{N\Delta\alpha}{C_F\alpha_F} \text{ and,}$$

$$\lim_{n_F \to N} A(n_F) = \frac{C_F\alpha_F(\bar{M}-\underline{M})C_I\alpha_I}{(C_F\alpha_F+2N\Delta\alpha)[(\bar{M}-\underline{M})C_F\alpha_F+N\Delta\alpha(\bar{M}-2\underline{M})]} < 1$$

If $\frac{C_I\alpha_I}{C_F\alpha_F} + \frac{\bar{M}}{\bar{M}-\underline{M}}\,\frac{N\Delta\alpha}{C_F\alpha_F} > 1$ we can determine a unique $\bar{n}_F$ such that $\forall\ n_F > \bar{n}_F,\ 1 \leq A(n_F)$, and $\forall\ n_F < \bar{n}_F,\ 1 \leq A(n_F)$. $\bar{n}_F$ is depicted in fig.3.2.

If on the other hand, $\frac{C_I\alpha_I}{C_F\alpha_F} + \frac{\bar{M}}{\bar{M} - \underline{M}}\ \frac{N\Delta\alpha}{C_F\alpha_F} \leq 1$ the function $A(n_F)$ lies entirely below 1 for all n_F. Hence $1 > A(n_F)\ \forall\ n_F$. So $d\tilde{p}_F/dn_F > 0$ throughout.

The intuition is clear. The higher is n_F the lower is $N-n_F$, and the larger is the share of an individual informal producer in total output $\tilde{Q}_I$ (i.e., the larger is $\tilde{q}_I$). Also a larger value of n_F implies the amount produced by each subcontractor $(\tilde{Q}_F/n_F)$ is smaller. Then if one person moves away from the informal sector and takes up subcontracting, the direct impact on $\tilde{p}_I$ is greater and the indirect impact through changes in $\tilde{p}_F$ is smaller. The opposite is true when n_F is small. In the first case $\bar{n}_F$ gives the cut-off point where the two opposing forces exactly balance. In the second case with the relevant expression given above being less than zero, the direct effect on $\tilde{p}_I$ always dominates.

So for $n_F > \bar{n}_F$, $\tilde{p}_I$ and hence $\tilde{\pi}_I = (\tilde{p}_I^2/C_I)(1-1/e_C)$ becomes a rising function of n_F and for $n_F < \bar{n}_F$ it is a falling function. For $n_F = \bar{n}_F$, $d\tilde{p}_I/dn_F = d\tilde{\pi}_I/dn_F = 0$. The function $\tilde{\pi}_F$ is shown in fig.3.3. The other situation arises where $\frac{C_I\alpha_I}{C_F\alpha_F} + \frac{\bar{M}}{\bar{M}-\underline{M}}\ \frac{N\Delta\alpha}{C_F\alpha_F} < 1$. Then $\tilde{p}_I$ and hence $\tilde{\pi}_I$ is a continuously rising function of n_F. We consider the first case since it covers the second case as well.

Before investigating the impact of a cost subsidy, it is essential to describe the initial equilibrium.

From the condition (10a) and the long neglected condition (10b) it is clear that corresponding to each W_r, there is an optimal choice of n_F.

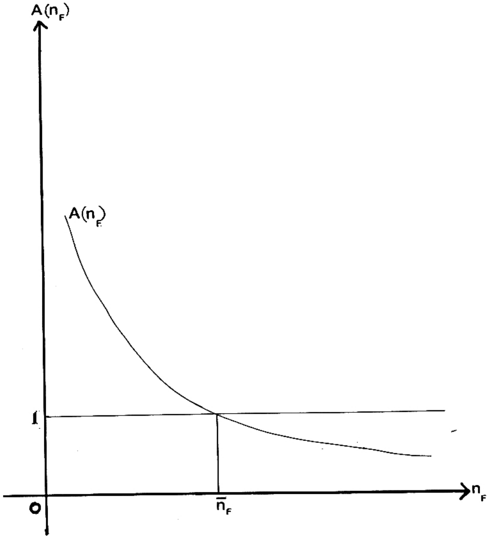


Fig 3.2

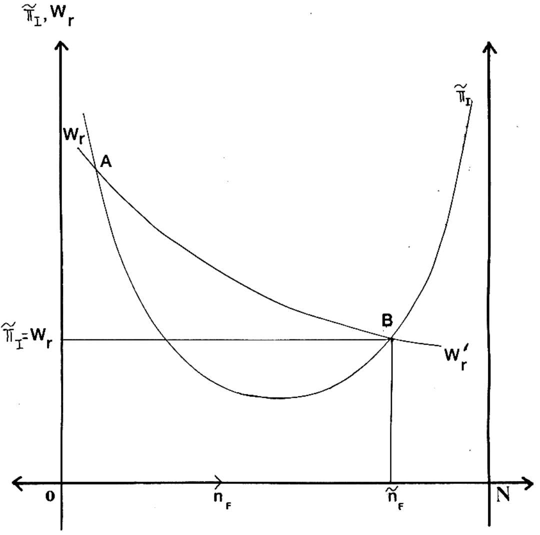


Fig 3.3

The following proposition states that optimal n_F will increase as W_r. falls.

Proposition 5.2. As W_r goes down n_F goes up.

Proof. Let us start with an intial equilibrium (Q_F^*, n_F^*, p_F^*) satisfying the conditions,

$$MR_F(Q_F^*, p_I^*) = C_F'(Q_F^*/n_F) = \frac{C_F(Q_F^*/n_F)+W_r}{Q_F^*/n_F} \text{ and,}$$

$$p_I^* = \tilde{R}_I(p_F^*, n_F^*),\ p_F^* = \tilde{R}_F(p_I^*, n_F^*)$$

Now, let there be a fall in W_r. to W_r' and let the corresponding choices be (Q_F', p_F', n_F'). The proposition requires that $n_F' > n_F^*$. Suppose not, then $n_F' \leq n_F^*$. Let $n_F' = n_F^*$. Then,

$$MR_F(Q_F^*, p_I^*) > \frac{C_F(Q_F^*/n_F')+W_r'}{Q_F^*/n_F'}.$$ This implies $Q_F' > Q_F^*$.

But then, $MR_F(Q_F', p_I^*) < C_F'(Q_F'/n_F')$. Therefore, $p_I' > p_I^*$. But that requires $n_F' > n_F^*$. Hence there is a contradiction. Let us now consider $n_F' < n_F^*$. As $\Pi_F(W_r', Q_F^*, n_F^*, p_I^*) > \Pi_F(W_r, Q_F^*, n_F^*, p_I^*)$, the condition

$\Pi_F(W_r', Q_F', n_F', p_I') > \Pi_F(W_r, Q_F^*, n_F^*, p_I^*)$ must be satisfied.

If $n_F' < n_F^*$, then given $W_r > W_r'$, i.e.

$[C_F'(Q_F^*/n_F^*)-\{C_F(Q_F^*/n_F^*)/(Q_F^*/n_F^*)\}](Q_F^*/n_F^*) >$

$[C_F'(Q_F'/n_F')-\{C_F(Q_F'/n_F')/(Q_F'/n_F')\}](Q_F'/n_F')$,

$Q_F^* > Q_F'$.

Also $MR_F(Q_F', p_I^*) > C_F'(Q_F^*/n_F^*) > C_F'(Q_F'/n_F')$. This is because as the size of the order has been reduced, the marginal cost must fall. This implies, $p_I' < p_I^*$. But $p_I' < p_I^*$ means formal sector producer is operating on a lower demand curve, compared to the previous situation. Also, $MR_F(Q_F, p_I') < MR_F(Q_F, p_I^*)$ $(MR_F = (1-1/e_{df})$ where e_{df}(elasticity of formal sector demand) $= \{(\bar{M}/Q_F)-1+(p_I/Q_F)(\alpha_I/\Delta\alpha)\}$. Therefore. as p_I is lower, e_{df} is lower and hence $1-1/e_{df}$ is also lower. So MR_F is lower at each

Q_F). This together with $Q'_F < Q^*_F$ and unaltered marginal costs implies:
$\Pi_F(Q'_F, P'_I, n'_F, W'_r) < \Pi_F(Q^*_F, P^*_I, n^*_F, W_r)$.
Hence there is a contraditction. So $n'_F > n^*_F$. (QED).

It is also clear that as an informal unit can freely move between subcontracting and independent production, W_r has to be at least as large as $\tilde{\pi}_I$ to keep the subcontractors satisfied. It has already been proved in the second chapter that $W_r = \tilde{\pi}_I$ will be the optimal offer on the part of the formal sector producer. So we add the additional condition:

$$W_r = \tilde{\pi}_I \tag{13}$$

$\tilde{\pi}_I$ has already been derived as a function of n_F using equations (9b) and (11). This curve is depicted in fig.3.3. while deriving this curve, it has been implicitly assumed that the formal sector producer optimally chooses Q_F for each possible n_F.

In the same figure, the downward sloping curve $W_rW'_r$ gives the optimal choice of n_F for each W_r. It can be identified as a kind of demand curve for subcontracors from the formal sector producer. At the intersection of the two curves the condition $\tilde{\pi}_I = W_r$ is satisfied. The offer by the formal sector producer exactly matches the opportunity cost of subcontractors.

However, two types of equilibria now become possible. One of them is shown in fig.3.3 itself. Here the curve $W_rW'_r$ is flatter than the downward sloping portion of $\tilde{\pi}_I$. So, it intersects both the upward rising part and the downward falling part at points B and A respectively. The condition $\tilde{\pi}_I = W_r$ is satisfied at both points, but B gives the stable equilibrium while A is unstable.[4] So we consider the

---

[4]Here stability implies that if due to any disturbances there is a movement away from equilibrium, the adjustment mechanism will work in such a way as to restore equilibrium. Point A gives an unstable

equilibrium at B only and name it type I euqilibrium.

The other type of equilibrium is shown in fig.3.4. Here W_rW_r' curve is steeper than the the downward falling portion of $\tilde{\pi}_I$, and, the intersection between them takes place in this portion only, at B'. The equilibrium at B' is again a stable equilibrium, which we call type II equilibrium.[5]

Let the equilibrium solutions be $(\tilde{Q}_F, \tilde{n}_F, \tilde{p}_I)$.

The first step towards determining the impact of a cost subsidy is to check separately how the two curves ($\tilde{\pi}_I$ and W_rW_r') get affected by a cost subsidy.

Initially, we consider the selective cost subsidy, which is provided to the independent informal units only, Then, for each level of n_F, formal sector producer's market share goes down, and informal sector's market share goes up, as has already been demonstrated. So, in equilibrium, the formal sector producer will be willing to employ only a lower number of subcontractors at each W_r. It follows from the relation:

$$[C_F'(\tilde{Q}_F/\tilde{n}_F)-\{C_F(\tilde{Q}_F/\tilde{n}_F)/(\tilde{Q}_F/\tilde{n}_F)\}]\tilde{Q}_F/\tilde{n}_F = W_r$$

For given $\tilde{n}_F$, $\tilde{Q}_F$ goes down with cost subsidy. So $\tilde{n}_F$ will also have to go down to maintain the equality. So W_rW_r' curve will always shift down.

The impact of a cost subsidy on $\tilde{\pi}_I$ is not so clear cut. The elasticity of demand of the adjusted demand curve (which has been defined in the previous section) now becomes:

---

equilibrium in the sense that if this equilibrium gets disturbed by some exogenous shock, there will be a continuous movement away from the equilibrium, as can easily be checked. In the same sense B gives a stable equilibrium.

[5]The case where $d\tilde{p}_I/dn_F > 0$ throughout, has already been covered under type I equilibrium.

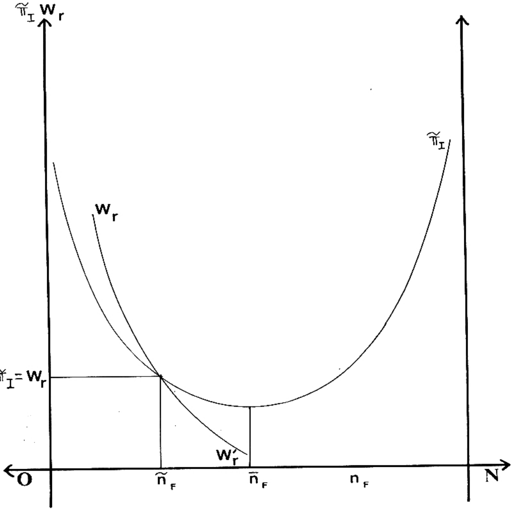


Fig 3.4

$$e^{I}_{da} = -\frac{\tilde{p}_I}{n_I\tilde{q}_I}\frac{d\tilde{Q}_I}{dp_I} = \frac{n_F C_I \alpha_I}{n_I C_F \alpha_F + 2n_I n_F \Delta\alpha}$$

$e^{I}_{da} < 1$ now requires that $n_I C_F \alpha_F - n_F C_I \alpha_I + 2n_F n_I \Delta\alpha > 0$. The condition will be immediately stisfied if $\tilde{n}_I C_F \alpha_F - \tilde{n}_F C_I \alpha_I > 0$. We can offer the follwing argument as to why this condition will be satisfied. Let us consider a situation where formal sector producer is a price leader. The relevant demand curve for him will be his own adjusted demand curve:

$$Q_F = \bar{M} - (\alpha_F/\Delta\alpha)p_F + (\alpha_I/\Delta\alpha)\,\tilde{R}_I(p_F)$$

where $p_I = \tilde{R}_I(p_F)$ gives optimal choice of p_I for each p_F. He will choose (Q'_F, n'_F, p'_F) such that $e^{I}_{da} > 1$, the necessary and sufficent condition for which is $n'_I C_F \alpha_F > n'_F C_I \alpha_I$. It can easily be checked that $Q'_F > \tilde{Q}_F$ (i.e. output is higher under price leadership). Also, at each n_F, π'_I will be lower than $\tilde{\pi}_I$ as the formal sector producer will use his control over p_I to push π_I further down. The two conditions will imply $n'_F > \tilde{n}_F$. That is, the number of subcontractors will be larger under price leadership. Then, if $n'_I C_F \alpha_F \geq n'_F C_I \alpha_I$, $\tilde{n}_I C_F \alpha_F \geq \tilde{n}_F C_I \alpha_I$. It should also be noted, that the condition $(\tilde{n}_I/\tilde{n}_F) \geq (C_I\alpha_I/C_F\alpha_F)$ includes the case where $\tilde{n}_I \geq \tilde{n}_F$.

Before proceeding further, we must establish whether it is necessary to consider both types of equilibria in order to explore the impact of cost subsidy. To that end, we first prove the following lemma.

<u>**Lemma: 5.1**</u> $n_F = \frac{1}{2}N > \bar{n}_F$, where $\bar{n}_F$ gives the minimum point of $\tilde{\pi}_I$ curve.

<u>**Proof:**</u> If we put $n_F = \frac{1}{2}N$ then,

$$A(n_F) = \frac{C_F\alpha_F[(\bar{M}-\underline{M})C_I\alpha_I + (1/2)N\Delta\alpha\bar{M}]}{(C_F\alpha_F + N\Delta\alpha)[(\bar{M}-\underline{M})C_F\alpha_F + (1/2)N\Delta\alpha(\bar{M}-2\underline{M})}$$

$$= \frac{C_F\alpha_F C_I\alpha_I(\bar{M}-\underline{M})+(1/2)N\Delta\alpha\bar{M}\ C_F\alpha_F}{(\bar{M}-\underline{M})C_F^2\alpha_F^2+(1/2)N\Delta\alpha(\bar{M}-2\underline{M})C_F\alpha_F+N\Delta\alpha(\bar{M}-\underline{M})C_F\alpha_F+(1/2)N^2\Delta\alpha(\bar{M}-2\underline{M})}$$

Given $C_F\alpha_F > C_I\alpha_I$, $C_F^2\alpha_F^2 > C_F\alpha_F C_I\alpha_I$.

$\frac{1}{2}N\Delta\alpha\ [(\bar{M}-2\underline{M})+2(\bar{M}-\underline{M})]C_F\alpha_F = \frac{1}{2}N\Delta\alpha(3\bar{M}-4\underline{M})C_F\alpha_F$.

If we can show that $3\bar{M}-4\underline{M} > \bar{M}$ then,

$\frac{1}{2}N\Delta\alpha\ \bar{M}\ C_F\alpha_F < \frac{1}{2}N\ \Delta\alpha\ C_F\alpha_F(3\bar{M}-4\underline{M})$.

Now, $3\bar{M}-4\underline{M} > \bar{M} \Rightarrow \bar{M} > 2\underline{M}$ which we have already assumed. So for $n_F = (1/2)N$, $A(n_F) < 1$. That is $n_F = (1/2)N > \tilde{n}_F$.

The significance of the above proposition is that we will have to take into account both type I and type II equilibria, while examining the impact of a cost subsidy. This is because $\tilde{\pi}_I$ start increasing with n_F before $n_F = \frac{1}{2}N$ (i.e. before $\tilde{n}_I < \tilde{n}_F$).

Let us first consider type I equilibrium. That is, we take an initial equilibrium with $\tilde{n}_F > \bar{n}_F$ and consider small changes around this equilibrium. Since the equilibrium is on the upward rising portion of $\tilde{\pi}_I$, this part alone is magnified in fig.3.5.

In case of type I equilibrium, incomes of the independent informal units as well as subcontractors definitely fall as is clear from fig.3.5. Down ward shift of $\tilde{\pi}_I$ as well as W_rW_r' both push down the income of these units. The effect on n_F however is ambiguous. If $\tilde{\pi}_I$ shifts by more than W_rW_r' then n_F might increase. If on the other hand, the opposite happens n_F will fall.

When we come to the equilibrium of type II, the impact on both n_F and $\tilde{\pi}_I$ seems to be ambiguous, as is shown in fig.3.6. While downward shift of the curve $\tilde{\pi}_I$ to π_I' tends to increase income, and reduce n_F, the downward shift in W_rW_r' curve tends to increase n_F and reduce $\tilde{\pi}_I$. However in the following proposition, we prove that income of all the informal units will be lower.

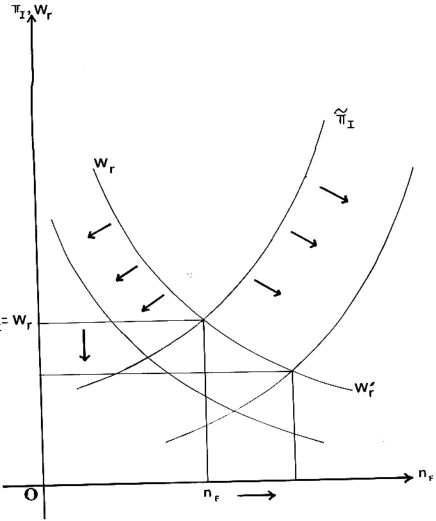


Fig 3.5

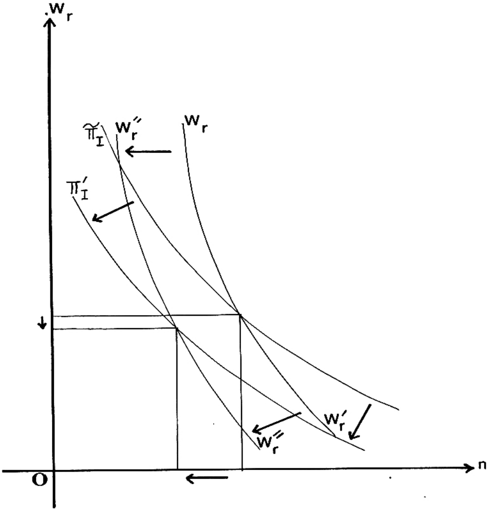


Fig 3.6

Proposition.5.3. Income of the independent informal units and hence that of the subcontractors also, will fall in type II equilibrium as a result of cost subsidy given to the independent informal units.

Proof: Suppose not. Then their incomes must either increase or remain unchanged. Condition (10b) can be written as:

$$[C'_F(\tilde{q}_F) - C_F(\tilde{q}_F)/\tilde{q}_F]\tilde{q}_F = [C'_I(\tilde{q}_I) - C_I(\tilde{q}_I)/\tilde{q}_I]\tilde{q}_I$$

where $\tilde{q}_F = \tilde{Q}_F/n_F$, $C_F(q_F) = C_F q_F^2/2$ (total cost),

$C'_F(q_F) = C_F q_F$ (marginal cost).

So, the above expression takes the form:

$$C_F[\tilde{q}_F - (\tilde{q}_F/2)]\tilde{q}_F = C_I[\tilde{q}_I - (\tilde{q}_I/2)]\tilde{q}_I$$

$$C_F \geq C_I \Rightarrow \tilde{q}_F \leq \tilde{q}_I$$

Now, suppose a cost subsidy is provided and C_I falls to $\bar{C}_I$. In equilibrium $\tilde{\pi}_I = W_r$ increases or remains unchanged by hypothesis. Let the new solutions be (q'_F, q'_I).

Then, $\bar{C}_I[q'_I - q'_I/2]q'_I \geq C_I[\tilde{q}_I - \tilde{q}_I/2]\tilde{q}_I = C_F[\tilde{q}_F - \tilde{q}_F/2]\tilde{q}_F$ together with $\bar{C}_I < C_I \Rightarrow q'_I > \tilde{q}_I$.

As condition (4.2b) holds for (q'_F, q'_I) also, therefore $C_F[q'_F - q'_F/2]q'_F \geq C_F[\tilde{q}_F - \tilde{q}_F/2]\tilde{q}_F \Rightarrow q'_F \geq \tilde{q}_F$. At the same time, as $\bar{C}_I < C_F$, $q'_F < q'_I$.

Since aggregate output is fixed at $(\bar{M}-\underline{M})$,

$$\tilde{q}_F\tilde{n}_F + (N-\tilde{n}_F)\tilde{q}_I = q'_F n'_F + (N-n'_F)q'_I = \bar{M} - \underline{M}.$$

As $q'_F > \tilde{q}_F$ and $q'_I > \tilde{q}_I$:

$$(\bar{M}-\underline{M}) = \tilde{q}_F\tilde{n}_F + (N-\tilde{n}_F)\tilde{q}_I < q'_F\tilde{n}_F + q'_I(N-\tilde{n}_F)$$

As $q'_F < q'_I$, therefore $n'_F > \tilde{n}_F$. That is to reduce the value of $q'_F\tilde{n}_F + q'_I(N-\tilde{n}_F)$ to $\bar{M}-\underline{M}$ higher weight must be put on the lower of the two values: q'_F and q'_I. But, from equation (10a) formal sector's market share falls with a fall in C_I. So, from equation (10b), $\tilde{n}_F$ can increase in equilibrium iff $\tilde{\pi}_I = W_r$ is lower. Hence there is a contradiction. So

$\tilde{\pi}_I = W_r$ can not be higher at the new equilibrium or remain unchanged either. Therefore in the event of a selective subsidy, income of all the informal units will always fall, while the impact on n_F remains ambiguous.

Let us now consider the case of overall subsidy. To keep the analysis tractable we also assume $C_F = C_I = C$ which we have already done before. Given $n_I > n_F$, for each n_F $d\tilde{Q}_I/dC > 0$, i.e. the market share of independent informal units fall as subsidy is provided to all the informal units, including the subcontractors. Fig.3.7. and Fig.3.8. show the impact of such subsidy in case of type I and type II equilibrium respectively.

As the formal sector's market share increases at each n_F, he is ready to employ a larger number of subcontractors at each W_r. So, the curve W_rW_r' shifts up, while $\tilde{\pi}_I$ shifts down.[6] The number of subcontractors is always increasing, i.e. the size of independent informal sector is shrinking under such circumstances. In type II equilibrium income of the informal units is clearly falling. However, in case of type I equilibrium, we see that there is ambiguity regarding the impact on the level of income. Following proposition removes this uncertainty.

Proposition.5.4. The income of all the informal units will fall in type I equilibrium, as a result of overall subsidy.

Proof. From condition (10b) we can write:

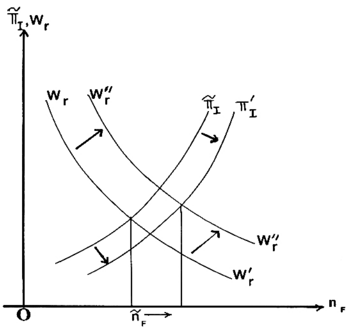
$$[C_F'(\tilde{q}_F) - C_F(\tilde{q}_F)/\tilde{q}_F]\tilde{q}_F = [C_I'(\tilde{q}_I) - C_I(\tilde{q}_I)/\tilde{q}_I]\tilde{q}_I$$

i.e. $C_F[\tilde{q}_F - \tilde{q}_F/2]\tilde{q}_F = C_I[\tilde{q}_I - \tilde{q}_I/2]\tilde{q}_I$

As, $C_F = C_I$, from the above condition $\tilde{q}_F = \tilde{q}_I$. *Substituting this value in:*

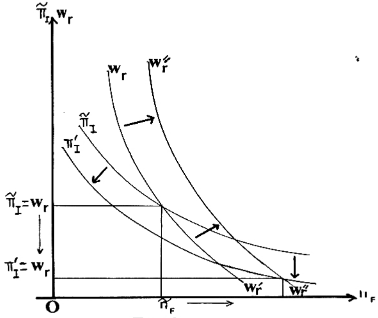
---

[6] $dQ_I/dC > 0$ requires $C\alpha_I n_F > C\alpha_F n_I$, which as we have already argued in the case of selective subsidy, is likely to be true.



$\tilde{\pi}_I, W_r$
W_r
W_r''
$\tilde{\pi}_I$
π_I'
W_r''
W_r'
O
$\tilde{n}_F$
n_F

Fig 3.7



$\tilde{\pi}_I, w_r$
w_r
w_r''
$\tilde{\pi}_I$
π_I'
$\tilde{\pi}_I = w_r$
$\pi_I' = w_r$
w_r'
w_r''
O
$\tilde{n}_F$
n_F

Fig 3.8

$(N-\tilde{n}_F)\tilde{q}_F+\tilde{n}_F\tilde{q}_I = \bar{M}-\underline{M}$, we get $\tilde{q}_F = \tilde{q}_I = (\bar{M}-\underline{M})/N$
Identical cost subsidy leaves the equality between C_F and C_I unaltered so the share of each individual informal unit remains unchanged at $(\bar{M}-\underline{M})/N$, be it subcontracting or producing independently. But the new $C_F = C_I$ will be lower. Hence income will also be lower.

After ascertaining the impact of a cost subsidy, we go on to compare it with the socially optimal choice. As the number of subcontractors is an additional choice variable, the social welfare function takes the following form:

$$\tilde{W} = \int_{\underline{M}}^{M_0} \alpha_I M dM - (\alpha_I C_I/2)\{(M_0-\underline{M})/n_I\}^2 n_I + \int_{M_0}^{\bar{M}} \alpha_F M dM - (\alpha_F C_F/2)\{(\bar{M}-M_0)/n_F\}^2 n_F$$

Here, M_0 is carrying the same meaning as $\tilde{M}$ in section II. The interpretation of the welfare function has also been furnished there.

The social planner will choose M_0 and n_F optimally, so as to maximize social welfare. The optimality conditions are:

$$\alpha_F[M_0-C_F\{(\bar{M}-M_0)/n_F\}] = \alpha_I[M_0- C_I\{(M_0-\underline{M})/n_I\}] \qquad (14a)$$

and

$$\alpha_F C_F[\{(\bar{M}-M_0)/n_F\}-\{(\bar{M}-M_0)/2n_F\}](\bar{M}-M_0)/n_F$$
$$=\alpha_I C_I[\{(M_0-\underline{M})/n_I\}-\{(M_0-\underline{M})/2n_I\}](M_0-\underline{M})/n_I \qquad (14b)$$

Equation (14b) can be rewritten as:

$$\alpha_F C_F[q_F-q_F/2]q_F = \alpha_I C_I[q_I-q_I/2]q_I. \qquad (14b)'$$

From equation (14a) for comparable values of n_F, the market share of the formal sector producer is larger at the socially optimal solution cumpared to $\tilde{Q}_F$. Hence, from (14b), as $\alpha_F > \alpha_I$ the socially optimal n_F should be larger than $\tilde{n}_F$. An overall subsidy always increases n_F while the impact of a selective subsidy on n_F is ambiguous. Therefore it acts better from the point of view of society's welfare.

It is to be noted that while the informal units' incomes unambiguously fall as a consequence of selective subsidy, supplied to the independent units, the impact of such a subsidy on formal sector producer's profit is ambiguous. He incurs a lose due to a fall in his share of the market demand. At the same time, he has to pay less to his subcontractors, and on that account he is making a gain. Lower income of the informal units imply a lower market price for the informal product, and hence a lower price of the formal product as the two vary directly. Again, the consumers of both the markets are clearly gainers from such a subsidy. If it is an indiscriminate subsidy the formal sector producer as well as all the consumers are clear gainers. The consumers gain from a lower price of both the products. The informal units on the other hand, are loosers. The formal sector producer's gain comes from the lower cost of hiring the subcontractors as well as higher market share. The following table presents the main results of this section.

SUMMARY OF RESULTS

		Selective Cost subsidy	Indiscriminate Cost subsidy
TYPE I EQUILIBRIUM	Informal units' income.	Falls	Falls for $C_F=C_I$
	No. of Subcontractors (n_F)	Ambiguous	Increases
	Market share of the independent informal units	Increases	Falls
	Producer's profit	Ambiguous	Increases
TYPE II EQUILIBRIUM	Informal units' income	Falls under the condition $C_F \geq C_I$	Falls
	No. of subcontractors(n_F)	Ambiguous	Increases
	Market share of the independent informal units	Increases	Falls
	Formal sector producer's profit	Ambiguous	Increases

6. CONCLUSION.

In the present chapter, the basic message is that ability to sell to the final consumers does not necessarily enable the informal sector producers to reap a benefit from governmental intervention. However, the results in this chapter are obtained under a restrictive condition. Through out the analysis, the aggregate market demand has been held fixed at $\bar{M}$-$\underline{M}$ by assuming that the whole market is served. As the focus in this chapter has been on the informal units' income, and the possibility of an adverse impact of a cost subsidy on output has already been discussed in the previous chapters, taking this liberty seems to be justified.

It has not been the author's intention to condemn the use of subsidy to improve the economic condition of the informal units. Rather, the aim is to construct examples where such a policy will not bring about the required effect. The present example shows that when the market is almost satuarted and the informal units enjoy a second rate status as dependable suppliers, providing them with cost subsidies may increase their problems instead of alleviating them. It should also be noted that further expansion of the informal sector may not be the most desirable solution. A number of alternative policy measures have been sketched out in this chapter which can achieve the objectives that the policy makers can possibly have in their mind.

Appendix.

We have also to consider the possibility that $\bar{\bar{n}}_F$ can be so large in equilibrium that the elasticity of demand of the adjusted demand curve of the informal sector becomes greater than 1. First, we establish that there exists an $\bar{\bar{n}}_F$ big enough for which this will always happen.

Proposition. $\exists\ \bar{\bar{n}}_F < N$ for which
$n_I C_F \alpha_F - n_F C_I \alpha_I + 2n_F n_I \Delta\alpha < 0$, i.e. $e^I_{da} > 1$.

Proof. The condition for $e^I_{da} < 1$ can be rewritten as
$n_I [C_F \alpha_F + 2n_F \Delta\alpha] > n_F C_I \alpha_I$.
Or, $(C_F\alpha_F/C_I\alpha_I) + 2n_F(\Delta\alpha/C_I\alpha_I) > n_F/n_I = n_F/N-n_F$
As $n_F \longrightarrow 0$, $(C_F\alpha_F/C_I\alpha_I) + 2n_F(\Delta\alpha/C_I\alpha_I) \longrightarrow C_F\alpha_F/C_I\alpha_I$, whereas $n_F/(N-n_F) \rightarrow 0$. So for any n_F close to zero, the above inequality holds. At the same time $\frac{d}{dn_F}[(C_F\alpha_F/C_I\alpha_I) + 2n_F(\Delta\alpha/C_I\alpha_I)] = (2\Delta\alpha/C_I\alpha_I)$, and

$\frac{d}{dn_F}\{n_F/(N-n_F)\} = N/(N-n_F)^2 > 0$, $\frac{d^2}{dn_F^2}(n_F/N-n_F) = 2N/(N-n_F)^3 > 0$.

That is, whereas the left hand side of the inequality is increasing at a constant rate the right hand side is increasing at an increasing rate.

Also, as $n_F \longrightarrow N$, $(C_F\alpha_F/C_I\alpha_I) + 2n_F(\Delta\alpha/C_I\alpha_I) \rightarrow (C_F\alpha_F/C_I\alpha_I) + 2N(\Delta\alpha/C_I\alpha_I)$ whereas $\frac{n_F}{N-n_F} \longrightarrow \alpha$.

So there exists an $\bar{\bar{n}}_F < N$, for which the above inequality is violated. $\bar{\bar{n}}_F$ is shown in fig.7. $\bar{\bar{n}}_F > (1/2)N$ (at $n_I = n_F$ the inequality is not violated). As $\bar{n}_F < (1/2)N$, we will have to consider the impact of cost subsidy only in the case of type I equilibrium in this case.

We consider selective cost subsidy only, as the case of indiscriminate cost subsidy does not give any additional result. As a result of selective cost subsidy, here the curve $\tilde{\pi}_I$ shifts up where as the curve $W_r W_r'$ shifts down. n_F is definitely falling. Proposition 4.4 will be applicable here also. So, for $C_F \geq C_I$ the informal units income will always fall.

REFERENCES

1. Banerjee, N. (1981): "Is Small Beautiful?" in A.K. Bagchi and N. Banerjee (eds.) *Change and Choice in Indian Industry*. K.P. Bagchi and Co.

2. Bardhan, P.K. (1980): "Interlocking Factor Markets and Agrarian Development: A Review of Issues." *Oxford Economic Papers*. Vol. 32, pp. 82-98.

3. Basu, K. (1983): "The Emergence of Isolation and Interlinkage in Rural Markets." *Oxford Economic Papers*. Vol. 35, pp. 262-280.

4. ———— (1984): *The Less Developed Economy. A Critique of Contemporary Theory*, Oxford University Press.

5. ———— (1986): "One Kind of Power", *Oxford Economic Papers*. Vol. 38, pp. 259-282.

6. Basu, T. (1977a): "Beedi Workers of Calcutta", Report in *Economic and Political Weekly*. Vol. 12, January 22.

7. ———— (1977b): "Calcutta's Sandal Makers", Report in *Economic and Political Weekly*. Vol. 12, August 6.

8. ———— (1977c): "Hosiery Workers of Calcutta", Report in *Economic and Political Weekly*. Vol. 12, Deccember 17.

9. Bhaduri, A. (1973): "A Study in Agricultural Backwardness under Semi-Feudalism." *Economic Journal*, Vol. 83, pp 120-137.

10. ———— (1977): "On the Formation of Usuroious Interest Rates in Backward Agriculture." *Cambridge Journal of Economics*, Vol. 1, pp 341-352

11. Bose, A.N. (1978): *Calcutta and Rural Bengal : Small Sector Symbiosis*, Minerva Associate Pvt. Ltd.

12. Braverman, A. and T.N. Srinivasan (1981): "Credit and Share Cropping in Agrarian Societies", *Journal of Development Economics*. Vol. 9, pp. 289-312.

13. Breman, J. (1976): "A Dualistic Labour System? A Critique of the 'Informal Sector' Concept", *Economic and Political Weekly*. Vol. 11, Nos 48-50, pp. 1870-1876, 1905-1908, 1939-1944.

14. Clark, C. (1951): *Conditions of Economic Progress*, Macmillan and Co.

15. Dutta Choudhuri, T. (1989): "A Theoretical Analysis of the Informal Sector", *World Development*. Vol. 17, No. 3, pp. 351-355.

16. Fields, G. (1975): "Rural Urban Migration, Urban Unemployment and Underemployment and Job Searching Activity in LDCs", *Journal of Development Economics*. Vol. 2, pp. 165-187.

17. Findlay, R. (1978): "An Austrian Model of International Trade and Interest Rate Equalization", *Journal of Political Economy*. Vol. 86, No. 6, pp. 989-1007.

18. Gang, I. N. and S. Gangopadhyay. (1990): "A Model of Informal Sector in Development", Mimeo.

19. Gangopadhyay, S. and K. Sengupta. (1987): "Small Farmers, Money Lenders and Trading Activity", *Oxford Economic Papers*. Vol. 38, pp. 333-342.

20. Harris, J. R. and M. P. Todaro. (1970): "Migration Unemployment and Development: A Two Sector Analysis", *American Economic Review*. Vol. 60, No. 1, pp. 126-142.

21. Hariss, J. (1982): "Character of an Urban Economy: Small Scale Production and Labour Markets in Coimbatore", *Economic and Political Weekly*. Vol. 17, Nos. 23, 24, pp. 945-954, 993-1001.

22. Hart, K. (1973): "Informal Income Opportunities and Urban Employment in Ghana", in R. Jolly et al (eds) *Third World Employment: Problems and Strategy*, Hammondsworth.

23. Hemmer, H. R. and C. Mannel. (1989): "On The Economic Analysis of the Urban Informal Sector", *World Development*. Vol. 17, No. 10, pp. 1543-1552.

24. Jaskold Gabszewicz, J and J.-F. Thisse. (1979): "Price Competition, Quality and Income Disparities. *Journal of Economic Theory*, Vol. 20, No. 3, pp. 340-359.

25. Jaskold Gabszewicz, J. and J.-F. Thisse. (1980): "Entry (and Exit) in a Differentiated Industry", *Journal of Economic Theory*, Vol. 22, No. 2, pp. 327-338.

26. Joshi, H. and V. Joshi. (1976): *Surplus Labour and the City : A Study of Bombay*, Oxford University Press.

27. Joshi, H. (1980): "The Informal Urban Economy and its Boundaries", *Economic and Political Weekly*. Vol. 15, No. 13, pp. 638-644.

28. Kuznets, K. (1966): *Modern Economic Growth, Rate, Structure and Spread*, Oxford and IBH Publishing Co.

29. Lewis, A. (1954): "Economic Development with Unlimited Supply of Labour", *Manchester School*. Vol. 22, pp. 139-191. Reprinted in A. N. Agarwal

and S.P.Singh (eds.) *Economics of Underdevelopment*(1958). Oxford University Press.

30.Little,I.M.D. ,D.Majumder, and J.M.Page.(1987): *Small Manufacturing Enterprises: A Comparative Study of India and other Economies*, Oxford University Press.

31.Marjit,S.(1987): "Trade in Intermediaries and Colonial Pattern of Trade", *Economica*.Vol.54,pp.164-173.

32.Mehta,M.(1985): "Urban Informal Sector: Concepts, Indian Evidence and Policy Implications", *Economic and Political Weekly*, Vol.20,No.2,pp.326-332.

33.Mohandas,M.(1980): "Beedi Workers in Kerala: Conditions of Life and Work", *Economic and Political Weekly*.Vol.15,No.36,pp.1517-1523.

34.Nagraj,R.(1984): "Subcontracting in Indian Manufacturing Industry: Analysis, Evidence and Issues", *Economic and Political Weekly*.Vol.19,Nos.31-33(Annual Number),pp.1435-1453.

35.Oi,W.(1971): "A Disney Land Dilemma: Two Part Tariff for a Mickey Mouse Monopoly", *Quarterly Journal of Economics*.Vol.85,No.1,pp.77-96.

36.Papola,T.S.(1980): "Informal Sector: Concept and Policy", *Economic and Political Weekly*.Vol.15,No.18,pp.817-824.

37.Papola,T.S.(1981a): *Informal Sector in an Urban Economy: A Study of Ahmedabad*, Vikas,Delhi.

38.Papola,T.S.(1981b): "Industrialization, Technological choices and Urban Labour Markets", in A.K.Bagchi and N.Banerjee (eds) *Change and Choice in Indian Industry*.K.P.Bagchi and Co.

39.Rakshit,M.(1982): *Labour Surplus Economy*,Macmillan and Co.

40.Rauch,J.E.(1991): "Modelling the Informal Sector Formally", *Journal of Development Economics*.Vol.35,No.1,pp.33-47.

41.Romatate,E.(1983): "Calcutta's Informal Sector: Theory and Reality", *Economic and Political Weekly*.Vol.17,No.50,pp.2115-2128.

42.Roy,D. and K.Sengupta.(1989): "Interlinkages and the Pattern of Competition", in P.K.Bardhan (ed) *Economic Theory of Agrarian Institutions*.Oxford Calendon.

43.Sanyal,K. and R.Jones.(1982): "The Theory of Trade in Middle Products", *American Economic Review*.Vol.72,No.1,pp.16-31.

44.Sarkar,A.(1985): "A Model of Trade in Intermediate Goods",*Journal of*

International Economics. Vol. 19, pp. 85-98.
45. Sarkar, N. and R. Mukherjee. (1987): "Dependence of Small Scale Manufacturing Enterprises on the Organized Sector-Some Evidence", *Artha Vijnana*. Vol. 29, No. 3, pp. 286-296.
46. Souza, P. and V. Tokman. (1976): "The Informal Sector in Latin America", *International Labour Review*. Vol. 114, No. 3.
47. Standing, G. (1987): "Vulnerable Groups in Urban Labour Process", Working Paper No. 13. World Employment Programme Research.
48. Streefkerk, H. (1981): "Too Little to Live on, too Much to Die on. Employment in Small Scale Industries in South Gujarat", *Economic and Political Weekly*. Vol. 16, Nos. 15-17, pp. 659-668, 721-728, 769-780.
49. Taylor, L. (1979): *Macro Models for Developing Countries*, Macgraw-Hill.
50. Taylor, L. (1982): "Food Price, Inflation, Terms of Trade and Growth", in Gersovitz et al (eds). *The Theory and Experience of Economic Development*. George Allen & Unwin.
51. Tirolé, J. (1988). *Theory of Industrial Organization*. MIT Press.
52. Watanabe, S. (1971): "Subcontracting, Industrialization and Employment Creation." *International Labour Review*. Vol. 6, Nos. 1-2, pp. 51-76.

ERRATA

Page No.	Line No.	Reads	Should Read
Acknowledgement	2	guidance	guidance
Acknowledgement	4	deligently	diligently
Acknowledgement	15	referres	referees
Acknowledgement	17	defeciencies	deficiencies
18	23	imformal	informal
23	8	7), the second ...	7), at (W^*, r^*) the second....
24	8	$(k + k^*)X = M_I + M_f + M_f^{*'}$	$(k+k^*)X$ $= M_I + M_f + M_f^* =$ $= M_I + M_f' + M_f^{*'}$
Acknowledgement	26	experince	experience
29	11	drived	derived
33	19	formal sector for finance	formal sector producer for finance
34	16	developes	develops
34	27	discridancy	discrepancy
39	15	above	below
42	6	$P(\bar{X}_F^m)\ \bar{X}_F^m -$ $(1+r)\ C(\bar{X}_f^m)$	$P(\bar{X}_F^m)\ \bar{X}_F^m -$ $(1+r^*)\ C(\bar{X}_f^m)$
49	23	$(\hat{n}_F^m\ x_F^m)$	$(\hat{n}_m,\ x_E^m)$
51	10	(CX)	C(X)
61	17	Prices	Price
68	4	Units's	Units'

Contd...2

Page No.	Line No.	Reads	Should Read
68	4	Profit	Profits
70	13	$\alpha_I C_I \ (\tilde{M} - \underline{M}^2)/2$	$\alpha_I C_I \ (\tilde{M} - \underline{M})^2/2$
71	7	$C_I \alpha_I < \bar{\bar{M}}(C_I \alpha_I + \Delta\alpha)$	$C_I \alpha_I < \bar{M}(C_I \alpha_I + \Delta\alpha)$
72	6	Units	Units'
80	4	absorbe	absorb
82	3	$d\tilde{p}_F/dn_E$	$d\tilde{p}_L/dn_E$
84	24	B and A	A and B
87	24	increase	reduce
87	24	reduce	increase
92	9	Producer's profit	formal sector producer's profit
87	26	reduce	increase
23	3	the	that

Other corrections :-

1. Omit footnote 2 in page 14.
2. Proposition 2.2, in page 39 should read :

If $r^* \leq 1$ and $\tilde{r} > 0$, then the output, when subsidized outside loan is used, will always be lower than the output when loan from producer F is used.

Contd... 3

3. The Utility function in page 61 should read :

$$U_i = \alpha_i (M - P_i)$$

where α_i : The index of quality. It can take three values, α_I, α_F and 0. $\alpha_i = 0$ implies the commodity is not purchased.