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CHOICE UNDER DISEQUILIBRIUM : A DIAGRAMMATIC APPROACH

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The paper looks into some of the core ideas of disequilibrium theory by means of a set of diagrams. This allows, in particular, a simple three dimensional representation of the well-known Benassy-Malinvaud classification of short-run macroeconomic equilibria into the Keynesian, classical and repressed inflation types and as opposed to standard practice, the paper provides a characterization of these equilibria on the basis of the position of the household's notional demand point on the budget plane. This representation shows amongst other things that the problem of nonuniqueness of fix-price equilibria is serious insofar as the same wage price configuration might be associated with more than one type of equilibrium. The comparative statics of a money wage cut are also developed diagrammatically.
(JEL : B 41)

I. INTRODUCTION

Much of macro policy analysis is carried out on the basis of aggregative models which rely heavily on tools such as the Keynesian consumption function. Economists have often expressed dissatisfaction with these models insofar as they lack an appropriate micro foundation. Indeed, any policy prescription based on such models would be suspect until detailed responses by individual agents to exogenous policy impulses are fully worked out. The search for micro foundations led to the emergence of disequilibrium theory which amongst other things, succeeded in providing he micro basis of the Keynesian consumption function. This involved, in particular, viewing the household's choice to be restricted not only by the size of the budget but also by the quantity constraints relating to limitations on trading opportunities imposed by disequilibrium prices.

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The literature in the area being well established, however, the purpose of the present paper is basically pedagogic. It is concerned with a simple diagrammatic analysis of the choice problem faced by economic agents in a disequilibrium situation and proceeds to apply these micro tools to study questions of macro policy, such as the effect of an autonomous change of money wage rates.

Earlier attempts of a similar nature are to be found in Bohm and Muller (1977), Basu (1992), Malinvaud and Younes (1977), Stoneman (1979), Muellbauer and Portes (1978). Basu as well as Malinvaud and Younes were concerned about the Dreze (1975) and the Younes (1975) equilibria respectively in the context of a pure exchange economy. by contrast, the present work concentrates on the Benassy (1975(a), 1975(b), 1982, 1986) equilibrium concept and applies it to problems associated with production. This naturally leads to a consideration of the phenomenon of unemployment and allows us a detailed representation of the different types of unemployment (viz. Keynesian, classical and repressed inflation) that may arise in a price rigid set-up.

The diagrammatic representation to be depicted here bears a close resemblance to the contribution of Muellbauer and Portes (1978). However, the technique of representation differs in several respects. In particular, ours utilizes the three dimensional commodity space which enables one to visualize the choice problem on the budget plane of the household and read the coordinates pertaining to the money good simultaneously with those for other goods. However, since we confine ourselves to the budget plane alone, which constitutes a two dimensional subspace of the commodity space, an extra dimension does not create any special problem.

More interestingly, our representation provides a complete characterization of the different types of Benassy equilibria on the household's budget plane. This is done on the basis of the position of the notional demand point on the household's budget plane.

The characterization turns out to be an interesting complement of the corresponding representation due to Benassy and Malinvaud. Thus, while their demonstrations are restricted to the wage price plane, the present work provides a dual characterization of the different equilibria in the quantity space. The quantity space representation also brings into sharp focus the problem of non-uniqueness of Benassy equilibria (discussed also by Hildenbrand and Hildenbrand (1978)).

The next section describes the basic framework under consideration together with the preliminary features of the diagrams. In Section 3, different types of Benassy equilibria (viz. Keynesian, classical and repressed inflation) are depicted separately. A complete characterization of the three types of equilibria is then presented. In Section 4, the diagrams are used to discuss the effect of a money wage cut policy. A concluding section sums up the findings.

2. THE MODEL AND PRELIMINARY FEATURES OF THE DIAGRAMS

2.1 *The Model*

The economy is question is comprised of three types of agents, viz., households, firms and the government. By assumption, the households have common characteristics while the firms share an identical technology. As a result, aggregate household (respectively firm) behaviour is a simple n-fold replica of that of a single household (respectively firm) and this permits the system to be represented by a single household and a single firm.

The household supplies labour l which the firm was as an input to produce an output called y. The household can supply a maximum of $\bar{l}$ units of labour (say, 24 hours per day). Equivalently $\bar{l}$ represents the (least) upper bound on its leisure time. Similarly, it has an endowment of $\bar{m}$ units of money. In what follows, the household's consumption of leisure will be denoted by x and its supply of labour by l. Thus, $x = \bar{l} - l$. The household's utility function depends on its consumption of y, of x and of the quanturn of real balances $\frac{m}{p}$ it ends up with. This is captured in the utility function $U = U(x, y, \frac{m}{p})$ which satisfies the following properties :

(H.1.a) U is monotonically increasing in all arguments;

(H.1.b.) U is strictly quasi-concave and differentiable; and

(H.1.c.) all goods are normal.

The firm on the other hand is characterized by a production function $y = F(l)$, where

(F.2.a) $\frac{\partial F}{\partial l} > 0$ and

(F.2.b) $\frac{\partial^2 F}{\partial l^2} \leq 0$

Its objective is to maximize profits, given the price of the good (p) and the money wage rate (w).

The government has a fixed real demand G of y which is assumed to be financed by money creation. Consistent with standard practice in disequilibrium theory, it is assumed that 'w' and 'p' are fixed.

The basic problem arises from the fact that at least one of the two price variables is set at a (Walrasian) disequilibrium level. This implies that the household and the firm will not be able to realize their 'notional' demands and supplies.[1] Under these circumstances the household's problem is to maximize U, subject to its budget constraint and other restrictions on its realizable trades. Thus the household may be assumed to

(1) maximize $U(y, x, \frac{m}{p})$

(2) $s.t.\ y + \frac{w}{p}x + \frac{m}{p} = \frac{w}{p}\bar{l} + \frac{\bar{m}}{p}$

and

1. The household's (firm's) notional demand and supplies are given by the solution to the problem (1) and (2) ((5) and (6)) below.

(3) $\underline{\underline{l}}_h \leq l \leq \overline{\overline{l}}_h$

(4) $\underline{\underline{y}}_h \leq y \leq \overline{\overline{y}}_h$

where (3) and (4) represent the constraints perceived by the household on its supply of l and demand for y.

As should be obvious from (2), current profits are assumed to remain undistributed. The profits may of course be distributed with a lag and these make their appearance through $\frac{m}{p}$.

Similarly the firm's problem is to

(5) maximize $y - \frac{w}{p} l$

(6) $s.t. y = F(l)$

and

(7) $\underline{\underline{l}}_f \leq l \leq \overline{\overline{l}}_f$

(8) $\underline{\underline{y}}_f \leq y \leq \overline{\overline{y}}_f$

where as in the case of the household, (7) and (8) represent the respective perceived constraints of the firm.

How the household and the firm arrive at these perception would be discussed in the sequel.

2.2 *Diagrams : Preliminary Features*

To begin with, we visualize the household's unconstrained maximization problem (i.e. (1) and (2) in three dimension, represented in Figure 1 by the axes x,y and $\frac{m}{p}$. The budget plane (i.e (2)) is given by the triangle IJL. An indifference surface in the three dimensional plane cuts the budget plane along the closed contour shown by he broken line in Fig. 1. The solution to (1) and (2), viz. the notional demand, is shown by the point of tangency (B).

The household's initial endowment of x,y and $\frac{m}{p}$ are represented by the point e (Figure 1) with coordinates $(\bar{x}, 0, \frac{m}{p})$. The point $\bar{x}$ marks off the leisure coordinate on the Ox axis. Labour is measured in a direction opposite to that of leisure. Thus, while O represents the origin for measuring leisure, x is the one relevant for labour. The vertical plane $x = \bar{x}$ drawn through the point $\bar{x}$ ($e\ \bar{x}\ f$) will intersect the budget plane in a line (parallel to JL) which

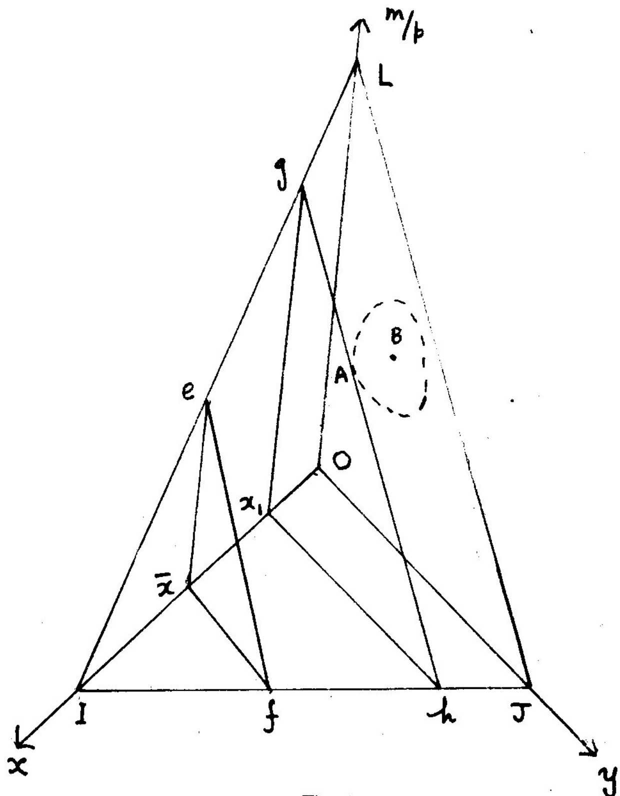

Fig. 1

represents the alternative combinations of y and $\frac{m}{p}$ the household can afford when restricted to consume $\bar{x}$ units of leisure. Constant levels of leisure (or, labour) associated with parallel lines such as *ef, gh* etc. (as shown in Fig. 1) will be referred to as *ef* level of leisure (labour), *gh* level of leisure (labour) etc.

Given the restriction *gh,* the household's trade are restricted to the zone delineated the trapezium *efhg,* which is an example of the types of restriction that might be imposed by (3). This construction clarifies another point, viz. that lines (like *gh*) lying *progressively away* from the vertex *I* represent successively lower levels of leisure (or higher levels of labour). The restriction imposed by *efhg* implies that the household cannot go to the right of *gh* and therefore the solution to (1) - (3) is given by the point *A* of tangency between a (restricted) indifference contour and *gh*.

Similarly, available choices of x and $\frac{m}{p}$ for given levels of y (respectively, x and y for given levels of $\frac{m}{p}$) can be shown by lines parallel to *IL* (respectively *IJ*) and it is easily checked that lines away from the vertex J (and parallel to IL) represent lower levels of y and those away from the vertex L (and parallel to IJ) represent lower levels of $\frac{m}{p}$. For each such quantity constraint the household's choices can be depicted as tangencies between the corresponding line on the budget plane and the restricted indifference contour.

We may now introduce the firm. In Figure 2, the firm's production function is shown in the two dimensional *x-y* plane by the curve $\bar{x}$ b x and the household's budget plane is shown as before by the triangle IJL. From (2) it is clear that (the absolute value of) the slope of the line IJ in the two dimensional *x-y* plane is $\frac{w}{p}$. For profit maximization, the firm equates its marginal product F' to $\frac{w}{p}$ and this is shown in Figure 2 by the point n on the production function.

Suppose the household supplies $\bar{x}s$ level of labour. This will be represented on the budget

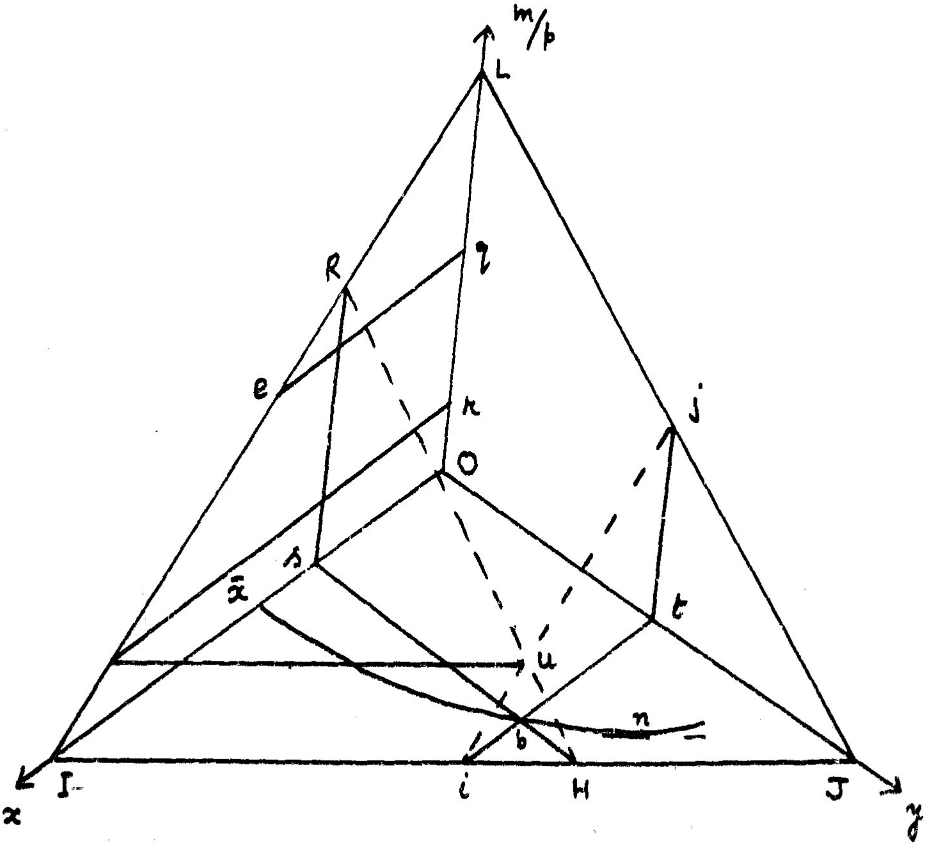

Fig. 2

plane by the line *H.R.* With $\bar{x}s$ level of labour the firm can at most produce *Ot* level of output, which is represented on the budget plane by the line ij. Therefore, by supplying HR level of labour the household could hope to purchase a maximum of *ij* level of output, provided that it is prepared at the same time to reduce its initial endowment of real balance by an amount *rq*. This allocation is represented by point u on *IJL*. Using the same procedure and varying the choice of labour supply (and simultaneously the choice of real balance) by the household, the entire schedule of the household's trading possibilities are traced out. This is none other than the locus of points like u corresponding to different levels of labour. Alternatively, this curve may also be viewed as the mirror image of the production function on the budget plane. In Figure 3 the curve in question is represented by the line *euv* and will be subsequently referred to as the '(gross) consumption possibility frontier' (where point *v* corresponds to *n* of $\bar{x}bn$)

Now we introduce a government that purchases a fixed amount *G* of *y* from the firm. For each level of labour, this will obviously reduce the amount of *y* that is available to the household by a fixed amount *G* and will shift the production function parallely inside on the horizontal plane. The shifted curve represents the part of society's output available for private consumption. The mirror image of the latter curve on the budget plane may be looked upon as the consumption possibility frontier *net* of the government's purchase of *G*. This curve will be referred to as the *net consumption possibility frontier* (or, NCPF is short). The relevant

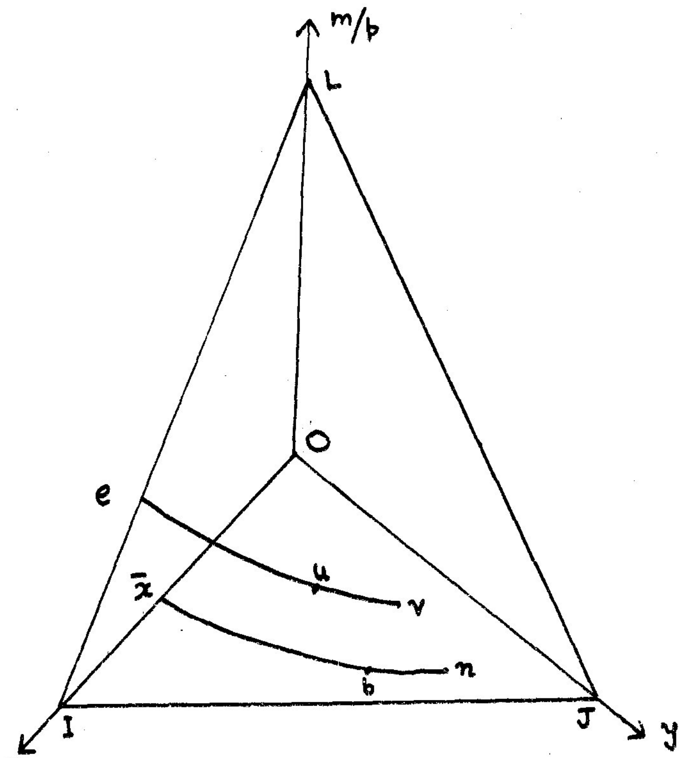

Fig. 3

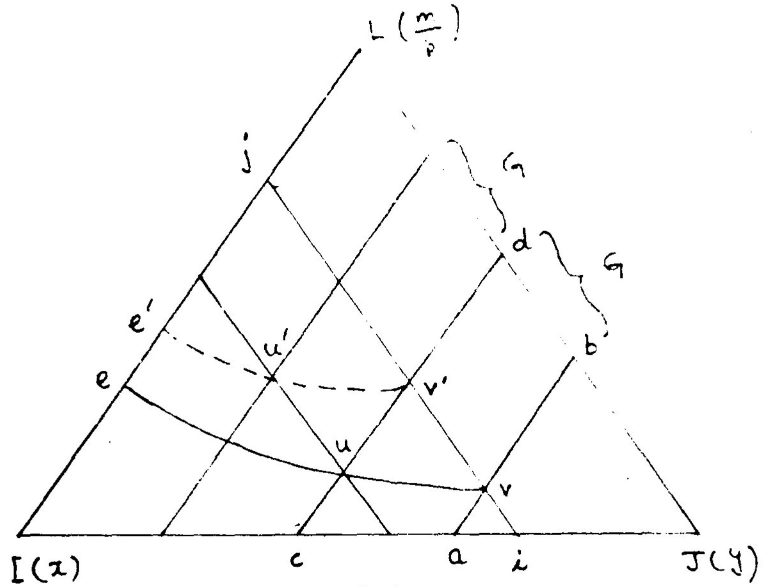

Fig. 4

curves are shown in Figure 4 which depicts the budget plane without reference to the coordinate axes. Thus, the NCPF is shown in Figure 4 by *e'u'v'* while the (gross) consumption possibility frontier is *euv*. Thus the firm, by absorbing the supply of labour equal to the level *ij*, produces an output *ab*. but after deduction of the public consumption of G, the maximum amount that remains for private consumption is *cd*[2]

We may now obtain the locus of the household's optimal choices $(y, \frac{m}{p})$ associated with alternative restrictions on its supply of labour. This is done in Figure 5. Thus, when the household is restricted to *ef*, its utility maximizing choice is given by *o* where, *o* is the point of tangency between *ef* and an indifference curve. similarly, by relaxing the labour supply constraints we get the optimal choices of the household, shown by the points on the curve *oB*. The curve *oB* designates the household's effective demand *curve* (EDC) for *y*[3].

In an analogous fashion one can find the household's optimal choices for different levels of rations on *y*. The locus of such points (viz. *o' B*) yields the household's effective supply curve (ESC) of labour (or, equivalently effective demand curve for leisure). The union of these two paths, represented by the curve *oBo'* will be called the household's *effective demand curve* (EDC).

The assumption made so far are not sufficient to establish any specific properties of the two curves *oB* and *o'B*. The classification of equilibria will be difficult, however, unless more precise information is available. We proceed, therefore, to strengthen the assumption on

2. By ab or cd level of output on the budget plane we would actually refer to the corresponding level of output on the Oy axis. Similarly for the other two components (x and m/p).

3. The terminology 'effective demand curve' was adopted at the suggestion of Amitava Bose.

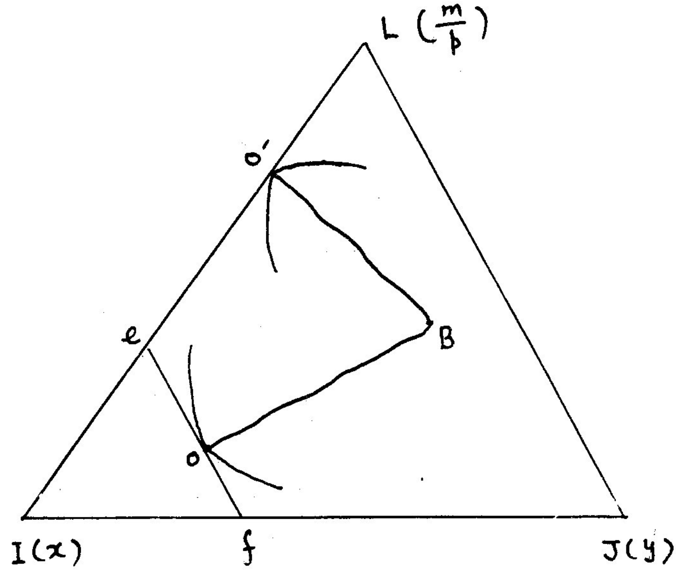

Fig. 5

household's preferences further.

Given any level of ration imposed on labour supply, one may define the budget for consuming y and $\frac{m}{P}$ as the *labour rationed budget.* Thus, when the household is restricted to consume at least $\bar{\bar{x}}$ units of leisure, its *labour rationed budget* is given by $(\frac{W}{P}(\bar{l} - \bar{\bar{x}}) + \frac{m}{P})$. Similarly, with demand for y rationed to lie below $\bar{\bar{y}}$, the *goods rationed budget* is $(\frac{w}{p} l + \frac{m}{p} - \bar{\bar{y}})$.

It has already been assumed in (H.1.c.) that all goods are normal i.e. the notional demands for all goods rise with a rise in the consumer's budget. We now assume further that:

(H.1.d) y^d and $(\frac{m}{p})^d$ rise with a rise in the labour rationed budget.

Under this assumption, the effective demand curve for y must satisfy the property that the tangent to it at each point is flatter than *IL* and steeper than *IJ* (Figure 6).

As opposed to the case of the *oB* curve no analogous assumption will be currently made regarding the household's effective supply curve of labour. It is worth pointing out, however, that if following Benassy (1982, 1986) and certain parts of Malinvaud (1977), labour supply is assumed to be perfectly inelastic (with respect to w and p), then a definite characteristic of the curve *o'B* also emerges. Suppose for example that $\hat{l}$ (which could equal $\bar{l}$, but not necessarily so) is the level of labour the household supplies inelasticity to the firm. This level is shown in Figure 6 by the line $o'Z$. We assume that o' lies to the right of e', otherwise

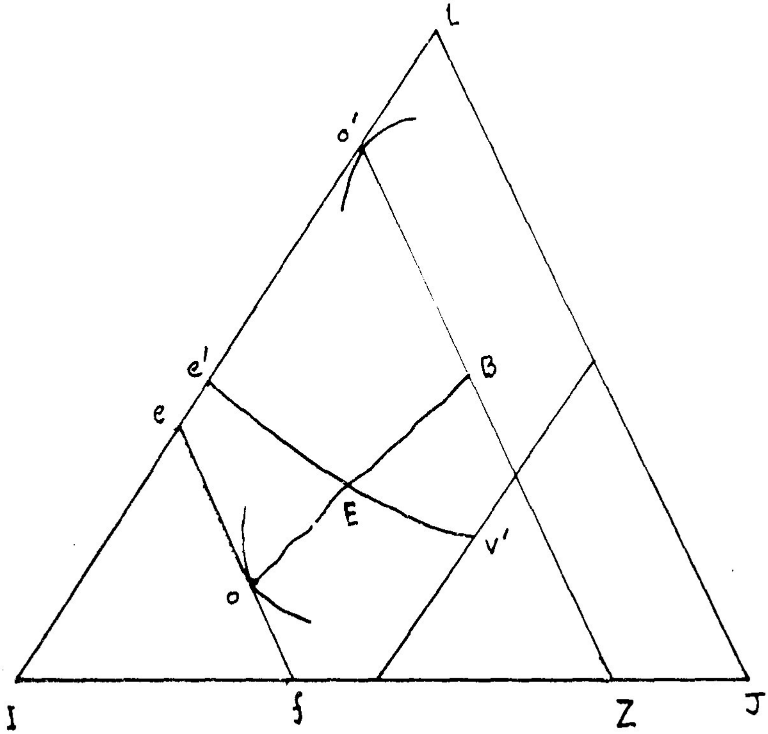

Fig. 6

it would not be possible to meet the government demand *G*. It is easily checked in this case that the NCPF will either lie inside the region *oBo'e* (Figure 8) or intersect the EDC at a *unique* point, *say E* (Figures 6, 9). The next section will show that depending on the relative positions of the two curves (i.e, whether they intersect or not), one may classify Benassy equilibria into the Keynesian, classical and repressed inflation types. Before going to that we briefly discuss the concept of a Benassy equilibrium.

2.3 BENSASSY EQUILIBRIUM

There are three major analytical concepts associated with Benassy equilibrium. These are (*i*) *actual transactions* (*ii*) *effective demands* (*iii*) *perceived constraints*. As already noted, the prices being rigid at a disequilibrium level notional demand and supply will not match in general and any attent at trade will make the households aware of quantitative constraints on their purchase and sale of each good. The actual transaction carried out by a typical household (respectively firm) are therefore found by solving (1)-(4) (respectively (5)-(8).

The next step consists of looking into the way in which the constraints (3), (4), (7) and (8) are determined, for Benassy actually constructs them endogenously. This is done by recognizing the all important distinctions between the actual transactions carried out and the ones which are desired. To calculate the desired purchase and sale of goods *c* (say) by any agent, Benassy undertakes the same optimizing exercise as above, except that while retaining the quantity constraints pertaining to transactions in all other goods, the ones concerning good *c* are withdrawn. The c-th component of this solution vector constitutes the aforementioned desired purchase (or sale) and is called the *effective demand (or supply) y* the agent in the market for good *c*. Thus, effective demand reveals the amount an agent would have liked to transact of a particular good had his transaction in this good been unrestricted.

In general, however, the aggregate effective demand for a good (say c) will, as in the case of aggregate notional demand and supply at disequilibrium prices, differ from the aggregate effective supply. Consequently, for each good, some agents at least will discover the restrictions impeding their optimizing behaviour and formulate in the process their *perceived constraints* on the transactions involving this good[4].

Thus, beginning from an initial set of perceived constraints for each agent, his effective demand (or, supply) for each market is found out. The agents then confront each other with these effective demands and supplies. Given their noncommensurate nature, however, a new set of perceived constraints is determined, generally differing from the initial one. Equilibrium is attained when two consecutive sets of effective demands (equivalently perceived constraints) coincide. As already noted, the actual transactions corresponding to this equilibrium situation are found out by solving (1), (2), (3) and (4) for the household and (5), (6), (7) and (8) for the firm, where the constraints pertaining to (3), (4) and (7), (8) are perceived constraints obtaining in equilibrium. Needless to say, the net transactions in each good will sum up to zero in equilibrium.

Finally, we would like to make an additional observation. It is obvious from (3), (4) and (7), (8) that while quantity constraints are clamped on the trade of both *l* and *y*, no such constraints is applicable to *m*. One might argue that there is no separate market for money. But we would like to emphasize on another explanation of this fact. It may be taken into consideration that Benassy (1975, 1982) as well as Malinvaud and Younes (1977) try to ascribe an additional role to odd *m*, viz. that of a *medium of exchange*. In this connection, if we contemplate on the stream of literature[5] which deals with this aspect of the money good, we find that a commodity is visualized as a medium of exchange if people acquire it in order to pass it on to other agents in exchange for goods can be acquire it in order to pass it on to other agents in exchange for goods they desire to finally possess. Therefore, for any good to function as a medium of exchange in a system, it is necessary for the agents to perceive that the good can be *acquired* as well as *passed on* (whenever the need occurs) in exchange for other goods. It is possibly in order to ensure this that the (disequilibrium) problem is formulated in a manner such that good 3 can indeed be perceived as an unconstrained good in equilibrium. We note that this condition, however, is necessary but not sufficient as the latter calls forth some additional restrictions (see Ostory and Starr (1974)).

3. TYPES OF BENASSY EQUILIBRIA

3.1 *Nomenclature*

Benassy equilibria may be classified according to the patterns of excess effective demands

4. The general rule to be used here is that agents in the long side of a market perceive binding constraints and those operating in the short side perceive themselves to be unconstrained.

5. Ostroy and Starr (1974)

and supplies characterizing the market for x and y. The classifications, which are due to Malinvaud (1977) as well as Benassy (1982, 1986), fall into three parts:

(*i*) equilibrium of the Keynesian type, characterized by excess effective supply in both the markets

(*ii*) classical equilibrium, characterized by excess effective supply in the labour market and demand in the goods market; and finally

(*iii*) a situation of repressed inflation, characterized by excess effective demand in both the markets.

Unless otherwise stated, it will be assumed for the purpose of this section that either the NCPF intersects the household's EDC at a unique point or is entirely enclosed by it.

3.2 *Keynesian Equilibrium*

We proceed now to demonstrate the first type of equilibrium i.e., the Keynesian type (Figure 7). As before $e'v'$ represents the NCPF and oBo' the household's EDC. As demonstrated below, the point of intersection of the two curves, viz. E, represents the optimal transactions corresponding to a position of Keynesian equilibrium.

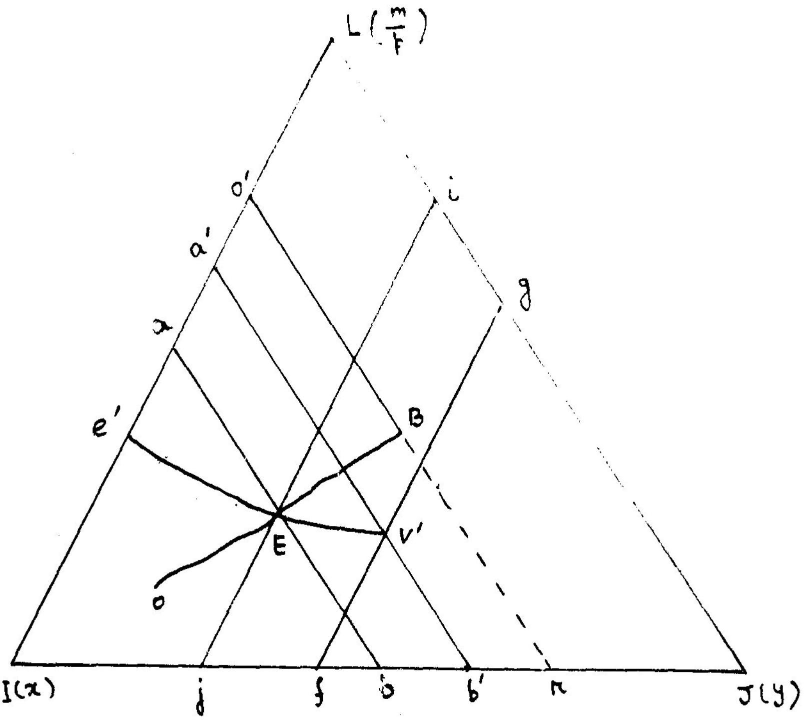

Fig. 7

The equlibrium is characterized by the household's perception that it cannot supply more than ob level of labour. Hence, its effective demand for *y* is given by *ij* which is its utility maximizing choice subject to *ab*. The firm on the other hand is assumed to feel unconstrained in the labour market and chooses *fg* as its effective supply of *y* which represents the unconstrained profit maximizing output net of *G*.

Under the assumed perceived constraints in the labour market, there is aggregate excess effective supply in the goods market to the tune of *ig* which represents the difference between the output levels *fg* and *ij*. The household therefore feels unconstrained in the *y* market whereas the firm feels that it is demand constrained at the level *ij*.

Since the household feels unconstrained in the goods market, its effective supply of labour is given by the notional supply *o'r*. Simultaneously, the firm perceives that it is constrained to sell no more than *ij* in the goods market and hence chooses its effective demand for labour at the level *ab*. This means that the effective supply of labour by the household is in excess of the effective demand by the firm (the difference being *ao'*). The latter therefore feels unconstrained in the labour market while the household feels constrained to supply up to a maximum level of *ab*. Thus, the perceived constraints for the two agents in the labour market lead them to behaviour patterns which vindicate their perceptions. The same arguments establish further that the firm's perception of a demand constraint at the level *ij* along with the household's feeling of being unconstrained in the goods market also need no revision. The configuration of effective demands and supplies thus qualifies as a Benassy equilibrium. It is of the Keynesian type given that effective supply exceeds demand in both the *y* and *l* markets.

The actual transactions in the two markets are now found by solving (1), (2), (3) and (4) for the household and (5), (6), (7) and (8) for the firm. The household is constrained in the labour market by *ab* and feels unconstrained in the goods market. Thus, (3) amounts to the restriction that the household lies on or to the left of the line *ab* in Figure 7. The solution to (1), (2), (3) and (4) is thus given by *E*.

Similarly, the firm's perception of constraints in the two markets reduces (7) to the requirement that it does not move to the right of *ij*. Consequently the solution to (5), (6), (7) and (8) is also the point *E*.

Hence, as claimed earlier, the optimal transaction corresponding to the position of Keynesian equilibrium are described by the point *E*.

It may be noted in passing that the extent of involuntary unemployment associated with this equilibrium is captured by *ao'*. The explanation of the persistence of such unemployment, moreover, is to be found in the shortfall of effective demand *y* (below effective supply) by an amount *ig*.

3.3 *Classical Equilibrium*

The case of classical unemployment is taken up next. This is typically associated with and EDC of the type *oBo'* in figure 8. In this situation the firm feels unconstrained in the labour market so that its effective supply of output is the profit maximizing (notional) one, viz., *fg*. The household, however, perceives the constraint *ab* in the labour market which leads

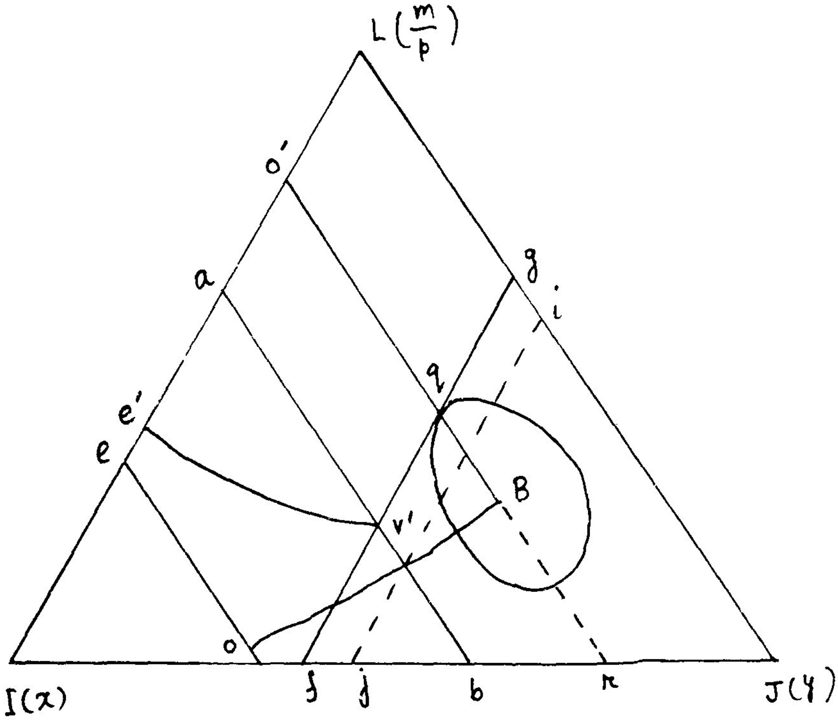

Fig. 8

it to an effective demand for y at the level ij. Thus, aggregate excess effective demand for y equals ig.

The firm obviously feels unconstrained in the goods market whereas the household discovers itself to be constrained by fg. Therefore, the firm's effective demand for labour coincides with the notional demand ab. The household's perceived constraint at fg results in the effective supply of labour $o'r$ (which is its utility maximizing choice subject to fg, since an indifference contour is tangential to fg at q). There is, therefore, excess effective supply of level ao' in the labour market. As a consequence the firm perceives no constraint in this market while the household perceives the constraint ab, which are identical to the perceptions they began with. The same arguments demonstrate that the perceived constraints in the market (viz., fg for the household and the firm visualizing a seller's market) are also in a state of equilibrium.

To determine the actual transactions for each agent, we consider the constraints perceived by it in the two markets simultaneously. Since the firm feels constrained in neither market, the solution to (5), (6), (7) and (8) occurs at v'. The household being constrained in both markets (by ab and fg respectively), v' is also a solution to (1), (2), (3) and (4). Hence v' represents the realized transaction pertaining to a Benassy equilibrium. Moreover, since y constitutes a seller's market I a buyer's one, the equilibrium is of the classical type[6].

6. The concept of classical unemployment needs to be distinguished from that f voluntary unemployment due to Keynes (1936). Keynes, it may be recalled, found voluntary unemployment to be consistent with full employment is the usual sense, i.e., the situation where B merges with v'. It is not possible to make the corresponding statement with respect to classical unemployment.

3.4 *Repressed Inflation*

The point of intersection viz. *E* between the NCPF and *oBo'* of Figure 9 represents the optimal transactions associated with a situation of repressed inflation.

The household feels unconstrained in the labour market and its effective demand for *y* is given by *ji*. The firm's demand for labour is constrained by *ro'*, so that its effective supply of *y* to the household is *fg*. There is, therefore, excess effective demand equal to *ig* in the goods market.

On the other hand, the firm perceives no constraint in the goods market and its effective demand for labour is given by its notional demand *ab*. The household perceives the constraint *fg* and comes out with *o'r* as its effective supply of labour (we note that an indifference contour is tangential to *fg* at *E*). Therefore, there is excess effective demand (equal to *ao'*) in the labour market also.

Thus, the perceived constraints satisfy the conditions of a Benassy equilibrium. That the realized transactions occur at *E* is easily checked. Being an instance of Benassy equilibrium with excess effective demands in both the markers, this is a situation of repressed inflation.

3.5 *The complete Characterization*

Depending on the position of the household's notional demand point *B*, different types

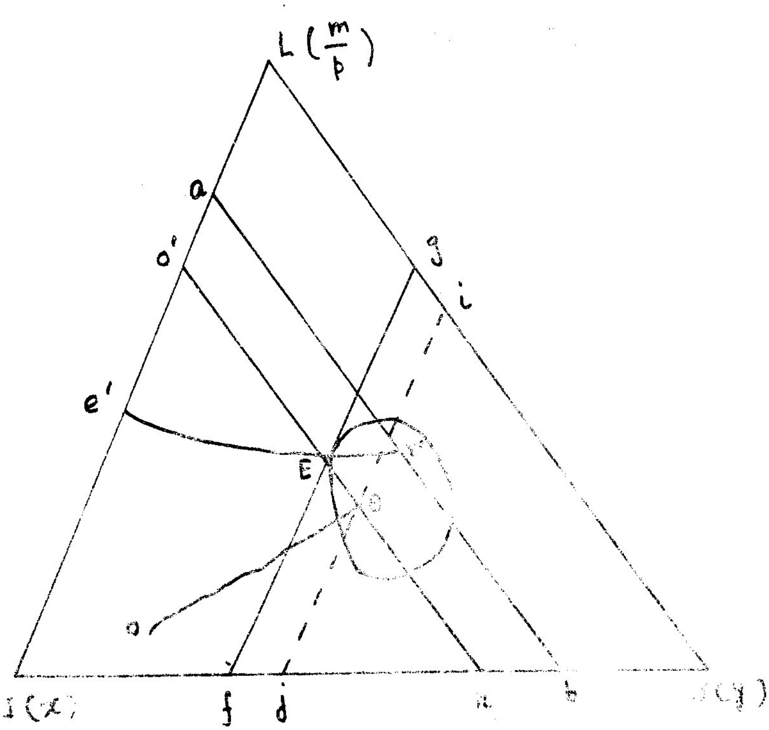

Fig. 9

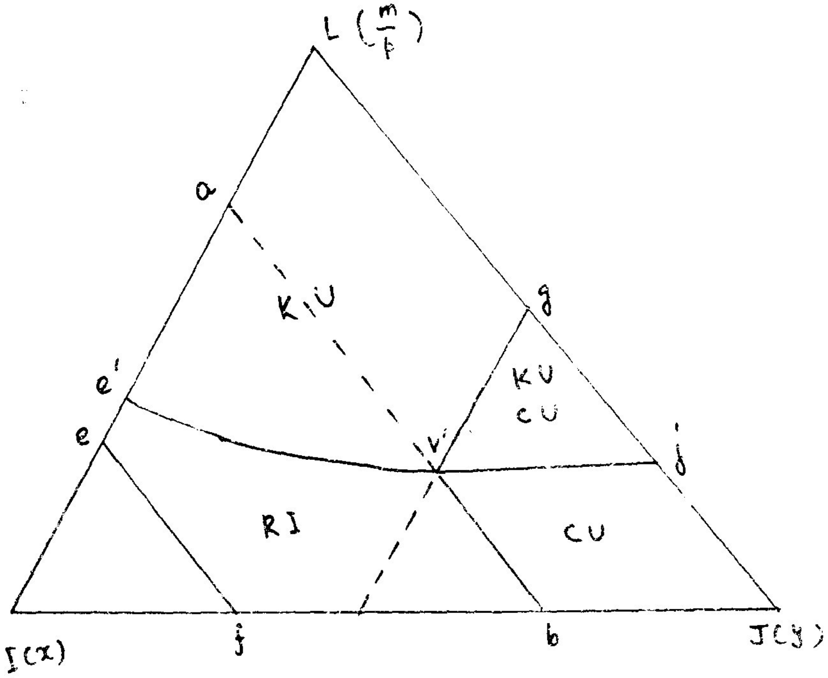

Fig. 10

of Benassy equilibria are obtained. This permits a complete characterization of the three of equilibria described above.

In Figure 10, *e* is the household's initial endowment point and *e'v'* represents as before the NCPF. The labour needed to produce the profit maximizing output *v'g* is shown by *ab*. The lines *v'g* and *ab* are parallel to *IL* and *JL* respectively and *v'j* and *ef* are drawn parallel to *IJ* and *LJ* respectively.

If point *B* lies in the interior of the region *e'v'gL* (Figure 10), then the effective demand curve for *y* intersects *e'v'* in its interior[7]. It is clear from subsection 3.2 that this gives rise to a Benassy equilibrium of the Keynesian unemployment type.

If on the other hand point *B* falls in the interior of the region *v'bJj* then the NCPF lies inside the region *oBo'e* as in the case of Figure 8. In this case, one gets a Benassy equilibrium of the classical unemployment type, with actual transactions at the equilibrium given by *v'*.

Suppose now that point *B* falls in the interior of the region *efbv'e'*. In such a case it is the ESC of labour that intersects *e'v'*. As is clear from Section 3.4, one now obtains a Benassy equilibrium of the repressed inflation type, where the actual transactions are given by the point of intersection between the ESC and *e'v'*.

7. The interior of *e'v'* implies the curve excluding the end points *e'* and *v'*

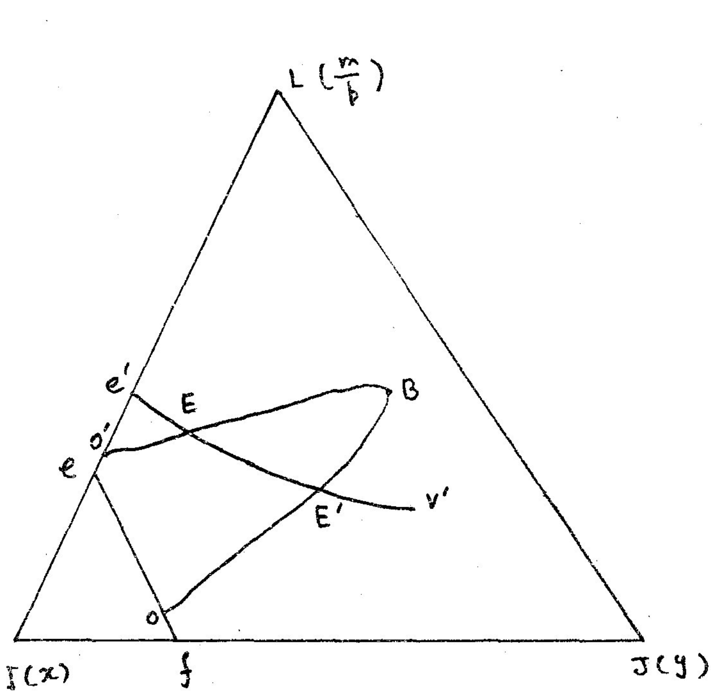

Fig. 11

In the case where point *B* falls inside the triangle *v'jg*, the equilibrium could be either the Keynesian unemployment or the classical unemployment variety depending respectively on whether the EDC intersects *e'v'* or not.

Finally, when point *B* coincides with *v'* we get a full Walras equilibrium.

It should be noted, however, that such a precise characterization is possible only under the assumption made at the end of Section 3.1. In other words, the characterization fails in more general situations, e.g., when the household's EDC intersects *e'v'* at two different points say *E* and *E'* *(shown in Figure 11)*. This case is very likely as when the household is permitted to consume a negligible amount of good *y*, it is natural on the part of the household to supply a negligible amount of labour too. This gives rise simultaneously to the situations of repressed inflation (at *E*) and Keynesian unemployment (at *E'*) for the same *w - p* constellation. Similarly, it is possible to show the simultaneous occurrence of both repressed inflation and classical unemployment. Whose still, no equilibrium will exist at all, if the EDC lies entirely below the NCPF.

First, we point out that if the point *o'* lies to the left of *e'*, then equilibrium, if it exists, must be nonunique (barring the borderline case where *o'Bo* is tangential to *e'v'*) which represents simultaneous occurrence of either repressed inflation and Keynesian unemployment (Figure 11) or repressed inflation and classical unemployment. When *o'* lies to the right of *e'*, the Benassy equilibrium may or may not be unique. In fact, the question of uniqueness

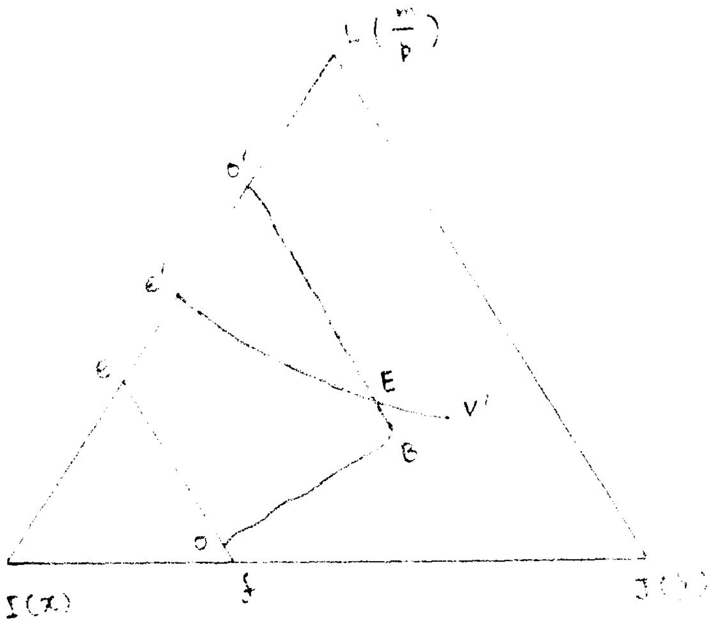

Fig. 12

is closely linked to whether the demands for x and $\frac{m}{p}$ are positively related to the size of the goods rationed budget or not.

To see this we begin with the assumption that the consumption of x decreases when the goods rationed budget increases. In this case, the ESC for labour must always be steeper than *LJ* (alternatively *ef*, shown in Figure 12). This is true, since, with a rise in the rationed supply *bar y* of y, the budget available for x and m/p (viz., $\frac{a}{p}\bar{l} + \frac{m}{p}$ − *bar y*) falls and this, along with the corresponding property of *oB* referred to earlier, ensures that either *oBo'* intersects *e'v'* at exactly one point or *e'v'* lies in the interior of the region.

On the other hand, suppose consumption of x is positively related to the size of the budget. This situation may give rise to a nonunique equilibrium. Suppose that x is positively related to the size of the goods rationed budget, whereas the opposite is the case for $\frac{m}{p}$. In such a situation the EDC would intersect with NCPF at most once with the result that the Benassy equilibrium is unique.

If, however, both x and $\frac{m}{p}$ are positively related to the size of the goods rationed budget,

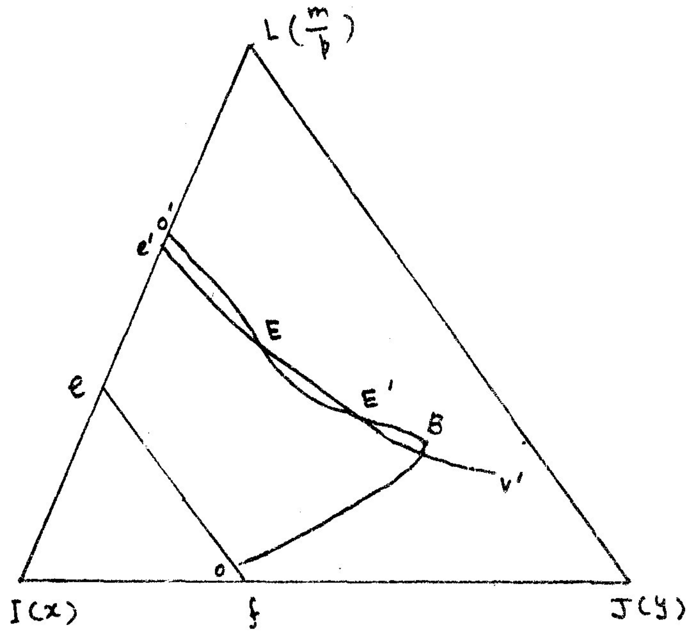

Fig. 13.

then one gets the possibility of nonunique Benassy equilibrium. This possibility is illustrated in Figure 13.

In between these two extremes, so to speak, lies the case of perfectly inelastic labour supply. This case, as already argued, produces a unique equilibrium.

The above discussion points out that except for particular specifications of the production and utility functions, .it may not be possible to classify Benassy equilibria according to wage-price specification may be associated with more than one type of equilibrium.

4. POLICY ISSUES

For the sake of completeness, the diagrams may now be used to discuss the effect of a money wage cut on effective demand. (It is elementary to study the effect of a change in autonomous government expenditure by means of these diagrams).

A change in money wage rate (from w to w') causes a change in the position of the budget plane itself from IJL to $I'J'L'$ as shown in Figure 14 by the broken lines.

From (2) it can be seen that the slope of the line JL in the two dimensional (y-m/p) plane is -1, which is independent of w. Therefore, JL and $J'L'$ will have the same slopes. Also, it can be easily checked that the two planes:

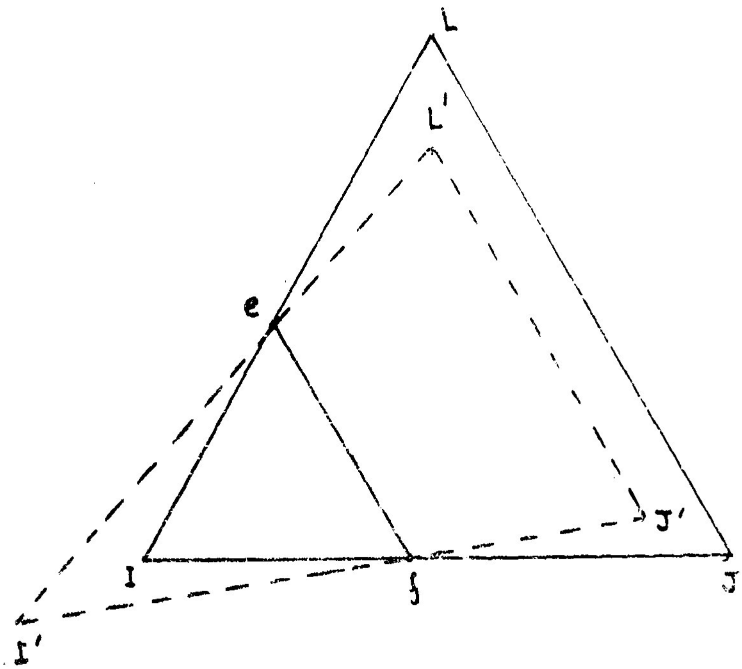

Fig. 14

$$y+\frac{w}{p}x+\frac{m}{p}=\frac{w}{p}\bar{x}+\frac{\bar{m}}{p}$$

and

$$y+\frac{w'}{p}x+\frac{m'}{p}=\frac{w'}{p}x+\frac{\bar{m}}{p}$$

have a common intersection ef with the vertical plane $x=\bar{x}$. since the household cannot supply less than zero labour, we are interested in the region lying to the right of the line ef and in this region the new budget plane (corresponding to w') lies entirely below the original plane (see Figure 15).

Hence, the household's net consumption possibility frontier on $I'J'L'$ (*i.e.*, $e''v''$) also lies physically below that on the original budget plane (*i.e.*, $e'v'$).

Suppose the household's EDC (Figure 15) on IJL intersects $e'v'$ at E which represents the transaction corresponding to a Keynesian equilibrium. Let E' be the projection of E on $I'J'L'$. Therefore, E' represents the same levels of l and y as at E. Now the effective demand (for y) curve oB' on $I'J'L'$ cannot pass through E' or to its right. The levels of labour corresponding to E and E' are equal, but since the wage rate has fallen, the same supply of labour will generate a lower wage income at E' than at E. Under assumption

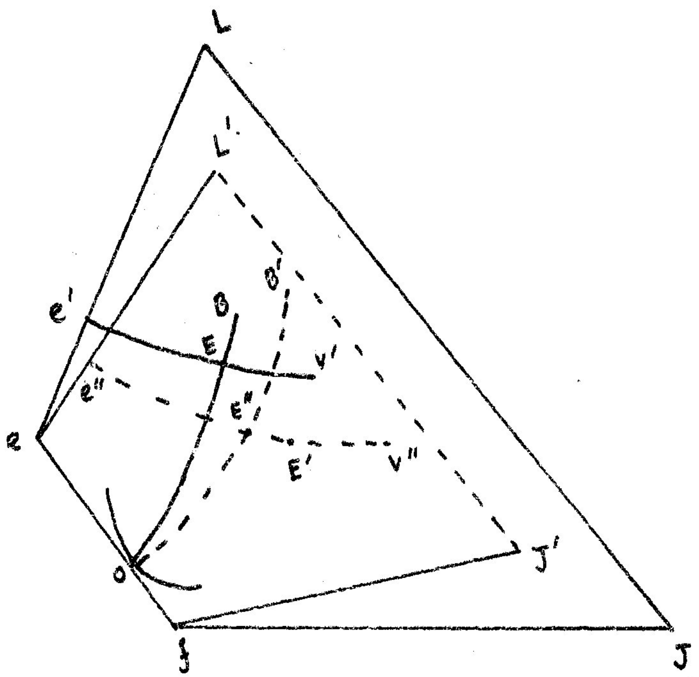

Fig. 15

(H.1.d.), the optimum consumption of y and $\frac{m}{p}$ at this same level of labour supply will thus be lower. In other woords, for the same supply of labour as at E, the houschold will demand a smaller quantity of y on the new budget plane. Therefore the effective demand (for y) curve in the new plane must pass to the left of E'. The effective demand (for y) curve is thus shown by oB' and the new equilibrium occurs at E'' (say). At this new equilibrium, transactions in output markets are smaller than those at E[8,9].

Remark 1: The diagrammatic scheme developed so far can be easily extended to incorporate the Barro-Grossman (1971) equilibrium (see Dasgupta and Rajeev (1989)). More interestingly, such a representation would reveal that the Keynesian unemployment equilibrium discussed by Barro and Grossman would remain completely unaffected by a money wage cut.

8. The money wage cut in the face of a fixed p thus leads to a fall in employment rather than a rise. The result is to be found in Malinvaud (1977), though proved there for a particular utility function. It is, however of a vintage which is much older, for Kalecki (1971) had arrived at precisely the same conclusion. The intuition underlying the result is obvious too. A fall in the money wage rate at a fixed p would reduce incomes of wage earners at each level of employment and this would not be compensated either by a rise in profits, which remain undistributed, or a rise in m / p. Consequently, expenditures fall and, via the multiplier, reduce employment.

9. The conclusion would change drastically in a flex-price model. Malinvaud (1977) obtains exactly the opposite result while Keynes (1936) an Mukherji and Sanyal (1986) claim ambiguity. This case is too complicated to be amenable to diagrammatic treatment. See also Bose (1990) and Dasgupta (1991) in this connection.

6. CONCLUSION

r studies through a diagrammatic device different varieties of B... equilibria e in the short run. The exercise reveals the problem of nonuniqueness of a ibrium. As a by product, some of the time-worn policy questions surrounding equilibrium are also discussed.

REFERENCES

D H.I. GROSSMAN (1971): A general disequilibrium model of income and employment, *American Review* 61, 82-93.

A geometry for non-Walrasian general equilibrium theory, *Journal of Macroeconomics* 14, 87-103.

1975a): Disequilibrium excahange in barter and monetary economies, *Economic Inquiry* 13, 131-156.

(1975b): Neo-Keynesian disequilibrium theory in a barter and monetary economy, *Review of Studies* 42, 503-523.

1982): *The economics of market disequilibrium*, Academic Press Inc., Orlando, Florida.

(1986): Macroeconomic : *An introduction to the non-Walrasian approach*, Academic Press Inc., Florida.

H. Muller (1977): Two examples of equilibria under price rigidities and quantity rationing, *für National economic Journal of Economics*, 37, 165-173.

Wage cuts and self-fulfilling beleifs, in *Economic theory and policy: Essays in honour of Dipak* B. Dutta, S. Gangopadhyay, D. Mukherjee and D. Ray ed.), Oxford University Press.

and M RAJEEV (1989): A diagrammatic exposition of disequilibrium theory, ERU Technical 6/89 I.S.I. Calcutta.

(1991): On the influence of high wages on the rate of private investment: the Keynesian story, *Economic analysis and policy* (D. Banerjee ed.), Oxford University Press.

): Existence of an exchange equilibrium under price rigidities, *International Economic Review 16*,

K. and W. HILDENBRAND (1978): On Keynesian equilibria with unemployment and quantity *Journal of Economic Theory* 18, 255-277.

971): *Selected essays on the dynamics of the capitalist economy*, Cambridge University Press,

936): *The general theory of employment, interest and money*, Harcourt, Brace and World Inc., New

. (1977): *The theory of unemployment reconsidered, Basil Blackwell, Oxford, England.*

and Y. YOUNES (1977): Some new concepts for the microeconomic foundations of macroeconomics (1977).

J. and R. PORTES (1978): Macroeconomic models with quantity rationing, *Economic Journal*

. and A. SANYAL (1986): Price flexibility and unemployment: microeconomics of some old uestion, *Kio Economic Studies, 19-35.*

d R.M. STARR (1974): Money and the decentralization of exchange, Econometrica 42, 1093-1113.

76): Decentralized non-monetary trade, *Econometrica* 44, 1087-1089.

(1979): A simple diagrammatic apparatus for the investigation of a macroeconomic model of equilibria, *Economica 46, 61-66.*

75): On the role of money in the process of exchange and the existence of a non Walrasian *Review of Economic Studies* 42, 489-501.