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INTERNATIONAL TRADE FLUCTUATIONS AND THE INCOME
AND WEALTH FLUCTUATIONS OF ECONOMIC GROUPS

by

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International Trade Fluctuations and the Income and Wealth Fluctuations of Economic Groups

In an earlier paper¹ we have discussed the relationship between fluctuations in the prices of internationally traded goods and welfare fluctuations of a given economy in relation to the level of flexibility or rigidity in economic structure of that economy. In particular, we equated flexibility of structure to concavity or non-concavity of the transformation curve. Thus a perfectly rigid economy was defined as one whose transformation curve was two perpendicular lines, one horizontal and one vertical, i.e., the non-dominated part of it was a single point. The somewhat surprising conclusion of the earlier study was that for a considerable range of types of price fluctuations (or more precisely a considerable range within which the international ratio may fluctuate) the welfare fluctuations² are smaller in a rigid economy than in a flexible one; this appeared to go against implicit assumptions made frequently in discussions of the international price fluctuation problem. In the previous study we did not analyze the fluctuations in income of individual groups within the population, i.e. we did not discuss income distribution questions related to the international price fluctuations. A discussion of these fluctuations yields some more insight into the intuition that price fluctuations are more serious for a rigid economy than for a flexible one.

The general hypothesis arising from the discussion which follows is that there could be greater resistance to international price fluctuations in a rigid economy even if such fluctuations led to smaller total income

¹R. Albert Berry and Stephen Hymer, "A Note on the Capacity to Transform and the Welfare Costs of Foreign Trade Fluctuations," Economic Journal, Vol. LXXIX, No. 316, December 1969.

²In this paper we equate the terms "income" and "welfare."

fluctuations for the country in this case than in the flexible economy, since under certain circumstances fluctuations of the incomes either of some important sub-groups of the population or perhaps even all sub-groups may be greater than for the flexible economy. It may be irrelevant that the sum of the incomes of these different groups is fluctuating less, if that of each sub-group is fluctuating more. And this can be true as long as it is difficult to make income transfers.

Unfortunately the number of potentially interesting situations (in terms of economic structure) we might look at are very many, so we will not try to form estimates of likelihood so much as to indicate that there are many cases where the above would indeed hold true. To facilitate the exposition, we begin with very simple (and special) cases and gradually relax the more unrealistic assumptions.

Two Goods; Two Factors; Goods Perfectly Complementary in Consumption;

Each Good Produced by only one Factor in the Rigid Economy; Straight-

Line Isoquants in Flexible Economy

In this and subsequent examples we will draw out the income curves for the various factors as a function of international price, comparing them for three economies---the completely rigid one, a completely flexible one (that is, a linear transformation curve, with the rigid point of the rigid economy lying on that transformation curve), and an intermediate flexible economy whose transformation curve also contains the rigid point of the rigid economy. In Figure 1 the first two economies are represented by BRB' and FRF'; the other two transformation curves, CRC' and IRI' correspond to intermediate economies, this difference between them will be clarified below.

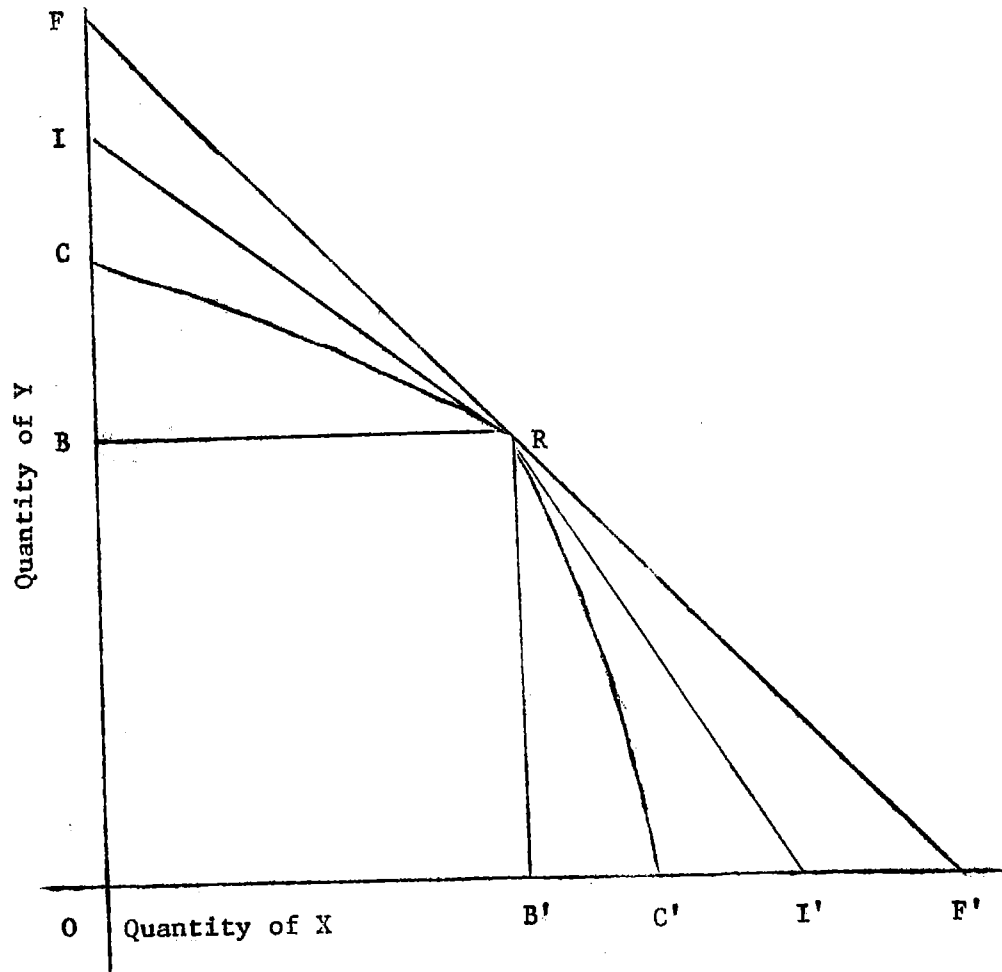


Fig. 1

We assume throughout this paper that production functions are linear homogeneous so that economies of scale and non-homogeneity do not enter the determination of the shapes of given transformation curves, or affect the differences between rigid economies and flexible economies. It is presumably a difference in the production function which leads to a rigid as opposed to a flexible economy; the nature of this difference is discussed below.

As long as we assume that there are only two factors, then the presence of a rigid economy must imply that only one factor goes into the production of each product. Thus, in terms of the ordinary isoquant analysis, the isoquants for one product are vertical straight lines and for the other they are horizontal straight lines. Thus in Figure 2 we present the isoquant map for the product Y which we assume to require and be able to use only factor K. The isoquant map for X would consist of vertical lines.

A transformation curve which is not quite rigid could be based on production functions differing slightly from those just referred to, either if the isoquants were straight lines not quite horizontal (or vertical) but rather having a small negative (positive) slope, or (at the other extreme) a perfect complementarity between the two factors with a factor ratio (capital/labor) very close to infinity (or zero). One can think of the extreme case pictured in Figure 2 as corresponding to a member of a set of production functions where the factors are perfectly substitutable at extreme different tradeoffs or where the factors are perfect complementary, (but with extremely different factor ratios for the two goods). We choose here to describe a gradual change from the rigid

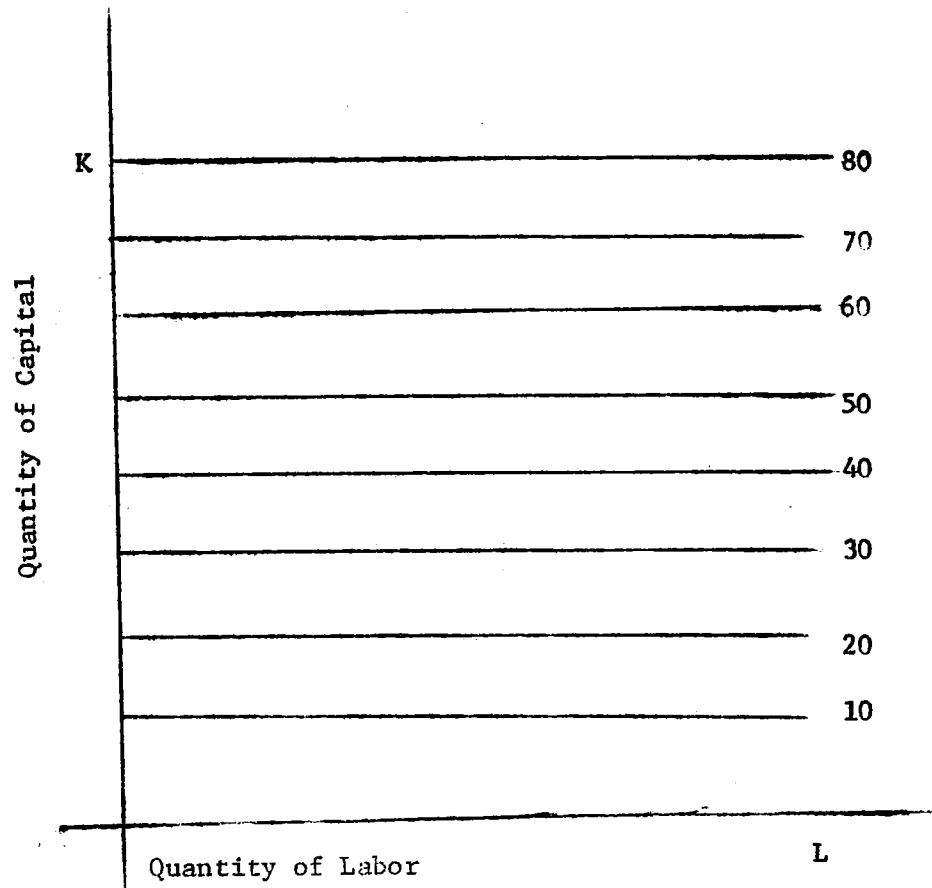


Fig. 2

towards the flexible economy, assuming that the factors are almost substitutable, as corresponding to a gradual change in the slope of the (linear) isoquants, i.e. choosing the first of the above cases. Using this assumption, it is clear that the perfectly flexible economy results from a situation in which the isoquants of the two goods X and Y are identical; they are straight lines with the same slope and with the same output numbers for a given isoquant if the transformation curve has a 45° degree slope. (Figure 3) Note also that when the slopes of the isoquants for the two products are still different, the transformation curve consists of two straight line segments with kink at point R. The isoquants would bear the relationship to each other indicated in Figure 4.¹

We now turn to Figure 5 to show how capital and labor incomes fluctuate as the price ratio of X and Y moves from zero to infinity. We assume first that the two goods are perfectly complementary in consumption; we may assume that the fixed proportions are one to one. (As portrayed in Figure 6). We assume, as in the previous paper, that utility is linear homothetic in the amounts of the two goods consumed. It is a particular characteristic of this case that the rigid economy will never need to trade with the rest of the world, since the only proportions at which goods can be consumed are the same proportions at which it cannot avoid producing them. There will be internal trade between the two factors. Suppose the welfare level, indicated in Figure 5 by

¹We consider in the next section and at various other points in the discussion below how the analysis is altered when the factors are not perfect substitutes.

the vertical line $r'r$, represents the result of the production of the combination R , given by the rigid point. This income is not a function of the price ratio $\frac{P_x}{P_y}$, for the reasons just indicated. Now consider the income of capital as $\frac{P_x}{P_y}$ varies. When the price ratio $\left(\frac{P_x}{P_y}\right)$ is equal to zero, so that one unit of y will buy all the x desired, then all of the income or welfare in the system is accruing to capital; when the ratio rises to infinity no income is accruing to capital; it is clear that the characteristic curve for the income of capital is a monotonic function of $\frac{P_x}{P_y}$, having the general form of the line $r'a_\infty$, where for purposes of symmetry $\frac{P_x}{P_y}$ is measured in logarithmic terms on the vertical axis. And clearly the characteristic curve for labor is a similar line, like a_r ; when the price ratio of products is one, the income of each factor is equal to one-half of the fixed total income.

Now consider the characteristic factor income curves for the completely flexible economy, represented by the transformation curve FRF' in Figure 1. It is clear, first of all, that the maximum income attainable for this economy when the relevant price is at either extreme is twice the fixed rigid economy welfare level ($a_r r'$). The total income level is a monotonic function of the price ratio as it moves from one to infinity in one direction and from one to zero in another; when the price ratio is one, of course, the income of the flexible economy is equal to that of the rigid economy so that their income curves share the point r_1 ; for all other price ratios income is higher. The characteristic income curves of the factors are easy to determine in this case, since, as long as the two production functions are linear homogeneous the relative price of the two factors is not a function of the relative outputs (given the linear transformation curve).

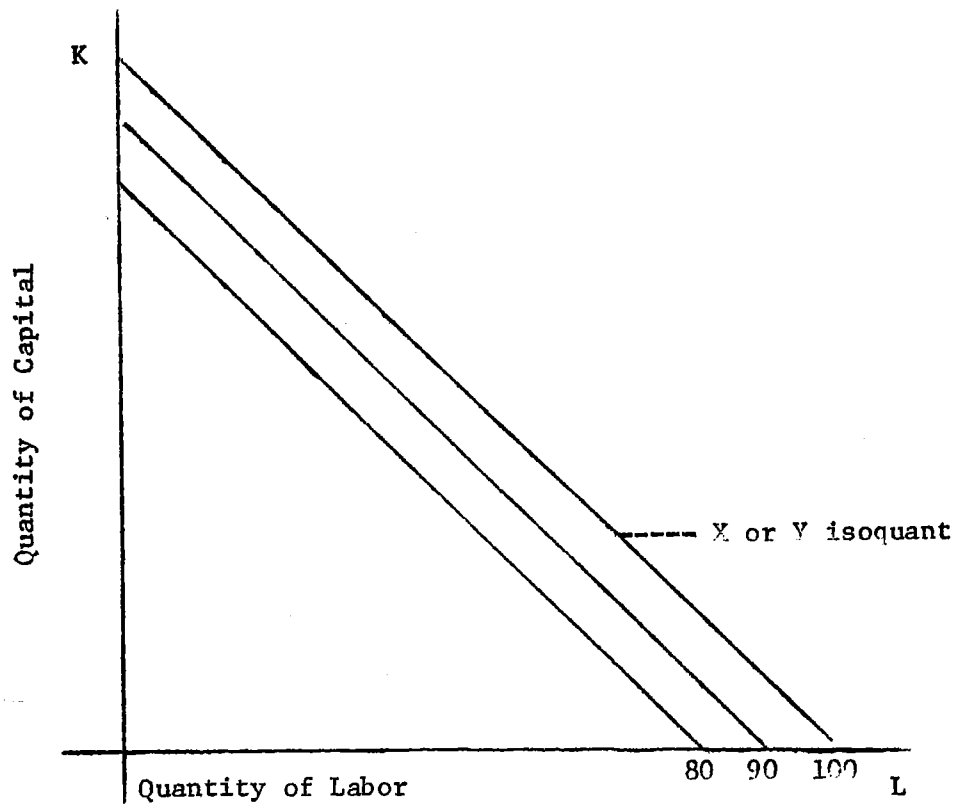


Fig. 3

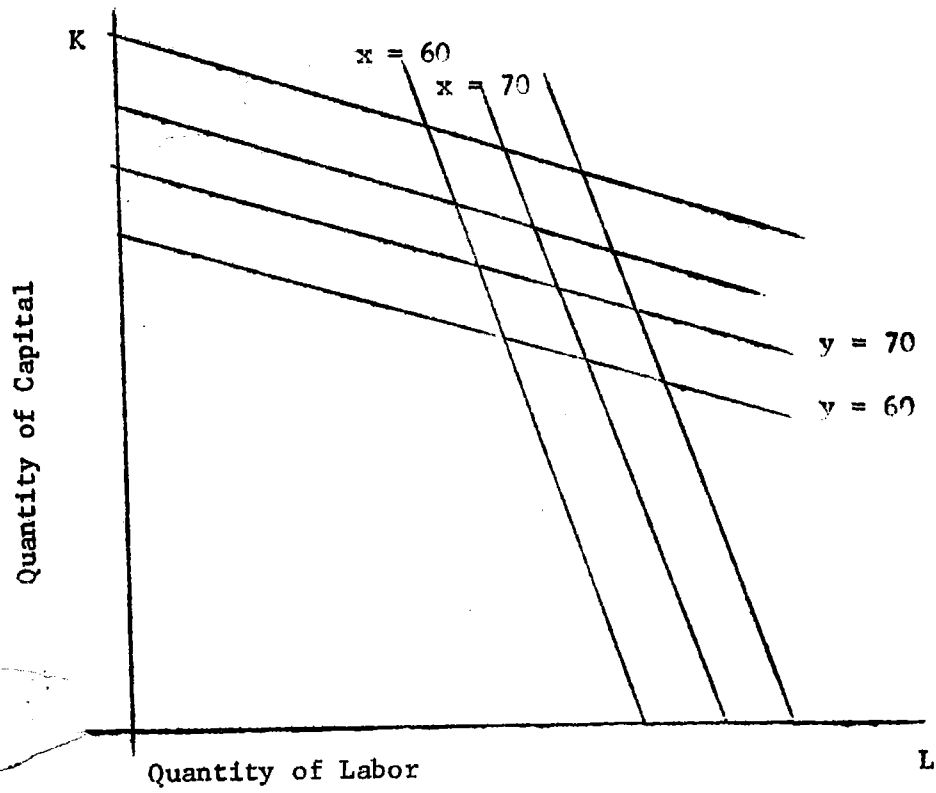


Fig. 4

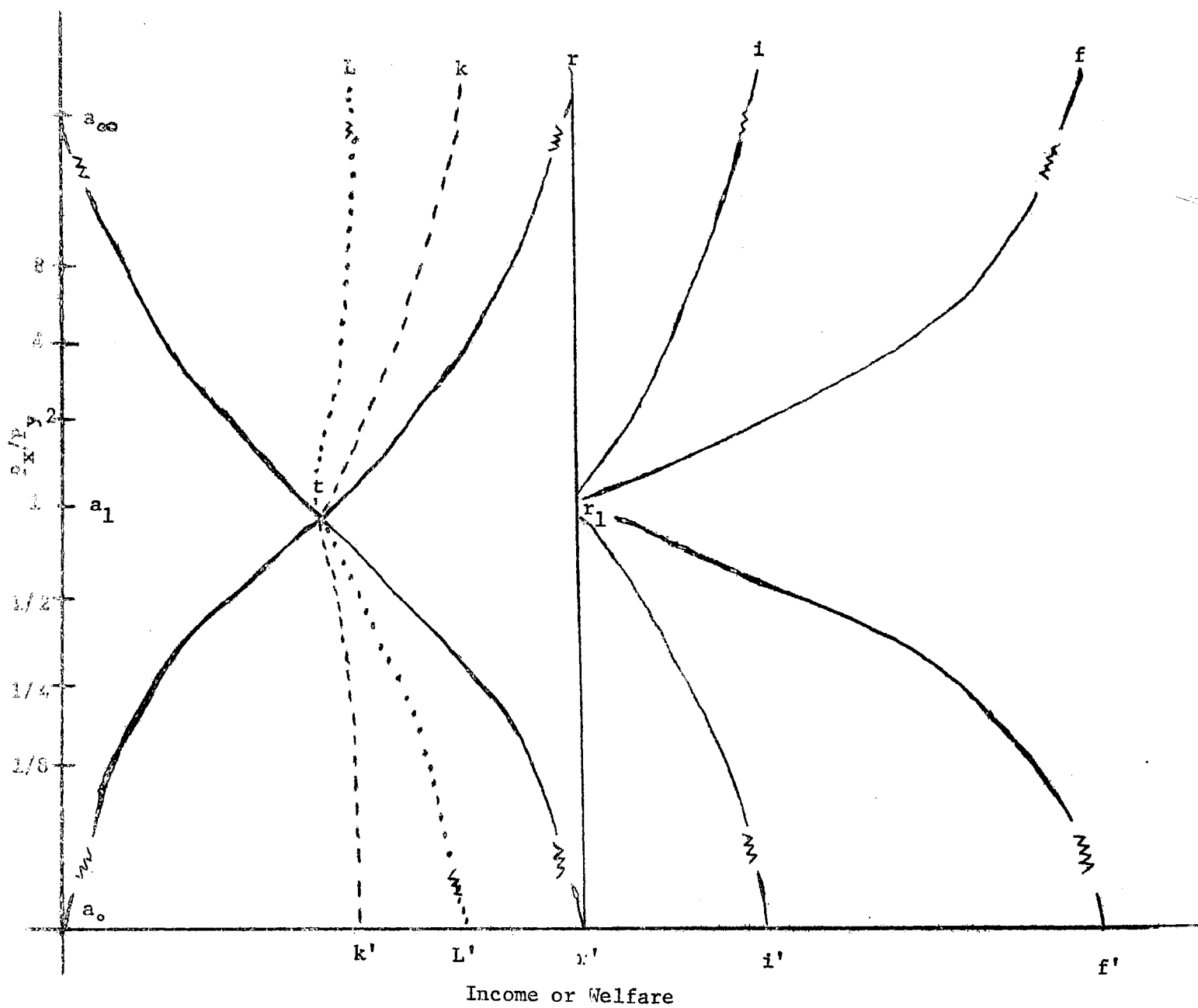


Fig. 5

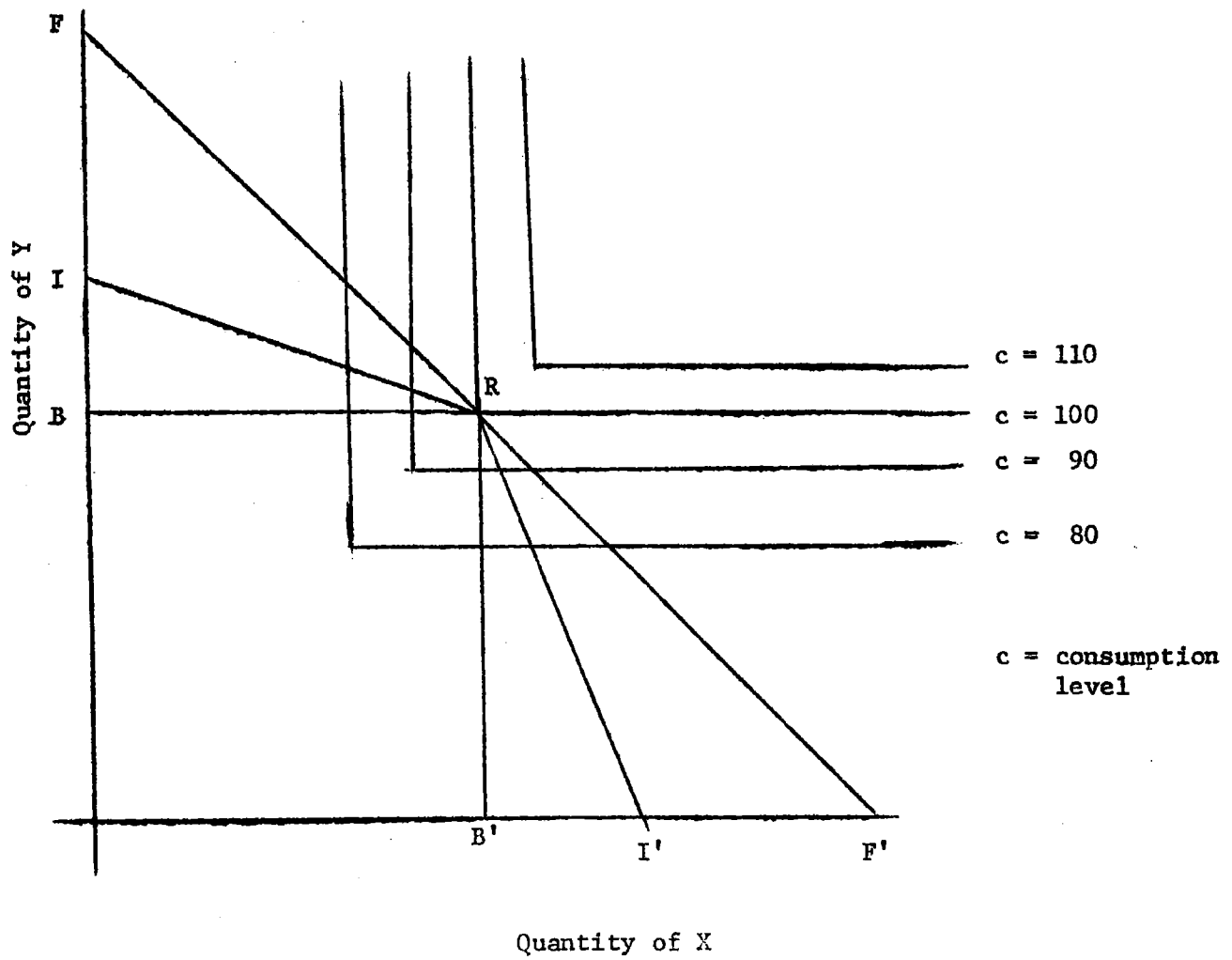


Fig. 6

If we assume that the number of units of each factor is the same, and that the isoquants are straight lines with a negative slope of -1 , then the factors must share equally whatever the total income in the economy is; thus the income curve of both factors is rtr' , (the dashed line in Figure 5). This first result suggests that factor incomes in the flexible economy may fluctuate less than those in the rigid economy over the range of possible produce price fluctuations.

It remains to consider the somewhat flexible economy, which may be made up of two linear segments, as IRI' of Figure I, or curved as CRC . The factor income curves ($k_t k'$ for capital and $l_t l'$ for labor) either for CRC' or for IRI' when the underlying isoquants are linear-(the present assumption) are a family of which the curves shown are members; the curves are closer to those of the flexible economy or the rigid economy according to how flexible the economy in question is; they will bear a monotonic relation to P_x/P_y if the economy is sufficiently inflexible, otherwise not. Consideration of the isoquants underlying this transformation curve indicate that the asymptotic upper limit income¹ a given factor can receive in this situation is (as for the previous cases) the income corresponding to the rigid economy. The factor income curves will typically be those given by the dotted lines in Figure 5. The factor incomes are the same for all three transformation curves when the relative price of the good in which the factor specializes is one; their differences correspond to differences when that price is above or below one; in the latter case, results range all the way from that of the rigid economy where the

¹A factor can only receive this income in the completely flexible case or when the other factor is in excess supply. The sort of two segment transformation curve of Figure I can result either when the isoquants are linear with different slopes, in which case neither factor is ever in excess supply, or with fixed and different coefficients, in which case, except at the point where the two segments cut, one factor is always in excess. Only in this latter case can one factor's income reach the maximum (total income of the rigid economy). Since the assumption currently being treated is that the isoquants are linear, income would not reach that maximum for intermediate cases (i.e. excluding the case of horizontal and vertical isoquants).

factor income goes down to zero and the flexible one where it reaches twice the level corresponding to $\frac{P_x}{P_y} = 1$; the closer the transformation curve is to the flexible one, the closer the income curve of the factor is to the latter result and vice versa.¹ Thus in some sense the rigid economy would be expected to have the highest level of fluctuations; presumably the lowest tendency to fluctuate would be defined as corresponding to a factor income curve which was vertical throughout, i.e. for all product price ratios.

Factors Perfectly Complementary in Production

Before proceeding to more realistic assumptions, we review the case where all assumptions are identical with those of the previous one except that we assume perfect factor complementarity in the two production functions, rather than perfect substitutability. Although in one sense this is an opposite assumption, in another it is a close substitute in that it results in the same sort of transformation curves. It also provides a stepping stone to the cases where the isoquants are curved. The perfectly flexible economy in this case corresponds to a situation where the isoquants (pictured in Figure 7) are right-angled at the same factor proportions, i.e. the two isoquant maps are identical. The intermediate economy results from isoquants which have perfect factor complementarity but at different factor proportions, as portrayed in Figure 8. Figure 9 presents representative factor income curves and economy income curves for these cases. The economy income curves are the same as in Figure 5 since the income

¹If the intermediate flexibility cases are characterized by perfect factor complementarity (but at different factor proportions, necessarily) this is not true, and the factor income curves for the intermediate cases manifest the greatest instability of all, in that for $P_x/P_y > 1$, labor receives all the income for $P_x/P_y < 1$, it receives none. See below.

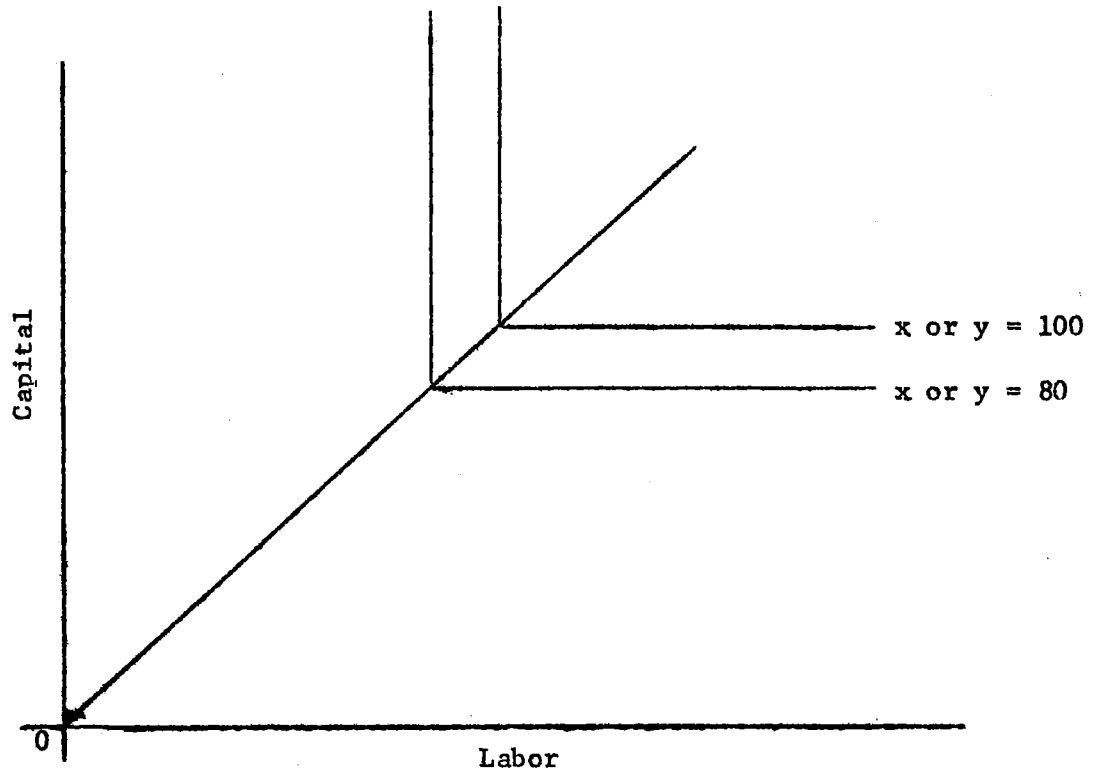


Fig. 7

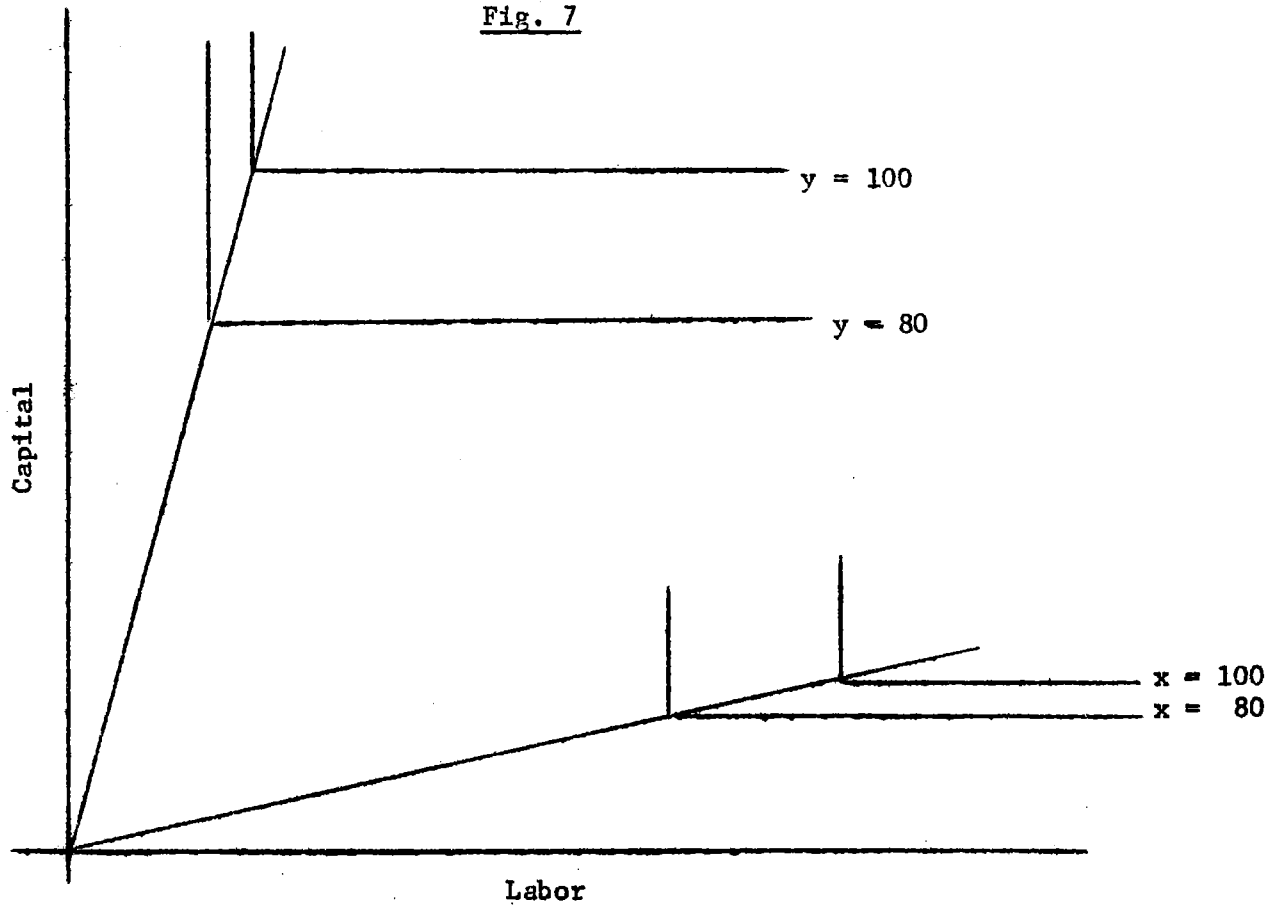


Fig. 8

which is derivable by trade from a given transformation curve does not depend on the type of isoquants underlying the transformation curve. In terms of instability of factor incomes, perfect factor complementarity in production leads to an extreme result. The characteristic factor income curves for the rigid economy are the same in this case as the previous one (Figure 5), since at the extreme where the isoquants for each product are simply either vertical or horizontal lines, there is no distinction between this case and the previous one. And for the flexible economy also the characteristic income curves are the same as they were in the previous case, since once again the isoquants for the two products are identical to each other, so it is clear that the two factors can never receive different remunerations, their roles being identical. The only difference, then, from the previous case, is in situations of partial flexibility. Once again partial flexibility, which in this case corresponds to the sort of relationship between isoquants pictured in Figure 8 (isoquants with right angles along different rays) leads to a transformation curve with two straight line segments. But the characteristic factor income curves are quite different from the previous case. This intermediate case leads to the greatest factor income fluctuation of all, since when the product price is above one then capital receives all of the income in that system and when it is below one capital does not receive any (and vice versa for labor); the characteristic curves are given by the two dotted lines in Figure 9.

In this case, then, one cannot draw any simple relationship between fluctuations in factor incomes and the degree of rigidity of the economy. It seems clear that the completely flexible economy offers the least fluctuations, but the partially flexible one offers the most, greater than

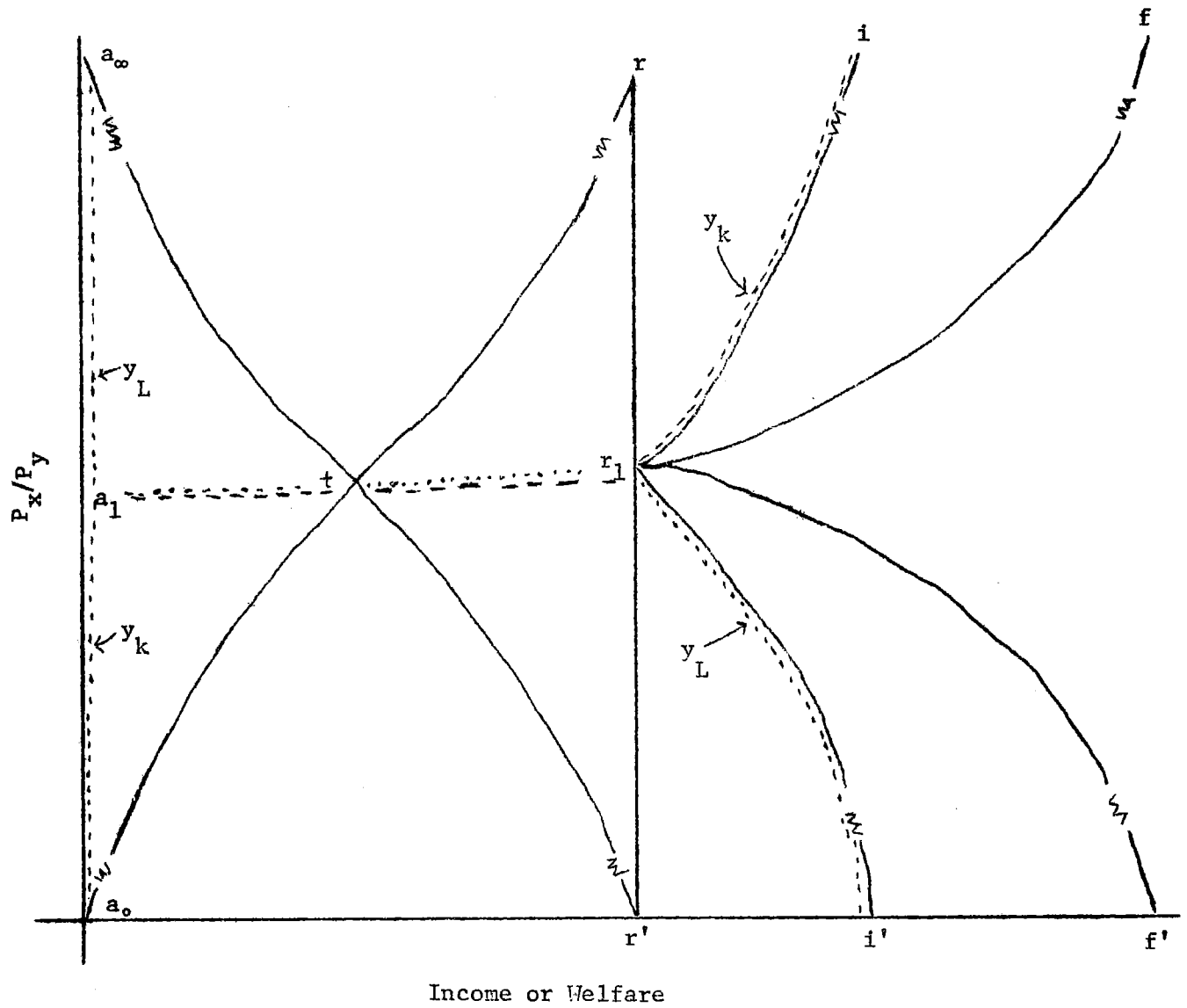


Fig. 9

those of the completely rigid system. In this case, then there was nothing which might be defined as a simple relationship between flexibility and lack of factor income fluctuations. It remains to be seen whether a move to more realistic assumptions will simplify or make more complex this relationship.

Production with Curved Isoquants

We now assume that in the flexible economy the isoquants are non-linear (it is necessary to continue to assume that they are either linear or right angled in the rigid economy since this is a necessary condition for rigidity). Figure 10 pictures the gradual alteration which we may assume to have occurred in the isoquants as we move from the rigid economy to the flexible one; in the case of good X, for example, the series of isoquants presented to the left of the vertical straight line (corresponding to the rigid economy) would correspond to more and more flexible economies, other things being equal, and for the last isoquant drawn here, which refers to the production of both x and y, we have the perfectly flexible economy.

The characteristic factor income curves of the rigid economy are as before (Figure 12); the same goes for the flexible economy, since once again the roles of the two factors are indistinguishable. The question of interest (since the real world presumably lies in this range) pertains to the intermediate cases. With two isoquants maps consisting of curved isoquants which are not coincident with each other, the resulting transformation curve, of course, is curved throughout its length. Once again the functional distribution of income is not uniquely determined by the transformation curve, since different series of isoquant maps can

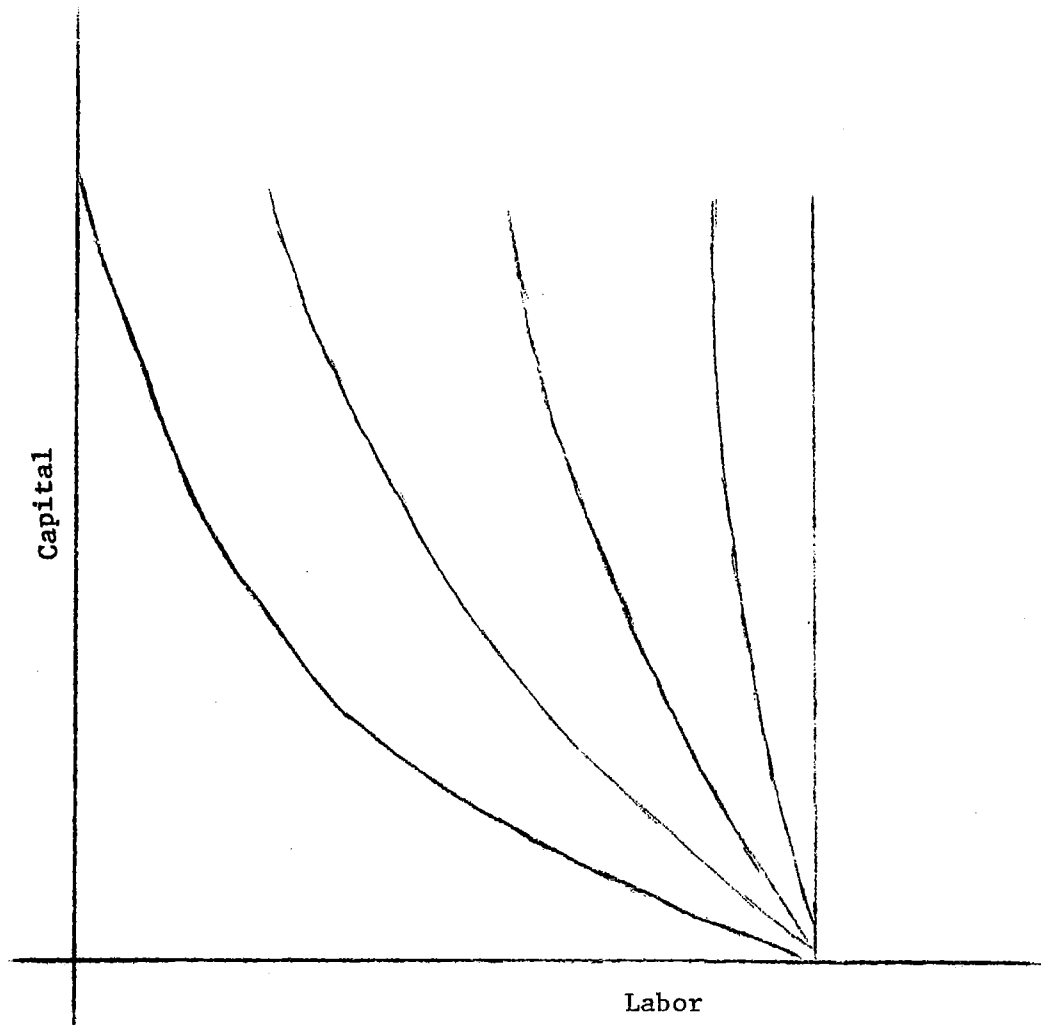


Fig. 10

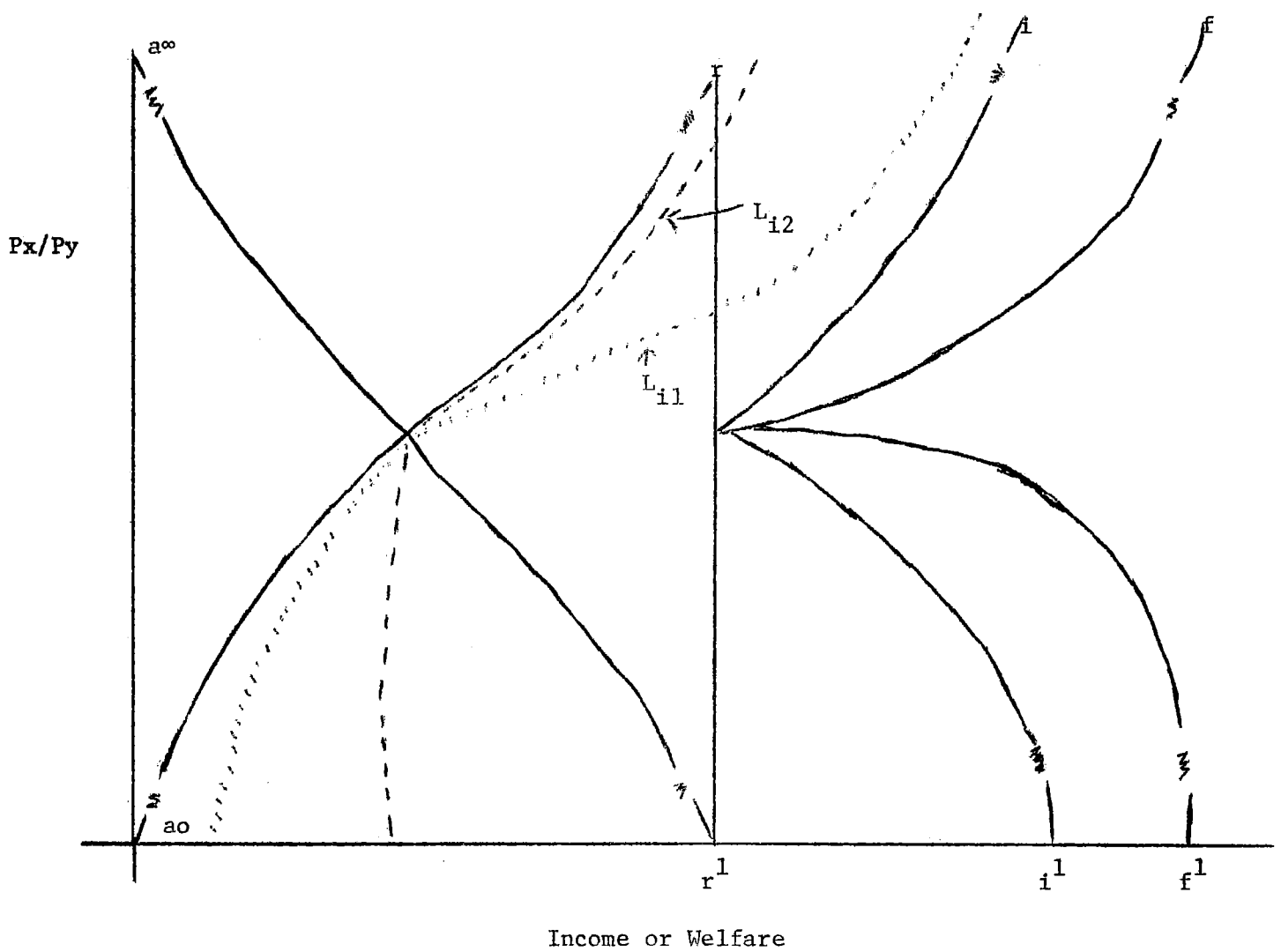


Figure 12

lead to the same transformation curve. In general the sort of "substitution" between production function parameters which leads to this result can be conceptualized as follows: the concavity of a transformation curve is greater the less the elasticity of factor substitution for each product and it is greater the greater the difference in factor proportions between the two industries, corresponding to given factor price ratios. We illustrate this in Figure 13. One pair of isoquant maps are those shown in heavy lines; in both cases the isoquants imply little substitutability between factors; for a given price ratio the two goods would be produced with similar factor proportions; a certain concavity of the transformation curve results. Now consider the pair of isoquant maps shown with dashed lines. Each isoquant is less convex to the origin than in the other cases, but the difference in factor proportions corresponding to a given price line is greater. This pair of isoquant maps could generate a transformation curve of about the same concavity as the first one. In other words since a high degree of factor substitutability per se leads to a relatively flexible production possibility curve, and so does similar factor proportions for given factor price ratios, a given level of flexibility can result from various combinations of isoquant maps.

Since two different types of isoquant map combinations imply different factor price relationships the factor income curves are not uniquely determined by the transformation curve. The functional distribution of income would be more unequal at either end of the transformation curve (where only one good is being produced) if the isoquant maps tend more to the first type presented in Figure 13--that is, the elasticity of substitution between the factors is quite low.

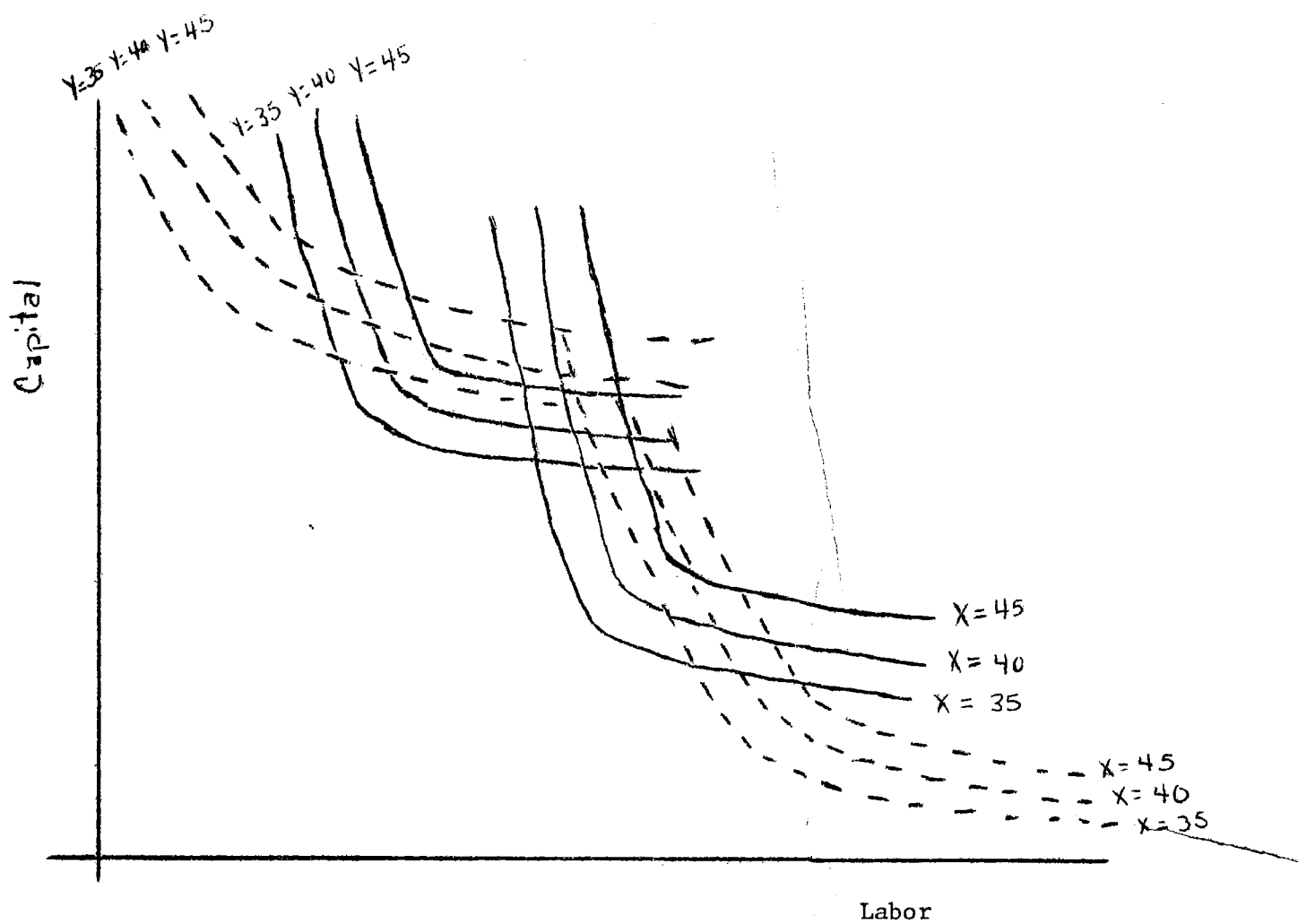


Figure 13

As the extreme of perfect complementarity is approached, the income of the low income factor would approach zero. As the other extreme is approached (that is, as the convexity of each isoquant is smaller and smaller with the isoquants being farther apart, in the sense of the factor proportions used in the production of different goods with a given factor price being farther and farther apart, then the concentration of income at these extremes becomes reduced. The case of nearly complete complementarity (that is, where the isoquants are nearly right angled) would therefore generate a labor income curve like the dotted line indicated by L_{11} in Figure 12 and the other extreme (quite curved isoquants but substantially different factor proportions for the two goods) would give a curve like L_{12} . The better off factor cannot receive less than it would in the rigid economy case, however, as can be demonstrated in terms of Figure 14. That labor could never receive less than Or' of income when P_x/P_y is infinite, with a curved transformation curve, can be seen from Figure 14 by demonstrating that the value of labor in terms of the welfare it will purchase with an infinite P_x/P_y could not be less than its value in the rigid economy. Suppose that the quantity of capital and of labor be defined to be 100 units (of each factor), that there are also 100 units of output of both products at the rigid point (point R in Figure 14), and that this output combination (100,100) lies on all the transformation curves we consider. In the rigid economy, then, the vertical isoquant AR will be assumed to correspond to 100 units of good X. For the perfectly flexible economy, where the two goods have the same isoquants, it is clear that the isoquant going through the point R will correspond to the production

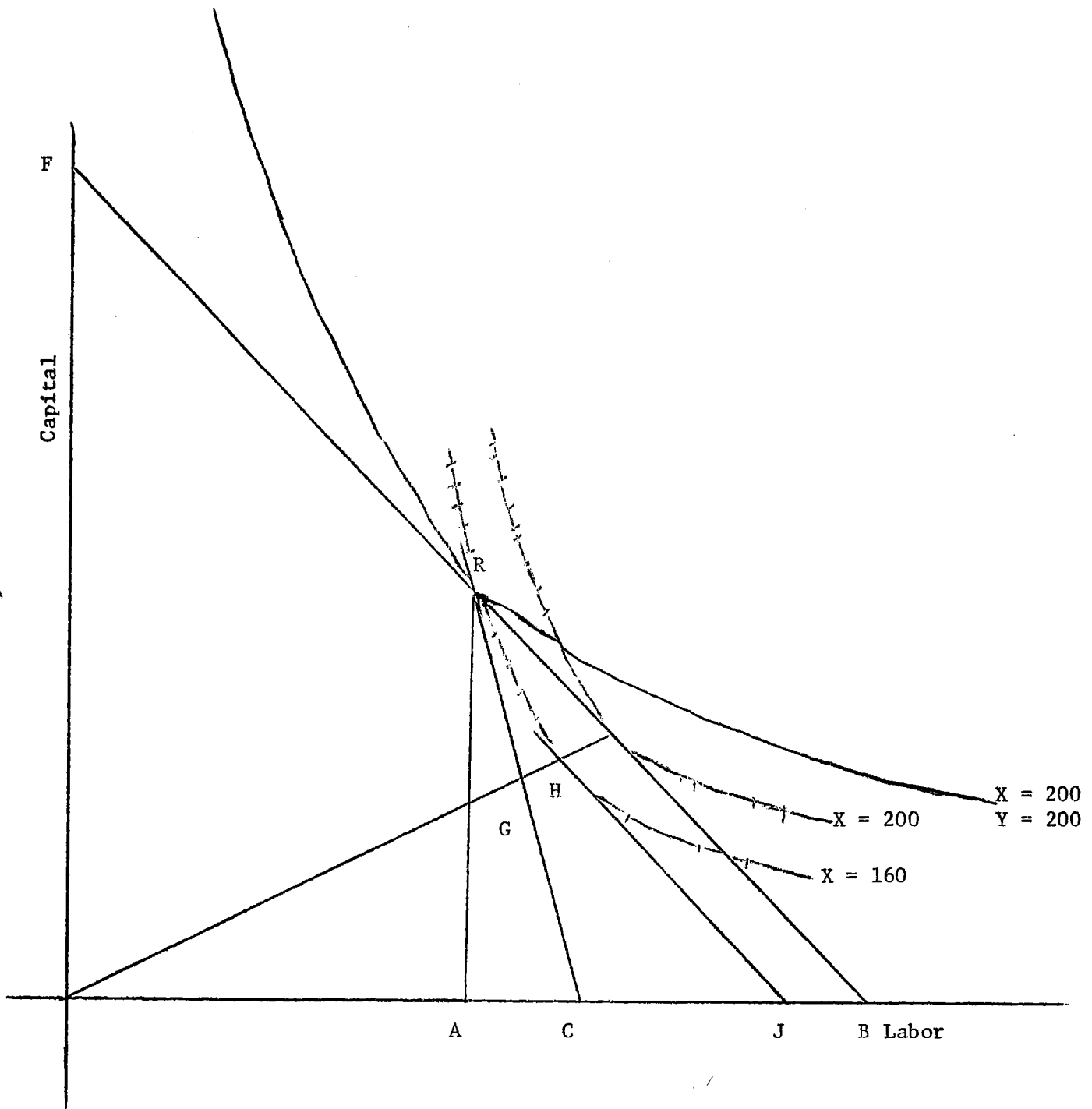


Figure 14

of 200 units of each product. For the imperfectly flexible economy the isoquants corresponding to 200 units will be tangent to some line FB which goes through R and whose slope represents the equilibrium factor price.¹ With this particular factor price, a higher share of labor will be used in the production of X and of capital in the production of Y.

Note that in the perfectly flexible economy case, the income of the total stock of OA units of labor, when the factor price ratio was -1 and the same quantity of both products was being produced, was 100 units. One can express the value of the labor as P_l/P_k times the total output. This ratio could be expressed in this case as $AR/AB \times 1/2 \times 100$.

In the case of the imperfectly flexible economy, as we saw above, the isoquants for $X = 200$ and $Y = 200$ would be tangent to a line FB, and the maximum achievable output of X would correspond to the number of the isoquant passing through the point R. The isoquant passing through R would be inside the $X = 200$ isoquant just mentioned; it is illustrated by the isoquant with $X = 160$ in Figure 14. From the above formula the share of the total 160 units of X which would go to labor would be equal to $AR/AR + AC$ (where the number of units of each factor is the same, and where RC is the line tangent to the isoquant $x = 160$ at the point R.) We wish to prove that this value is greater

¹Since all factors must be used, in equilibrium, in one or the other of the two industries, the two factor bundles corresponding to the two industries must be equidistant from a point halfway between O and R and lie on the line giving the relative factor prices. In a sort of special symmetrical case, the slope of the line FB would be -1.

than 100. Now the ratio OG/OH is, by the assumption of linear homogeneity, equal to 0.8; by similar triangles, so is the ratio OJ/OB.

The total payment to labor is $\frac{AR}{AC + AR} \left(\frac{OG}{OH} \right) \times 200$

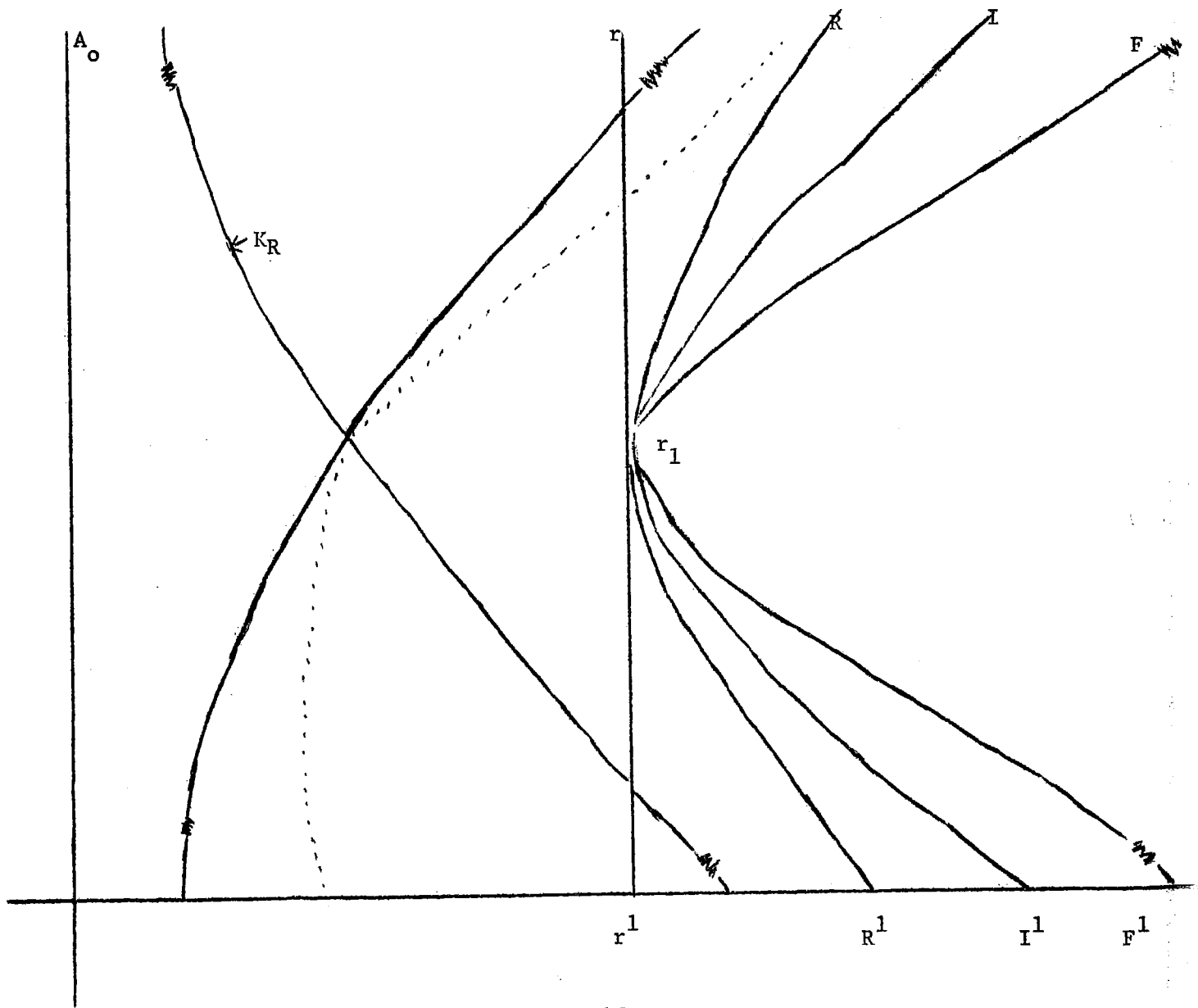
$$\text{or} \quad \frac{OA}{OC} \left(\frac{OG}{OH} \right) \times 200$$

$$\text{or} \quad \frac{OT}{OD} \left(\frac{OG}{OH} \right) \times 200.$$

Suppose OD were equal to OG; then the payment to labor would be OT/OH(200) where OT/OH cannot be less than one half. Since, abstracting from the case of perfect factor complementarity, OD < OG, we have a total payment of > 100 units.

Non-Perfect Complementarity of X and Y in Consumption

Many of the similarities in our results (for rigid and flexible economies) achieved thus far have been due to the assumption of perfect complementarity in the consumption of X and Y, that is, to the assumption of right-angled indifference curves. We now relax that assumption. Figure 15 presents the characteristic total income and factor income curves for this situation. For the same reason that welfare now increases with a movement of relative prices away from the unitary level in the rigid economy, the welfare level of the factor intensively used to produce a good whose price approaches zero, except in the case of perfect complementarity. When $P_X/P_Y = \text{infinity}$, it is still impossible for a holder of units of Y to purchase a single unit of X; this previously meant that his welfare level was zero but now it depends on the degree of complementarity of consumption of the two goods. If they are fairly close to being substitutes then the negative impact of price change on the income of the owners of the low price good is much smaller. At



Income or Welfare

Figure 15

the same time it is easy to see that the welfare level of the owners of the units of the expensive item will rise farther in this case than in the case of perfect complementarity in consumption. Thus the income curve of labor in the rigid economy (see Figure 15) begins (for high P_x/P_y) to the right of point r , once again passes through the point t_1 but then does not fall as quickly as it otherwise would, although it does continue to move to the left, indicating a decrease in income, as the price of X falls. The same holds for the intermediate cases for which we present only one illustration in Figure 15. As we saw earlier the factor income curves here depend on the elasticity of factor substitution; the point of interest here is that when the factors are substitutable, so that neither ever has an income of zero except at the limiting price ratios, income is increased when there is substitutability between the consumed products; when the factors are perfectly complementary, and one is in excess for half the total price range. Then this substitutability makes no difference. For the flexible economy, the factors once again split the total income evenly.

Note that the income level of labor in the flexible economy is equal to that in the rigid economy when the price of X is infinite; in fact this is a characteristic of all the cases we have seen so far (and appears to be a general result). Flexibility implies a greater maximum potential income for the favored factor only when that flexibility is not complete. In fact, as before, the income curve for each factor consists, in the flexible case, of the two right-most segments of the income curves in the rigid case, with a kink at point t_1 . Once again the most extreme instability of real income of factors occurs in the intermediate transformation curve cases at

least when factor substitution is not zero; when it is zero the rigid economy and intermediate economy curves are, as we just saw, the same.

Perfect Substitutability in Consumption

A brief glance at the other extreme assumption in terms of the relationship between the two goods in consumption, i.e. perfect substitutability, yields the following. The income curves for the two systems move toward infinite levels of welfare as infinite prices are approached, although for a given price ratio the flexible economy is always farther to the right than the rigid one. (In this instance, in the rigid economy neither factor's income could ever fall below a certain minimum, since when the price of the product it produces becomes low enough, none of the other product is consumed; further decreases in price do not affect real incomes). This leads to the sort of characteristic income curves shown in Figure 17. The difference in the factor income curves in Figure 17 as opposed to Figure 15 is similar to the difference between those of Figure 15, and, for example, Figure 15 or Figure 5. There is a minimum welfare level for each factor except in intermediate cases with perfect factor complementarity; but the upper limit is removed, so that it may be a question of definition, or at the least of more detailed knowledge of the preference systems whether the overall level of welfare fluctuations is likely to be greater or less than before; certainly it has changed in nature to some extent. Welfare (income) curves for factors in the flexible economy fluctuate more than before and it is worth noting that as infinite and zero price ratios are approached the income of each factor in the flexible economy approaches the total income of the rigid economy. Thus it appears that the characteristic income curve in the flexible economy for a given factor

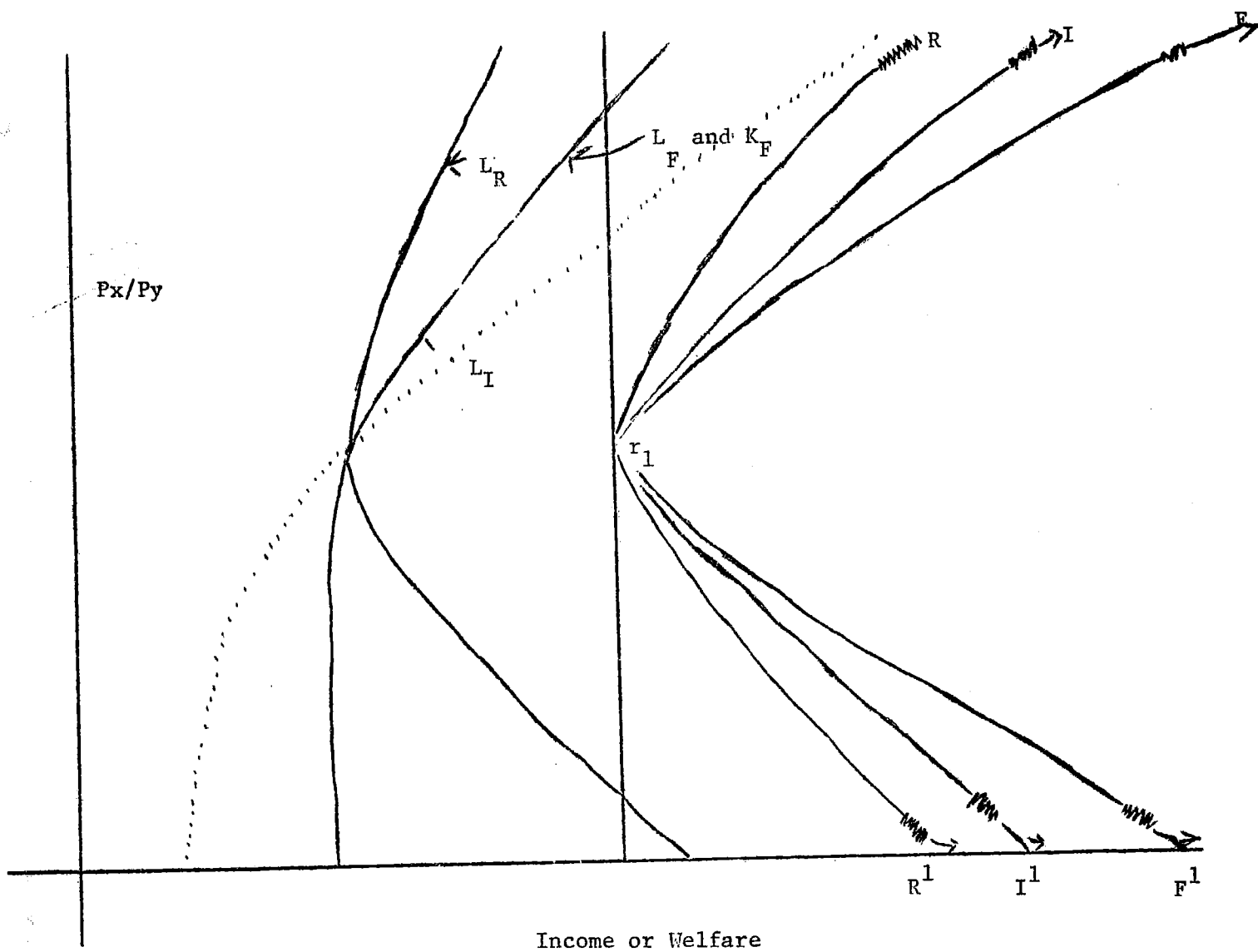


Figure 17

will always be to the right of that in the rigid economy.

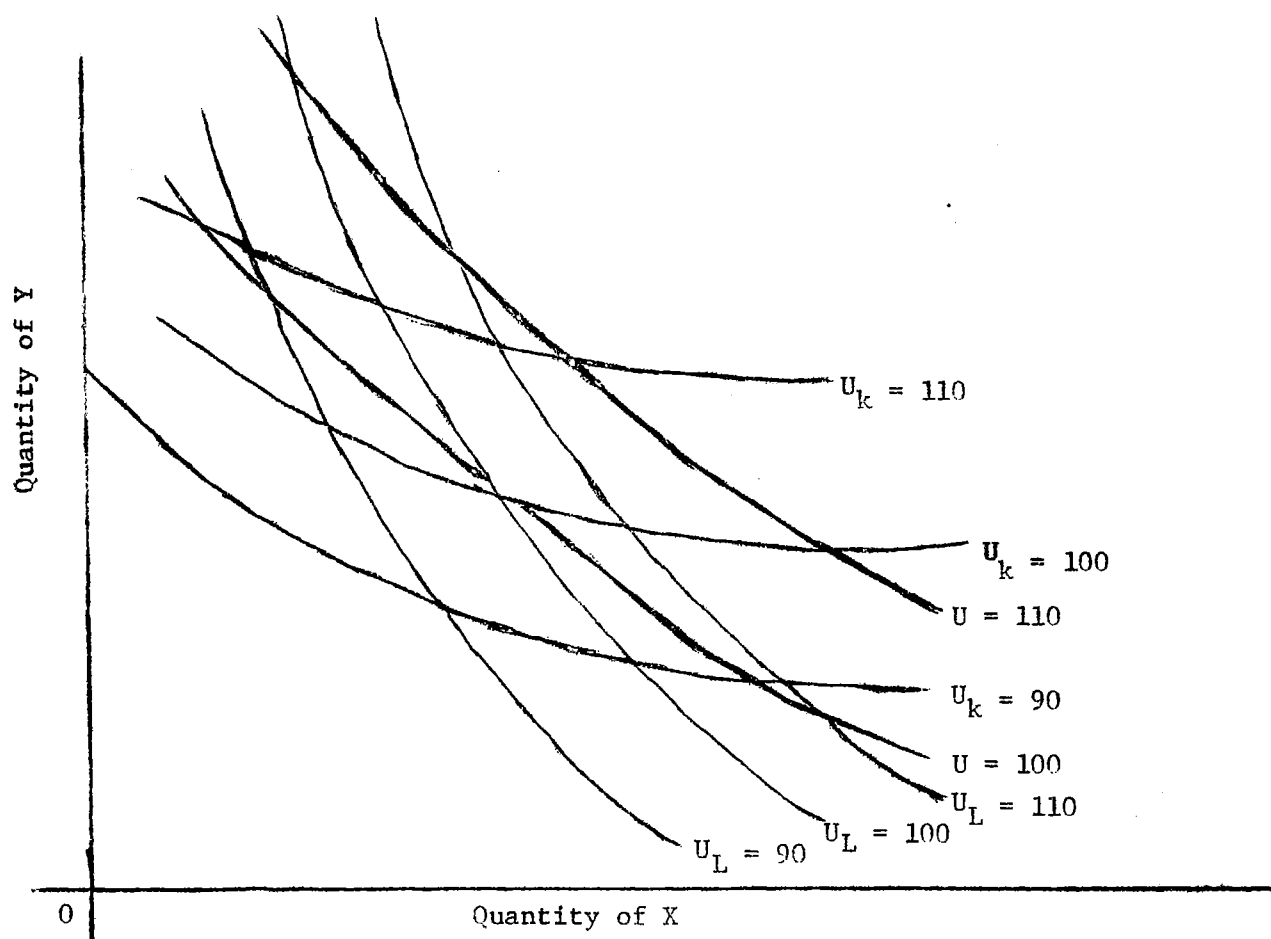
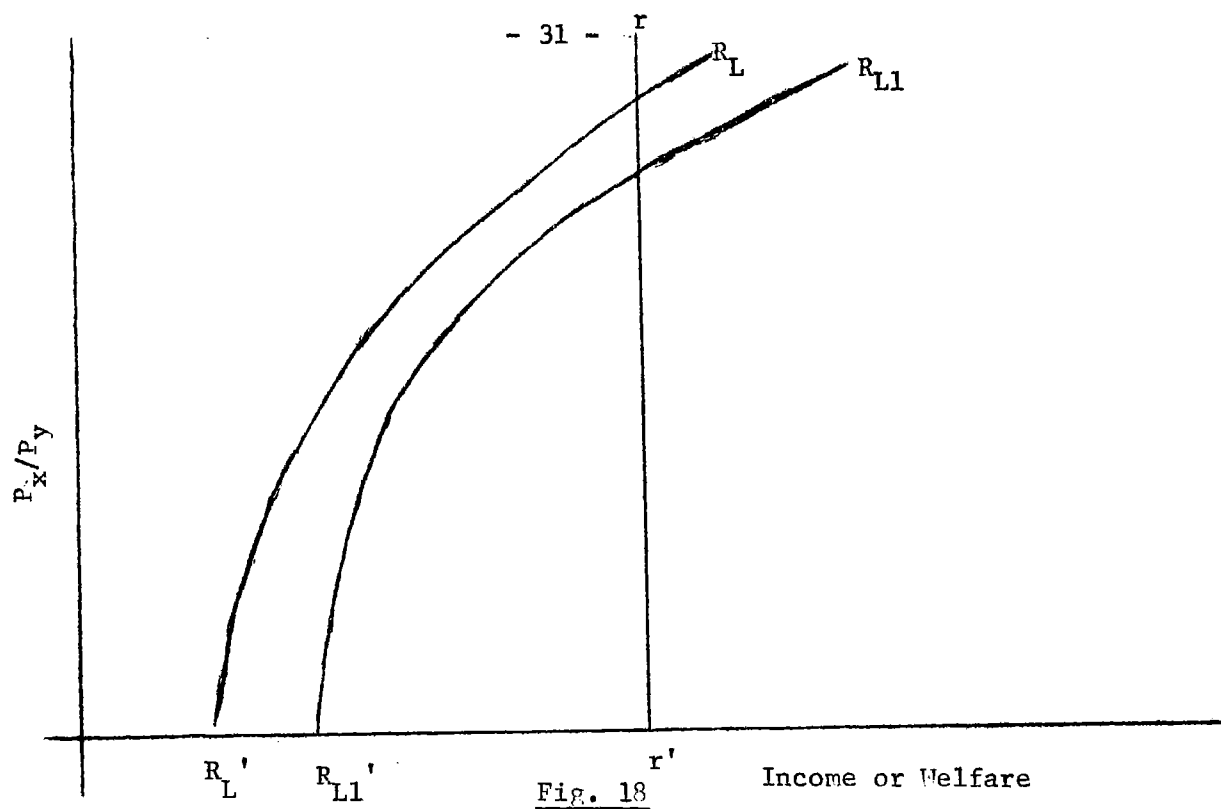
Once again the intermediate economy is the one which provides the maximum potential for welfare fluctuations, and it is clear that the situation most conducive to such fluctuations is one where the goods are almost perfect substitutes in consumption and almost perfect complements in production.

An example of a quite violent income fluctuation situation is shown by the labor share in the intermediate economy in Figure 17.

Different Consumption Functions for Different Factors

What happens if each factor puts a relatively higher consumption value on the product in whose production it is intensively used? It seems intuitively clear that this decreases the potential loss a factor can undergo when this product suffers a decline in price. We use as a basis for comparison the "basic reference" case presented in Figure 15.

This is the first case we have analyzed in which the welfare level (as we measure it) obtained by the society is a function of income distribution. As a result the economy income (welfare) curves tend to lose a good deal of their interest and significance, so we focus here on the factor income curves. To normalize, let us assume that the combination (100,100) implies the same level of utility for both labor income earners and capital income earners now (100 units) as it did for any member of the society in the analysis underlying Figure 15. Thus, in terms of Figure 19, we can say that the indifference curves indicated with U refer to all members of the society in the analysis of Figure 16, and that those indicated with U_L refer to the laboring group, and those indicated by U_k to the



capitalists corresponding to the present analysis. Knowing then what each factor can buy at the market price that it faces, we can move to an analysis of its welfare levels, doing this separately for the two levels. In Figure 18 we have plotted the labor income curve for the rigid economy from Figure 15, shown as $R_L R_L'$. It is clear (and can be seen from looking at Figure 19) that the real income curve for labor with its new utility function will be higher at all prices than for the situation in Figure 15. Thus our new curve $R_{L1} R_{L1}'$ is to the right of $R_L R_L'$. Although it is not clear whether the curves are farther separated in absolute terms with a low P_x , it is clear that the percent increase in welfare is greater when that price is low. To this extent then, one can argue that the fluctuations would be less than in the situation of Figure 15. The same relationship based on the present curve between any assumptions and its counterparts from Figure 15. As a result one cannot make a general statement as to whether fluctuations will be greater or less when the owners of a factor tend to consume the good in which their factor is intensive in production; instead we can only generalize that overall income will always be higher than it would otherwise have been.

Wealth Distribution Effects

The above analysis has made many simplified assumptions and thus remains far from being an interpretation of real world phenomena. Below we suggest some of the major simplifications which have been made,

and possible ways to extend the analysis and complicate it; here we restrict our further analysis to one question--that of the relationship between income changes and wealth changes, and the corresponding relationship between the factor incomes and factor wealth levels. Liquidity will also function importantly in our discussion.

The fact that the above discussion is very incomplete as an analysis of the implications of fluctuations in product prices is suggested by the fact that a decrease in the price of the product which uses capital intensively not only decreases the price of the service of any given amount of capital, (this corresponds to the decrease in income from current production accruing to owners of capital) but also decreases (though perhaps in somewhat different proportions) the wealth of the owner of that capital. This relationship is most obvious and simple when it refers to one particular type of capital in a larger economic system. Assuming a once and for all change in the price of the service of a particular machine, the wealth corresponding to the discounted future productivity of that machine does change in the same proportion.¹ This will normally be much more important to the owner of that capital than the fact that his current income from the machine goes down. If we were to define the income accruing to a person in a given period as the change in his wealth, plus his consumption expenditures, then the impact of the fluctuation in the price of the machine would be much more drastic than the fluctuations in "income" that we have discussed thus far. These fluctuations would be greater the lower the rate of interest (rate of return to capital). The income would no longer be a function only of the relative prices of the two factors but of this relative price and also its change from the last period.

¹ since there is no reason for the interest rate to change.

(One can draw a wealth curve which is a function just of the prices themselves, and income derived from changes in the value of assets is then based on the changes in this curve.)

The tendency of the market value of productive assets to fluctuate relatively strongly raises several further questions. There is the technical question of whether the analysis relevant in the case of an individual type of capital could also apply to the whole capital stock. The answer to this does not seem intuitatively clear and will be pursued later.

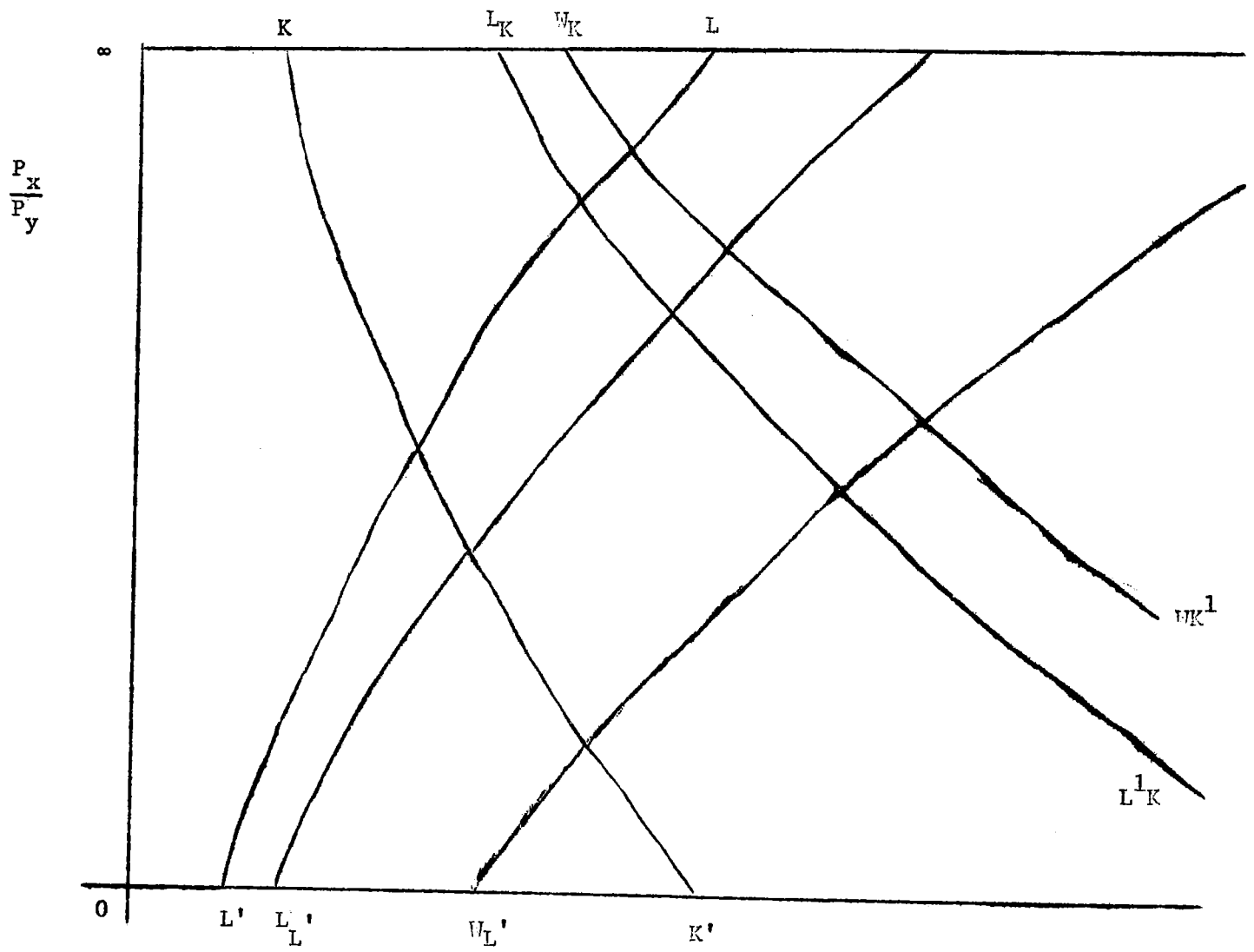
The consideration of wealth changes as stemming from relative price changes of types of capital have their parallels in the case of other factors. Obviously this is so in the case of natural resources; in fact this is the simplest case to analyze, since capital has the complexity of being reproducible. For labor, also, something of this nature clearly occurs; a person's welfare is not independent of his future income stream. While a person cannot sell himself (nowadays) for a market price (since institutional barriers don't normally allow him or force him to do this), he can do something of this sort; to the extent that the market is functioning and enough people's judgment of his future income is the same, the extent to which he can borrow in the credit market will constitute a recognition of future earning power. The market appears, however, to be substantially less perfect in terms of future services than of capital goods. Thus while a person's wealth, defined as his discounted future income stream, fluctuates as much as the wage fluctuates (just as the value of physical capital changes with the value of the services of this capital), we conclude that in some practical sense the changes in the

two cases will be different and asymmetrical; this is illustrated in Figure 20. For simplicity we assume two simple factor income curves; that for labor is indicated by LL^1 and that for KK^1 . Assuming a given interest rate used for both physical capital and labor to arrive at the wealth estimate, the fluctuations in wealth are based on wealth curves which are simply "blown up" versions of the factor income curves; the extent to which they are blown up is, of course, dependent on the interest rate. A given price change leads to a change in a person's wealth which is equal to $\frac{100}{\text{interest rate}}$ times the change in income from current services which it causes: thus if even a fairly small negative price change occurs a person's income defined by the change in his net asset position during a given period will be negative.

For rather obvious reasons, a person's economic situation is a function of his liquidity as well as his wealth (as just defined). His current spending pattern is most obviously linked to liquidity, but probably even his subjective evaluation of his wealth will give greater weight to liquid than illiquid forms. In any case, the relevance of the concept needs no extended defense. We may assume that for physical capital a "liquidity curve" of "marketable value of assets curve" is relatively close to the wealth curve, as indicated in Figure 20; meanwhile the liquidity curve for labor may well be closer to the income curve than to the wealth curve; certainly it will be farther from the latter than is the case for physical capital.

Some Implications for Economic Change

One of the purposes in the above analysis is to compare, as between flexible economic systems and rigid ones, the tendency toward



Income or Welfare

Fig. 20

income fluctuations as specific income groups as opposed to the economies as a whole. It has already been seen that for economies as a whole there is perhaps a general tendency for rigid ones to have smaller welfare fluctuations than flexible ones. But the above analysis has tended (with qualifications and complications) to reverse this result then reference is made to specific factor income groups; fluctuations may well be greater in rigid economies for capital and labor income taken separately. And while the applicability of this result seems large, even if one is only referring to the fluctuations of current income from production, it is much larger when reference is made to changes in wealth. Even an elementary understanding of group dynamics of pressure in a political-economic system in a situation where large negative changes in wealth are possible, there may be substantial political pressures arising to prevent these potential wealth fluctuations. Consider the situation of an industry, currently protected by tariff which faces a decrease or elimination of that tariff. It may sustain a substantial decrease in profits in the short run, but sustaining quickly the total loss in wealth (discounted future profits) involved, could run into a much greater amount. All this tends to imply that price fluctuations (for example, international prices) which would normally lead to a change in output composition and an important decrease in income from capital for some group will be sought. Capitalists are a smaller number and more powerful politically than other groups and therefore can make their weight felt more easily. Further, to the extent that they represent already existing industries, they are by definition better organized to lobby than are currently non-existent industries. Finally, if one assumes that the reaction of a group which is about to lose a substantial

amount of wealth is stronger (in a restraining direction) than the comparable reaction (in a promoting direction) of a group about to gain the same amount of wealth, we have another bias against change.

The above paragraphs are somewhat out of context with the earlier discussion, which was in terms of homogeneous capital and homogeneous labor in a simple two factor model with implicit perfect competition, etc. Where neither labor nor capital are treated as homogeneous and/or there are third factors such as nonreproducible capital in the form of land and other resources, the model becomes more complicated and more realistic. Here the interests of one capitalist group may be against the interests of another. Although the complexity of this situation prevents our giving it detailed discussion here, a couple of points may be worth making.

First of all, it is clear that if one thinks of a three factor model involving labor, reproducible capital, and resources, the fluctuations in wealth which will result may well be of rather different proportions for the different factor owners.¹

Of more interest are the economic determinants of interest group formation in a system. It is clear that if both labor and capital were homogeneous, (and assuming perfect markets) then the only relevant interest groups would be workers and capitalists and one would expect them to be at odds on every economic issue worth discussing. It is only when capital and labor are not homogeneous, and that there are

¹Intuitively one might expect them to be greatest for natural resources, since these may be, in general, less flexible than reproducible capital. But such a generalization is not obvious; a fuller understanding of these relationships would require empirical investigation.

substantial complementarities between a particular type of capital and a particular type of labor that one would expect to have several interest groups and the possibility of sectoral clashes rather than class clashes. It would be of interest to try to summarize in the form of coefficients of complementarity the likelihood of class versus sectoral clashes or the overall tendency to one or the other in the system as a whole.

Note that, especially with respect to capital, (but also with respect to labor) which has a cost of transferring from one use to another, it is clear that sectoral clashes will tend to have a more short run character or definition than will class clashes. A sectoral clash could be permanent, however, if different types of resources and labor have innate advantages in one line of production as opposed to another. Even the fact that each new worker entering the labor force and each new piece of capital to be invested is flexible with respect to the industry to which it is applied (being mobile in this long-run respect) will not, of course, affect the fact that there will always be some people locked in, both workers and capitalists, so that they would have an interest in working together. Diversification of capital by types will obviously decrease the implications of fluctuations of income from different types of capital.¹

Wealth Fluctuations with Two Homogeneous Factors

The above discussion leads us back to the question of whether the results of our partial analysis dealing with one type of capital

¹At the extreme we could have a two commodity model with two different types of capital and two different types of labor in which functional distributional would not change as a function of price changes. Or if individuals are well diversified in terms of asset holdings, there may not be a change in personal distribution of income when one occurs in the functional distribution.

are generalizable. When only for one type of capital does the rental price change, the resulting change in the market price of the capital is simply analyzed, since the interest rate may be assumed constant. But if the rental price for capital as a whole changes, this assumption cannot be made, and the mechanism by which the interest rate is determined must be considered. The simplest situation to consider is where capital is exclusively in the form of natural resources. When the rental price falls and the value of the resources fall at the existing interest rate, the interest rate may either rise or fall. The current income stream and the implicit future one have fallen by the same percent¹ for the capitalists; the old interest rate will imply equilibrium in the new situation as well provided the elasticity of utility with respect to income (or consumption, according to which is more relevant) is the same in present and future. If this elasticity is greater in the future, capitalists will prefer to redirect some otherwise future spending to the present, thus raising the interest rate and lowering further the value of their capital stock; in the opposite case "r" will fall and the value of the capital stock will fall by less than current income. Probably the case of no change in "r" is as plausible as any; in this case the results of the partial analysis carried out above are applicable here as well. But there is undoubtedly more uncertainty as to what will happen.

For capital which is reproduceable, the same conditions (via a little more complicated analysis) can be reached.

Note that where a fall in the rental of physical capital is causally associated with a rise in the wage rate, the total

¹This is true if their only income is from capital or if their capital is the same share of total income in both present and future.

discounted value of physical and human capital need not change. Whether people react to the fall in the former price by trying to save more depends on how symmetrical they consider these two income sources and whether the same people tend to earn from both (or if not, to have similar preferences as between present and future consumption). We do not go further into the possible ramifications of these issues since the real interest of the wealth change phenomenon seems to be at the industry level.

Further Ramifications

It seems clear that the discussion at hand is as applicable to the question of the vulnerability of various income groups in a given economy where various types of exogeneous changes may occur to a given group as it is to the international trade price fluctuation situation. Such changes might be, for example, shifts in the overall spending pattern of the economy, resulting from the changes in income distribution after taxes. The same sort of restraining pressure groups are sure to go into action.

There is little reason to believe, especially taking into account the results of this sort of extension in our earlier paper, that analysis of n-factor cases would lead to any significant qualitative changes in the results. It would make them more complicated than stated above.

Conclusions

Although the income fluctuations resulting from product price fluctuations are not a simple function of the degree of flexibility of an economy's transformation curve (since they depend also on the type of isoquants underlying the transformation curve), the general presumption that the more flexible the economy the greater the welfare

fluctuations to be expected does not hold for individual factors. In other words the conclusion of our earlier paper, that this presumption holds for the total income of an economy (or at the least that the opposite does not hold) tends to be reversed when the income of specific factors is analyzed, i.e. more rigid economies tend to generate more violent income fluctuations for given product price fluctuations. This conclusion presumably implies a modification of our earlier result that a rigid economy may have stability advantages, unless redistribution of income via the country's budget is administratively easy and efficient.