Factor Intensity Reversals: Stopler-Samuelson & Rybczynski Theorems

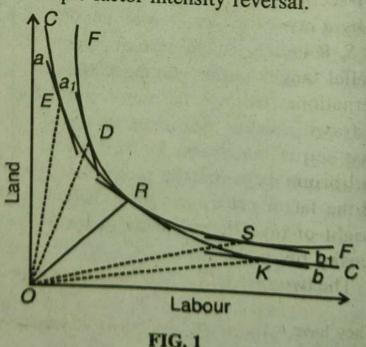
1. MEANING OF FACTOR INTENSITY REVERSAL

The H.O. theorem assumes that production functions are different for two different commodities which are traded, but are the same for each commodity in the two countries. It means that the production function of commodity X is different from commodity Y. But the technique used to produce X in both the countries (A and B) is the same. So is the technique used to produce Y is the same in both A and B countries. If country A is capital-abundant and Y is a capital-intensive good, A will export Y commodity. Similarly, B being a labour abundant country will export its labour-intensive good X According to factor intensity reversal the same good Y will be capital-intensive in country A and labour-intensive in B. In such a situation, according to H.O. theorem, both A and B countries would export the same commodity Y to each other. Since this is not possible, the H.O. theorem breaks down in the presence of factor intensity reversal because it fails to explain the pattern of trade between the two countries.

Factor intensity reversals may exist if one isoquant 'sits on the other' or if one isoquant intersects the other at multiple points. The former is known as single factor intensity reversal and the latter as multiple factor intensity reversal.

Single Factor Intensity Reversal

A single factor intensity reversal is illustrated in Fig. 1 where the isoquant FF sits on the isoquant CC at point R. It is only at R that a tangent representing the common price line ? representing equal international price ratios can be drawn. The ray shows the proportion in which the two factors are combined in different intensities for both commodities at one factor price ratio. Lerner calls the ray OR a "radiant



of tangency" which is the sign of factor intensity reversal. Points of equilibrium to its left or right on the two isoquants will reveal that the production functions have shifted in factor intensity. We know from the factor price equalisation theorem that food is relatively land-intensive in America and clothing is relatively labour-intensive in Britain. Now Fig. 1 reveals that the factor proportions represented by the rays OE and OD to the left of the ray OR show different factor intensities. The ray OE, as compared with ray OD, shows that the production of clothing is land-intensive in America relative to the production of food. The factor price ratio for both the commodities in America is the same as represented by the parallel tangents, $a = a_1$ at points E and D on the isoquants CC and FF respectively.

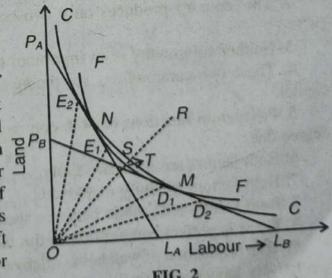
On the other side, rays OK and OS to the right of the ray OR show that clothing is labour-intensive relative to food production in Britain, given parallel factor price lines $b = b_1$

Thus the above analysis shows that clothing is relatively land-intensive in America and relatively labour-intensive in Britain. America now produces clothing instead of food by substituting land for labour in producing cloth which is a labour intensive commodity. There has been a factor intensity reversal. Factor prices for the production of cloth in the two countries also differ as shown by the slopes of the price lines a and b. It is not possible to tell from factor intensities which country will export which commodity. In fact, both countries will try to produce and export clothing and import food. Thus the factor-price equalisation theorem breaks down.

Multiple Factor Intensity Reversals

When two isoquants intersect each other at multiple points, there are multiple factor intensity reversals. This is explained in Fig. 2, where the two isoquants

CC and FF intersect twice at M and N. In between these two points of inter-section, the two isoquants are cut by a ray OR from the origin at T and S. It is only at these points that parallel tangents representing equal international factor price ratios can \mathbb{S}^{P_B} be drawn thereby showing factor price equalisation*. Points of equilibrium between the isoquants and the factor price lines to the left or right of ray OR will show factor



The two rays OE_1 and OE_2 on the factor price line P_AL_A represent land/labour intensity reversals.

^{*} They have not be drawn here to avoid confusion.

ratios in the production of food and clothing in America. Rays OD_1 and OD_2 show similar ratios on the factor price line P_BL_B in Britain. The figure reveals that clothing is land-intensive in America (point E_2) but labour-intensive in Britain (point D_2), while food is labour-intensive in America (point E_1) but land-intensive in Britain (point D_1). Thus the land-intensive commodity food is labour-intensive in the land-abundant country America, while it is land-intensive in the labour-abundant country Britain. This shows factor intensity reversals. Factor prices differ in the two countries as points E_1 and D_1 of the isoquant FF lie on two different factor price lines P_AL_A and P_BL_B . Both will try to export food and import clothing by substituting their factors. Thus the factor-price equalisation theorem breaks down.