Sellers' Income Effects and Unstable Equilibrium: A View of the Korean Rice Market

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The backward-bending supply has long received standard textbook treatment, its primary application being the supply of labor. A number of economists have also suggested the existence of a backward-bending supply curve for commodities in the underdeveloped economies, but this application has been usually derivative of the supply curve for labor.(1) A more interesting, and perhaps not unusual, case is the backward-bending supply curve for commodities in underdeveloped economies as a reflection of the sellers' own demand in those cases in which additional consumption is preferred to additional leisure. Thus, for example, in Korea most farms produce little more than subsistence quantities of cereals. When the price of rice, the preferred good, is low, farmers will sell their rice harvest in order to purchase lower priced barley, the deferred good (which immediately suggests a backward-bending supply). This is not to say, however, that farmers here might not prefer, in any case, to consume more total cereal foodstuffs as well as other consumer goods, given sufficient incomes. Indeed, it is commonly regarded here are low price elasticities of demand for most basic foodstuffs and rather high income elasticities of demand. But this is a possible error, to which we will return in the next section.

This suggests that the market supply curve of, say, rice is a function of income of the farmer as well as the usual direct function of price itself and that the farmer's income is directly a function of the price of rice.

1. $q=f(p, y)$, $y=g(p)$, where p is the market supply rice (not to be confused with the physical output of rice during the season), p is the market price of

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(1) In private correspondence with this writer, Professor Martin Bronfenbrenner has observed that following land reform in some underdeveloped economies, a backward-bending supply curve for farm products may arise. Released from the pressure of making large rent payments, farmers may choose both more leisure and greater consumption of their own product. This may tempt the Government to resort to collectivization of land, but the consequence of such policy might be farmer sabotage or other resistance.

rice, and y is the farmer's income.

2. $\frac{dq}{dp}=\frac{\partial q}{\partial p}+\frac{\partial q}{\partial y}\frac{dy}{dp}$, were ordinarily $\frac{\partial q}{\partial p}>0$, $\frac{dy}{dp}>0$, and $\frac{\partial q}{\partial y}>0$.

It follows that when the absolute value of the second term on the right hand side of equation 2, is greater than the first term, that portion of the supply curve is backward-bending; that is, when

$$\left|\frac{\partial q}{\partial y}\frac{dy}{dp}\right|>\frac{\partial q}{\partial p},\ \frac{dq}{dp}<0.$$

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It is intersting to note that many economists speak of the backward-bending portion of the supply curve as the result of positive income effects. This usage is confusing, the Slutzky equation, concerned with the explanation of consumers, demand behavior takes the form of the following expression,

3. $\frac{dq}{dp}=\frac{\partial q}{\partial p}-q\frac{\partial q}{\partial y}$.

The second term on the right hand side, in its entirety, is the income effect. Thus, in order for $-q\frac{\partial q}{\partial y}>0$, $\frac{\partial q}{\partial y}<0$. Clearly, this is the case of inferior goods. Presumably when commentators speak of positive income effects with regard to normal goods they are neglecting the entire second term on the right hand side of the Slutzky equation and are simply speaking of $\frac{\partial q}{\partial y}$. However, while we may speak of positive income effects, in this looser sense, with regard to the demand curve, we cannot do so with regard to the supply curve. We have here a simple case of the reversibility of demand. Thus if the good in question is a preferred good; that is, if the seller withholds quantities from the market as the price increases in order to satisfy his own demand, $\frac{\partial q}{\partial y}<0$, the seller's income effect is negative in the supply sense, else there is no possibility for the supply curve to turn back on itself.

The notion of reversibility of demand or of the community demand curve leads us to return to equation 2, and to re-examine the question of elasticity as derived therefrom. Multiplying both sides of equation 2 by p/q gives us the expression for the elasticity of supply:

4. $\frac{pdq}{qdp}=\frac{p\partial q}{q\partial p}+\frac{p\partial q}{q\partial y}\frac{dy}{dp}$.

We know that this is ordinarily a positive number, but that in the case of a backward-bending market supply curve it becomes negative above the point where

$\frac{pdq}{qdp}=0$. Thus, if $\frac{pdq}{qdp}<0$, then $\frac{p\partial q}{q\partial p}+\frac{p}{q}\frac{\partial q}{\partial y}\frac{dy}{dp}<0$.

But in the case of the backward-bending supply curve while all other elements on the right hand side of equation 4 are positive, $\frac{\partial q}{\partial y}<0$. That is, the rate of change of supply with respect to a change in farmers' income is negative since farmers' own demand increases with his income. Again, the second element on the right hand side must be negative and its absolute value must be greater than that of the first element (if positive).

Multiplying both sides of equation 4 by $\frac{y}{p}\frac{dp}{dy}$ gives us the expression for the income elasticity of demand:

5. $\frac{y}{q}\frac{dq}{dy}=\frac{y}{q}\frac{\partial q}{\partial y}+\frac{y}{q}\frac{\partial q}{\partial p}\frac{dp}{dy}$.

But this is the farmers' income elasticity and it must be positive in the sense of own demand if he is withholding quantities from the market as his income increases. This suggests that so far as the sellers' own demand is concerned $\frac{dq}{dy}$ is of the same sign as $\frac{dq}{dp}$ in the case of a normal good, while this relation is only true for the buyer in the case of an inferior good. This is simply another corrolary of the reversibility of demand. But it has been shown elsewhere(2) that normal commodities have price elasticities greater than unity and this directly negates the usual proposition heard here of low price elasticities and high income elasticities. Indeed, it seems that these are rather contradictories. An important corrolary of this proposition is that if, indeed, price elasticities are higher than has been generally supposed, then the market price system will be a more effective mechanism than it might have been in the absence of high price elasticities.

3

Superimposing a demand curve on the backward-bending supply curve permits the possibility of two points of intersection of the supply and the demand curves and therefore two different equilibrium points. The higher price equilibrium will be unstable if the supply curve lies to the left of the demand curve above the point of intersection. Thus, if the price were to jump above the unstable equilibrium there would be a "relentless divergence from equilibrium." This is evidenced

(2) See, for example, H.H. Liebhafsky, *The Nature of Price Theory*, Dorsey Press, 1963; Homewood, Ill., especially Appendix A, p. 486, for a nonmathematical discussion of this proposition.

somewhat in Korea recently by the existence of high and rising prices for rice immediately following a bumper harvest of rice. This concurrence is most unusual and ordinarily one's expectations would be declining prices. That is, ordinarily $dq/dp<0$, except in the case where sellers, own demand is dominant or the case of inferior goods. Another possible explanation for such a perverse movement of price and quantity might be that because of rapid inflation over the past year and a half, in part, as a result of government policy, there are expectations of further price rises and so sellers withhold sales and buyers bid up prices.

These two explanations are not alternative in the sense of being mutually exclusive, however. Indeed, they might coexist and be mutually reinforcing. This is all the more conceivable in the face of the government's successful determination to change the terms of trade here vis-a-vis the urban and the rural sectors in favor of the latter in combination with an overall inflationary policy.

What is most remarkable, perhaps ironic, in the case of such unstable equilibrium is that the import of foreign grains, lowering the price of domestic grain through shifting its demand curve leftwards and flattening it by means of making substitutes available on the domestic market, might well have the additional effect of increasing the quantities of domestic grain offered for sale on the domestic market as determined by a new stable equilibrium intersection of the positively sloped portion of the supply curve with the demand curve. Indeed, this might prove to be a rather useful, if oddball, application of A.I.D. shipments of surplus wheat abroad.

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A final observation: Since the writer has no definitive evidence as to the existence of a backward-bending supply curve for rice but rather the suggestive evidence offered above, and since the analysis has abstracted from the channels of distribution and the institutions surrounding these, the above mentioned policy of combatting market instability is at best a tentative suggestion and not a requirement. In the absence of unstable equilibrium, reliance on the market mechanism combined with tight money policies would tend to be a more effective policy than ill-conceived discretionary actions. The above is a theoretical speculation awaiting empirical research.