Results from Pareto Inferior Trade, Market Integration and Stabilisation

Clement Allan Tisdell, Serge Svizzero

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RESULTS FROM PARETO INFERIOR TRADE, MARKET INTEGRATION AND STABILISATION

Clem Tisdell* Serge Svizzero**

Two models, one with fluctuating supply and the other with fluctuating demand, and used to show that as a result of integration of a market for a product (for example, due to introducing international or interregional trade), either consumers or producers of the product lose. However, a Kaldor-Hicks gain occurs. This contrasts with a finding of Newbery and Stiglitz for a similar model that market integration results in a Pareto inferior change. Apart from finding that market integration neither has Pareto improving nor Pareto reducing results in the circumstances considered, the paper extends previous discussion of this subject. Previous discussions have concentrated on supply-side fluctuations whereas in this paper demand-side fluctuations are considered also. A general perspective about whether buyers or sellers in a market gain from market integration then emerges.

1. Introduction

Although it is possible for market integration, such as occurs with economic globalisation, to increase the price instability of a market (cf. *Lasselle et al.*, 2001), such integration can reduce price fluctuations in markets if markets tend to their equilibrium. Newbery and Stiglitz (1984) consider such a case and suggest that market integration, in their case, results in a Pareto inferior outcome after market integration. They assume two regions and argue that, in terms of their model both producers and consumers are liable to be worse off once free trade between the regions becomes possible. Such trade equalizes and stabilizes the price of a product that becomes tradeable between the regions. Mookherjee (1994, p.56) claims that when markets are incomplete, the results of Newbery and Stiglitz (1984) "show that the effect of opening new markets may be to increase income-risks and thereby cause the welfare effects of risk-averse agents to decrease" and claims that this supports a similar conclusion of Hart (1975).

The results of Newbery and Stiglitz (1984) depend heavily on their assumptions that demand for the commodity that eventually becomes tradeable between the regions exhibits unitary elasticity and the demand curve in each is the same. The model suggests that if, after market integration, the farmers do not change their product mix, the price of the tradeable product will be equalised between the markets and stabilized in both regions whereas previously it fluctuated according to weather conditions in each of the regions. After the market integration, the income of farmers from the product is, on average, the same as prior to integration but it is now more variable. Newbery and Stiglitz (1984) suppose that farmers will be adverse to this increased income instability and so they are worse off. Prior to market integration, they were perfectly insured against supply variations arising from weather variations due to price changes in the local market. After integration, this benefit is lost.

We develop a similar but somewhat different model to Newbery and Stiglitz (1984) assuming linear demand curves and reach a different conclusion to these authors.

* Dr. Clem Tisdell is Professor of Economics, The University of Queensland, Brisbane, Australia.
** Dr. Serge Svizzero is Professor of Economics, University de La Réunion, France

Our first model parallels that of Newbery and Stiglitz (1984) but our second model does not. The first model takes account of supply-side fluctuations as does that of Newbery and Stiglitz (1984). The second model is a departure because it concentrates on demand-side fluctuations. In the first model fluctuations in equilibrium market quantity traded and price are due to variations in supply, for example due to alterations in weather conditions. In the second model, variations in trading conditions in regional markets are assumed to arise from fluctuations in the demand for the product being considered. In both models, market integration results in the price of the tradeable commodity being stabilized.

In the first situation, it is argued that producers make an economic gain and consumers a loss as a result of market integration but that overall a Kaldor-Hicks gain occurs. While all agents do not gain, neither do all lose as the model of Newbery and Stiglitz suggests, and producers could compensate consumers for their loss and remain better off than before the change. In the second case, it is producers who lose on average by market integration and consumers who gain. Market integration does not result in a Pareto improvement but there is a Kaldor- Hicks gain. In this model, producers could compensate consumers and remain better off than prior to the change. Consider the specific models.

2. Model I : Market Fluctuations due to Supply-Side Variations

Consider two separate but identical markets for the same product, each being located in different countries or regions. The demand curve for the product, X, is assumed to be normal and the same in each region. The supply of the product in each region is supposed, for simplicity, to depend only on the prevailing weather conditions, and is identical in each region given the same weather conditions.

Imagine that the weather conditions are favourable (good) in each region half the time and unfavourable (bad) in the remaining time. Furthermore, suppose that the weather conditions in each of the countries or regions displays perfect negative correlation. Thus when a bad season is experienced in region A, a good season prevails in region B, and vice versa.

Given these circumstances, the behaviour of the regional markets can be illustrated by Figure 1. This shows the market situation for region A or B. DD represents the demand curve for the product in each region, and the supply curve marked S_1 represents supply in a bad season and that marked S_2 represents supply in a good season. Depending on the season, market equilibrium fluctuates between E_1 and E_2. The market equilibrium price varies between P_1 and P_2 and supply to the market oscillates between X_1 and X_2.

Suppose now that trade between the two regions becomes possible and that this can take place with zero transaction costs e.g. zero transport costs. Then each region imports from the other when it has a bad season. Consequently, the supply of product X in each market will effectively become equal to that marked by the line $\overline{S}$. Each market is continuously supplied with $\overline{X}$ of the product $[\overline{X} = (X_1 + X_2)/2]$ and the product price is stabilized at $\overline{P} = (P_1 + P_2)/2$.

We can observe the economic effects on the market participants. First the income of suppliers becomes more unstable. When suppliers experience a bad season, their income is reduced and in the favourable season, it is increased when the markets are integrated. They could, however, counteract the increased fluctuations by saving more in the good season. At the same time suppliers also experience a rise in their income on average. Over the cycle of

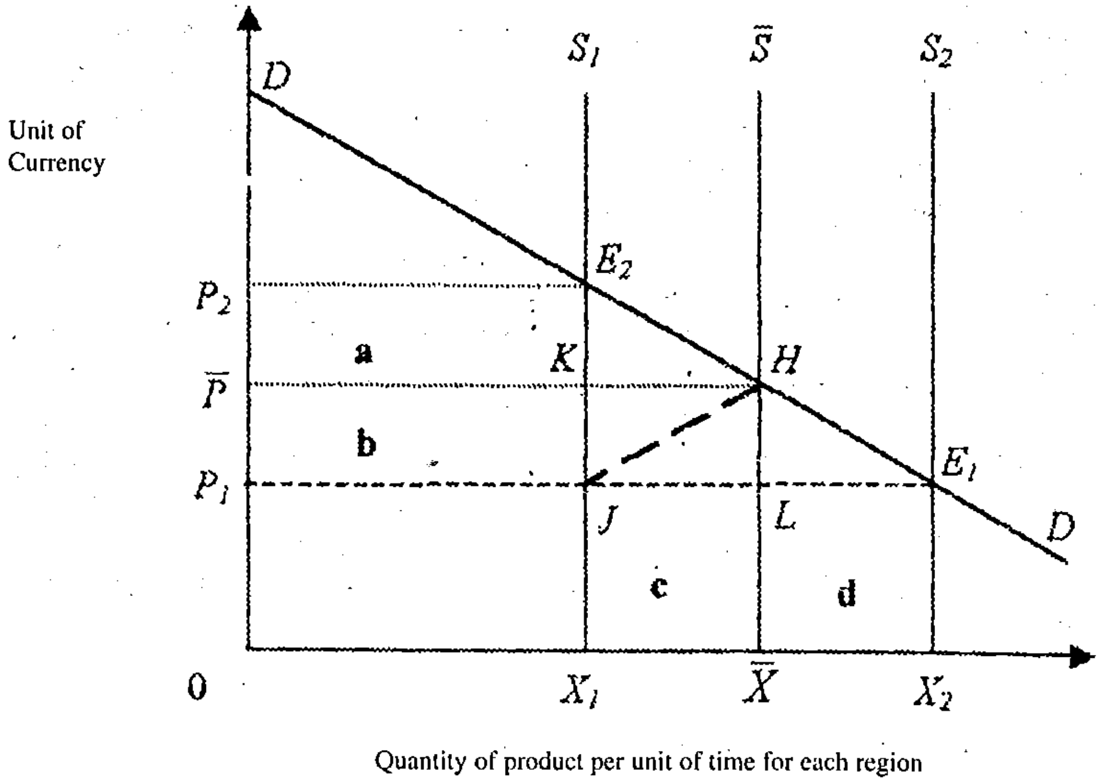

Figure 1. A case in which instability in regional markets arises from supply-side fluctuations. Integration of these markets stabilizes price and quantity of sales in each region. Integration of these markets benefits sellers but disadvantages buyers.

good and bad seasons, their income can be shown to increase by an amount equal to twice the area of rectangle JLHK in Figure 1.

In the absence of market integration,. the income of producers is equivalent to the area of rectangle $0X_1F_2P_2$ and in the good season equivalent to the area of rectangle $0X_2E_1P_1$. After market integration, it is equal to the area of $0\overline{X}H\overline{P}$ in each season. If we consider the differences in these areas the rectangles marked **a** and **b** cancel out, and over the cycle of bad and good seasons, twice the area of rectangle $\overline{X}_1\overline{X}HK$ is earned but an area equal to the rectangle **d** is lost. Therefore the net gain of producers from market integration is twice the area of rectangle JLHK. Basically this result (the gain by producers) holds because the total revenue obtained by producers is a concave quadratic function of the price received by them.

On the other hand, surprisingly, consumers' surplus is reduced on average by this market integration. After market integration consumers receive a higher surplus when their region experiences a bad season but when a good season prevails in their region they experience a reduction in consumers' surplus equal to the area of quadrilateral $P_1E_1H\overline{P}$. This is not compensated for by their gain in a bad season equivalent to the area of quadrilateral $\overline{P}HE_2P_2$. For a combination of a good season and a bad season, the net loss in consumers' surplus is equal to the area of triangle JE_1H.

Note that the area of triangle JE_1H equals the area of rectangle JLHK. Consequently as a result of market integration producers gain twice as much as consumers lose. Hence, there is a Kaldor-Hicks gain equivalent to the area of rectangle JLHK.

3. Model II: Market Fluctuations due to Demand-Side Variations

Consider now a different case in which there are two separated but identical markets in which variations in demand are the source of market fluctuations. Assume that when demand for product X_1 is high in one market, it is low in the other and vice versa. Assume that in each market, demand is low for half the year as represented in Figure 2 by line D_0D_0 and high in the remainder as represented by D_2D_2. The supply curve of the product in each region is represented by SS. Therefore, in each market the equilibrium fluctuates between E_0 and E_2 if the markets are isolated from one another.

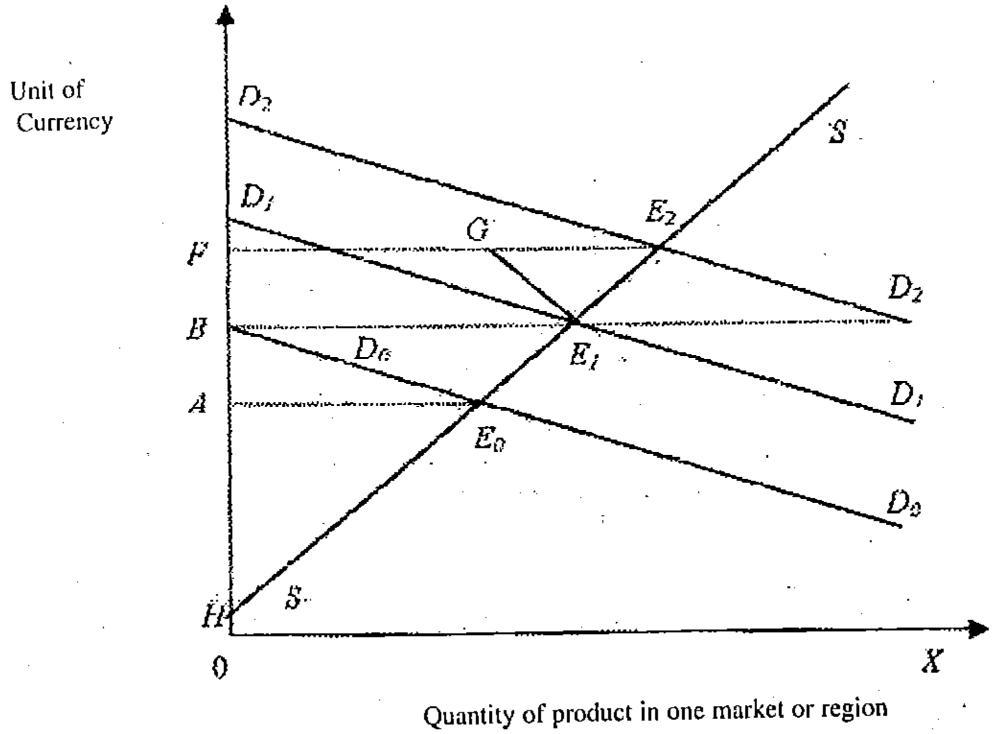

Figure 2 A case in which instability in regional markets arises from demand-side fluctuations. Integration of these markets benefits buyers but disadvantages sellers.

If the markets become integrated and no market transaction costs are present, the market demand curve D_1D_1 prevails in both because only one price can prevail in the merged markets. D_1D_1 is the average of curves D_0D_0 and D_2D_2. Therefore price in each market stabilizes at 0B and no longer fluctuates between 0A and 0F.

It can be observed that as a result of market integration consumers experience a significant rise in consumers' surplus on average. Take any region. In that region, consumers lose surplus equivalent to the area of triangle AE_0B when the region experiences a period of low demand and when the markets are integrated. But the increase in consumers' surplus is much greater than this in the region's period of high demand when the markets are integrated. The gain in consumers' surplus during such a period is equivalent to the area of quadrilateral BCE_2F.

On the other hand, producers' surplus is reduced by the market integration that stabilizes market price. In the absence of market integration, local producers would obtain a surplus of an amount equal to the area of triangle HE_0A half the time and an amount equal to the area of triangle HE_2F the remainder of the time. In an integrated market they obtain a surplus equivalent to the area of triangle HE_1B all of the time. But twice this area is less than the sum of the other two areas mentioned. It is less by the area of triangle E_1E_2G where quadrilateral BE_1GF is constructed to be equal in area to quadrilateral AE_0E_1B.

Hence, in this case there is a loss in producers' surplus as a result of market integration. In effect, this is what is to be expected given an earlier fmding by Oi (1961) about the impacts of price stabilization on the average level of profit of purely competitive firms. However, the gains to consumers in this case clearly outweigh the loss to producers from market integration. Thus a Kaldor-Hicks gain from market integration occurs and this exceeds the area of triangle E_1CE_2.

4. Concluding Comments

In the perfectly competitive markets considered here market integration disadvantages consumers in the first case and producers in the second case. However, in both cases, there is a Kaldor-Hicks gain from market integration.

The somewhat paradoxical results are explained by the convexity and concavity of the relevant objective functions which for the cases considered here are all quadratic. In the first model, consumers' surplus decreases at a decreasing rate as the price of the product is raised. Consumers' surplus is therefore strictly convex function of the product's price. On the other hand, the income of producers is an increasing but strictly concave function of the product's pricc. In the second case, producers' surplus as a function of the product's price is an increasing and strictly convex function. For convex functions, the average value of the function for variations in its independent variable is always higher than its value calculated for the average value of the independent variable. The reverse situation occurs for stricty concave function. These relationships help explain these results and enable them to be generalised to some extent. The quadratic objective functions involved imply that the average values are a function merely of the mean and the variance of the independent variable, in this case, price.

Note that no allowance is made in the above models for uncertainty involving error in economic decisions. This is consistent with the approach of Newbery and Stiglitz (1984). In the first of our models, uncertainty is in fact irrelevant as no errors can be made in production decisions—there are none in the sense that production depends purely on exogenous events. However, in cases where uncertainty is present and can result in decision errors, it may alter the conclusion (cf *Tisdell*, 1963 ; *Oi*, 1963).

The results suggest that the Paretian inferior results claimed by Newbery and Stiglitz (1984) on the basis of their model are exceptions. In our case, which parallels theirs, we find that while market integration does not bring about a Pareto improvement (one set of agents suppliers, gains and another, consumers, loses), there is a Kaldor-Hicks solution. Our conclusion for the second model, which differs from that of Newbery and Stiglitz (1984) by concentrating on demand-size fluctuations, is similar,except that the set of gainers and losers is reversed. Nevertheless, in the cases analysed here, trade is neither Pareto inferior, as it is claimed to be in the Newbery and Stiglitz (1984) model, nor Pareto improving as strongly suggested by some economists (e.g. *Summers*, 1999).

A general perspective emerges from the particular type of models considered here involving parallel shifts of supply and demand curves. If the source of market fluctuations in market prices arises from variations in the supply-side of a market, it is sellers who gain from market integration.[1] If the source of fluctuations in market prices arises from variations in the demand-side of the market, it is buyers who gain from market integration. However, those on the opposite side of the market lose. Buyers are worse off in the first case and suppliers are disadvantaged in the second case by market integration. Market integration might occur for instance as a result of the expansion of international trade or the creation of free trade areas. These economic consequences of market integration are not intuitively obvious.

Note

1. This may not be immediately apparent from the discussion of the first model which was tailored so it would be similar to that of Newbery and Stiglitz (1984) but it is clear from Figure 3. In Figure 3, DD represents the demand for a product X in each of two regions. When the season is poor, the supply curve in each region is as represented by line S_3S_3 and when it is favourable, it is indicated by line S_1S_1. In the absence of interregional trade, market equilibrium alternates in each region between E_1 and E_3. Should, however, the markets be merged then in the absence of transaction costs and given that weather conditions show perfect negative correlation between the regions, the effective supply curve of the product to each region becomes S_2S_2 and the price of product X stabilizes at P_2 in each region. P_2 is the average of the pre-existing prices, P_1 and P_3. While suppliers in each region will lose (after the markets merge) a surplus of an area equivalent to that of quadrilateral $P_2E_1BP_3$ when a bad season occurs, in a good season they gain an area equivalent to quadrilateral $P_1E_1BP_2$. For normally sloped supply and demand curves, this will be much larger than the latter area, as it is in this particular case. So market merger will result in the normal case in a rise in the average producers' surplus in each region although the variability of producers' surplus will rise. On the other hand, the average level of consumers' surplus will fall in each region because consumers' surplus declines at a decreasing rate as the price of the product rises.

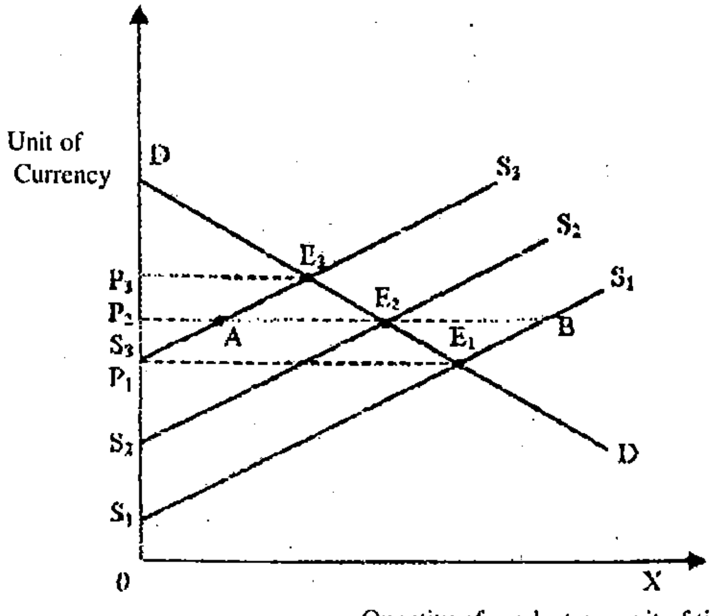

Figure 3. A regional market situation in which supply is not perfectly inelastic and for which market integration benefits producers but not consumers.

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