Epidémiol. santé anim., 1997, 31-32

DISTRIBUTION OF BENEFITS FROM IMPROVED ANIMAL HEALTH DECISION MAKING

Ramsay G.C., Tisdell C.A., Harrison S.R.[1]

La productivité de la filière viande bovine augmentera avec l'amélioration des choix stratégiques en santé animale. Cette augmentation se traduira par une déviation vers la droite de la courbe d'approvisionnement en viande bovine. Trois marchés sont examinés. Sur le premier il n'y a pas d'exportation, seulement des ventes libres sur un marché national. Sur le second, il y a des exportations et sur le troisième les exportations ont lieu vers un marché où existent des quotas d'importation. Le type de déviation sur la courbe d'approvisionnement est un facteur important pour déterminer si les producteurs gagneront d'une augmentation de la productivité, alors que les consommateurs gagneront toujours si l'évolution se traduit par une baisse des prix. Sur un marché national libre, les consommateurs bénéficient toujours d'une telle déviation d'approvisionnement car les cours baissent. Le bénéfice pour les producteurs dépend du type de déviation. Pour un marché d'exportation sans contrainte, les consommateurs nationaux ne gagneraient rien car l'Australie est un petit producteur à l'échelle de la planète, mais le bénéfice serait pour les producteurs. En cas de quotas d'importation, ce qui est le cas des marchés d'exportation australiens, les consommateurs et les producteurs seraient bénéficiaires. Cependant, dans ce dernier cas, il est possible que les surplus des producteurs diminuent après la déviation de la courbe d'approvisionnement.

If government agencies are to participate in collection of additional animal health information and if livestock producers are required to contribute to cost of collection of information, it is important to determine who benefits from that information. In this paper the distribution of benefits from improved private animal health decisions following the collection of additional animal health information in Australia is examined for the beef industry. Changes in economic surplus following the shift in supply to the right that will occur following an increase in productivity are considered. A free international trade model is developed followed by a model that includes the effects of trade restrictions in the form of quotas. In the restricted trade model exports into large and small markets are considered.

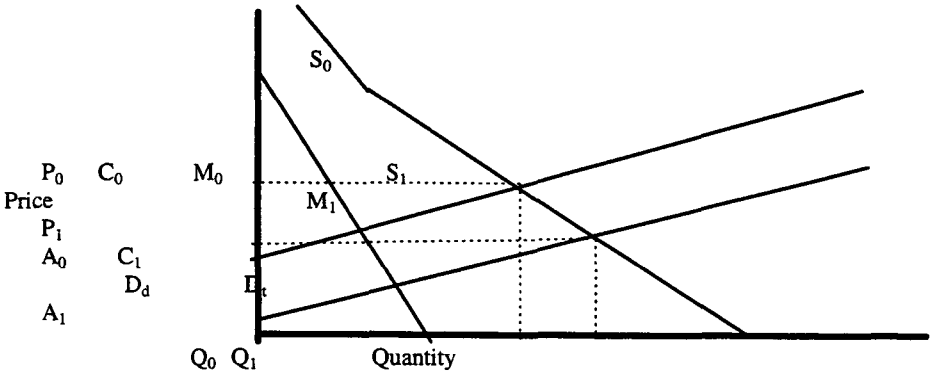
THE EFFECT OF A SHIFT IN SUPPLY WHEN BEEF IS EXPORTED

A disaggregated commodity supply and demand model along the lines of that developed by Edwards and Freebairn (1984) is used in this paper. In this model separate sectors for the home country, Australia, and the rest of the world are specified. World demand is obtained by the horizontal summation of demand specifications for Australia and the rest of the world. The total demand curve and the supply curve of domestic producers are illustrated in Figure 1. In this case a shift in supply from S_0 to S_1 results in a change in equilibrium price from P_0 to P_1 and quantity demanded from Q_0 to Q_1. Total benefits due to a shift in supply are the area $A_0M_0M_1A_1$. The change in consumer surplus is area $P_0M_0M_1P_1$, of which $P_0C_0C_1P_1$ goes to domestic consumers and $C_0M_0M_1C_1$ goes to consumers in the rest of the world. Producer surplus equals the total benefit less consumer surplus or $A_0M_0M_1A_1$ minus $P_0M_0M_1P_1$.

The effects of a parallel shift in the supply curve within this model were assessed by Edwards and Freebairn (1984). They determined that a county's producers will always gain from a parallel supply shift when the costs in the rest of the world are not affected. A reduction in costs confined to a country comprising part of a market will reduce price less than the reduction in costs unless demand in the market as a whole is completely inelastic and supply in the whole market is perfectly elastic. Edwards and Freebairn (1984) also demonstrated that when the country being examined produces 20% or less of world production, and the shift in the supply curve occurs in both the country and the rest of the world, as long as the ratio of reduction in costs in the country to reduction in costs in the rest of the world is greater than 1:4 the country's producers will benefit. This means that while producers in a country gain less when information reduces costs in the rest of the world, as well as their own costs, they will only lose from such a shift if cost reductions in the rest of the world are considerably larger than their own. The above information can be used to estimate whether domestic producers will benefit from a supply shift when beef is exported into a free market. Australia produces 3.6% of the world's beef and therefore meets the criteria of a small producer country as defined in Edwards and Freebairn (1984). Australian beef producers would therefore be expected to benefit from a parallel shift to the right if the additional animal health information only increases efficiency in Australia. Australian consumers would not receive any benefit. This is because Australia is a small producer on an international scale and a small increase in beef production in Australia would be expected to have a small impact on the total amount of beef produced in the world and therefore a small impact on the world price of beef.

[1] Department of Economics, University of Queensland, Queensland 4072, Australia

Figure 1
Benefits from a shift in beef supply in a free market with exports



THE EFFECT OF A SHIFT IN SUPPLY FOR AN EXPORTING COUNTRY WITH IMPORT RESTRICTIONS

This section examines the effect of a quota or import restriction, imposed by an importing country, on domestic economic surplus following an improvement in the efficiency of beef production. The beef market in the Pacific rim is highly regulated with most countries including the United States and Japan imposing trade restrictions. In the United States the restrictions take the form of "voluntary" limitations on the quantity exported by a country to the United States. In Japan restrictions take the form of ad valorum tariffs together with a system of quotas (Harris et al., 1990; Reithmuller et al., 1990). The situation for a small producing exporting country is examined where exports are into a single large overseas market. This is the case for Australia exporting beef into the United States market.

The effect of a production quota on the distribution of benefits when a country is a large exporter of a good was examined by Alston et al. (1988). They determined that all of the benefits from an improvement in efficiency of production accrued to producers and quota holders and domestic consumers did not receive any benefits.

Figure 2 presents the effects of an import quota on beef demand curves. Here D_d represents domestic demand and D_o represents demand in the U.S. market. The import restriction limits U.S. market demand to Q_q. The total demand curve is D_{tq} and is made up of the sum of domestic and restricted U.S. demand curves. All of the product sold into the U.S. market is sold at the U.S. market price and demand in the U.S. market is perfectly elastic. In the situation of the small producing country the import quota will not be filled while the domestic price exceeds the overseas market price (p). Once the domestic price equals the U.S. market price the import restriction would begin to be filled. While the quota is being filled the price would not vary as the quantity exported from Australia would not have an impact on total supply in the U.S. market and therefore not affect the price. When the import restriction is filled, increased supply would cause the price to fall as the market is again restricted to the domestic market.

Figure 2
Effects of an import quota on beef demand curves for a small producer exporting into a large market

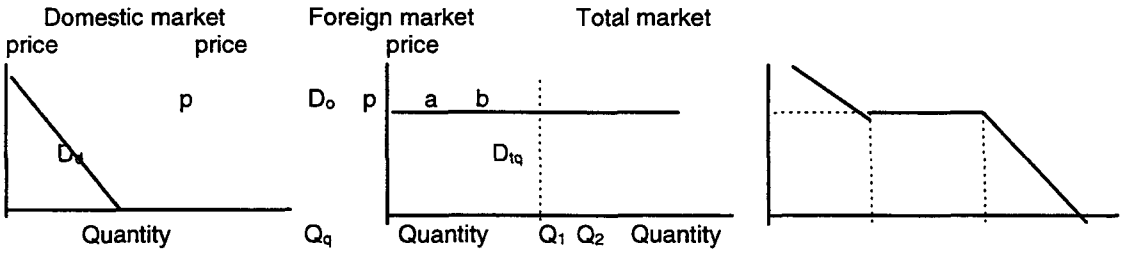
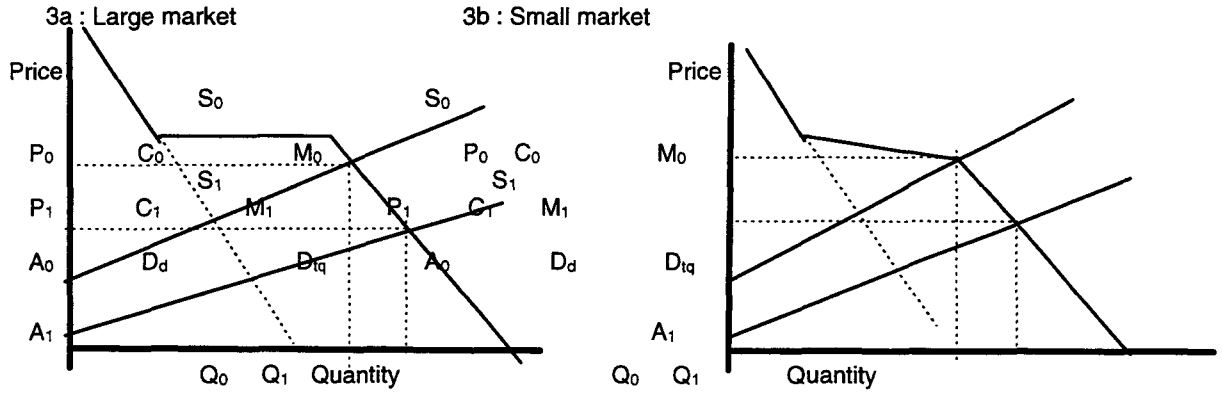


Figure 3a illustrates the combined domestic and trade demand curves with an import quota in place and the effects of a shift to the right in the supply curve. Total benefits due to a shift in supply are the area $A_0M_0M_1A_1$. The total increase in consumer surplus is the area $P_0M_0M_1P_1$. The increase in domestic consumer surplus is area $P_0C_0C_1P_1$. The area $C_0M_0M_1C_1$ which is the total consumer surplus less the domestic consumer surplus would not accrue to the consumers in the U.S. as the price in the U.S. would not change. This benefit would instead go to the holders of quotas. Producer surplus equals the total benefit less consumer surplus or $A_0M_0M_1A_1$ minus $P_0M_0M_1P_1$. Whether producer surplus increases or decreases would depend on the type of shift in the supply curve and the elasticity of supply. With a pivotal shift in the supply curve it is likely that producer surplus would decrease due to the import restriction. This examination suggests domestic consumers would benefit from a shift to the right in supply where import quantity restrictions are imposed in the overseas market. This is because once import restrictions are filled the domestic price would fall. The effect on producer surplus is less clear. With a quota in place and with inelastic supply, the domestic price would fall (as illustrated in Figure 3a). It is probable under these circumstances that most benefits from a shift in supply would go to the owners of quotas and domestic consumers. The effect of the shift on beef producers surplus is uncertain and dependant on the type of shift in the supply curve. It is possible that they may not benefit unless they are the owners of quotas. If the

export market is smaller, as is the case for the Canadian market, it is possible that as the quota is filled the export price will fall because enough product is exported to affect the market equilibrium. This effect is illustrated in Figure 3b. Provided the price decrease is not large the effect on the distribution of benefits would be small.

Figure 3
Effects of a quota on the distribution of domestic benefits following a shift in the beef supply curve



It is important to note the type of shift in supply plays an important role in determining whether producer surplus increases as a result of that shift. The use of additional animal health information to improve the productivity of beef producers would probably result in shift in the Australian beef supply curve that would be divergent and to the right if the disease occurred throughout Australia. This is because many producers are already making appropriate decisions either to control or not control disease and the additional information will not improve their productivity. It is also likely that producers currently controlling disease appropriately are the more efficient lower cost farmers corresponding to the left of the supply curve and referred to by Lindner and Jarrett (1978) and Duncan and Tisdell (1971) as inframarginal producers. It is therefore, producers who are not making an appropriate decision who will benefit most from the additional information and these are probably the less efficient marginal producers corresponding to the right of the supply curve. If we examine the specific case of additional information about disease caused by *Babesia bovis* the situation changes. Disease caused by *B. bovis* only occurs in areas where the vector *Boophilus microplus* is present. Therefore, additional information on *B. bovis* would not be used by producers or affect the supply of beef outside this area. If producers in areas where disease caused by *B. bovis* occurs are inframarginal producers then the shift in supply would be convergent following the use of the additional information on disease caused by B. bovis. Producers would gain from the shift. This is because the decrease in price is less than the increase in production. If, however the producers are marginal producers then the shift in supply is likely to be divergent and in this situation it is possible that producer surplus will decrease.

ACKNOWLEDGMENTS
This work was carried out as part of ACIAR project 9204 we thank ACIAR.

BIBLIOGRAPHY

Alston, J.M., Edwards, G.W., Freebairn, J.W., 1988. Market distortions and benefits from research. American Journal of Agricultural Economics. 70(2), 281-288.

Duncan, R., Tisdell, C., 1971. Research and technical progress: the returns to producers. The Economic Record. 47(117), 124-129.

Edwards, G.W., Freebairn, J.W., 1984. The gains from research into tradeable commodities. American Journal of Agricultural Economics. 66(1), 41-49.

Harris, D., Dickson, A., Corra, G., Gerardi, W., 1990. Effects of the liberalisation of North Asian beef import policies. ABARE Discussion paper 90.11, AGPS, Canberra.

Lindner, R.K., Jarrett, F.G., 1978. Supply shifts and the size of research benefits. American Journal of Agricultural Economics. 60(1) 48-58.

Reithmuller, P., Roberts, I., O'Mara, L.P., Tie, G., Tulpule, V., Hossain, M., Klijn, N., 1990. Proposed strategies for reducing agricultural protection in the GATT Uruguay Round: a synthesis and assessment. ABARE Discussion Paper 90.6, AGPS, Canberra.