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EFFECTS OF THE CONCESSIONAL SALES TAX ARRANGEMENTS FOR FRUIT JUICE BEVERAGES

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The sales tax concession on fruit juice beverages has been an important assistance measure for Australia's fruit growing industries. The concession is linked to a local content scheme. The extent of assistance provided to fruit growing industries and the impact of concessional tax rates have received little economic evaluation.

In this paper, a partial equilibrium framework is developed for evaluating the effects of the sales tax concession. A mathematical model is then derived and validated to assess determinants of assistance levels provided by these arrangements.

Introduction

The sales tax concession which applies to manufacturers of certain fruit beverages has been an important assistance measure for fruit growers. Most beverages, whether produced locally or overseas, have a 20 per cent sales tax imposed on them at the wholesale level. However, if at least 25 per cent of these beverages is local fruit juice and if they are not carbonated, then the sales tax is halved. Prior to August 1986, these products were totally exempt from the tax.

The objective of the sales tax concession is to assist growers by increasing demand for locally produced juices. However, previous work by the Bureau has shown that growers receive a benefit from this arrangement only when there is insufficient local juice to meet the 25 per cent local content requirement (BAE 1986). In this situation, competition for local juice increases juice prices. But since 1984, local orange juice has been in sufficient supply and no premium has been paid for local juice.

The sales tax concession also modifies consumption patterns as the retail price is directly affected by this form of intervention. This was shown to be the case when retail juice prices increased in the September quarter of 1986, in response to the imposition in August 1986 of a wholesale sales tax of 10 per cent on previously tax exempt products. The Bureau concluded that consumers '... have paid less for their juice and imports have been greater than would have occurred without the exemption arrangements' (BAE 1986, p.23). In addition, consumer purchases have been directed away from non-exempt juices and carbonated drinks.

This form of assistance (especially to growers) is indirect and so is difficult to measure (see IAC 1982, 1986). As a result, the effects of the sales tax concession on the fruit industries are not taken into account in the IAC's estimates of effective rates of protection. In this paper, the effects of the concession are assessed using a partial equilibrium framework, and a simple mathematical model derived from this analysis is then validated using industry data. Implications of the sales tax arrangements for resource use are then considered.

Theoretical Analysis

There are two types of fruit juice manufacturers: grower co-operatives that also process fruit (referred to as processor converters); and private manufacturers that purchase juice in bulk and then package it but do not process fruit (referred to as converters). Processor converters are normally located in fruit growing regions and converters in metropolitan areas. The structure of the fruit juice manufacturing industry is shown in Figure 1.

For the purpose of exposition, it is useful to make two initial simplifying assumptions: first, all juice is used to produce pure juice (rather than some being used for 'fruit juice drinks', which contain water); and, second, all manufacturers mix local and imported juice to minimise their average juice costs. The effects of relaxing these assumptions are examined later.

Given these assumptions, the sales tax concession provides an incentive for juice manufacturers to use local and imported juice in the ratio 1:3. If there is more than sufficient local juice available for all manufacturers to achieve the 1:3 ratio, all juice produced can qualify for the lower concessional sales tax rate. Once manufacturers meet the 25 per cent local content requirement, there is no economic incentive for them to prefer local juice over imported juice because the price of local juice will equal the

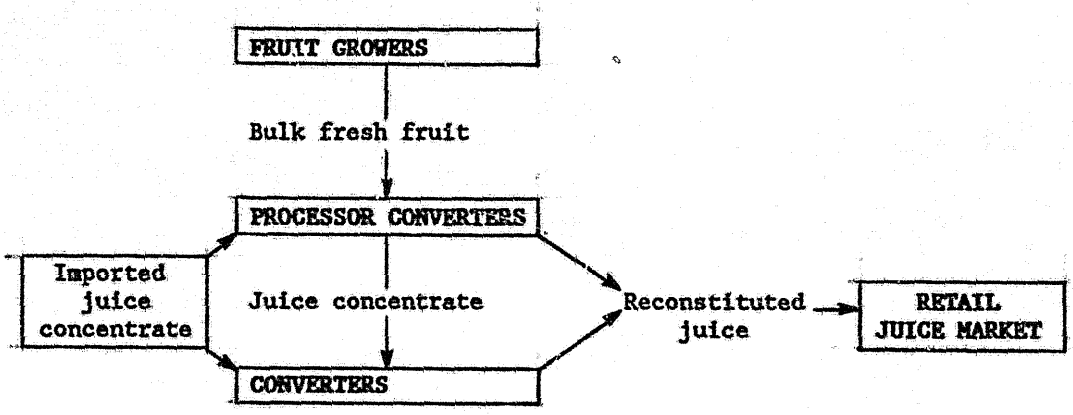
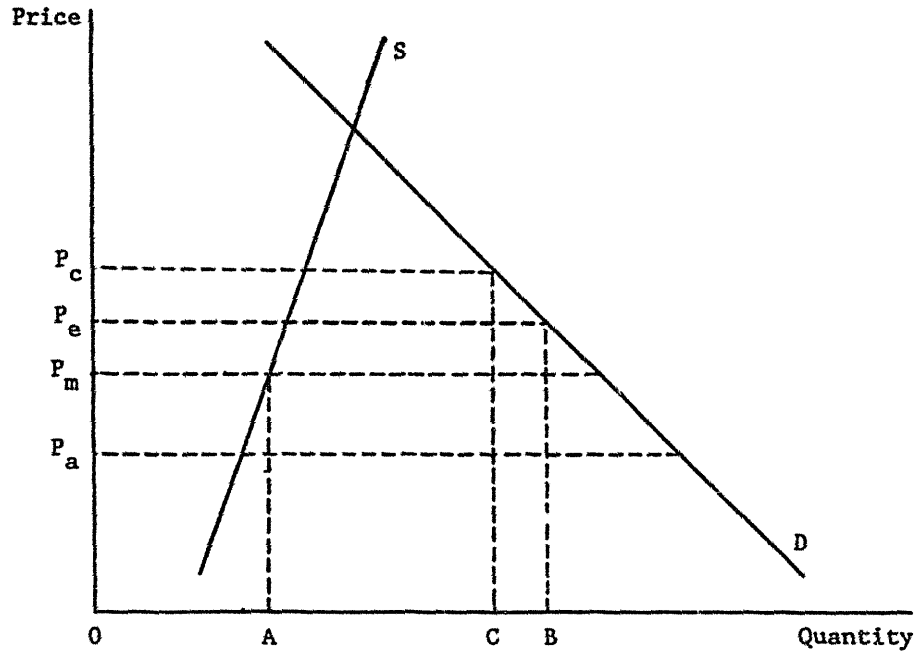


FIGURE 1 - Structure of the Fruit Juice Manufacturing Industry.



where

D = the total demand curve for juice;

S = the local supply curve for juice;

P_c = the consumer price with the full 20 per cent sales tax;

P_e = the consumer price with the concessional 10 per cent sales tax;

P_m = the landed import price, which is equivalent to the grower price in this case (adequate local supplies); and

P_a = the price which leads to the local content requirement being met (currently, 1:3 ratio of local to foreign juice).

FIGURE 2 - Representation of the Citrus Juice Market: Adequate Local Supply.

landed import price. This situation, depicted in Figure 2 in a partial equilibrium framework, is consistent with that established by Corden (1971) in his discussion of quantity linking schemes.

Adequate local supply

In Figure 2, consumption is B, of which AB is imported and A is locally produced. Consumers pay P_e for their juice and growers receive P_m, which is equal to the landed import price. The effect of the sales tax concession is to reduce the consumer price from P_c to P_e, and reduce tax revenue from $(P_c - P_m)C$ to $(P_e - P_m)B$. The grower price is unaffected by either the local content provision or the sales tax.

Inadequate local supply

If there is insufficient local juice available to enable all manufacturers to meet the local content requirement for payment of the concessional sales tax rate, then some manufacturers will be able to meet the requirement and others will not. The price of local juice will then be bid up so that the average price of the blended product (with the concessional sales tax rate) will equal the price of wholly imported juice (with the higher sales tax rate). Hence, the price received by growers will adjust to clear the market.

In Figure 3, total consumption is D, of which B is locally produced juice and D - B is imported. The quantity C - B is three times B and represents the amount of foreign juice which is mixed with local juice to produce juice that qualifies for the concessional rate of sales tax. The quantity D - C is imported juice which is charged the full rate of sales tax. The consumer price is set by the full rate of sales tax and the import price. The producer price is determined so that the weighted average of imported and local juice prices (with the concessional rate of sales tax) equals the landed import price with the full rate of sales tax. Hence, the area G + H + I equals the area M. Tax revenue is therefore G + N + V.

The effect of the sales tax and local content requirement is to increase the price paid by consumers from P_m to P_c, to increase the grower price from P_m to P_g and to provide government revenue. The social cost of the tax or deadweight loss is the areas, K + I, and W. For a discussion of the conditions necessary for economic surplus measures to accurately approximate welfare changes, see Borrell, Sturgiss and Wong (1987).

From Figure 3, it can be seen that if the concessional tax rate is reduced (that is, areas G and N are reduced and M is made larger), the producer price (P_g) will rise. There will be no effect on the consumer price unless the area V disappears.

The amount of the assistance provided to the industry by these arrangements when local juice is in short supply can be estimated in the following manner. The wholesale price paid by a converter who uses only imported juice is P_c (to simplify the analysis wholesale and retail margins have been ignored) and

(1) $$P_c = P_m(1 + T_H)$$

where

T_H = the higher rate of sales tax applicable to imports.

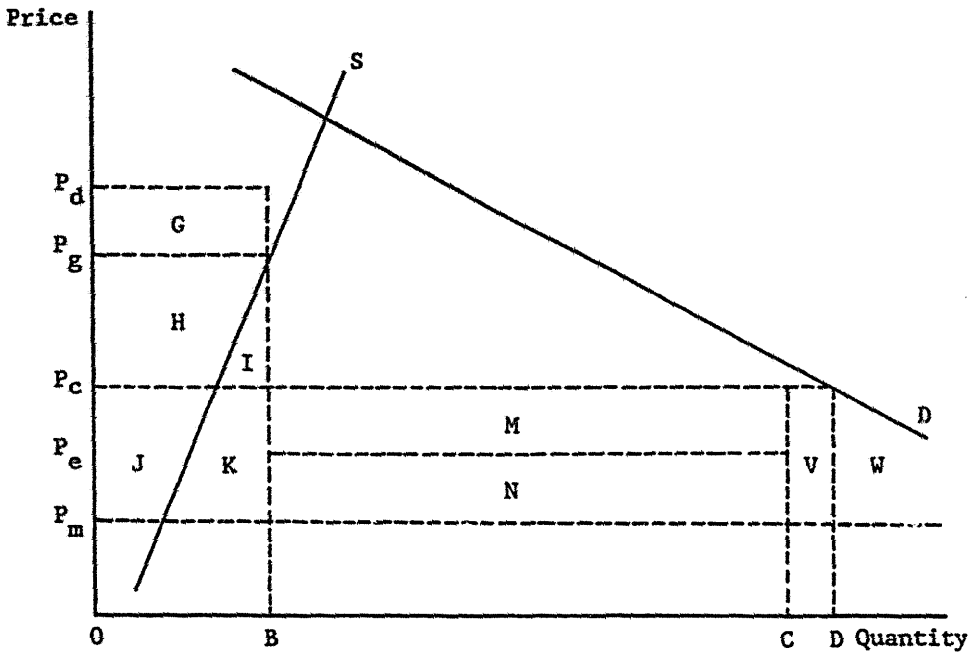
However, the price paid by a converter who mixes local and imported juice in the ratio (expressed as the proportion R) to qualify for the concessional rate of sales tax is

$$(2) \qquad P_c = [RP_g + (1 - R)P_m] [1 + T_L]$$

where

T_L = the concessional sales tax rate.

The grower price will adjust so that a converter will be indifferent to paying the full tax on imported juice or paying the concessional tax on the mix of local and foreign juice that just satisfies the local content requirement. So, P_g, the equilibrium grower price, can be calculated by equating equations (1) and (2). Then



where

D = the total demand curve for juice;

S = the local supply curve for juice;

P_d = the implied grower price of local juice with the concessional 10 per cent tax;

P_g = the grower price;

P_c = the consumer price with the full 20 per cent sales tax;

P_e = the implied price of imported juice with the concessional 10 per cent sales tax; and

P_m = the landed import price.

Figure 3: Representation of the Citrus Juice Market: Inadequate Local Supply.

$$(3) \qquad P_g = P_m \left[1 + \frac{T_H - T_L}{R(1 + T_L)}\right].$$

If the value of T_H is 0.2, T_L is 0.1 and R is 0.25 (as under present arrangements), then P_g will be 36 per cent above P_m, the landed import price.

The intermediate case

Figures 2 and 3 do not exhaust the possible supply situations. There is an intermediate case. This occurs when the local content requirement (the 1:3 ratio) is met at a price between the concessional and full rates of sales tax. In this case, firms are able to meet the local content requirement exactly. It can be found mathematically by solving the constrained profit maximisation problem for the firm as follows:

$$(4) \qquad \max P(1 + T_H)\, f(K, Q_m + Q_d) - P_m Q_m - P_d Q_d - K P_k$$

subject to

$$(5) \qquad R = \frac{Q_d}{Q_d + Q_m}$$

where

- P = the output price;
- K = other inputs;
- Q_m = the quantity of juice input from imports;
- Q_d = the quantity of juice input from imports and from domestic sources;
- P_k = the price of the other inputs; and
- f = the production function with inputs K and Q where domestic and imported juice are perfect substitutes.

If y is the Lagrangian multiplier on the local content constraint, then the first order conditions are

$$(6) \qquad P(1 + T_L)f_1 = P_k$$

$$(7) \qquad P(1 + T_L)f_2 = P_m - y(1 - R)$$

$$(8) \qquad P(1 + T_L)f_2 = P_d + yR$$

$$(9) \qquad RQ_m = (1 - R)Q_d.$$

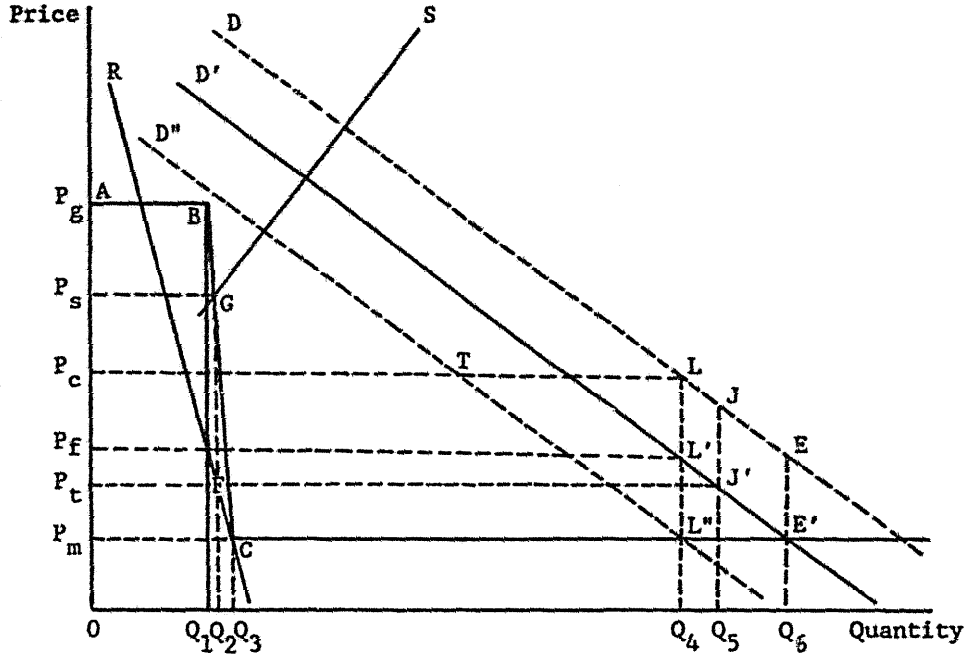
The second and third conditions (7 and 8 above) can be solved for y, which equals $P_d - P_m$, and replaced by the single condition

$$(10) \qquad P(1 + T_L)f_2 = RP_d + (1 - R)P_m.$$

Thus, when the local content requirement is exactly met, an extra unit of output will be sourced from domestic and foreign supplies in the ratio of $R/(1 - R)$. The cost of that extra unit is $RP_d + (1 - R)P_m$.

A profit maximising firm will set the ratio of the cost of an extra unit of juice and the cost of the non-juice input to the marginal rate of substitution between the inputs. This determines the demand for juice and for non-juice inputs.

Following Grossman (1981), the net demand for domestic juice can then be derived. The intermediate case is relevant for domestic juice availabilities between Q_1 and Q_3 (see Figure 4). For example, for supply S and domestic juice availability Q_2, the content requirement is met at point F with the juice mixture having a cost P_t (the weighted average of the domestic price P_s and the import price P_m). The total quantity demanded is Q_5, with Q_2 being supplied domestically and $Q_5 - Q_2$ imported. Point G represents the point on the net demand curve for local juice corresponding to point J on the total demand curve and point J' on the derived total demand curve D'.



where

D = total juice demand;

D' = derived juice demand with the concessional 10 per cent sales tax;

D" = derived juice demand with the full 20 per cent sales tax;

RD' = the locus of points where the local content requirement is met exactly;

S = supply curve for local juice;

P_s = the local juice price;

P_t = the weighted average of P_s and P_m; and

P_f = the weighted average of P_g and P_m.

FIGURE 4 - Representation of the Citrus Juice Market: Intermediate Case.

Point B represents the boundary situation, where all juice users can just meet the local content requirements.

For the intermediate case, grower prices lie between the other two cases, as do consumer prices. The effect of the concessional tax arrangements is therefore to provide assistance to both growers and consumers.

The net demand for local juice, when there is either insufficient or more than sufficient local supply (that is, the two previous cases) can also be represented in Figure 4. The section AB represents the situation where there is insufficient supply to meet the local content requirement. Here grower prices are supported at P_g, converters pay P_f for blended product (on which they pay the concessional tax) or pay P_m for fully imported product (on which they pay the full rate of tax). The total quantity demanded is Q_4 at point L on the total demand curve D. When there is more than sufficient supply to meet the local content requirement but imports are also required, the price of local juice falls to the import price P_m and total juice demand is Q_6, which is represented by point E on the total demand curve. The net demand for local juice is represented by the line segment CE'. Thus the line segment ABCE' represents the net demand for local juice covering all three cases.

A possible effect of the tax policy is some instability in the industry. This can be shown by comparing the shape of the net demand curve for local juice with what it would be in the absence of the tax concession arrangements. If the tax were levied at its full rate on all production, then the net demand for local juice could be represented by the line segment P_cTL''. Citrus fruit, like other perennial fruit crops, exhibits quite inelastic supply in the short run, but may be more elastic in the longer run. If this is the case, the tax policy has the potential to encourage instability as the industry moves between having more than sufficient local juice to fulfil the local content requirement and insufficient juice. The market could develop a long term cycle as the protective effect of the local content provision cuts in and then cuts out. This would be much less likely if there were a tax on all juice, as then there would be no strongly inelastic BC segment of the net demand curve.

Some Extensions

Juice blends

So far the analysis assumes that juice is used only in 100 per cent juice products and that a competitive market structure exists. However, a substantial part of the market consists of juice drinks which are juices blended with water. These products can fulfil the local content requirement by mixing 25 per cent local single strength juice with 75 per cent water. As a result, the proportion of local juice required for all juice products to fulfil the local content requirement is in excess of 25 per cent. For example, if half the demand for juice is for single strength juice products and half for juice drinks containing 25 per cent single strength juice, the proportion of total juice demanded that is required to be sourced locally is 37.5 per cent (or more) for all juice to qualify for the concessional sales tax rate. If local juice is in short supply, the local juice price will be 24 per cent above the landed import price. This can be shown using equation (3) with R = 0.375.

Market structure

A further factor influencing the availability of local juice, and hence the size of the local juice premium, is the behaviour of the processor converters. Because of their links with growers, these manufacturers often produce juice products with more than 25 per cent local content, effectively reducing the availability of local juice to converters. In doing so, they may choose to process members' fruit at some cost to profitability.

Validating the Model

The model can be validated in two ways. First, the model provides a prediction of the price premium on local juice over imported juice. This premium can be compared with the actual premium in the market. Second, an implication of the model is that the premium rapidly disappears when the ratio of local juice supplies to total demand exceeds a critical value. So an examination of this ratio over time and when price premiums exist provides a further test of the theoretical model.

Before doing the validation it is necessary to establish an appropriate mix of local and imported juice, R, which is consistent with the structure of the market. Two factors, the market mix of single strength juices and drink products, and different local juice usage by processor converters and converters, together mean that an appropriate value for R exceeds 0.25.

To determine the effect of market mix between single strength juices and juice drinks on the value of R, data were obtained on supermarket sales of these items in 1985. These data showed that approximately 75 per cent of single strength juice sold was used in single strength products and 25 per cent was included in juice drinks or products less than single strength. To qualify for exemption from sales tax, 25 per cent of the juice in single strength products would have had to be local juice, as would have all of the single strength juice in drinks. Therefore, the minimum proportion of the total availability of juice (local and imported) that would have had to be local juice for all products to qualify for exemption from sales tax would have had to be around 45 per cent.

To determine the effect on R of different usage of local juice by processor converters and by converters with no grower links, data were obtained on juice sales by each. It was found that each group accounted for approximately 50 per cent of retail juice sales. If converters use the minimum quantity of local juice necessary to satisfy the local content requirement, then the previously determined value of R of 0.45 is applicable for this group. For processor converters, R was assumed to be about 0.75 as a result of their obligation to accept members' fruit. Averaging the two gives a value of R of around 0.6. With R = 0.6, T_H = 0.2 and T_L = 0, equation (3) generates an implied premium for locally produced juice of 33 per cent. This is consistent with import prices and premiums paid for local juice during 1982-83 (see Figure 5). Furthermore, the period in early 1984 when premiums for local juice were no longer paid coincides with when the actual local juice proportion increased from 0.49 in 1983-84 to 0.63 in 1984-85 (see Figure 6), thereby passing the previously estimated critical value of R of around 0.6.

Thus, the results of the model are consistent with the performance of local prices in the 1980s. Both the size of the premium for local juice (when the premium existed) and the cessation of the premium when local juice became more abundant are explained by the model.

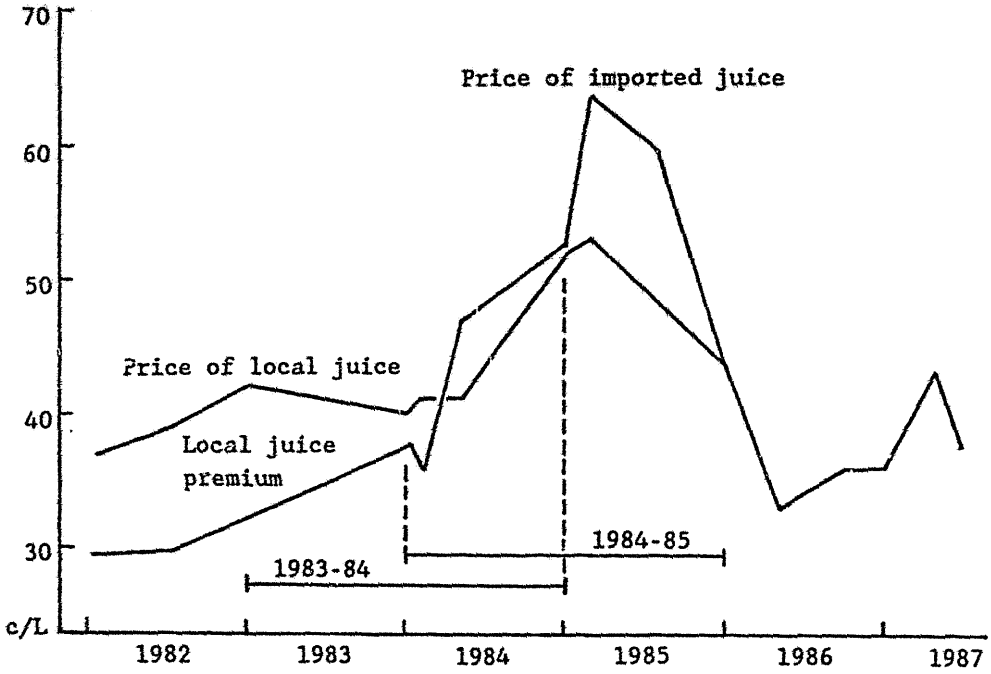


FIGURE 5 - Prices for Local and Imported Orange Juice.

Tariffs

The model also shows that the extent of assistance afforded by the sales tax exemption arrangements depends on the size of the tariff. For example, if the price paid by a converter using both imported and domestic juice is

$$(11) \qquad P_c = [RP_g + (1 - R)\, P_w(1 + m)]\ (1 + T_L)$$

where

P_w = the world price of orange juice; and

m = the tariff in ad valorem equivalent

and the price paid by sole importers is

$$(12) \qquad P_c = (1 + T_H)\, P_w(1 + m),$$

then

$$(13) \qquad P_g = \left(1 + \frac{T_H - T_L}{R(1 + T_L)}\right) P_w(1 + m).$$

This equation shows that the sales tax exemption and tariff have a multiplicative effect: the larger the tariff the greater the assistance provided by the sales tax concession.

Conclusions

From the theoretical discussion, it is clear that the current policies can either provide assistance to growers or simply tax consumers. The question remains: what has been the effect of the tax concession? An examination of the relationship between landed import prices and grower prices provides an indication of the effects. Prior to 1984, grower prices were maintained above the landed import price (see Figure 5). However, since then the margin has disappeared. This coincides with an increasing proportion of juice consumption being provided from local production in 1984-85 (see Figure 6). This experience is therefore consistent with the theoretical analysis in the paper.

It would appear, therefore, that the local content provisions of the sales tax did provide protection to the industry. However, they no longer do so. Australian citrus growers receive no benefit from these measures. Moreover, they are no longer affected by the sales tax, as consumers pay it all. On the basis of this analysis, the increase in sales taxes on citrus juice could be expected to be borne by consumers and lead to a fall in imports with little effect on growers (unless juice imports were to cease altogether).

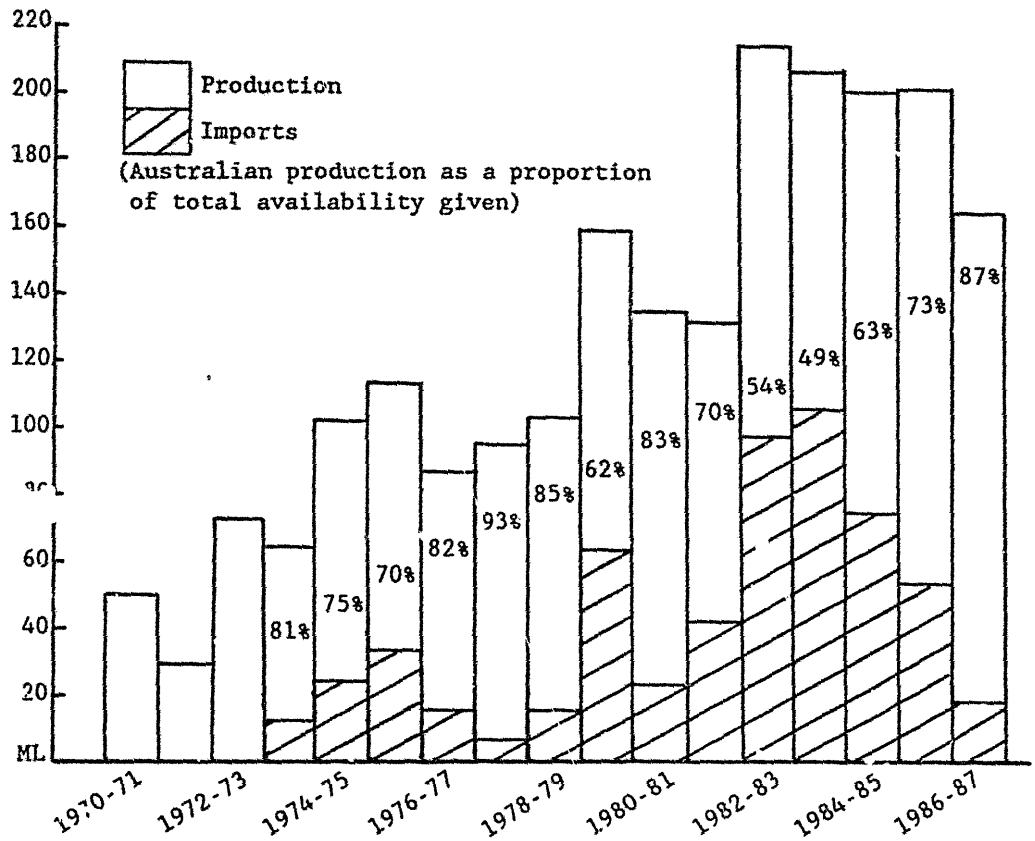


FIGURE 6 - Australian Orange Juice Supplies.

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