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Final Report

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# Refillable glass beverage container systems in the UK



Identification and quantification of the barriers and opportunities for the wider adoption of refillable glass beverage containers in the UK.

WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

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**Front cover photography:** Refillable bottle, AG Barr

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# Executive summary

WRAP (Waste & Resources Action Programme) commissioned Oakdene Hollins in December 2007 to investigate the barriers and opportunities for the wider adoption of refillable glass beverage containers in the UK, as part of their primary objective of diverting waste (glass) from landfill. This report documents the findings from the study undertaken between January and May 2008.

Since the 19<sup>th</sup> century, refillable glass beverage containers<sup>1</sup> have been a packaging format used in the UK, with the doorstep delivery of milk (introduced in the 1880s) being the most well cited example. Historically, the high cost of glass and the local nature of production and consumption favoured reuse. However, in recent years there has been a dramatic decline in the use of such refillable containers. The market share of refillable milk bottles has dropped from 94% in 1974 to 9.7% in 2006; meanwhile refillable beer containers dropped from 33% of the market in 1961 to just 0.3% in 2006, and for soft drinks the 1980s represented a particularly bad time for refillables falling from 45.5% in 1980 to 10.4% in 1989.

Reasons for the dramatic decline in refillables include:

- **The change in consumer behaviour.** For example, traditionally the majority of beer was consumed in the on-trade, namely pubs, clubs, hotels, restaurants, etc where empty bottles were retained by the establishments and returned to be washed and refilled via the traditional dray system, i.e. a closed loop system. However the UK has seen a significant growth in the popularity of the consumption of beer at home where a more complex recovery infrastructure is needed to get the empty bottles back for refilling and hence many breweries abandoned refillables in favour of one-way bottles and cans.
- **The growth of the supermarkets.** For example, the decline in the doorstep delivery of milk results directly from the growth in supermarket shopping where milk is cheaper in one-way packaging.
- **Improvements in single trip packaging.** For example, the market share of refillable glass containers in the soft drinks sector dropped by 35% in the 1980s due to the growth in PET (polyethylene terephthalate) bottles. This growth was not only due to improvements in PET bottles but coincided with a change in consumer habits with the growth in away-from-home consumption of soft drinks, where lightweight packaging is favoured.

Other countries such as the USA, New Zealand and Australia have witnessed a similar decline in refillables, but for other countries such as Germany, South Africa, Mexico and Denmark refillables still play a major role. This study has found that in emerging economies such as South Africa and Mexico the relatively high cost of glass and the fragmented nature of the supply chain means that refillables can compete against the single trip alternatives via voluntary refillable schemes operated by individual businesses or business sectors. Conversely such voluntary systems do not perform well in developed economies where the infrastructure is in place to produce, distribute and retail single trip containers on a large scale. In such cases economies of scale can undermine the more regional small-scale refillable systems. In developed countries voluntary schemes tend to operate in niche markets. The study found that in such economies, state intervention is required if refillables are to maintain significant market share; Germany and Denmark are examples of this.

Barriers to the increased use of refillable glass beverage containers in the UK include:

- **The case sensitive nature of the environmental merits of refillables.** Refillables work best when transport distances are low and trip rates are high, i.e. local, closed loop markets such as the doorstep delivery of milk. However the UK has seen a significant rationalisation of the manufacturing base resulting in a greater number of centralised manufacturing facilities, especially in sectors such as lager and soft drinks. The extended transport distances and greater supply chain complexity favours one-way containers. Therefore

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<sup>1</sup> Also referred to as re-usable containers, multi-trip containers or refillable containers.

from an environmental perspective the environmental benefits of refillables must be determined on a case by case basis, which inhibits the types of intervention that can be introduced to promote refillables.

- **The economic cost of setting up refillable systems.** The manufacture of beverages for the UK market is predominantly undertaken in large scale, centralised production facilities. In addition, market share of one-way PET bottles and cans has grown in recent decades. Conversion to refilling of glass containers in small scale, local manufacturing facilities would incur high capital costs of over £15 million per production line. The conversion of local, small scale, one-way glass bottling plants to refillables is the least cost option at circa £2 million to £3 million per production line.
- **The reluctance of retailers to engage in refillable systems.** The study shows that there has been a significant growth in the market share of beverages sold into the off-trade and more specifically the supermarkets who have, historically, voiced a reluctance to engage in refillable systems.
- **Packaging differentiation.** One way packaging provides greater flexibility in terms of packaging design, a key factor in fast moving sectors such as soft drinks.
- **The dominance of the imports market.** For wine especially, the high volume of imports favours one-way systems.
- **Aesthetics.** Some brand owners perceive that scuffing and other blemishes and general wear seen on refillable bottles portrays a negative brand image.
- **European Law.** Although the Packaging and Packaging Waste Directive cites the encouragement of reuse (Article 5), the state laws implemented by a number of the member states, including Germany, Denmark and Hungary, that have specifically included incentivising the use of refillables have been challenged in the European courts. This is because such laws are interpreted as favouring local businesses and restricting internal markets.

However, although there is a significant list of barriers there are a number of changes happening in the UK that may work in favour of refillables:

- **Local sourcing strategies.** Some retailers have developed local sourcing strategies as a direct consequence of the negative press associated with food miles.
- **Carbon labelling.** Brand owners and retailers are beginning to include the carbon impact associated with products on labels. The next stage in such a process is to look to reduce these carbon burdens and local refillable systems may provide a low carbon option.
- **The growth in 'veggie box' home deliveries.** Taking into consideration the success of the doorstep delivery of milk, this may represent an opportunity for refillables. It is important to note, a secondary opportunity would be the home delivery services operated by the supermarkets.

In addition, the study has identified examples of innovation in refillable systems developed to overcome these barriers. For example Reverse Vending Machines located at retail outlets to remove the burden on retailers of handling returns, and the plastic coating of glass bottles to reduce scuffing. Others target niche markets, for example waste management companies recovering, washing and selling wine bottles back to producers, and companies providing refillable water bottles for in-house refilling.

To conclude, although refillable glass beverage containers have seen a dramatic decline, a number of opportunities exist to stem this. However caution should be exercised to ensure that the refillable systems being developed and implemented provide a true environmental benefit, since LCA studies show that the level of benefits refillables have over single use systems is dependent on a number of key factors, e.g. capture rates, transport distances and recycling rates. This stresses the need to view refillables on a case-by-case basis and not simply to promote the wholesale use of refillables irrespective of circumstance.

# Contents

<b>1.0</b>	<b>Introduction .....</b>	<b>6</b>
1.1	Container Glass Recycling .....	6
1.2	Container Glass Waste Reduction .....	7
1.3	The Different Forms of Refill .....	9
1.4	Project Scope .....	10
<b>2.0</b>	<b>A world wide review of refillable beverage container systems .....</b>	<b>11</b>
2.1	Background.....	11
2.2	Non-regulatory systems .....	11
2.2.1	Voluntary deposit systems.....	11
2.2.2	Open systems.....	18
2.2.3	The discount system .....	23
2.3	Regulatory Systems .....	23
2.3.1	Deposit laws.....	24
2.3.2	Eco-taxes .....	26
2.3.3	Quotas .....	27
2.3.4	Bans .....	28
2.3.5	Agreements .....	29
2.4	Section Discussion and Conclusion.....	31
<b>3.0</b>	<b>A review of refillable glass beverage container systems in the UK .....</b>	<b>32</b>
3.1	Background.....	32
3.2	Beer .....	32
3.2.1	Introduction .....	32
3.2.2	The decline in refillable beer bottles .....	33
3.2.3	International refillable systems for beer bottles.....	40
3.3	Soft Drinks .....	43
3.3.1	Introduction .....	43
3.3.2	Carbonates.....	43
3.3.3	Water.....	52
3.4	Milk .....	53
3.4.1	Introduction .....	53
3.4.2	Alternative refillable systems .....	55
3.5	Wine.....	56
3.5.1	Introduction .....	56
3.5.2	The enablers to the use of refillable wine bottles .....	57
3.5.3	The constraints and challenges to the use of refillable wine bottles .....	59
3.5.4	Existing UK refillable systems.....	60
3.5.5	International.....	61
3.5.6	Stakeholder perspective .....	62
3.5.7	Section conclusion .....	62
<b>4.0</b>	<b>Viability Analysis .....</b>	<b>63</b>
4.1	Environmental Analysis .....	63
4.1.1	Conclusions .....	64
4.2	Economics.....	65
4.2.1	Production costs .....	65
4.2.2	Retailer costs.....	68
4.2.3	A review of programme cost.....	68
4.2.4	Conclusions .....	69
4.3	Consumer Perception.....	69
4.3.1	Conclusions .....	71
<b>5.0</b>	<b>Conclusion and discussion .....</b>	<b>72</b>
5.1	An overview of the history of refillables in the UK: why the decline? .....	72
5.2	Barriers to the increased use of refillable glass beverage containers in the UK.....	72
5.3	Opportunities for the increased use of refillable glass beverage containers in the UK .....	73
<b>6.0</b>	<b>Recommended Further Work .....</b>	<b>76</b>
	<b>Appendix 1 Summary of International refillable systems.....</b>	<b>77</b>
	<b>Appendix 2 Countries in Europe with Container Deposit Legislation.....</b>	<b>81</b>

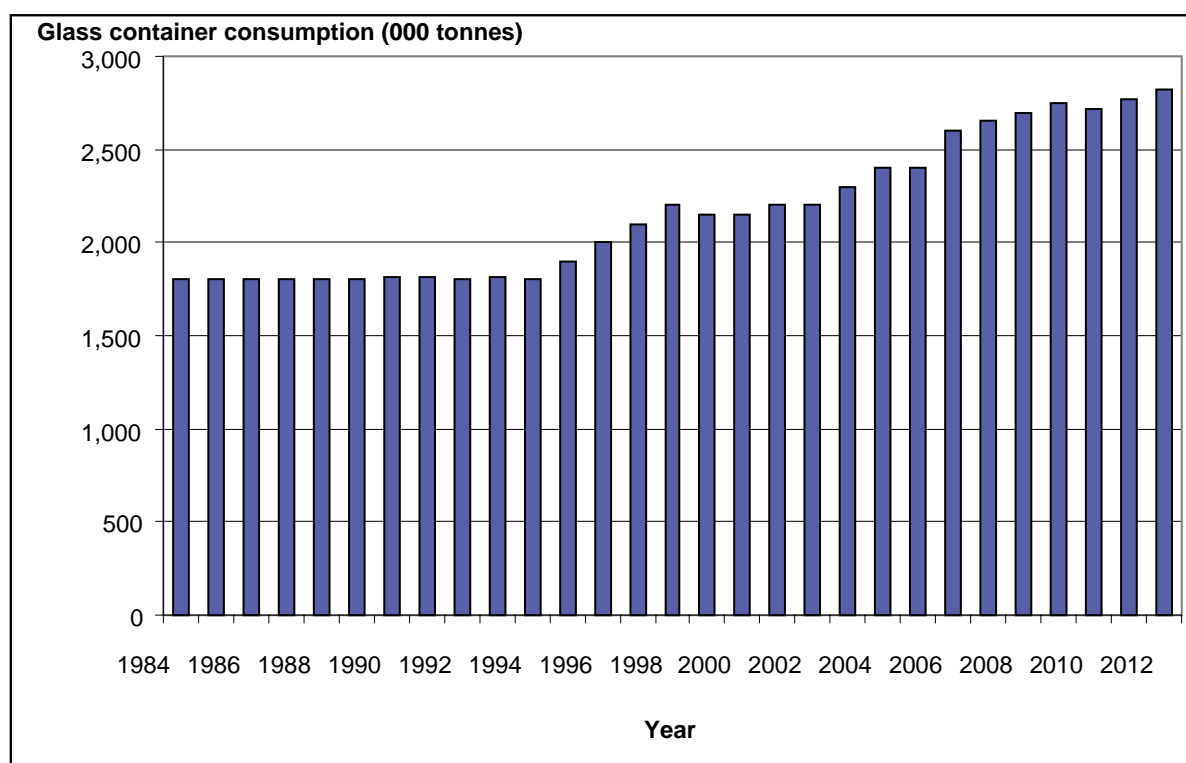
<b>Appendix 3 Canadian Container Deposit Return Systems .....</b>	<b>82</b>
<b>Appendix 4 Canadian States-Prince Edward Island .....</b>	<b>86</b>
<b>Appendix 5 American Container Deposit Return Systems (Bottlebills) .....</b>	<b>87</b>
<b>Appendix 6 American States with Bottlebills .....</b>	<b>90</b>

## 1.0 Introduction

In 2007, 2.65 million tonnes of glass container waste was generated in the UK, accounting for 9.1% of total household waste<sup>2</sup>, Figure 1.1. Historically, as with most other wastes in the UK, disposal to landfill has been the favoured option but in recent years alternative waste management options have become more prominent, namely:

- Recycling and
- Waste minimisation.

**Figure 1.1.** UK glass container consumption 1984 to 2012.



Source: Consultation on recycling targets for packaging for 2008 and thereafter. Defra, October 2007.

### 1.1 Container Glass Recycling

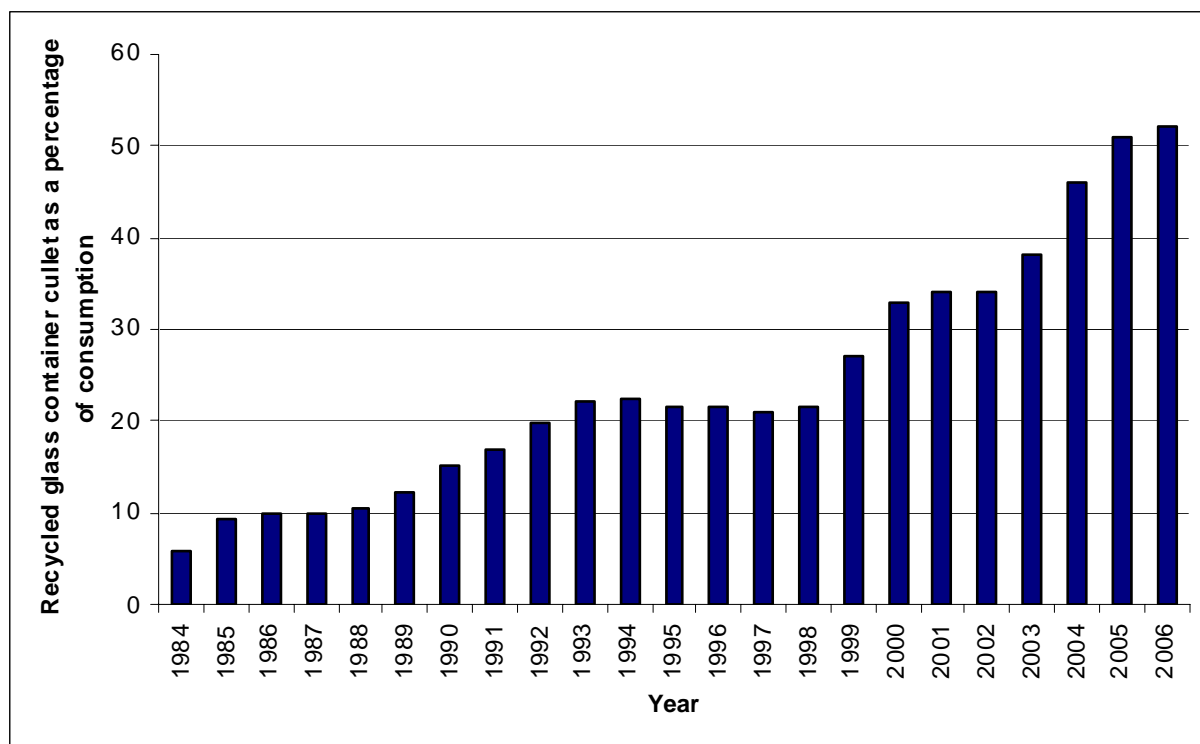
Container glass recycling has increased from 6% in 1984 to 52% in 2006, Figure 1.2. The key driver behind this increase has been the EC Directive on Packaging and Packaging Waste 94/62/EC transposed into UK law in 1997 through the Producer Responsibility Obligations (Packaging Waste) Regulations 1997 SI No 648 (as amended). The Regulations have, since 1998, imposed specific annual packaging recovery and recycling obligations on all UK businesses having a turnover exceeding £2 million and which handle more than 50 tonnes of packaging per annum. The material specific targets for 2008 are:

- paper 60%;
- glass 60%;
- metals 50%;
- plastic 22.5%; and
- wood 15%.

<sup>2</sup> Open University household waste arisings study key findings from 2007. Defra



**Figure 1.2.** Recycled glass container cullet as a percentage of consumption 1984 to 2006.



## 1.2 Container Glass Waste Reduction

WRAP has funded a number of projects aimed at reducing at source the volume of waste container glass being generated. WRAP report that<sup>3</sup>:

*"250,000 tonnes of glass could be saved each year by reducing the average container weight across all grocery categories by just 10%".*

WRAP have funded three projects under the overall 'GlassRite' banner:

- GlassRite Wine – focusing on the lightweighting of glass wine bottles and encouraging the bulk importation of wine for bottling in the UK to be filled in UK manufactured bottles with a high recycled content;
- GlassRite Beer – focusing on the lightweighting of glass beer and cider bottles; and
- GlassRite Food – focusing on the lightweighting of glass food, soft drinks and Ready To Drink (RTD) or Flavoured Alcoholic Beverages (FAB) containers.

Key successes to date include: Adnams and O-I (in collaboration with WRAP) producing a new benchmark in lightweight glass beer bottles, reducing the weight from 455g to 299g (Figure 1.3); and in 2006 Ardagh Glass (formerly Rockware) produced what it called the "UK's first ever" 70cl spirit bottle made with less than 300g of glass.

<sup>3</sup> [http://www.wrap.org.uk/downloads/15203-02\\_Container\\_Lite\\_CS\\_Whisky\\_image.2681d971.pdf](http://www.wrap.org.uk/downloads/15203-02_Container_Lite_CS_Whisky_image.2681d971.pdf)

**Figure 1.3.** An example of the Adnams / O-I lightweight beer bottle.



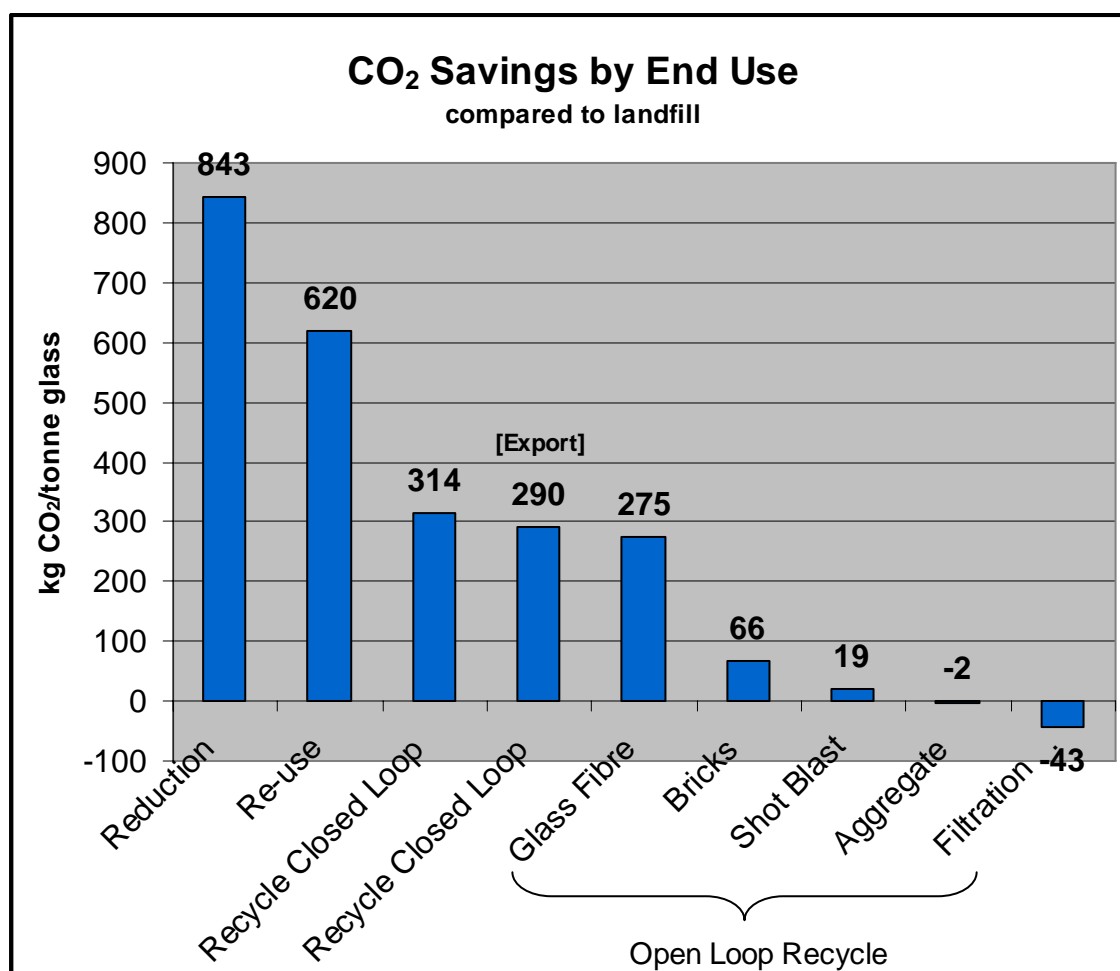
Source: WRAP

From an environmental perspective this switch away from the landfilling of waste container glass to recycling and waste minimisation has been extremely beneficial. Figure 1.4 shows that on average 843 kg CO<sub>2</sub> are saved for every one tonne of waste prevented at source through 'reduction' and, when recycling the glass back into containers (i.e. closed loop recycling) in the UK, 314 kg CO<sub>2</sub> is saved for every one tonne of waste recycled. It is important to note that further research into the environmental impact of using recycled glass as a filtration medium has shown it to have a significant environmental benefit when compared against landfilling.

However, Figure 1.4 also shows that 'reuse' (or refilling a product back into a container) provides a significant environmental benefit when compared against both landfill disposal and recycling. In the UK the decline in the use of refillable glass beverage containers is much cited with the decline in the refillable milk bottle, on-trade beer and soft drinks from CTN (confectioners, tobacconists and newsagents) stores being cases in point.

This study investigates the markets and potential opportunities for refillable glass beverage containers in the UK and investigates the parameters affecting their economic and environmental viability.

**Figure 1.4.** LCA analysis of waste technology options for container glass in the UK.



Source: All data with the exception of the reuse figure is taken from Glass Recycling: Life Cycle Carbon Dioxide Emission, Enviros Consulting Ltd, 2003. Reuse data taken from Life Cycle Analysis Assessment of Packaging Systems for Beer & Soft Drinks, Danish Environmental Protection Agency, 1998.

Note: Transportation impacts have been included in the data and 'reduction' refers to the full embedded CO<sub>2</sub> value of the glass.

### 1.3 The Different Forms of Refill

The most well known refillable systems for beverage containers in the UK are the doorstep delivery of milk and the take-back systems in operation in the on-trade (pubs, clubs, restaurants, etc) for beer and soft drinks. Such systems follow the same convention whereby the manufacturers / producers are responsible for the collection, transportation, washing and filling of the recovered bottles. There are however a number of other refill systems, and within this study it is intended to investigate not only the traditional systems but also the alternative systems for the refilling of glass beverage containers.

INCPEN splits re-usable packaging into two main categories<sup>4</sup>:

- **In-plant refilling:** containers which undergo a number of return trips between the end user and the factory where the product is filled – examples include refillable milk, beer and soft drinks bottles, bread crates and other crates, drums and pallets; and
- **Home refilling:** packaging which remains with the end-user after first purchase, is used for product storage and is replenished by replacement product supplied in non-re-usable packaging – examples include tea caddies, biscuit tins and containers for detergents and other cleaning products.

<sup>4</sup> European Packaging policy study by Ecolas - Pira – INCPEN comments on reuse – July 2004.

In 2006 Loughborough University analysed refills and classified them with respect to their delivery mechanism and the level and nature of their consumer / business interaction - sixteen different types of refillable packaging were identified<sup>5</sup>:

- Lightweight self-contained refill delivered through dispenser - Customer buys a self-contained refill which they take home and put into their durable dispenser. Applications include wipes, face creams, razors, cosmetics, fabric conditioner & air fresheners.
- Lighter weight refill through part reuse - Customer buys a new bottle of product and reuses the spray pump. Applications include cleaning products.
- Empty packaging refilled in shop - Customer takes the original packaging back to the store for it to be refilled with the same product. Applications include shampoo, conditioner, shower gel, bath products and fabric conditioner.
- Self dispense - Customer takes re-usable container back to the store where they refill it with the same product. Applications include dry goods, personal care products and cosmetics.
- Original packaging swapped for new product - Customer returns empty packaging to a unit where they leave it and pick up a new product. The old packaging is refilled for future use by someone else. Applications include toner cartridges, single use cameras and Calor gas.
- Door to door delivery, packaging replaced - On demand the customer receives full packaging and leaves empty packaging for supplier to collect, when they are finished. Returned packaging is refilled for other customers. Applications include milk bottles and vegetable box system.
- Deposit system - Customer returns empty packaging to supplier for a financial incentive. Applications include soft drinks and beer bottles.
- Top up card - Customer pays for a service which is delivered on the production of the payment card. Applications include downloadable music and payment systems for services such as mobile phones.
- Creation - Customer buys the constituent parts to make the product themselves. They buy refills to allow them to repeat the process. Applications include soft drink makers and orange juicers.
- Door to door delivery, packaging refilled - Customer dispenses quantity required from a delivery van, using special containers and only paying for the quantity taken. Applications include detergent products.
- Refilled with different product - Once original packaging has been used it is refilled with a different product. Applications include toys filled with sweets or durable packaging used to store other products.
- Dispensed concentrate - Customer buys a dispensing unit. They also purchase refills containing concentrated product which are delivered through the dispenser. Applications include coffee machines.
- Dispensed product - Customer buys a dispensing unit. They also purchase refills which are delivered through the dispenser. Applications include personal care products in showers.
- Concentrate mixed in original packaging - Customer buys a concentrated refill which they dilute with water and mix using the old packaging. Applications include laundry products.
- Fill your own packaging - Customers fill their own packaging with product in shop. Applications include the bags for life.
- Bulk purchase - Customer buys in bulk and refills a sampler package at home. Applications include cooking ingredients (such as oil, vinegar, peppercorns) and household cleaning products.

## 1.4 Project Scope

The objectives of this study are:

- to provide a comprehensive reference document on the many refillable glass bottle schemes operating in jurisdictions through out the world – including the UK;
- to provide a detailed analyses on past and current UK schemes; and
- to identify and quantify barriers and opportunities for the wider potential adoption of refillable glass bottles in the UK, referencing in particular the economic and environmental issues.

The study concludes by providing recommendations on the actions that the UK could take if it wished to encourage the uptake of refillable glass beverage containers.

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<sup>5</sup> Lofthouse, V.A. and Bhamra, T.A. (2006) An investigation into consumer perceptions of refills and refillable packaging, Loughborough University, Loughborough.

## 2.0 A world wide review of refillable beverage container systems

### 2.1 Background

Refillable systems for beverage containers can be split into two main categories:

- non-regulatory systems; and
- regulatory systems.

The non-regulatory systems are systems operated by the manufacturers or producers of the beverages, i.e. are industry led systems. The regulatory systems are imposed at state or national level (state imposed systems).

This section discusses these two systems.

### 2.2 Non-regulatory systems

Non-regulatory systems or industry-led refillable glass beverage container systems date back well over 100 years with examples being:

- canadian soft drinks in refillable glass 1820s<sup>6</sup>;
- the UK milk bottle 1880s<sup>7</sup>; and
- the 33cl refillable beer 'Stockholm' bottle used in Sweden 1886<sup>8</sup>.

Historically, the key driver to the adoption of refillable systems was the relatively high cost of glass, which made reuse far more attractive than one way systems. The lack of alternative one-way packaging formats (PET bottles and metal cans) and the local / regional, closed loop nature of the markets ensured high capture rates and contributed to the success of these systems.

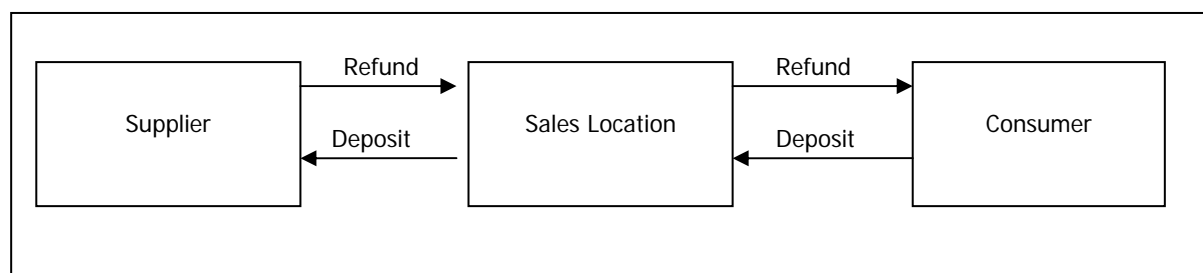
Industry-led systems can be further categorised into three generic systems:

- voluntary deposit systems;
- non-payment 'open' systems; and
- 'discount' systems.

#### 2.2.1 Voluntary deposit systems

The voluntary deposit system is extremely popular, with examples in countries such as the UK, USA, China, India, Pakistan, Mexico, Argentina, Brazil, South Africa, Australia and New Zealand. Figure 2.1 shows how the system works with the deposit being paid at the point of sale of the product and refunds being paid back on the return of the empty containers. The value of the deposit is typically set with respect to the replacement value of the container, and hence the supplier either receives the bottle back for washing and reuse or retains the deposit on which he can pay for a new bottle to be manufactured.

**Figure 2.1.** The schematic of the voluntary deposit system.



<sup>6</sup> <http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0007539>

<sup>7</sup> Vaughan, P., Cook, M. and Trawick, P. (2007), *A Sociology of Re-use: Deconstructing the Milk Bottle*. Sociologia Ruralis, 47:2, 120-134.

<sup>8</sup> <http://www.sverigesbryggerier.se/eng/1-emballage/1-glasflaskor.html>

In the UK voluntary deposit systems have traditionally operated within the on-trade for beer and a combination of on- and off-trade for soft drinks. Very few beer companies still operate such systems, but one example is Refresh UK. Refresh UK currently sell approximately 3,250,000 bottles of their Manns Brown Ale in refillable containers (Figure 2.2).

**Figure 2.2** An example of the Refresh UK refillable Manns bottle.



The refillable system used is one that was commonplace, namely:

- focussed on the on-trade;
- using a standard 'London half pint' container; and
- a deposit of £2.04 per crate of 24 containers (£1 per crate and £1.04 per 24 containers – equivalent to 4.33p per container) is paid by the pub to the brewery at the time of purchase and reimbursed on receipt of the empty containers and crate by the brewery.

One slight change from the traditional system is that the bottles are washed and filled at a contract packer, Holdens of Dudley, rather than being processed in-house.

Refresh UK report<sup>9</sup> that they are struggling to get containers and crates back and have seen trip rates drop from six to 2 or 3 over the past three years. Initially this was not a problem since the additional container stocks acquired from companies moving away from refillables were sufficient to overcome any shortfalls. However, this was a short term fix and Refresh UK must now replenish stocks with new costly bottles. This has led to the need to review the viability of their refillables system.

Soft drinks companies operating such systems in the UK include:

- AG Barr;
- Purity Soft Drinks; and
- Dayla.

<sup>9</sup> David Townsend and Helen Taylor, Refresh UK. Personal communication, February 2008.



### AG Barr

AG Barr sells approximately 24 million 750ml refillable bespoke bottles per year (Figure 2.3), containing branded carbonated soft drinks such as IRN-BRU, Tizer, Orangina and Pepsi. Approximately 95% of sales are in Scotland and AG Barr's focus is predominantly on the off-trade markets: confectioners, tobacconists and newsagents (CTNs), chip shops, etc. A 30p per bottle deposit is paid and it is estimated that trip rates have declined, from pre-1970 when nearly all bottles were recovered; to 15 years ago when bottles were averaging 9 to 10 trips, to current trip rates of 4 or 5. Inspection losses for such systems are high at 3-4%, but the biggest reason for the low trip rates is the difficulty in getting the bottles back.

AG Barr invested in a new refillables production line in 1996 as part of the consolidation exercise merging three factories / production sites into one (Cumbernauld). The new line has a capacity of 24,000 bottles per hour. The weight of the bottle was last changed in 1994, and is 598g. Innovation is provided through the labels, hence the decision to have both a neck and a body label<sup>10</sup>.

**Figure 2.3** An example of the AG Barr refillable bottle.



### Purity Soft Drinks

Purity Soft Drinks offers its Masons Pop in refillable one litre glass bottles. Masons Pop has over 30 different flavours in cordials, squashes and carbonated drinks. The one litre bottles are generic National Association of Soft Drinks Manufacturers (NASDM) bottles. The carbonates and cordials manufactured are mostly supplied to independent wholesalers who either distribute door-to-door or to small retail outlets and to some of the smaller breweries for the on-trade. The deposit is £2.04 per case of 12 bottles (17p per bottle) and the case is deposit free.

Last year sales equated to 6,367,416 one litre refillable glass bottles<sup>11</sup>. Bottles are filled on site, packed in dozens into plastic crates, and the crates are palletised 40 to a pallet. Larger customers will take 24 pallets at a time but smaller customers have the option to take smaller volumes. After consumption, palletised crates of empty bottles are returned by the customers for refilling, and the processing operations comprises of automatic depalletisation of crates, and automatic decrating before washing and refilling. Filled bottles are then capped, labelled, date coded, re-crated and palletised.

It is estimated that current trip rates average around 13 but Purity feel that, given the emphasis on glass recycling and the availability of recycling centres, that figure may be changing rapidly.

<sup>10</sup> Ray Helliwell and Andrew Walkden, *Personal Communication*. February 2008.

<sup>11</sup> Richard Gay, *Purity Soft Drinks*. *Personal Communication* January 2008.

Ardagh Glass, who produce the NASDM bottle, reports that the bottle weighs 715g (some 95g heavier than their equivalent standard one litre Non-refillable Bottles NRB). NASDM bottle sales have dropped significantly over the past five years and are currently at approximately 0.5 million bottles per year<sup>12</sup>. This is close to the minimum run quantity and hence a major threat to the process is the lack of guarantee of the continued availability of new glass. This highlights the decline of the refillable bottle since the NASDM bottle was developed in the 1970s as a collaboration between glass manufacturers and the then soft drinks trade association, since the manufacturers did not want small runs of bespoke bottles<sup>13</sup>.

### Dayla

Dayla, formerly North and Randall, is a regional wholesale drinks company established in 1851, and delivering within a 40 mile radius of its distribution centre in Aylesbury, Buckinghamshire.

Dayla sells its own-brand lemonade in the standard one litre NASDM bottle (Figure 2.4). Trip rates have reduced significantly in recent years due to the growth in non-refillable bottles and the difficulty experienced in segregating the bottles<sup>14</sup>.

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**Figure 2.4** An example of the Dayla refillable 1 litre lemonade bottle.



In New Zealand numerous brewers, including the two large brewers Lions and DB, operate deposit return systems using the Swappa Crate system. The system is administered by Associated Bottling Company, which is jointly owned by Lion and DB, but operated independently. Unlike in the UK where each brewer uses its own bespoke plastic crate, the Swappa Crate is a standard wooden crate (Figure 2.5) used by everybody and operated within a pool. The main advantage of such pooling is that it simplifies the logistics of repositioning the crates within the supply chain, e.g. getting them back to the brewers etc. It is important to note, an alternative system is run by the Green Man Brewery in the South Island, who introduced the Smart Bottle system in 2004.<sup>15</sup> DB Breweries reports that refillables now only account for about 3% of the total New Zealand beer market with non-refillable bottles being the favoured option with focus being placed on maximising recycling rates and suppliers using high recycled cullet rates in new glass<sup>16</sup>.

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<sup>12</sup> Rod Simmonds, Ardagh Glass. *Personal Communication, January 2008.*

<sup>13</sup> Ray Helliwell, AG Barr. *Personal Communication, March 2008.*

<sup>14</sup> Kevin Saw, Dayla. *Personal communication, February 2008.*

<sup>15</sup> Tom Jones, Green Man Brewery, New Zealand. *Personal communication. April 2008.*

<sup>16</sup> John Richardson, DB Breweries, New Zealand. *Personal communication, April 2008.*



**Figure 2.5.** The Swappa Crate system in New Zealand.



In Australia, Swords Select operates a deposit-refund system on their wines. One litre swing-top bottles, Figure 2.6, (even the lid is re-usable) are sold with a \$3 deposit attached, which is either refunded on return of the bottle, or transferred when a new bottle is purchased.

**Figure 2.6.** An example of the Swords refillable wine bottle.



Source: WRAP.

The systems in operation in the UK, Australia, New Zealand and USA have little market penetration. However in other countries, such as South Africa, refillables have a greater national penetration. The South African system merits discussion since it has been in operation for over 60 years. Typically, products are bought and returned by the crate load rather than individually, and Figure 2.7 shows the crate system used in South Africa. Consol, the major glass manufacturer in South Africa reports that it is one of the most efficient refillable glass bottle systems

in the world in the beer and soft drinks industries, where approximately 75% and 45% respectively of the total sales volumes are in refillable glass packs<sup>17</sup>. The wine, spirits and ready-to-drink (RTD) industries also operate refillables but this represents a much smaller proportion of their sales volumes.

**Figure 2.7** An example of the conventional crate system used in South Africa.



Consol report that the South African system was introduced by the manufacturers and is independent of the government, although the manufacturers are legally obligated to payback the deposits. The deposit works in the conventional way incentivising the return of both the bottle and the crate. The refundable deposit rate is usually about 8-15% of the retail price of the filled product, except in the wine and spirit industries where it is very low at about 0.5-1% and therefore very inefficient. Typically a refillable bottle will do about 8-10 trips a year on average and will have a life of 20-30 trips. Losses are often due to bottles being scrapped (sent for recycling) because they are badly scuffed and rejected for visual quality, even though they are otherwise fully functional.

Reasons cited for the success of the South African refillables system include; the high cost of glass, the poor road networks which favour local rather than centralised 'mass-scale' production plants, the 'thrift' culture of the consumer and the lack of market presence of the large retailers who are most likely to favour the use of one-way containers.

Latin America represents a jurisdiction in transition. In countries such as Mexico, Central America and Columbia voluntary deposit systems are still prominent. In such countries the retail market is extremely fragmented, which has helped the traditional refillable schemes to maintain a reasonable market share. For example, in Mexico in 2000, 67% of beverage sales were in the small scale, local, 'mom and pop' type stores where such systems work very effectively (Figure 2.8). Such refillable systems are not however restricted to the small manufacturers or retailers. Cost is a particular driver in such markets and Coca Cola-Femsa, the second largest Coca Cola bottler in the world – located in Mexico, reports that for the Mexican market<sup>18</sup>:

*"Refillable plastic and glass presentations offer consumers a more affordable, albeit less convenient option. On average, a refillable package is priced 18% less than the same size non-refillable package".*

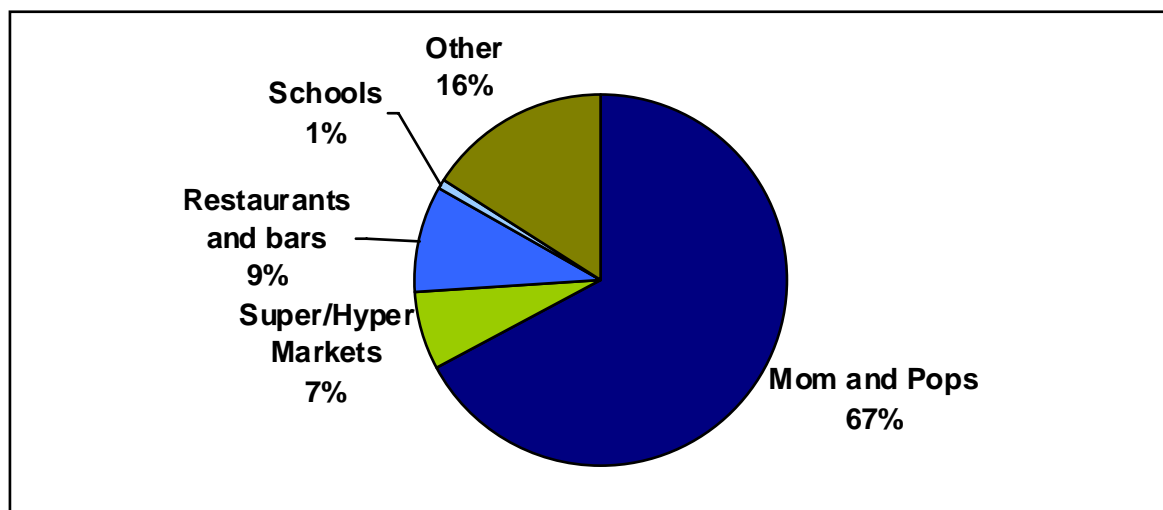
However, Coca Cola–Femsa also report that the use of refillables is a means of protecting market share since;

*"Coca Cola – Femsa plans to use refillable bottles to thwart the entry of 'non-branded' products into its market and to maintain its strong sales in the small grocery stores"*

<sup>17</sup> Bruce Williams, Consol Glass, South Africa. Personal Communication March 2008.

<sup>18</sup> Coca Cola – Femsa Annual Report 2001.

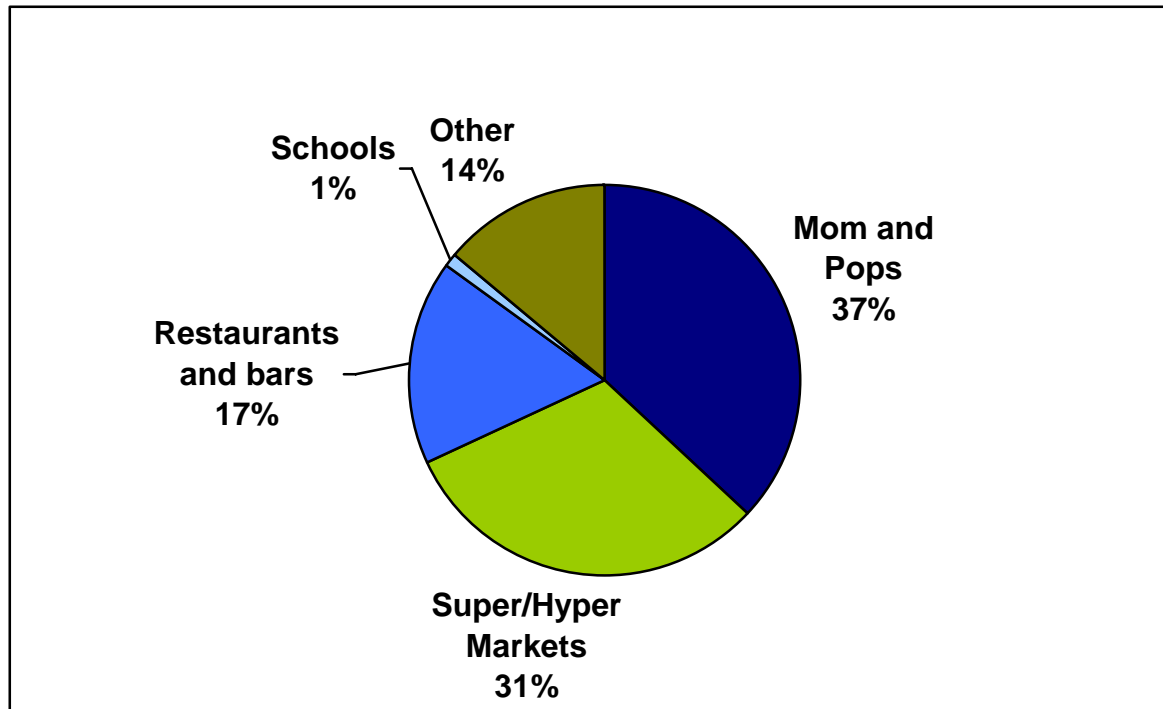
**Figure 2.8** A breakdown of retail sales in Mexico in 2000<sup>19</sup>.



In more affluent areas such as central Buenos Aires (Argentina) the retail mix is more heavily influenced by super/hyper markets which account for 31% of the market (Figure 2.9). In such areas refillables are less prominent and Coca Cola-Femsa report that<sup>20</sup>:

*"within this retail environment, we are focussed on product portfolio strategies and pricing segmentation to compete"*

**Figure 2.9** A breakdown of retail sales in Buenos Aires in 2000.

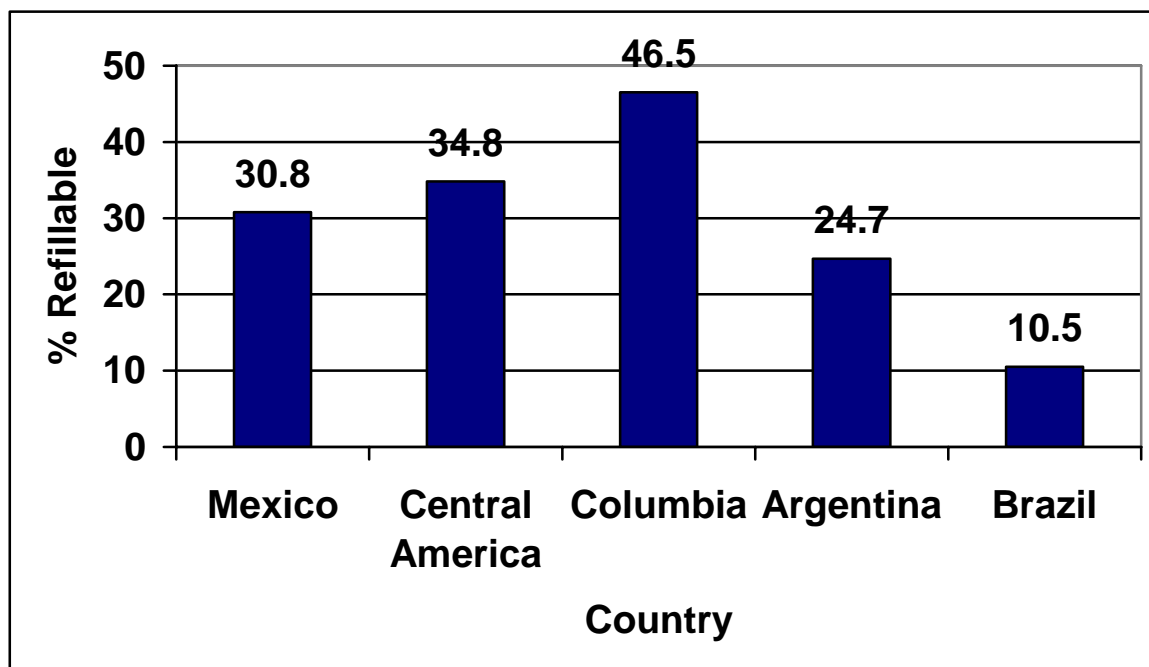


<sup>19</sup> Coca Cola – Femsa Annual Report 2001.

<sup>20</sup> Coca Cola – Femsa Annual Report 2001.

Figure 2.10 shows the break down of Coca Cola-Femsa sales by packaging type in five Latin American countries. This shows the market share held by refillables to range from only 10.5% in Brazil to 46.5% in Columbia. However, although Argentina shows the overall market share in refillables to be 24.7%, within the Buenos Aires territory it is only 9.8%, reflecting the contrasting market structures in the two jurisdictions.

**Figure 2.10** The percentage of beverages sold by Coca Cola-Femsa in refillable bottles within selected Latin American countries in 2000.



One significant reason for the low market share in refillables in Brazil is the growth in one-way PET containers resulting from supermarket chains slowly capturing the retail grocery markets from the traditional stores<sup>21</sup>. In Brazil the market share of refillable bottles fell from 88% in 1990 to just 9% in 2000. This dramatic decline came as PET containers gained popularity, increasing from a market share of 2% in 1990 to 80% in 2000. Table 2.1 shows that in Brazil's carbonated soft drinks market PET container sales grew from just 0.07 billion units in 1990 to 5.4 billion units in 2000.

**Table 2.1** PET bottles sales in Brazil 1990 to 2000<sup>22</sup>.

Year	1990	1995	1999	2000
No of units (billions)	0.07	2.5	5.0	5.4

### 2.2.2 Open systems

The most popular 'open' system is the doorstep delivery of milk. The direct, closed-loop nature of the interaction between supplier and consumer means that no economic incentive is required to encourage the consumer to return the empty containers. NB: the additional cost of milk delivered via the doorstep rather than through a retail outlet in the UK is due to the higher overhead costs and not due to any economic mechanism being in place to encourage the return of the bottle.

<sup>21</sup> Reduce, Reuse, Refill. Institute of Local Self Reliance. April 2002.

<sup>22</sup> Latin America PET 2001. Recent developments in PET applications and where it is likely to go. Graham Wallis, Datamark Brazil.

The acquisition of Express Dairies by Dairy Crest in 2006 made it Britain's biggest delivery service with two million customers and with a market share of approximately 45%. Dairy Crest, like most delivery services, provides more than just milk in their service offering other essentials such as butter, cheese, eggs, fruit juices, yoghurts, cream, bread, mineral water and potatoes, to name but a few.

Dairy Crest reports that the trip rates for their standard bottles vary between 10 and 16. This is dependent on the location of the dairy<sup>23</sup>.

The experience of the USA is similar to that of the UK where a shift from home delivery to retail sales occurred. When supermarkets took the distribution of milk away from home delivery, they forced the use of one-way containers by packaging their own-brand milk in cartons and by refusing to accept milk from other companies in refillable bottles<sup>24</sup>.

Some doorstep deliveries do still occur, such as the Oberweis Dairy of North Aurora, Illinois, which delivers milk to both homes and stores in half-gallon refillable glass bottles. Home deliveries are placed in an insulated box, which is purchased on first delivery. This maintains the vitamin content of the milk by protecting against sunlight and ensures the products are kept fresh. Marcus Dairy of Danbury, Connecticut has around 2,000 customers and also uses the half-gallon refillable glass bottle.

The doorstep delivery system for milk is discussed in detail in Section 3.

Many milk companies provide orange juice in refillable (milk) bottles (Figure 2.11) although volumes are quite modest, estimated at 2% of overall refillable bottle sales. Dairy Crest reports that annual sales of orange juice and flavoured milk equates to 2.5 million gallons<sup>25</sup>.

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**Figure 2.11** An example of the home delivery orange juice in refillable 'milk' bottles.



Other such closed-loop 'open' systems include the system operated by the UK's Samuel Smith for bottled beer, cider and soft drinks. Samuel Smith has maintained its vertical integration (ownership of both brewery and pubs), with an in-house refillable bottling facility and ownership of 204 pubs. Unlike the Refresh UK system, Samuel Smith uses bespoke bottles (Figure 2.12 and Figure 2.13) with no deposit return system. This is possible due to the closed loop nature of the system resulting in 'leakage' rates from the system being very modest.

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<sup>23</sup> Stuart Goldsmith, Dairy Crest. Personal Communication. February 2008.

<sup>24</sup> Case Reopened: Reassessing Refillable Bottles. David Saphire. New York: INFORM. 1994.

<sup>25</sup> Stuart Goldsmith



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**Figure 2.12** An example of the Samuel Smith refillable glass bottles.



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**Figure 2.13** An example of the refillable soft drinks bottles used by Sam Smith.



An additional company using refillables is Nectar. Nectar has been supplying drinks to businesses around the UK for over twenty years, ranging from soft drinks to beers and unusual foreign liqueurs. These drinks are sourced from all over the globe, including European countries with container deposit legislation in place.

Whilst some of the products Nectar distributes are imported by third parties, a large number are collected from source by Nectar direct, using their own network of trucks. Last year 32,000 cases (24 bottles per case) of beer in refillable containers were purchased in Belgium and 3,000 cases (20 bottles per case) were purchased from Germany. As part of this system, Nectar returns the refillable bottles and kegs back to the country of origin. This therefore provides an unusual example where refillable bottles consumed in the UK are reprocessed abroad using their reprocessing infrastructure.

EcoPure Waters have developed a 'local' closed loop system utilizing the availability of water 'on tap'. Such systems are unique to water since they can be classified as 'home refilling' systems.

EcoPure Waters (Classic Crystal range) provide on-site purification and bottling systems to clients such as:

- Government (OFCOM, Dept of Communities and Local Government, National Assembly of Wales, etc);
- Hotel groups (Best Western, Radisson Edwardian Hotels, Whitbread Group, etc);
- Restaurants (Strada, Rainforest Café, etc);
- Private estates (Castle Leslie, Chatsworth House, Doddington Hall, etc);
- Corporate offices (Scottish Widows, The Law Society, Institute of Directors, etc); and
- Health / Medical (The Royal Society of Medicine, BMI Hospitals, etc).

EcoPure Waters designs and supplies carbonated or still water filtration systems for business use in refillable glass bottles (Figure 2.14). The filtered water (from mains, borehole or spring water) is manually filled into personalised re-usable glass bottles (Figure 2.15), which comes in a range of three sizes (200ml, 500ml and one litre). The company claims that the drinking water produced has the highest purity and matches the taste of the finest bottled water; the system also cuts costs by up to 80% compared with bought-in water<sup>26</sup>. Once empty the bottles are washed in conventional commercial dishwashers, ready for reuse. Therefore filling, consumption and washing all take place on the same premises.

**Figure 2.14.** An example of the EcoPure Waters refillable bottles.



Source: EcoPure Waters

<sup>26</sup> [www.ecopurewaters.com](http://www.ecopurewaters.com)

**Figure 2.15** An example of the refilling of the EcoPure re-usable bottles.



EcoPure estimate that the annual consumption of water by their customers is currently 6.5 million litres. Given that customers' bottle usage is virtually a 50/50 split between one litre and half litre bottles, this equates to 3.25 million one litre bottles and 6.5 million half litre bottles that are not transported annually. Due to the nature of the process, trip rates for the bottles are very high with some customers obtaining trip rates of over 50<sup>27</sup>.

EcoPure report that:

*"The EcoPure purification system adds just 3% to the carbon impact of tap water and that makes it 580 times less environmentally damaging than most branded bottled water"*

A system operated in New Zealand is interesting in that it was operated through a third party rather than an incumbent of the existing forward supply chain. In 2005, Terranova, a waste management company in Christchurch, trialled the collection of wine bottles which they washed, de-labelled and sorted by type for return to the bottling plants in crates (Figure 2.16). Unfortunately, they struggled to make the process economic. They developed their own washing operation, but removing the labels proved difficult due to the different glues. It took a long time to fill a crate of a particular bottle type and transport costs back to the bottling plant were high, and the manufacturers regularly changed the bottle design<sup>28</sup>. The scheme was abandoned in 2006 due to declining take-up of the bottles from the bottling plants.

<sup>27</sup> Paul Proctor, EcoPure, Personal Communication, March 2008.

<sup>28</sup> Colin Murchison, Caledonian Environment Centre, Personal Communication, March 2008.



**Figure 2.16** An example of the crate systems used by Terranova in New Zealand.



Source: Caledonian Environment Centre.

Specialist shops such as Unpackaged in London also operate open systems selling olive oil and vinegars from 25litre drums into 50cl and 25cl glass bottles or bottles that people bring back for refill. The intention will be to assess the viability of refillable beverage containers once the shop is established, since it has only been operating for 6 months<sup>29</sup>.

### 2.2.3 The discount system

The typical 'discount' system involves consumers receiving a discount if they use their own containers or return containers for refilling. Where customers provide their own containers the filling of the containers is undertaken in-house. Many micro-breweries in the UK and small vineyards on the continent offer such a service although plastic containers are the most common packaging format.

Rewine, a Melbourne-based company, sells wine in refillable bottles then either delivers refill containers holding at least 4.5 litres directly to customers' houses, or sell from a retail store in Melbourne centre where customers can either buy new bottles or get their own washed bottle refilled at a discounted rate.

## 2.3 Regulatory Systems

Regulatory or State systems on beverage containers can be split into five main categories<sup>30</sup>:

- deposit laws;
- eco-taxes;
- quotas;
- bans; and
- agreements.

Appendix 1 shows a summary of the countries or regions operating each system; each system is discussed in detail below.

<sup>29</sup> Catherine Conway. *Unpackaged*. Personal Communication. April 2008

<sup>30</sup> Brenda Platt and Doug Rowe, *Reduce, Re-use, Refill!* (Washington DC: Institute for local self reliance, April 2002), produced under a joint project with the GrassRoots Recycling Network.

### 2.3.1 Deposit laws

Deposit laws or deposit refund systems (DRSs) are similar to the voluntary deposit systems. The key difference is that, unlike the voluntary deposit schemes operated by industry, the level of deposit is set by Government and does not necessarily reflect the replacement cost of the container. The value of the deposit is typically low in systems focussed on cleanliness or litter reduction, such as in the 10 State systems operating in the USA, since capture rates of 80% are considered reasonable. However, in schemes focussed on reuse, such as in Germany and Denmark, the deposits are much higher reflecting the need for high capture rates to ensure the economic viability of recovery.

Many of the deposit laws do not focus on encouraging reuse and there are three main reasons for implementing such a system:

- to improve cleanliness and reduce litter<sup>31</sup>;
- to reduce waste quantities and landfill volume; and
- to encourage recycling and reuse of beverage containers.

A representative example of a deposit law on refillables is operated in Denmark. The Danish deposit and return system combines the recovery of one-way containers for recycling with the recovery of refillable containers for reuse. Similar systems are in operation in Germany, Ontario and Quebec. Applying a deposit to both refillable and one-way containers ensures that the deposit does not unduly favour one packaging format over another.

In assessing the effectiveness of state-imposed deposit law, a European Commission report in 2005 stressed that<sup>32</sup>:

*"Users of refillable systems say that the deposit systems for single-trip packaging are highly effective to support refillable systems. In cases where reusable and single trip packaging both bear deposits, proponents say that this gives equal footing to both packaging types since both face deposits and both achieve high recovery and recycling rates".*

Between 1982 and 2002 Denmark operated a ban on aluminium cans: however this was deemed to violate European Union Law and on 4<sup>th</sup> September 2002 the Danish deposit and return system was made statutory for beer and certain soft drinks. This was subsequently extended to include alco-pops, energy drinks and cider products on 16<sup>th</sup> March 2005, and it is proposed that mineral water will be included in 2008.

Figure 2.17 shows the deposit flow with Dansk Retursystem, a not-for-profit organisation, being responsible for overseeing operations including ensuring that grocery stores receive their handling fee and that importers, producers and stores receive the refund of deposits for one-way containers.

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<sup>31</sup> The Campaign to Protect Rural England (CPRE) is currently campaigning for redeemable deposits on every drinks container sold in the UK to minimise litter. The Minister of Waste (Joan Ruddock) has asked officials to look at "novel ways on how we can deal with the worst litter offenders, which are bottles and cans". Source: Timesonline April 16 2008. Joan Ruddock may bring back deposit charges for bottles.

<sup>32</sup> Study on the Implementation of Directive 94/62/EC on Packaging and Packaging Waste and Options to Strengthen Prevention and Re-use of Packaging. Pira and Ecolas, Final Report 21 February 2005.

**Figure 2.17** The deposit flow in the Danish deposit and return system.

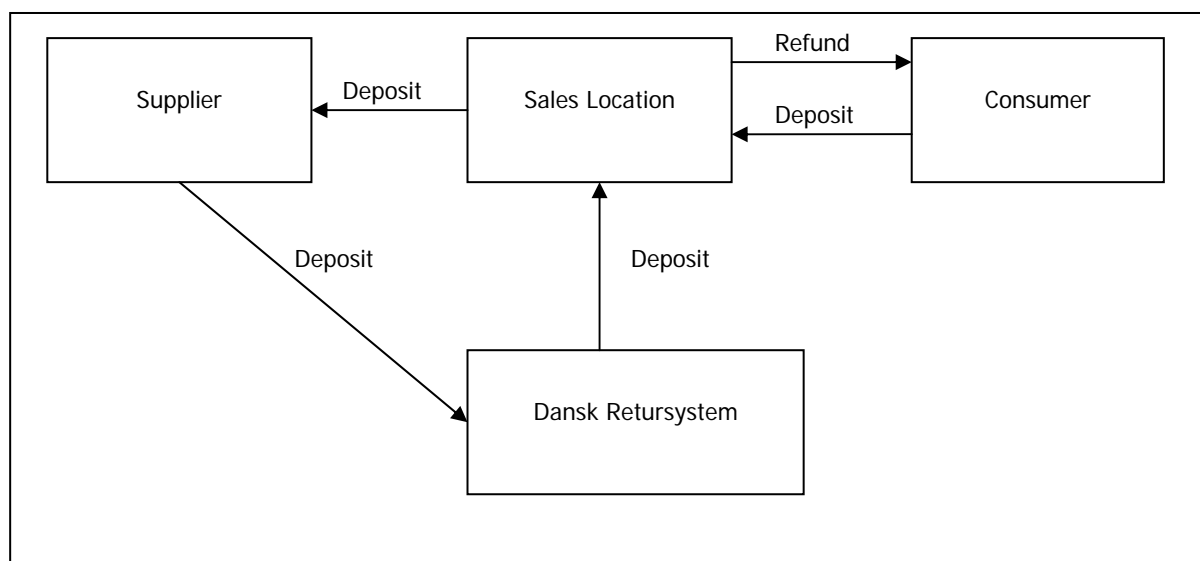


Table 2.2 shows the refundable deposits in the Danish system. In 2006, 86% of one-way containers were returned, as were close to 100% of refillable bottles. Refillables had a 68% market share in 2007 a drop of 9% on 2006 (77%). The Danish Brewers Association reports that<sup>33</sup>:

*"The reason for this high share for refillable is primarily that the can ban was lifted only 5 years ago in 2002. However the share of one-way packaging has risen from 2% to now approx 10% and will grow rapidly in the coming years until a 'natural' balance between refillable bottles and one-way packaging has developed".*

**Table 2.2** The Danish deposit and return system refundable deposits.

Refillable Bottles		Deposit
Glass bottles up to and including 0.5 litre		DKK 1.00
Glass bottles over 0.5 litre		DKK 3.00
Plastic bottles under 1 litre		DKK 1.00
Plastic bottle of 0.5 litre		DKK 1.50
Plastic bottles of 1 litre and over		DKK 3.00
One-way packaging		Deposit
Type A	Cans, glass and plastic bottles under 1 litre	DKK 1.00
Type B	Plastic bottles of 0.5 litre	DKK 1.50
Type C	Cans, glass and plastic bottles of 1 litre and over	DKK 3.00

Source: [www.dansk-retursystem.dk/](http://www.dansk-retursystem.dk/)

One sensitivity that any state system in Europe needs to take into consideration is the issue of free trade. The OECD reports that deposit-refund systems will create barriers to trade<sup>34</sup>:

- if the initial deposits are high compared to the value of the goods;
- if foreign producers see that the costs of participating in a co-operative retrieval and recycling scheme are out of proportion to their market share;
- if non-refillable containers are an important condition for the competitiveness of imports;
- if they are applied only to certain types of containers or packaging which are primarily used for imported products; or
- if they are applied in a fashion which is discriminatory or which unduly favours domestic products.

<sup>33</sup> Knud Loftlund, Danish Brewers Association. Personal Communication, March 2008.

<sup>34</sup> OECD. Applying economic instruments to packaging waste: practical issues for product charges and deposit refund systems 1993.

### 2.3.2 Eco-taxes

Much like deposit laws, eco-taxes can be split into three categories according to their intended function:

- to help finance waste management (internalising the externalities associated with disposal of one-way beverage containers);
- an incentive tax, e.g. taxes on one-way containers to incentivise the use of refillables; and
- a revenue raising tax.

Belgium is held by many as the land of the eco-tax. The aim of the original Belgian eco-tax on drinks containers was to promote the use of refillable containers, on the understanding that refillable containers are better for the environment than the disposable alternatives. The revenue recipient is the national government through the tax and customs administration. There is no earmarking of revenue, nor are there any mechanisms for refunds<sup>35</sup>.

The Belgian eco-tax on drinks dates back to 16 July 1993, when the Belgian Government passed a series of eco-taxes (Ecoboni Law) in order to redirect consumer buying patterns away from materials considered to be environmentally damaging. Drinks packaging was originally exempt from the tax as long as strict recycling targets (quotas) were met by industry through its Green Dot scheme (20% of containers recycled in 1996, to rise to 70% in 2000). Unfortunately, the recycling rate was 63% in 2000<sup>36</sup> and hence the non-refillable drinks packaging charge of €9.85/hl of product packed in individual containers was implemented on 1<sup>st</sup> April 2004. Refillables were exempt from the tax on the proviso that the containers could be, and were actually being, reused at least seven times.

However in January 2007 the Belgian Court of Arbitration ruled that the exemption on refillable containers was discriminatory in the light of the high recycling rate being achieved for non-refillables, and that it discriminated against imported drinks shipped long distances in non-refillable containers. The 'exempt' status of refillables was annulled and on 10 April 2007 it was replaced by a tax by which containers reused seven times are taxed at a rate one-seventh that of non-refillables, i.e. €1.41/hl of product packed in individual containers for refillable containers and €9.89/hl of product packed in individual containers for non-refillables<sup>37</sup>.

Eco-taxes that favour one packaging format over another have been challenged. For example, the European Packaging Federation, EUROPEN, sees the Finnish tax as potentially a barrier to trade. The evidence that they use to support the assertion relates to the relative level of imports of beer and carbonated drinks in Finland compared to other European Countries. EUROPEN suggest that in countries like Denmark, Finland and Norway, refillable bottles account for 96%-100% of the market for both beer and carbonated soft drinks. Imported beverages represent less than 1% of the Danish market and no more than 2% in Finland and Norway. Across Western Europe as a whole, 57% of beer volumes and 39% of carbonates volumes are packed in refillables, and imports average 7%<sup>38</sup>.

In addition, the European Commission has moved to the second stage of infringement proceedings against packaging taxes in Hungary by issuing a 'reasoned opinion' formally requesting Hungary to amend its legislation (Reference Case No 2005/4209)<sup>39</sup>.

It is important to note that the Institute for Public Policy Research and the Green Alliance recommended the introduction of an eco-tax on environmentally damaging or hard-to-recycle products such as beverage cartons<sup>40</sup>. The report states that these cartons are:

*"Made of layers of cardboard, plastic and sometimes metal foil, they are highly functional but are at present difficult to collect and recycle along with other more simply constructed materials – less than 10 per cent are recycled in the UK"*

<sup>35</sup> *Good product, bad product? Making the case for product levies. Green Alliance 2008.*

<sup>36</sup> [http://www.assurre.eu/uploads/documents/pub-36\\_en-bb63a048-e44e-43b0-abde-0ef9954138fe.pdf](http://www.assurre.eu/uploads/documents/pub-36_en-bb63a048-e44e-43b0-abde-0ef9954138fe.pdf)

<sup>37</sup> *Lambert De Wijngaert, Belgium Brewers, Personal Communication, February 2008.*

<sup>38</sup> *Study on Environmental Taxes and Charges in the EU. Final Report CH12: packaging. ECOTEC in association with CESAM, CLM, University of Gothenburg, UCD and IEEP (CR).*

<sup>39</sup> *Europen Press Release 06/07/2007.*

<sup>40</sup> *A zero waste UK. IPPR and Green Alliance. November 2006.*

INCPEN, the Industry Council for Packaging and the Environment, said that cartons could be recycled but the infrastructure in the UK to enable collection had been “largely absent”<sup>41</sup>.

### 2.3.3 Quotas

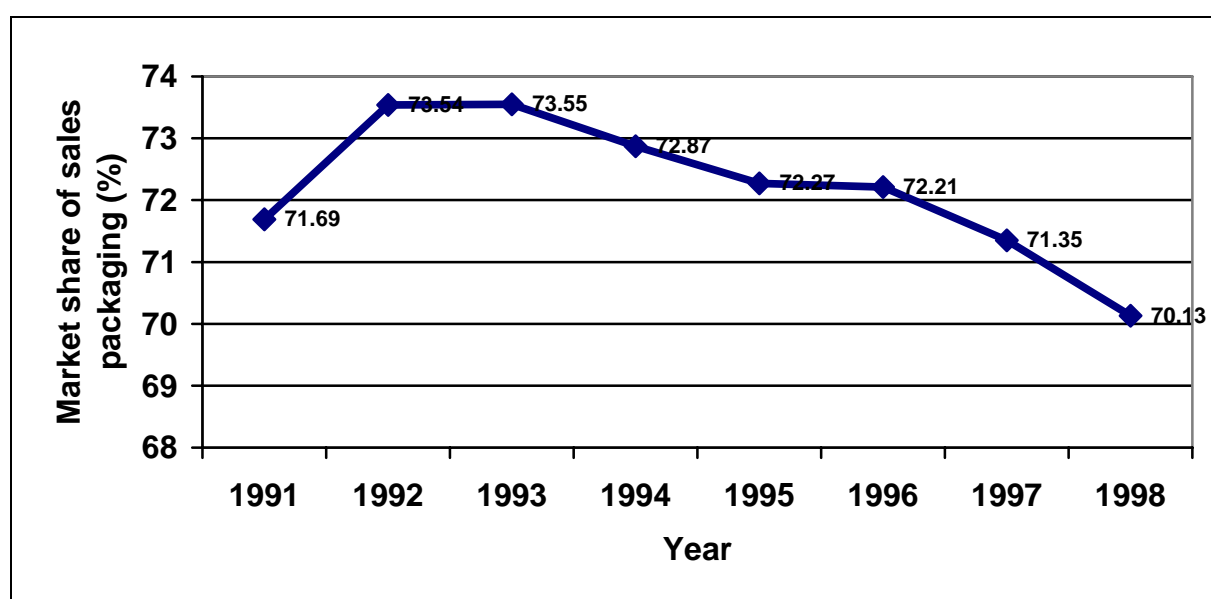
In the context of refillables, quota systems require that an entire industry or individual company package or sell a specified percentage of the packaged volume in refillable containers.

Germany has a long tradition of using refillables and, much like the UK, some beverages (beers, soft drinks, etc) were packed only in refillables via a voluntary deposit and return system (DRS). The objective of the quota was to provide the manufacturers with an incentive to keep refillables above 72%, since Germany had witnessed a decline in the market share of refillables in the light of increased demand for one-way cans and PET. Quota systems have been cited as being effective in stopping the decline in refillable systems rather than in increasing their market share<sup>42</sup>. Unfortunately, one of the disadvantages is that they provide no incentive for the consumers, retailers or bottlers.

The German quota system was introduced in 1991 as part of the German Packaging Ordinance<sup>43</sup>, and as amended in 1998. This stipulated that, if the overall recycling targets for sales packaging were not achieved and if the national market share of refillable containers fell below 72%, then a regulatory deposit would be imposed on non-refillable containers of any material in the drinks categories whose market share fell below its level in 1991<sup>44</sup>.

Figure 2.18 shows that the introduction of the quota in 1991 initially had the desired effect with a near 2% increase in market share for refillables in 1992. However, from 1993 market share began slowly to decline and in 1997 and 1998 it had dropped below the 72% quota.

**Figure 2.18** Market share of refillables in Germany 1991 to 1998.



Source: TOMRA.

Figure 2.19 shows the breakdown of the product-specific quotas in 1999. This shows that it was water and beer, the two products with the highest quotas, that most underperformed with respect to their quotas and hence were the two top candidates for inclusion in the regulatory deposit system.

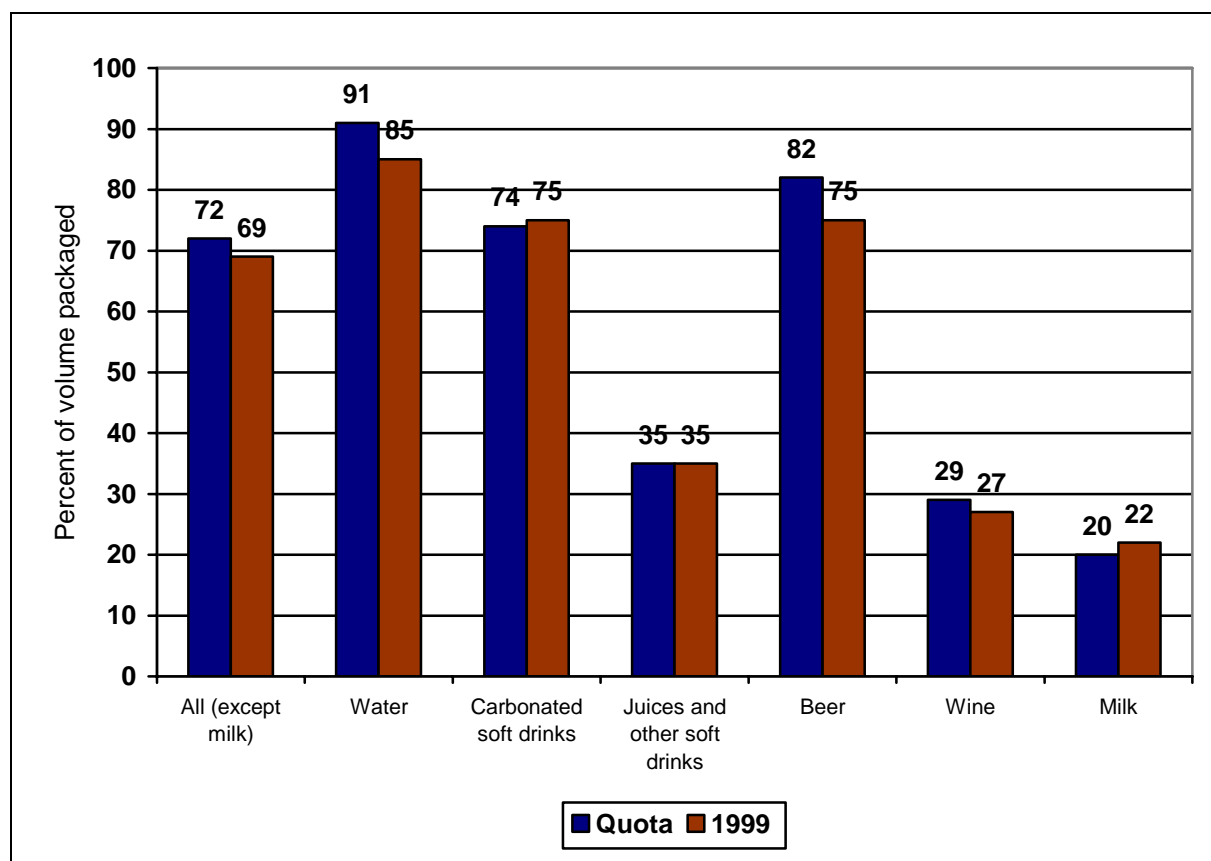
<sup>41</sup> [www.packagingnews.co.uk](http://www.packagingnews.co.uk) Tax idea “poorly thought through” 01 December 2006.

<sup>42</sup> Brenda Platt and Doug Rowe, *Reduce, Re-use, Refill!* (Washington DC: Institute for local self reliance, April 2002), produced under a joint project with the GrassRoots Recycling Network.

<sup>43</sup> Verordnung über die Vermeidung und Verwertung von Verpackungsabfällen – Verpackungsverordnung

<sup>44</sup> Perchards (2007). Study on factual implementation of a national take-back system in Germany

**Figure 2.19.** Refillable beverage containers in Germany in 1999.



Source: Reduce, Reuse, Refill. Institute for Local Self Reliance, April 2002.

After much deliberation, a regulatory deposit scheme was introduced in January 2003. Table 2.3 shows the impact this has had on the market share of refillables. This shows that for the two products that were traditionally produced in refillable bottles (beer and soft drinks) the market share of refillables has increased significantly but in the bottled water sector the regulatory deposit has had no effect in halting the decline of the market share of refillables.

**Table 2.3** Market share of refillables in Germany 2002 and 2005.

Product	Included or exempt from deposit	Refillable market share (%)		Difference between 2002 and 2005 (%)
		Dec 2002	2005	
Beer	Included	69%	87%	+18%
Soft drinks	Included	48%	55%	+7%
Water	Included	66%	53%	-13%
Juice	excluded	18%	11%	-7%

### 2.3.4 Bans

Very few jurisdictions operate outright bans on specific packaging formats, with the Danish can ban (1982 to 2002) being the most high-profile example in Europe. Prince Edward Island (Canada) is the other high-profile case. In 1968 only 20% of the beverages sold on Prince Edward Island (PEI) were in cans or other one-way containers. By 1973 this had increased to 60% causing a roadside litter problem<sup>45</sup>. As a result PEI introduced the litter control regulations (1973) requiring that all beer be sold in refillable containers. In 1977 the ban was extended to include soft drinks bottles and in 1984 the regulations were expanded to include cans. Annually

<sup>45</sup> <http://www.gov.pe.ca/infopei/index.php3?number=43696>

17 million soft drinks and 24 million bottles of beer are sold in refillable containers and PEI consistently shows a return rate on refillables of 98%; the highest in North America.

However, the PEI Premier, Pat Binns, reported in April 2007 that the ban would be lifted, stressing that the regulations had a positive environmental impact for many years but had become less effective with changes in the marketplace. To quote the Premier<sup>46</sup>:

*"In recent years, we have seen rapid growth in the number of non-carbonated drinks such as water, juices and sports drinks available in cans and plastic bottles. As a result, we can no longer prohibit certain beverages from being sold in cans and bottles while millions of cans and plastic bottles of these other drinks are sold."*

To replace the ban, PEI have implemented a DRS similar to that in New Brunswick and Nova Scotia where consumers pay a 10 cent deposit on non-refillable containers such as cans and plastic bottles and receive five cents back when they return the empty container. This type of deposit law is called the half-back deposit system. The objective of the DRS is to raise new funding that Government will invest in environmental projects (priority areas are watershed planning and management and litter prevention).

In addition to the DRS, a quota system is also to be introduced as a means of supporting the existing refillables systems. The quota represents a 50/50 split between refillable and recyclable containers.

### 2.3.5 Agreements

The Netherlands is the one jurisdiction that has operated voluntary agreements between government and industry with the intention of preserving its refillable systems for beverages. Between 1991 and 2005, packaging policy was agreed through covenants and the companies which signed up to a covenant organisation were exempt from the regulations of the Dutch Packaging Ordinance<sup>47</sup>.

The first covenant was signed in 1991, before the European Packaging Directive came into force. After the implementation of the European legislation the government and industry revised the covenant and Packaging Covenant II was signed in 1997. The aim of this covenant was to preserve refilling by preventing beverage producers and importers from substituting refillable bottles with one-way containers unless it could be proved that they had no additional impact on the environment. Over 250,000 companies signed up to this covenant and it was reported that<sup>48</sup>:

*"thanks to the combined efforts of the private sector, this unique pact achieved some excellent environmental results which exceeded the norms specified by EU legislation"*

In 2002 the Packaging Covenant III was signed maintaining the ruling on the substitution of refillables by one-way containers, but placing greater emphasis (than the previous covenant) on minimising litter. This was superseded in 2006 by the Packaging, Paper and Cardboard Decree. The Decree dropped the rules on re-usability due to developments in packaging that had taken place in the market, e.g. the growth in PET bottles, and problems with the EC on re-usability. In the development of the Decree it was stressed that<sup>49</sup>:

*"alternatives for 2006 and further have to be EU-proof and with no more negative effects for the environment than would have been the case with keeping reusable bottles"*

In light of this the Decree states that<sup>50</sup>:

*"The [EU] packaging directive explicitly offers Member States the opportunity to promote product reuse. A system of deposits for drinks packaging, combined with compulsory multi-use, were implemented by the*

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<sup>46</sup> <http://www.governmentofpei.ca/news/getrelease.php3?number=5154>

<sup>47</sup> Implementation of packaging directive, prevention and reuse (Annex 17) – Ecolas – PIRA 03/07884. European Commission.

<sup>48</sup> Summary Packaging Covenant III. SVM.PACT 2007.

<sup>49</sup> What is next after the covenant: packaging policy in the Netherlands in 2006 and years to come. Kees Clement. Annual Conference European Packaging Law 2006. 15 March 2006.

<sup>50</sup> Decree of 24 March 2005, laying down regulations for packaging, packaging waste, paper and card (Packagings, Paper and Card (Management) Decree). Netherlands Bulletin of Acts and Decrees. Series 2005.



*Netherlands in compliance with this opportunity. As in a number of other Member States, refillable packagings and deposits have been used in the Netherlands for many years.*

*The compulsory introduction of multi-use packagings clashes however with the principle of the free traffic of goods within the European Union. This obligation has therefore not been adopted in this decree. In order to ensure that the benefits to the environment achieved with multi-use plastic drinks packagings are retained when switching to single-use systems, an investigation has been carried into whether the separate collection of small bottles and using the recycled material from these bottles in the production of new bottles can lead to the same environmental benefits. The research proved that this was indeed possible, provided that at least 95% of large bottles are collected separately, at least 55% of small bottles are collected and subject to the condition that plastic bottles are made from at least 25% recycled, separately collected bottles. The basic assumptions stated above in relation to separate collection and reprocessing have been included in this decree. The commercial sector has indicated its willingness to voluntarily also use 25% recycled material in the production of new bottles, so that in combination with the above-mentioned percentages of separate collection and re-processing, the same environmental benefits are achieved as with re-useable bottles”.*

Drawing upon this research Article 4 of the Decree states:

*“The producer or importer shall ensure that, each calendar year, of the total quantity of packagings he has made available to another party in the Netherlands during the previous calendar year and of the packagings he has introduced and disposed of during that calendar year:*

- 1. of the plastic drinks packagings with a capacity of more than 5 decilitres, at least 95% is collected separately and reused as a material;*
- 2. of the plastic drinks packagings with a capacity of less than 5 decilitres, at least 55% is collected separately and reused as a material;*
- 3. of the remaining plastic packagings with a capacity of less than 5 decilitres, at least 27 percent by weight will be reused as a material;*
- 4. of the other material type, at least the following percentages by weight will be put to good use through their reuse as materials:*
  - o 90 percent by weight of glass packagings,*
  - o 75 percent by weight of paper and card packagings,*
  - o 85 percent by weight of metal packagings.”*

Furthermore, the Netherlands Government has recently announced that it would be introducing a carbon-based packaging tax aimed at reducing carbon emissions related to the use of packaging, the first of its kind in the EU. The tax is likely to be based on a calculation of CO<sub>2</sub> emissions from the production of each kilogram of packaging material put into the Dutch market and the embedded carbon content of the packaging. Details of how the tax will be apportioned between each material have yet to be announced<sup>51</sup>.

In terms of the market share of refillable glass containers resulting from the voluntary agreement, it was reported that for beer refillable glass represented 50% of total sales and one-trip glass containers only 15% in 2006<sup>52</sup>. However, as in most other countries, soft drinks are dominated by PET. In 2006 refillable glass accounted for 4.1% of soft drinks and one-way glass 0.01%<sup>53</sup>. Refillable PET bottles were introduced in the Netherlands in 1989, and became one of the most popular formats of soft drinks container. Within just six months, they held 17% of the market share, with an average trip rate of 20.

New formats are still being developed however, and a plastic-coated glass bottle has been designed which is expected to have a trip rate of 40. However, the plastic causes a problem of contamination, rendering the bottle unsuitable for recycling at end of life.

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<sup>51</sup> *Good product, bad product? Making the case for product levies. Green Alliance 2008.*

<sup>52</sup> *Jouke Schar (BBM), Personal communication, February 2008.*

<sup>53</sup> *Jouke Schar (BBM), private communication. March 2008.*



## 2.4 Section Discussion and Conclusion

This section describes eight alternative refillable systems; three industry-led systems and five state-imposed systems. The three industry-led systems work best, in terms of the potential market penetration of refillables, in developing markets where the fragmented nature of production, distribution and retailing inhibits the development of high volume, low cost centralised one-way bottling plants, the associated distribution networks and large retail outlets. In such markets, refillables can compete on price against the smaller scale one-way systems.

In addition - and more importantly from a UK perspective - voluntary systems can operate in niche markets within developed countries, and this section has described a number of traditional schemes (doorstep delivery of milk, etc) and more innovative systems that can operate in markets dominated by one-way systems. Such systems are driven by individual businesses.

However, if wide-scale adoption of refillables is considered in the UK, then a state-imposed system could be the better alternative. A key issue in Europe is the need to maintain free trade and not to inadvertently favour local businesses at the expense of importers. As Denmark experienced, the use of bans is difficult to implement without contravention of free trade laws, and the lifting of the ban in Prince Edward Island (Canada) demonstrates that it is difficult to maintain such a ban even in jurisdictions where free trade laws are less exacting. The voluntary agreements in the Netherlands were successful in the promotion of refillables but eventually it was considered appropriate to switch to a system encouraging both reuse and the recycling of one-way containers. The Courtauld Commitment is evidence that UK retailers and brands are willing to sign up to voluntary agreements. However, this is a long way from the 250,000 businesses signed up to the covenants in the Netherlands, and evidence as to the benefits of refillables is still needed in order for companies to justify the signing of such agreements.

Quota systems face the same barriers as voluntary agreements in that the evidence base is required to justify a need to take action. In addition, such systems focus on producers and since the retailers are so powerful in the UK it is likely that this would not deliver the desired outcomes.

Eco-taxes and deposit laws are the two most popular state systems and the format of such systems takes numerous forms. From the UK perspective the proposed eco-tax in the Netherlands is most interesting since it attempts to align the value of the tax with the environmental burden of the packaging. This system is in the early stages of development and hence it would be advantageous to monitor its progress.

In terms of deposit laws a non-differentiated deposit of similar value applied to both refillables and one-way containers is considered most appropriate since it does not differentiate between the two formats and hence does not contravene free trade. Such a system would overlap with the current PRN system in operation in the UK and hence a viability analysis would be required to determine whether this could supersede the existing systems. A similar eco-tax could be adopted with the revenue generated being ring fenced, e.g. used to fund innovation in packaging.

To conclude, this section has identified a number of possible refillable systems that could be considered if the UK adopted a more widespread approach for the use of refillables. However, further work is required to better understand the UK market and to investigate the environmental and economic viability of such systems. This is discussed in Sections 3 and 4 of this report.

### 3.0 A review of refillable glass beverage container systems in the UK

#### 3.1 Background

To date, the UK Government has opted against introducing statutory policies on beverage containers to encourage reuse. Instead the refillable glass beverage container systems in place are driven predominantly by manufacturers and producers, i.e. industry led systems.

This section reviews four main product categories within the beverage container market:

- beer;
- soft drinks;
- milk; and
- wine.

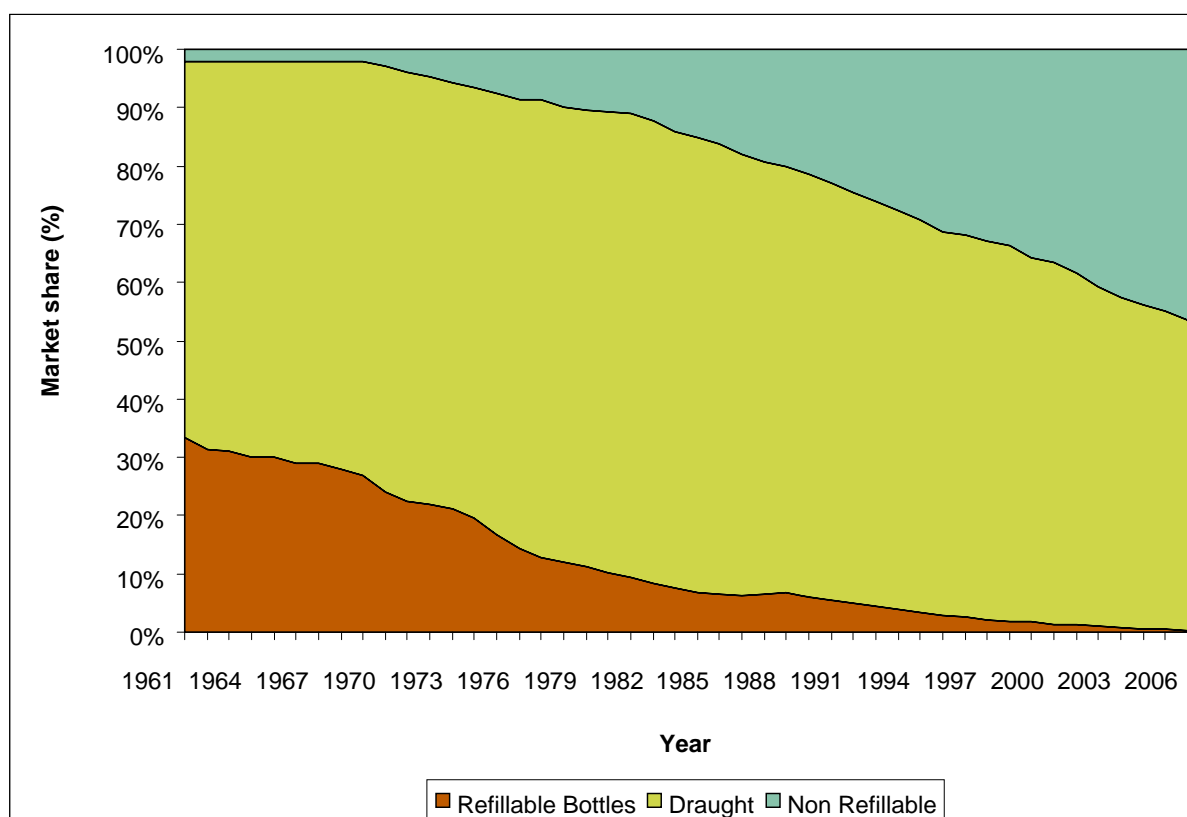
The first three have historically been packaged in refillable glass containers and the fourth (wine) is a growth market where non-refillable bottles (NRBs) currently dominate.

#### 3.2 Beer

##### 3.2.1 Introduction

In 1961, 98% of total beer sold in the UK was in refillable containers with refillable casks and kegs accounting for 65% and refillable glass bottles 33% (Figure 3.1). However in 2006 the market share of refillable casks and kegs had dropped to 53% and refillable glass containers to just 0.3%. In complete contrast non-refillables increased from 2% in 1961 to 46.7% in 2006.

**Figure 3.1** Market share by packaging type in the beer sector from 1961 to 2006.



Source: BBPA – Statistics Handbook 2007.

The following section explores the reasons behind the decline in refillable beer bottles.

### 3.2.2 The decline in refillable beer bottles

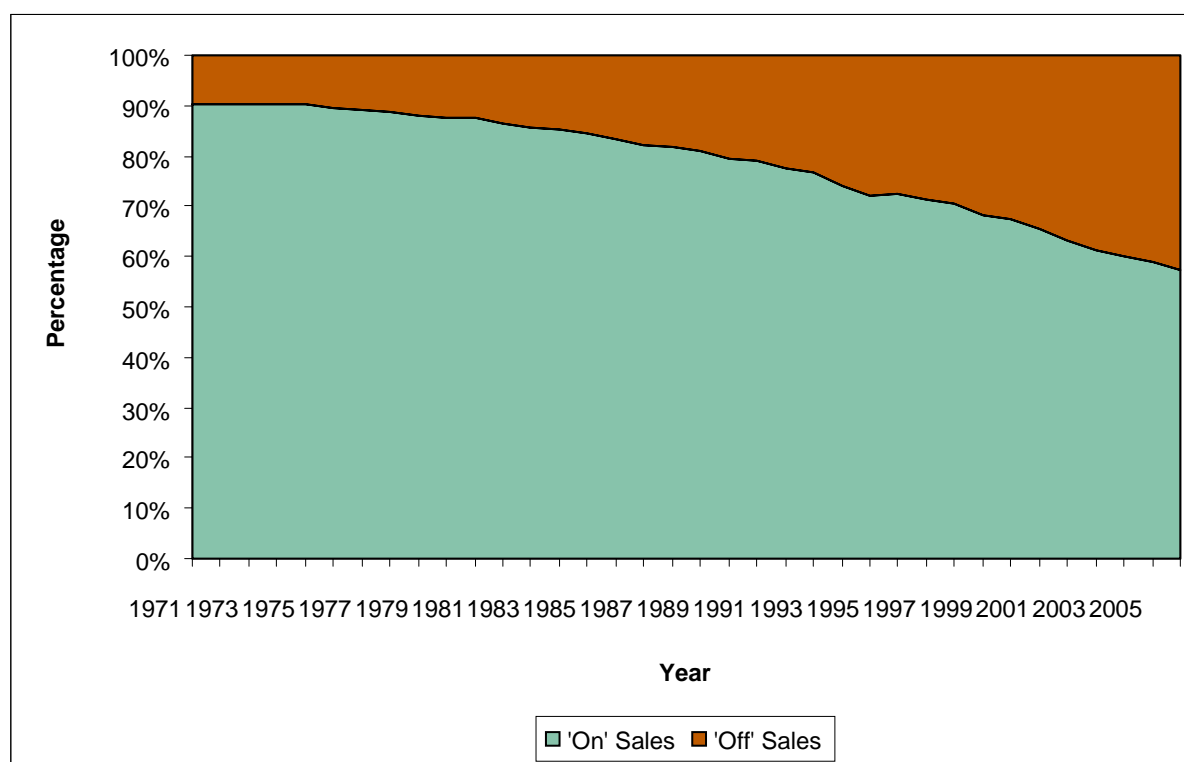
The reasons behind the decline in refillable glass beer bottles include:

- changes in the retail market;
- centralised manufacture;
- increased supply chain complexity;
- brand differentiation; and
- bottle sorting.

#### Changes in the retail market

Figure 3.2 shows the split of beer sales between the on- and off-trade from 1971 to 2006. This shows that the on-trade accounted for over 90% of all beer sales in the 1970s; since then it has been in steady decline and in 2006 only accounted for 57.4% of total beer sales. The knock-on effect the growth of the off-trade has had on refillable systems is due in part to the traditional refillable bottle systems focusing solely on the on-trade and in part to the development of packaging formats that were seen to favour the off-trade, such as multi-packs in cans or lighter weight NRBs.

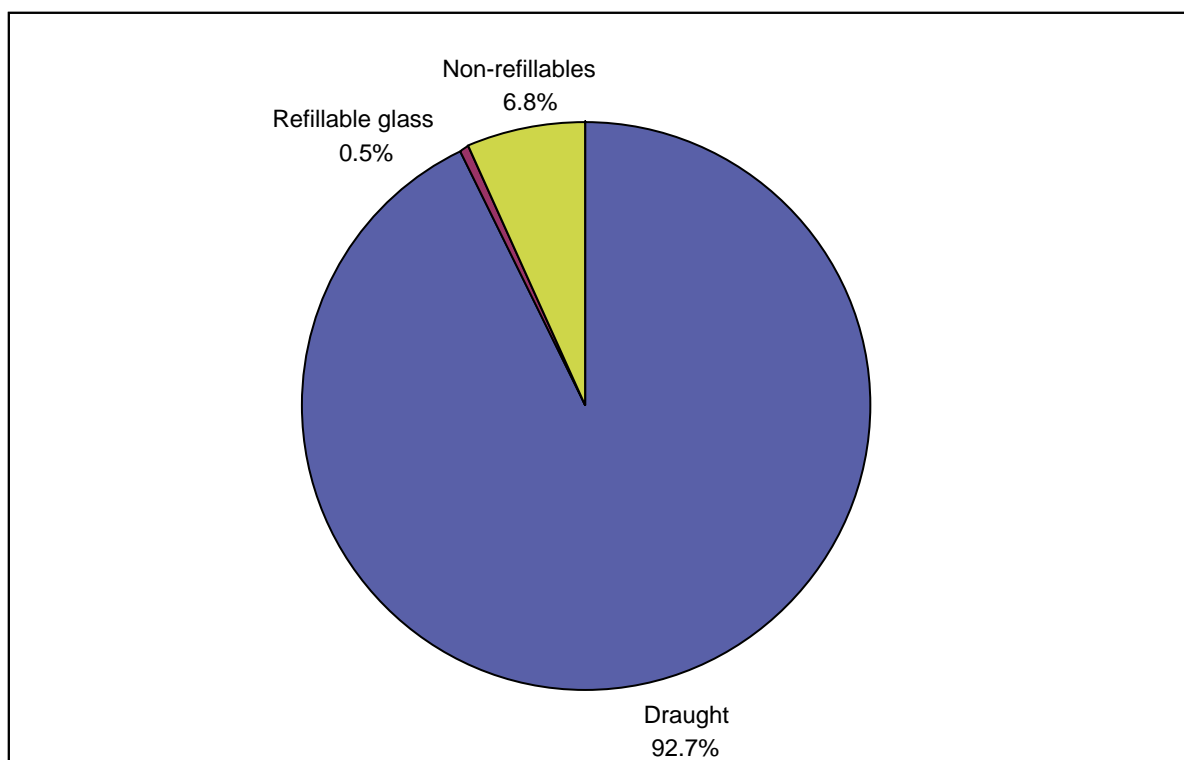
**Figure 3.2** The trend in total UK beer sales; on-sales vs off-sales.



Source: BBPA – Statistics Handbook 2007.

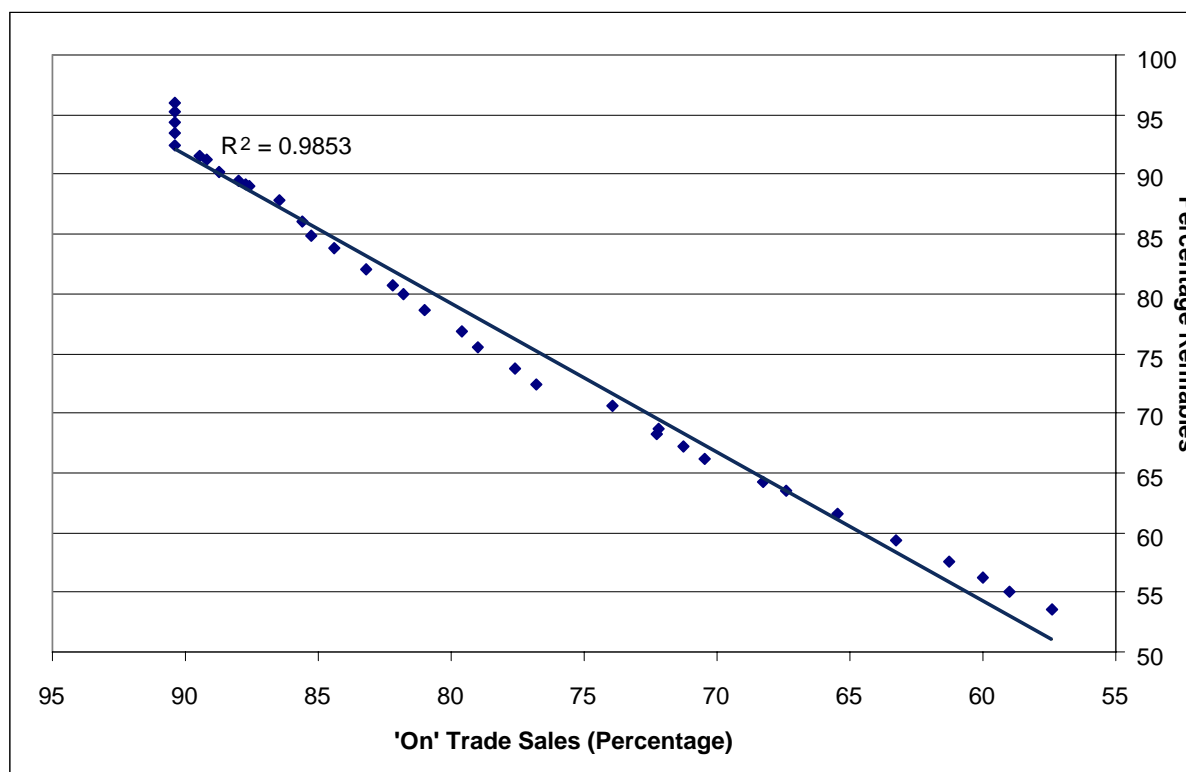
Figure 3.3 shows the breakdown of beer sales within the on-trade in 2006, with refillables accounting for 93% of total beer sales. This is significantly different from the overall analysis of beer sales shown for 2006 in Figure 3.1, and is more in keeping with the picture in 1961, albeit with draught being more prominent than bottled beer. For the off-trade the 2006 picture is completely different, with nearly 100% of all beer sales being in NRBs.

**Figure 3.3** A breakdown of package format for UK beer sales in the on-trade in 2006.



The correlation between the reduction in market share held by the on-trade and the overall reduction in the use of refillables is extremely strong. Figure 3.4 shows the plot of the data from 1971 to 2006 and shows an  $R^2$  value of 0.985 (an  $R^2$  value of 1.00 indicates an exact or perfect correlation).

**Figure 3.4** The correlation between refillables and on-trade sales.



Scottish and Newcastle reports<sup>54</sup> that one of the reasons for ending refillable bottling for Newcastle Brown Ale was that the same production line and heavy bottles were used in the on-trade (mostly going to pubs and clubs) where the refillable system was in place and the off-trade (mostly going to supermarkets and off licences) where the bottles were non-refillable and hence capture rates were low. The steady growth in off-trade sales meant that making it all non-refillable produced a large saving in glass and transport costs. The change in bottle weight for Newcastle Brown Ale was from 430g to 320g, a reduction of over 25%.

Adnams reports that 99.9% of their bottled beer is sold through the off-trade: therefore the traditional on-trade refillable systems would not be viable, hence their focus on the light-weighting of NRBs<sup>55</sup>. Frederic Robinson, an extensive glass bottle contract packing operation, explored the possibility of extending the refillable system to the off-trade but found that the supermarkets did not want to receive back, or credit, empties<sup>56</sup>.

It is important to note, the Retail Packaging (Recycling) Bill was tabled in parliament by Liberal Democrat MP Andrew Stunell in May 2007<sup>57</sup>. The aim of the Bill was to force retailers to provide a free collection point for any packaging materials they sold or supplied. The retailers would also have to ensure that the packaging is reused, returned to the supplier or disposed of through a licensed contractor. The Bill was subsequently dropped after its second reading on 13 June 2007.

### Centralised manufacture

The British Beer and Pub Association (BBPA) reports that<sup>58</sup>:

*“against a background of decline in production, there has been a marked rationalisation within the industry through brewery acquisitions. In the past thirty years, the number of UK breweries has declined from 140 to 52 although there has been a growth in the micro-brewer sector, particularly in more recent years. The positive side of such a rationalisation is the opportunity to improve utilities efficiencies by optimising production and packaging facilities”.*

Refillables work best at local or regional level and hence this rationalisation or centralising of the manufacturing base works against such systems. The growth in the popularity of lager has also had a profound effect on the distribution networks and market structure. Figure 3.5 shows how the market share of lager has grown from 1% of the total beer market in 1961 to 73.6% in 2006. Traditionally, both ale and stout were produced by regional small scale brewers, with a high percentage of sales coming from the local market.

In contrast, lager is typically produced in large scale, centralised facilities and the distribution channels can include wholesalers, importers, third party distributors, etc. Figure 3.6 shows the large brand owners have a significantly greater share of the lager market than the ale market, accounting for 72% of on-trade and 57% of off-trade lager. This is an indicator of the centralised / large scale nature of the lager industry.

Figure 3.7 shows the correlation between the growth in market share of lager and the growth in market share of imports for the 30 years between 1976 and 2006. The  $R^2$  value of 0.91 again shows a strong correlation and emphasises the increase, from a geographic perspective, in the complexity of the distribution channels for beer.

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<sup>54</sup> Richard Naylor, Scottish and Newcastle, Personal Communication. January 2008.

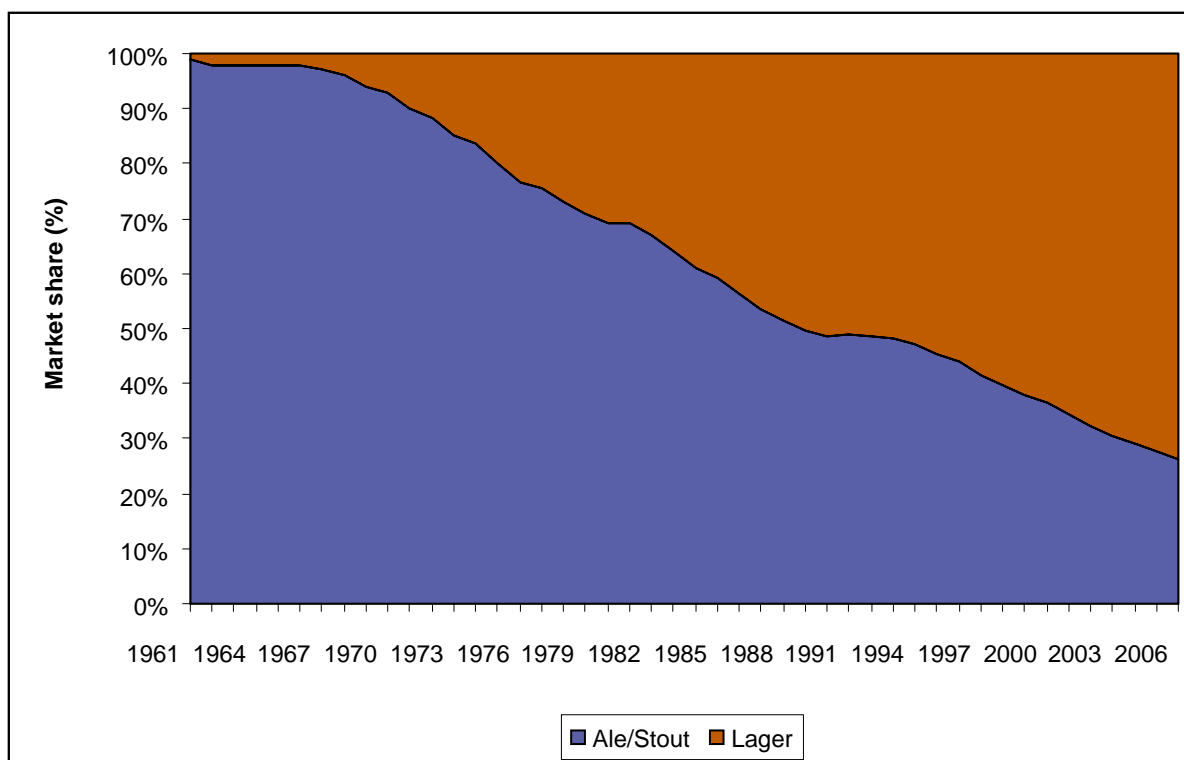
<sup>55</sup> Fergus Fitzgerald, Adnams, Personal Communication, January 2008.

<sup>56</sup> David Robinson, Frederick Robinson Ltd, Personal communication, January 2008.

<sup>57</sup> The Retail Packaging Bill. Bill 71 Session 2006-07. The United Kingdom Parliament.

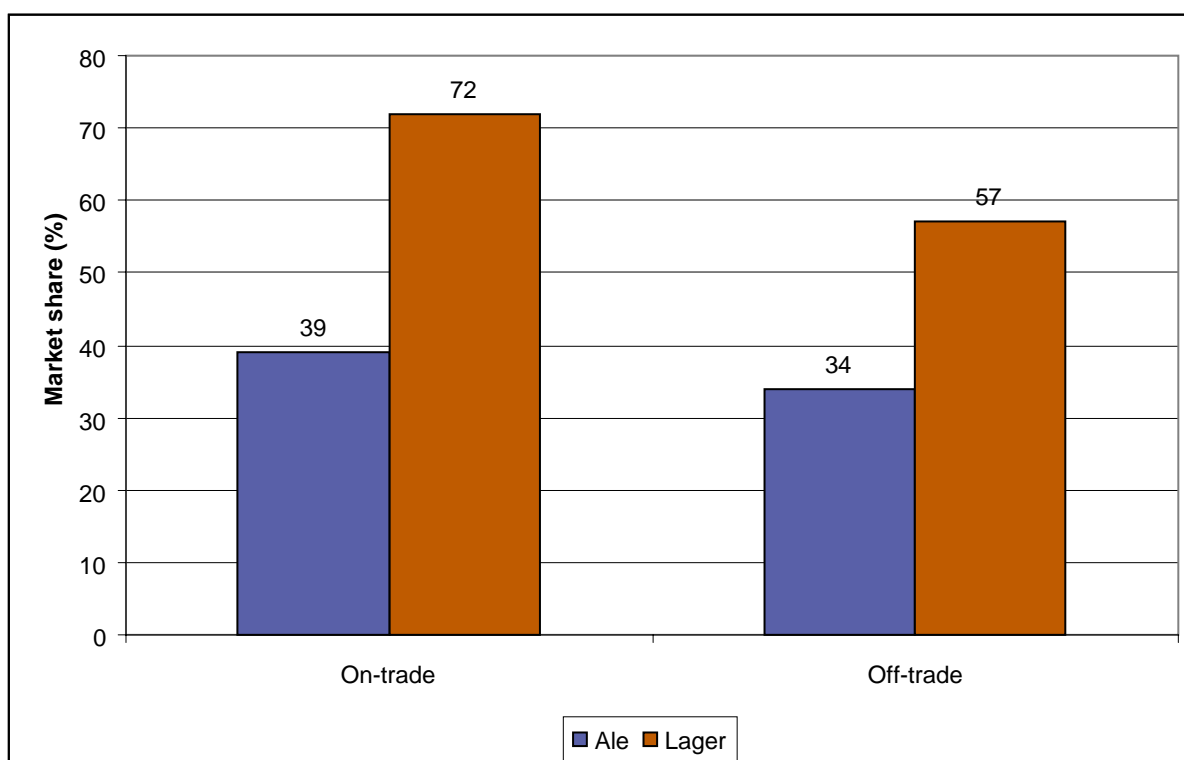
<sup>58</sup> The British Brewing Industry: Thirty years of environmental improvement 1976 – 2006. The British Beer and Pub Association.

**Figure 3.5** The market share of lager versus ale/stout in the UK.



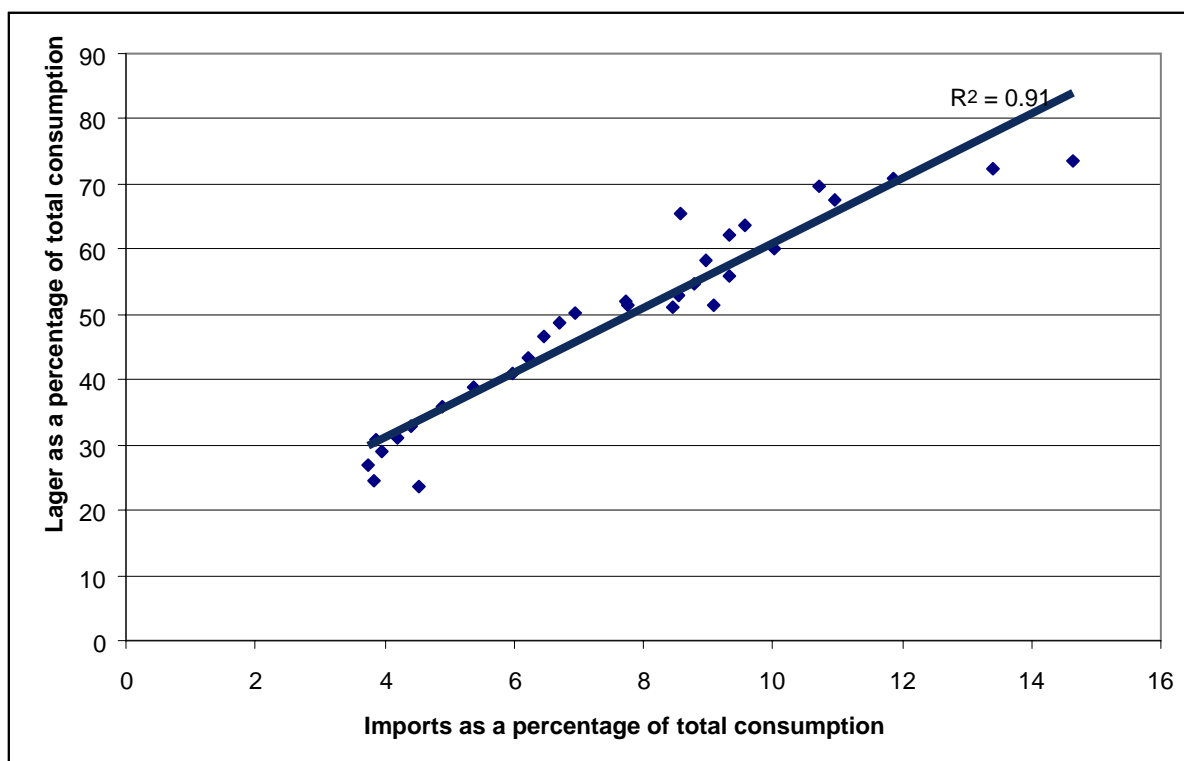
Source: BBPA – Statistics Handbook 2007.

**Figure 3.6** The aggregate share of the top five brands by drink type (2004).



Source: AC Nielsen: Drinks pocket handbook 2006.

**Figure 3.7** The correlation between the growth in market share of lager and the growth in imports.



Scottish and Newcastle reports that Newcastle Brown Ale used to be brewed and filled at their Tyne Brewery. When this was closed as part of their rationalisation programme, brewing was transferred to the Gateshead Brewery (Dunston) with the product bottled in Tadcaster. The Tadcaster bottling line does not have refillable capability.

### Increased supply chain complexity

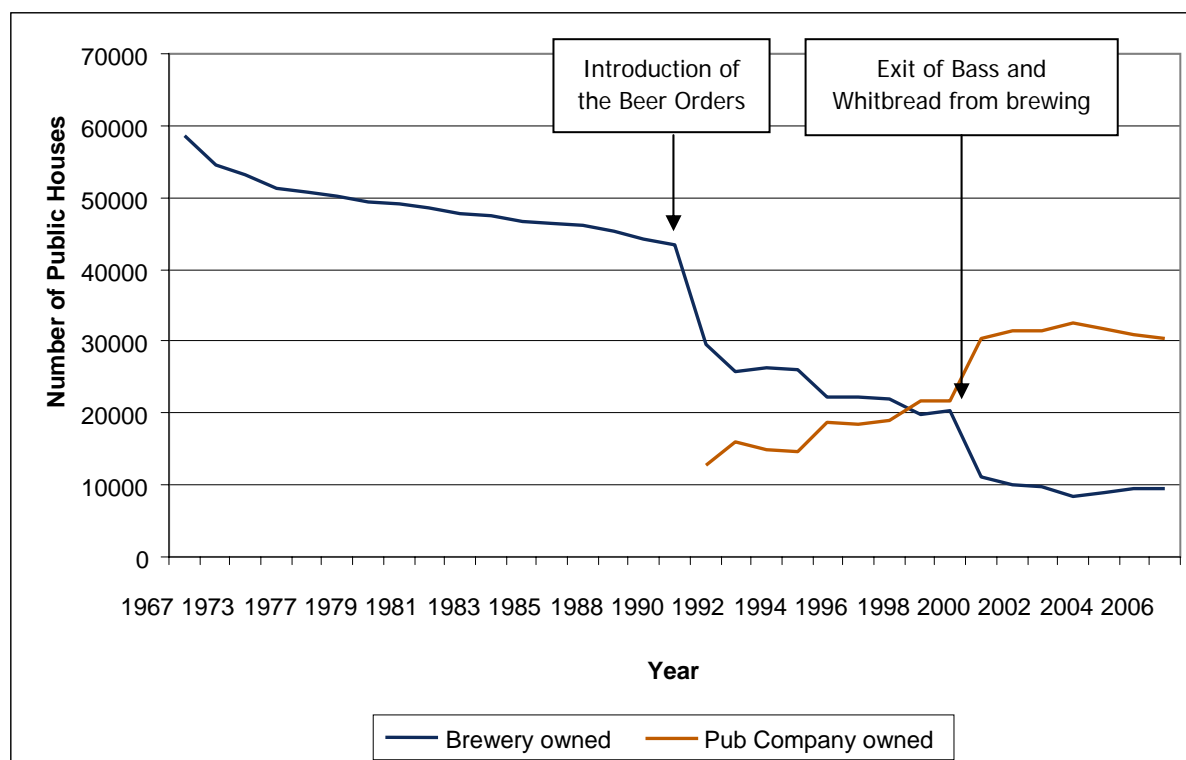
Traditionally the on-trade was vertically integrated, with brewers producing and bottling the beer and selling it through their own pub estates. The closed-loop nature of the supply chain made the recovery infrastructure of crates and bottles very simple. However, although the number of brewery-owned pubs was slowly declining pre-1991, the 'Beer Orders 1989' implemented in 1991, which required brewers owning more than 2,000 pubs to sell the excess off, resulted in a major switch to independent pub companies (Figure 3.8). (It is important to note that the significant drop in brewery-owned pubs in 2000 was due to the decision by both Bass and Whitbread, two of the big four brewers at the time, to stop brewing.)

Inbev report that the collapse of the vertical integration of the beer trade (through the Beer Orders 1989) removed the top-down incentive for pubs to co-operate with brewers<sup>59</sup>. Pubs increased the purchasing of beer from much further afield and Inbev report that the proliferation of bottle sizes and shapes made it more difficult for bar staff to sort and segregate NRBs and refillables.

An additional factor affecting the vertical integration of the supply chain was the growth in non-refillable packaging used to satisfy the off-trade markets. Many brewers considered it non-viable to upgrade their own bottling lines to accommodate the change in packaging format, and instead looked to contract packers, adding an additional stage in the return journey if refillables were to be used. Adnams used to bottle into refillable bottles when they did their own bottling in the mid-1980s, when the vast majority of bottles were used within their own pub estate and pubs were delivered to directly. Adnams moved to contract bottling and found that few companies still had the facility to handle refillable bottles, and this influenced the move to NRBs.

<sup>59</sup> Mark Wingfield Digby Inbev, Personal Communication. February 2008.

**Figure 3.8.** The trend of brewery owned versus pub company owned public houses in the UK.



Source: BBPA: BBPA – Statistics Handbook 2007.

### Brand differentiation

The beer industry has faced stiff competition for market share in the overall alcohol market and saw market share fall from 57.4% in 1984 to 44.4% in 2004 (Figure 3.9). This drop in market share has primarily been as a result of the growth in popularity of wine. Consequently, the beer industry has placed more emphasis on marketing and product image of beer. Frederick Robinson reports that the switch to non-refillable bottles was driven primarily by the requirements of customers who wanted bottles for their products to be:

- unscrewed;
- individually brand / brewer dedicated (embossed etc) where possible; and
- sometimes designed to accommodate imaginative labelling requiring surface areas and angles to allow this.

In terms of innovation, the refillable bottle is viewed as being at a disadvantage<sup>60</sup>:

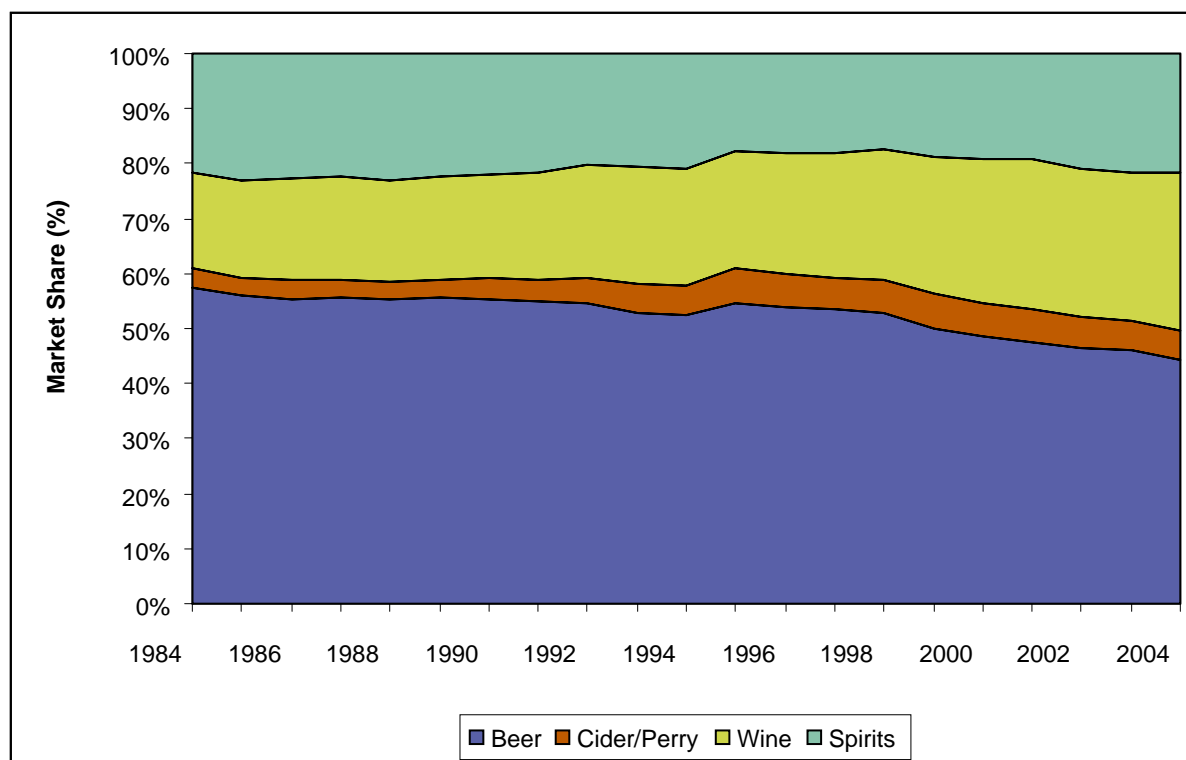
*"In the case of refillable bottles, developments can be delayed as a result of the existing bottle population. For example, to run down the same filling line as the bottles already in circulation, new refillable bottles have to be of the same external dimensions. If they are to hold the same quantity of product, they also have to have the same internal dimensions. Thus refillable bottles are the prisoner of history – the gradual improvements that are common in the development of non-re-usable packaging are not possible and changes take place in large and infrequent steps, when the existing population lags so far behind the state of the art that it becomes cost-effective to withdraw and replace all the bottles in circulation."*

The bottle is now seen as an additional means of brand differentiation. Adnams used a standard bottle for their first NRB but have since developed a bespoke bottle, and they stress that there would be great reluctance to lose that differentiation. Many companies have made large investments in designing and lightweighting bespoke one-trip bottles and hence would be reluctant to change.

<sup>60</sup> Monkhouse, C., Bowyer, C. and Farmer, A. (2004) PACKAGING FOR SUSTAINABILITY: Packaging in the context of the product, supply chain and consumer needs, INCPEN.



**Figure 3.9** The proportion of total alcohol consumption by beverage type.



Source: AC Nielsen: Drinks pocket handbook 2006.

### Bottle sorting

At a practical level, as the market for NRBs has grown, added pressure has been placed on the remaining RB systems. For example, traditionally when all brewers operated a refillable system all stray crates and bottles picked up by other brewers would be collated and returned. The crates were colour coded with each brewer having their own distinct crates, for ease of sorting (Figure 3.10). However, one brewer who no longer operates a returns scheme stressed that all refillables they receive back at their distribution centre are now put through their crusher and sent for recycling since there is no longer an incentive for them to return either bottles or crates. In addition, bar staff are less likely to segregate refillables. This not only impacts on the capture rate of bottles but often results in crates being held up in the system.

**Figure 3.10** An example of the colour sorted crates ready for redistribution.



### 3.2.3 International refillable systems for beer bottles

#### USA

In 2006, refillable glass bottles accounted for just 0.3% of beer sales in the USA, in line with the market share in the UK (Figure 3.1). However, unlike the UK where more than half of all beer sales are in draught format, in the USA draught only accounted for 9.3% of total sales in 2006. Hence refillables only account for 10.6% of the total US beer market (Table 3.1). Over the past 25 years metal cans have been the prominent packaging format, but NRBs can be seen to have been the fastest growing format with an increased market share of 19%.

Before Prohibition in the 1930s, most beer was served draught in restaurants and bars. During the years between the end of Prohibition and the beginning of the Second World War, the beer market was still dominated by local and regional breweries, which shipped all of their beer in kegs and refillable bottles and sold almost all of it to restaurants and bars. During the Second World War the US brewers shipped millions of cans to military personnel overseas. After the war, veterans influenced the increasing popularity of one-way containers. In addition, television advertisements for the national brewers' one-way systems made local breweries offering refillable systems seem irrelevant. The difficulty of competing with the national brewers' mass production and mass marketing, and the inherent difficulty of managing a small business, forced many of the once dominant local and regional brewers to close<sup>61</sup>.

**Table 3.1** Market share by packaging type in the USA.

YEAR	% METAL CANS	Glass bottles		% DRAUGHT	% Plastic
		% Non refillable	% Refillable		
1981	53	23	12	12	
1982	53	26	8	13	
1983	54	25	8	13	
1984	57	23	7	13	
1985	59	22	7	12	
1986	57	25	6	12	
1987	58	24	6	12	
1988	58	25	6	11	
1989	59	25	5	11	
1990	59	25	5	11	
1991	60	24	5	11	
1992	59	25	5	11	
1993	58	26	5	11	
1994	55	30	4	11	
1995	53	33	3	11	
1996	52	34	3	11	
1997	52	35	3	10	
1998	51	36	3	10	
1999	51	37	3	9	
2000	51	38	2	9	
2001	50	39	2	9	
2002	49	40	2	9	
2003	48	41	2	9	
2004	48	42	1	9	
2005	48.1	41.8	0.6	9.2	0.3
2006	48.3	41.9	0.3	9.3	0.3

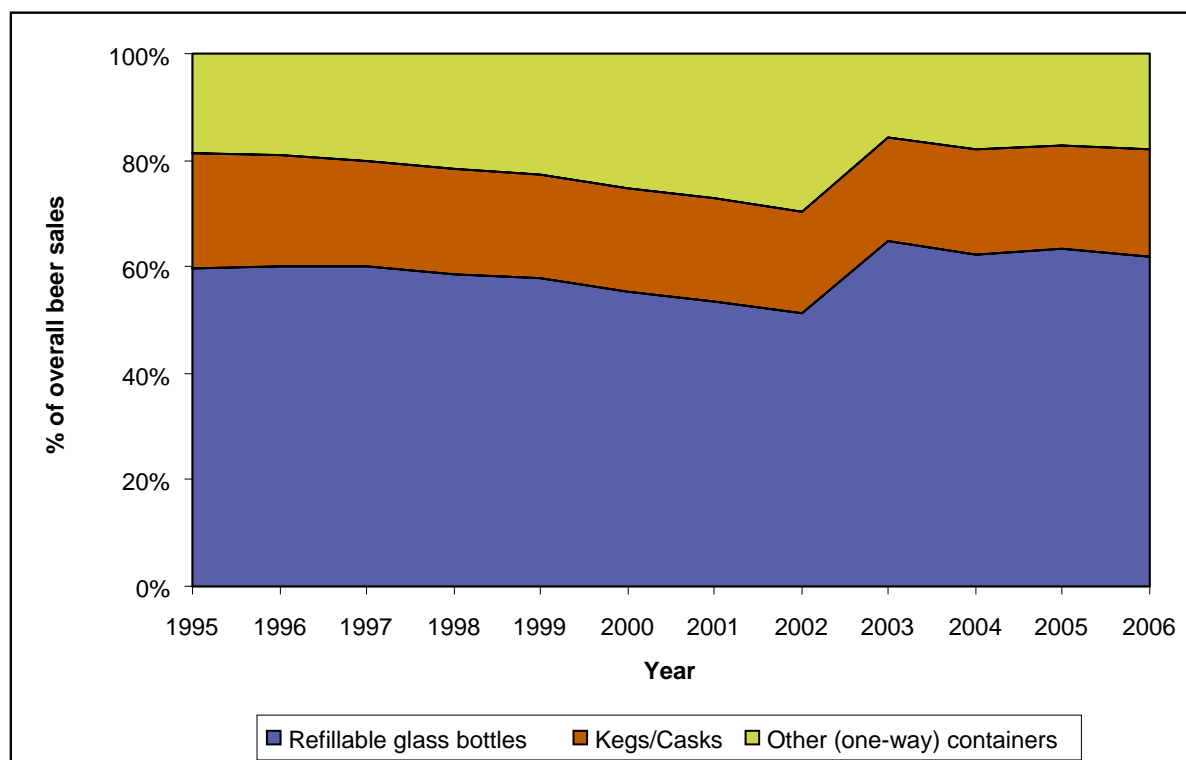
Source: Beer Institute: Brewers Almanac 2007.

<sup>61</sup> [www.grrn.org.uk](http://www.grrn.org.uk)

## Germany

Germany operates a deposit/return system (DRS) for both on-trade and off-trade beer bottles and, in marked contrast with the UK, refillable bottles still account for more than 50% of total beer sales (Figure 3.11). The increase in refillable glass bottles seen in 2003 was due to the regulatory deposit being imposed on non-refillable containers (beer, packaged water and carbonated soft drinks) from January 2003. Inbev report that in countries or jurisdictions where such systems are in place, bottles are generic and brand differentiation is achieved through labels, branded crates, labelled crates, advertising, point of sale material, promotions etc. Bottle weights are much heavier than the equivalent one-trip containers: Inbev report that refillable containers weigh around 300g and one-trip bottles 195g.

**Figure 3.11** The trend in German beers sales by packaging type.



Source, Eva Wellman. Die deutschen Brauer.

It is important to note, brand owners are flexible in terms of the packaging format used in each jurisdiction. For example, Heineken, the major brand-owner from the Netherlands, takes a pragmatic approach to the varying needs of each country in which it imports or has a manufacturing presence, stressing that<sup>62</sup>:

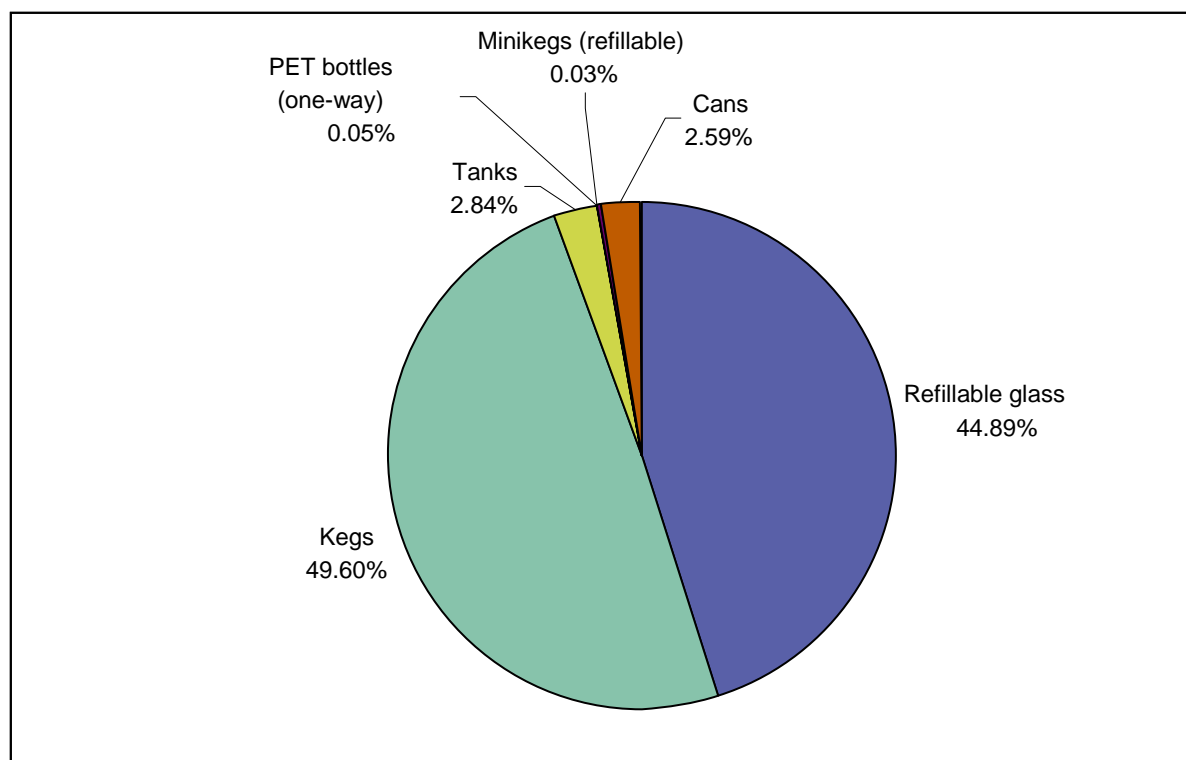
*"At a national level, our operating companies make their own choices about the packaging (one-way or refillable, bottle or can). Packaging preferences vary from country to country. They are generally developed in consultation with public authorities, wholesalers, producers and consumers. In most countries in which we operate, glass is the packaging material of choice and 76% of all our markets, beers and soft drinks are distributed predominantly in refillable packaging"*

## The Czech Republic

In 2006, the Czech Republic - the world's highest per capita consumer of beer (160 litres) - sold over 97% of beer in refillable containers, with refillable glass bottles accounting for 45% (Figure 3.12). The system uses nine different types of glass bottles, all refillable with the same deposit.

<sup>62</sup> [www.heinekeninternational.com/environment/policies.aspx](http://www.heinekeninternational.com/environment/policies.aspx).

**Figure 3.12.** The packaging format of beer sold in the Czech Republic in 2006.



Source: Jan Vesely, The Czech Beer and Malt Association.

### Austria

Table 3.2 shows that the use of refillable glass in Austria has dropped by 10% between 2000 and 2007 although it still holds the majority share of the market.

**Table 3.2** A summary of beer packaging formats in Austria 2000 to 2007.

	2000	2001	2002	2003	2004	2005	2006	2007
Refillable Glass	53.8	52.4	51.9	51.0	49.8	48.5	47.2	46.4
Draught	31.5	31.5	31.1	30.5	30.2	29.5	29.2	28.9
<b>Refillable Sum</b>	<b>85.3</b>	<b>83.9</b>	<b>83.0</b>	<b>81.5</b>	<b>80.0</b>	<b>78.0</b>	<b>76.4</b>	<b>75.3</b>
Non-refillable	14.7	16.1	17.0	18.5	20.0	22.0	23.6	24.7
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Heinrich Werner: Austrian Brewery Association

### Australia

In South Australia, where a regulatory DRS is in place (the only state in Australia to operate a DRS), the brand leader Coopers operates a refillables system for its 375ml beer bottle. This is undertaken through a conventional bottle and crate system via a 5c deposit (Figure 3.13).

**Figure 3.13** An example of the labelling used by Coopers in South Australia.



### 3.3 Soft Drinks

#### 3.3.1 Introduction

The UK soft drinks sector was valued at £8.2 billion in 2006 with sales volumes of 7.7 billion litres, Table 3.3.

**Table 3.3** A summary of UK Soft Drinks sales in 2006.

Outlet	Value		Volume	
	£m	% Share	£m	% Share
Take home	5,895	71	7,164	93
On premise	2,391	29	570	7
<b>Total</b>	<b>8,286</b>	<b>100</b>	<b>7,733</b>	<b>100</b>

Source: Britvic soft drinks report 2007

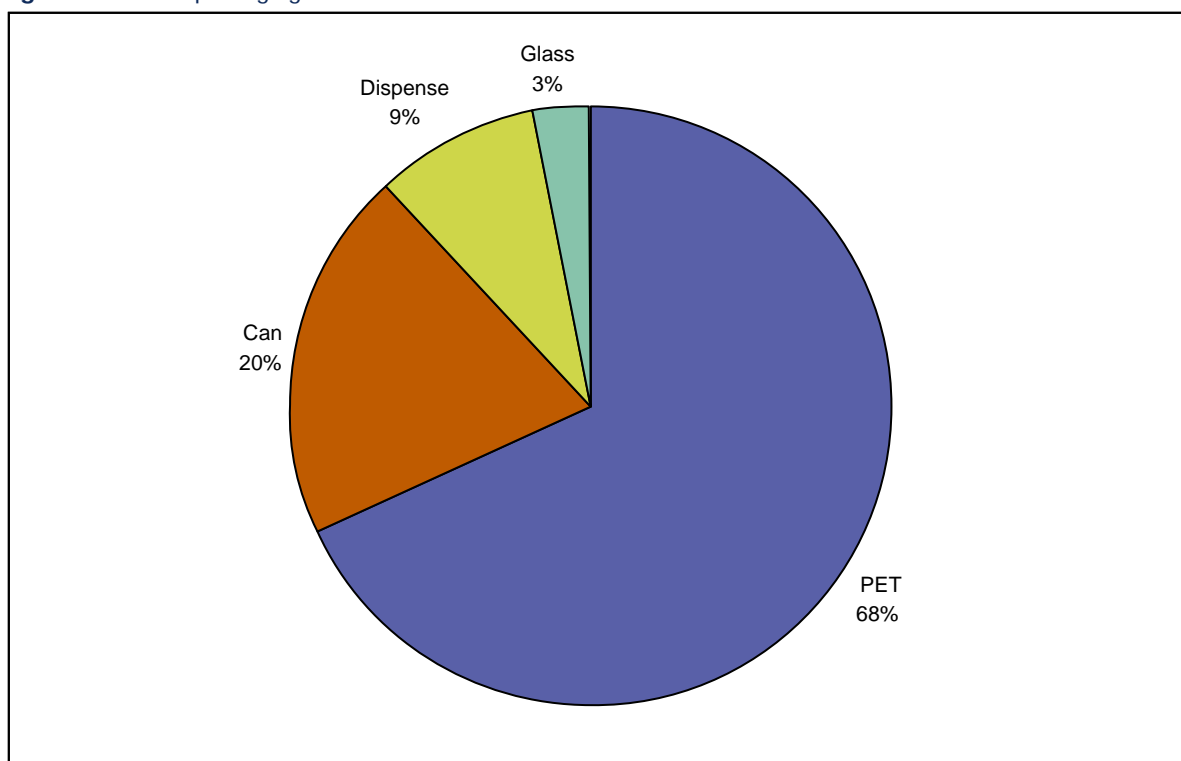
Much like the beer sector the market share of refillable glass beverage containers has declined in recent years but, unlike the beer industry where a steady decline has been seen, within the soft drinks industry much of the decline occurred over a relatively short period of time. The Industry Council for Packaging and the Environment (INCPEN) reports that between 1977 and 1987 the volume of soft drinks sold in refillable containers in the UK fell from 60% to just 3%<sup>63</sup>. This section explores the reasons behind this dramatic downward trend.

#### 3.3.2 Carbonates

Carbonates represent the largest soft drinks category by sales volume and changes in this market reflect the changes that have taken place in the soft drinks market in general. The market is dominated by PET with glass being the format for premium and adult-positioned carbonates (Figure 3.14). Note that the 3% 'glass' figure includes both refillable and non-refillable containers.

<sup>63</sup> [www.incpen.org/pages/userdata/incp/mandatdepssept2006.pdf](http://www.incpen.org/pages/userdata/incp/mandatdepssept2006.pdf)

**Figure 3.14.** UK packaging formats for carbonate sales<sup>64</sup>.



Source: BSDA 2007 Soft Drinks Report

Table 3.4 shows that between 1980 and 1989 sales of carbonates in refillable glass bottles fell by over half at a time when the industry saw an overall doubling in sales volume. This is illustrated in Figure 3.15 with the market share of refillable bottles falling from 45.5% in 1980 to 10.4% in 1989.

**Table 3.4** UK volume trends in carbonated soft drinks packaging 1980-1989, in ready-to-drink litres (millions).

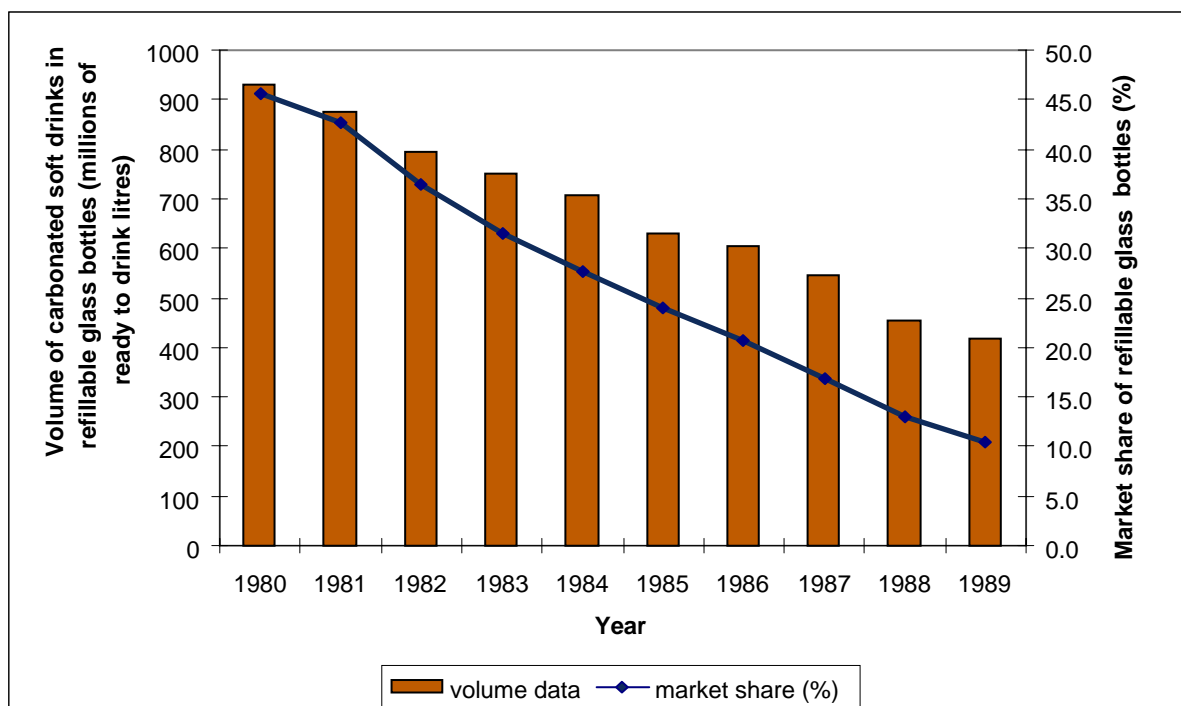
Packaging format	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	% change 1980 – 1989
Refillable glass bottles	929	876	795	751	707	629	603	547	455	419	-55
Non-refillable glass bottles	315	296	245	243	242	235	230	220	210	181	-43
PET	225	305	440	616	752	865	1,030	1,265	1,448	1,759	+682
Cans	396	390	501	564	615	655	720	840	950	1,179	+198
Dispense	175	183	199	216	234	236	330	390	420	487	+178
<b>Total</b>	<b>2,040</b>	<b>2,050</b>	<b>2,180</b>	<b>2,390</b>	<b>2,550</b>	<b>2,620</b>	<b>2,913</b>	<b>3,262</b>	<b>3,483</b>	<b>4,025</b>	<b>+97</b>

Source: Carbonated drinks: a report on the supply by manufacturers of carbonated drinks in the UK. [www.competition-commission.org.uk/rep\\_pub/reports/1991/fulltext/309c3.pdf](http://www.competition-commission.org.uk/rep_pub/reports/1991/fulltext/309c3.pdf).

<sup>64</sup> Dispense refers to systems used in places like pubs and fast food restaurants. Retailers are either supplied with large containers of ready-mixed drinks (pre-mix dispense) or with containers of syrup that are diluted and carbonated at the time of sale (post-mix dispense)



**Figure 3.15** Volume and market share trends of carbonated soft drinks in refillable glass containers 1980 to 1989.



### The decline in refillable glass carbonates bottles

The Competition Commission Report of 1991<sup>65</sup> states that:

*“Change [from refillable glass bottles] has come about in part because of the costs inherent in the system of delivery, collection, washing and refilling and a preference by retailers in the take-home trade for non-refillable containers. More generally, the industry has invested in a technology that can deliver efficient, low-cost, high-volume output. New materials have been developed capable of performing the same, or similar, functions to those of glass with fewer demands upon consumers and retailers. As a result there has been a trend away from glass bottles, most particularly in the take-home sector”*

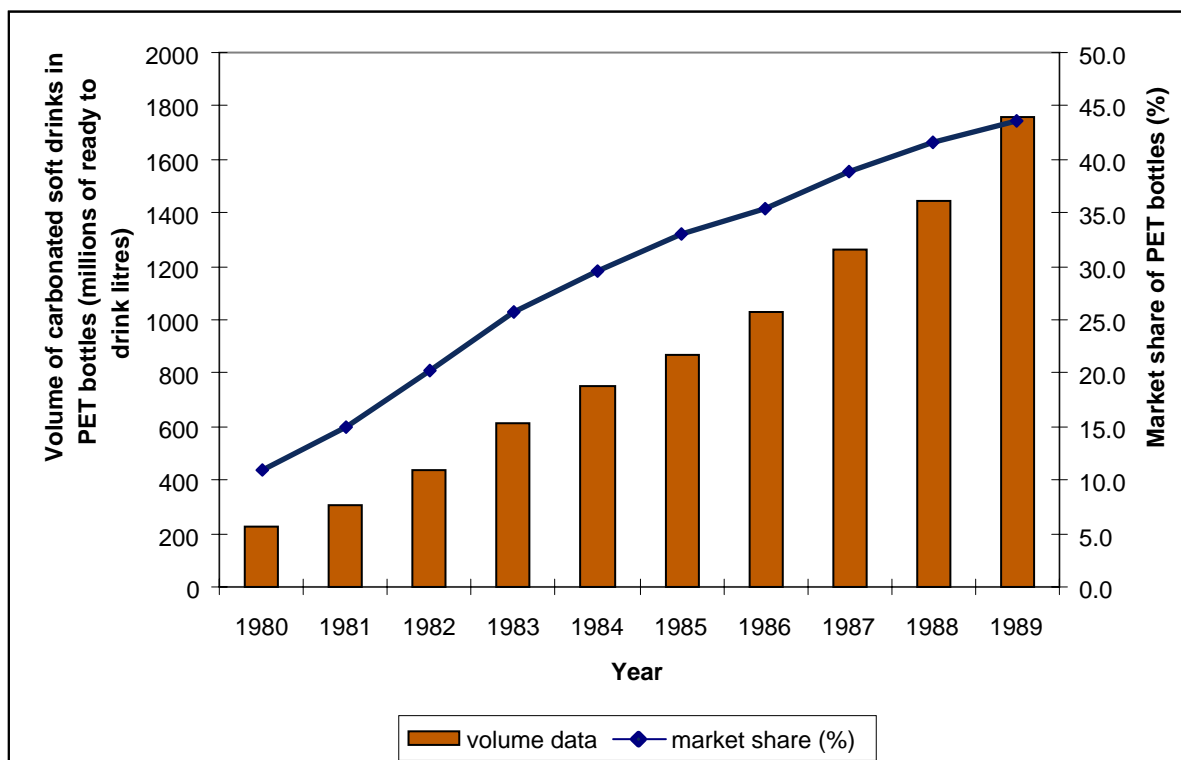
To touch on a number of points made within this statement:

- The British Soft Drinks Association reports that the majority (82%) of carbonates are consumed by the off-trade with the remaining 18% on-trade<sup>66</sup>. As reported within the beer section, historically there has been reluctance by the major retailers to use refillable glass beverage containers due to the added complexities of material handling and storage.
- Figure 3.16 shows that the market share of PET increased from 11% in 1980 to 43.7% in 1989.

<sup>65</sup> Carbonated drinks: a report on the supply by manufacturers of carbonated drinks in the UK. [www.competition-commission.org.uk/rep\\_pub/reports/1991/fulltext/309c3.pdf](http://www.competition-commission.org.uk/rep_pub/reports/1991/fulltext/309c3.pdf).

<sup>66</sup> BSDA 2007 Soft Drinks Report

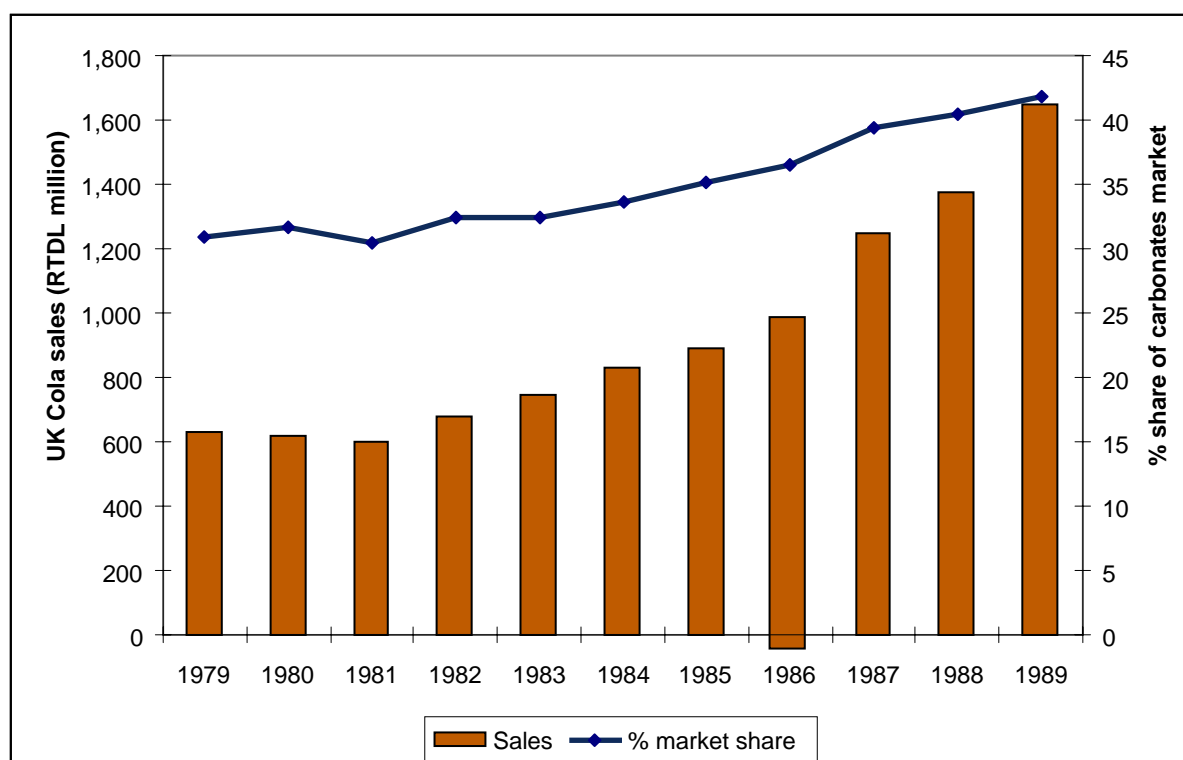
**Figure 3.16.** Volume and market share trends of carbonated soft drinks in PET bottles 1980 to 1989.



In addition, individual producers / brand owners also had a major impact on the change to single trip packaging. Between 1983 and 1989 Coca-Cola made a concerted effort to gain market share in this changing market. Figure 3.17 shows the growth of cola sales (all brands) and its share of the carbonates market between 1979 and 1989. Until 1983 Coca-Cola only had a 2-3% share of the UK beverage market, below that of many other European countries and the United States. Prior to the 1980s Coca-Cola was bottled through regional licensed bottlers, but the company felt this was not aligned to the changing market conditions:

- the market was becoming national, with the retail chains and groups of powerful buyers looking to do business with a supplier which could meet their needs nationally. Co-ordinating a number of regional licensed bottlers was becoming complex and resulted in much duplication;
- refillable bottles were continuing to be supplanted by other forms of packaging, with supermarkets having declined to handle refillable glass bottles since the 1970. This incentivised the development of centralised high speed, high volume one-way packaging lines; and
- retailers and distributors own-label beverages had come to represent a substantial and growing portion of sales.

**Figure 3.17** UK volume trends in cola soft drinks sales 1979 to 1989 in ready-to-drink litres (millions).



In 1987 Coca-Cola went into a joint venture with Cadbury Schweppes to form CCSB with Cadbury-Schweppes becoming the single bottler for Coca-Cola in Great Britain. By 1989 CCSB had a 42.7% share of the carbonates market by value and 36.3% by volume.

Until the joint venture with Coca-Cola, Schweppes had been bottling for Pepsi across all trade channels and hence Pepsi had to find an alternative bottler. The merger between Beecham Bottlers and Britvic provided an opportunity, and Pepsi was invited to take a 10% stake in the new entity. The result was that, at the same time as CCSB was formed, Britvic commenced operation in its present form bottling for Pepsi, creating two dominant companies. In 1989, Britvic had a 22.4% share of the carbonates market in terms of value and 19.9% in volume terms. Therefore, in 1989 these two companies, CCSB and Britvic, accounted for 65% of the market by value and 56% by volume.

In 2006, CCSB accounted for 26% of the total soft drinks off-trade market and 35% of the on-trade and Britvic accounted for 11% of off-trade and 44% of the on-trade<sup>67</sup>.

Table 3.5 shows the breakdown of the packaging format used by the two companies in 1989. This shows that refillable bottles accounted for 8.7% of packaging below the sector share of 10.4%. Somewhat surprisingly the analysis shows cans to have the largest market share (41.1%), significantly higher than the sector average (29.3%) although the total use of one-way PET and cans (73.7%) was in line with that of the industry average (73%).

<sup>67</sup> Britvic annual report 2007.

**Table 3.5** Analysis of market share by type of packaging in 1989.

Packaging Format	CCSB	Britvic	Total (CCSB & Britvic)		Total carbonates market share %
			Volume	%	
<b>Cans</b>	16.1	7.0	23.1	41.1	29.3
<b>PET</b>	12.2	6.1	18.3	32.6	43.7
<b>Refillable bottles</b>	2.1	2.8	4.9	8.7	10.4
<b>Non-refillable bottles</b>	1.1	0.6	1.7	3.0	4.5
<b>Dispense</b>	4.8	3.4	8.2	14.6	12.1
<b>Total</b>	36.3	19.9	56.2	100	100

Source: adapted from the 1991 Competition Commission Report

Coca-Cola Enterprises reported a number of additional factors that influenced their decision to move fully away from refillable bottles in the UK, and these include<sup>68</sup>:

- Difficult to develop high distribution efficiency in pubs when the backhauling of refillables is an integral part of the delivery system. This was compounded by Britvic's hold on the market. Moving to one-way containers meant that third party logistics companies could be used, which brought about significant improvements in distribution efficiencies.
- Product differentiation. Competition to differentiate products has extended into packaging to such a degree that hundreds of packaging formats are being used to supply ever smaller segments of the market. Packaging frequently changes both to establish a new format and to respond to a successful competitor format. In this environment, refillables have a major drawback: they constrain the switch to new packaging forms.
- The seasonality of the soft drinks sector meant that large storage areas were needed at the off-peak times to store the surplus float of bottles and crates.
- In the late 1980s / early 1990s more and more beer was being sold in NRBs and pubs were becoming less committed to returning refillable bottles and hence capture rates had reduced to circa 50%. The cost of replenishing expensive heavy bottles was increasing.
- The administrative burden of managing crates, bottles, deposits and refunds.

Until May 2007 Britvic still operated refillable systems for their 'baby' 115ml and 'split' drinks, bottles (Figure 3.18).

<sup>68</sup> Paul Smith and Suzannah Cooley, Coca-Cola Enterprises, Personal Communication, March 2008.

**Figure 3.18** An example of the old Britvic refillable bottle system.



Britvic reported the reasons they or the industry have switched away from refillables include<sup>69</sup>:

- **Changes in ownership** and consolidation in the soft drinks industry and the Brewing Industry. The soft drinks industry was originally regionally based and established by local brewers as a side line. Britvic was at one time part of Allied Tetley which had two plants for soft drinks in Leeds and Liverpool. It brought together R Whites and Canada Dry, which were originally regional brands. Whereas in 1997 there were 11 plants and 81 depots, three mergers later in 2008 there are six plants and no depots (the latter sold off to K&N). Starting out with 9 out of 10 lines being refillable, gradually - as new NRB lines were introduced and with various mergers resulting in the consolidation of plants - it was the refillable bottle filling lines which tended to be closed. The rationalisation meant distances increased and an increasing loss of control over the system e.g. more 'empty nesting' in returned crates i.e. spaces not filled or filled with other bottles.
- **Consolidation** in the glass industry – push to increase sales, reduce material inputs. This was linked to changes in glass bottle making technology. Refillable bottles were made like jam jars using a 'blow blow' method. They were heavier and it was difficult to control the weight. 'Press and blow' was applied to bottle manufacture and enabled a narrow neck and control of weight (up to 25% reductions) but the bottle was less durable. This led to a growth in NRBs.
- **Less standardisation** – packaging became a source of differentiation e.g. different coloured glass bottles began appearing (flint, green and amber) and, as different glass bottle shapes came into pubs, some chains did not differentiate the empties so the capture rates declined.

<sup>69</sup> David Syrett, Britvic Soft Drinks Ltd, Personal Communication, April 2008.

- **Less incentive** - the deposit was no longer an incentive to return bottles for refilling, pubs “didn’t care” if all their bottles were recycled and couldn’t be bothered to differentiate – maybe labour costs were involved?
- **Aesthetics** – the clean, non-scuffed bottle looked better.
- **Competition** – Coca Cola switched ahead of Britvic and that had an impact. There were concerns about the scuffed glass and its association with poor quality – CCE are very concerned about brand image, especially its iconic Coke bottle.
- **Space requirements/costs** - The cost of the refillable filling line (requiring de-palletisers, de-craters, washers, fillers and then automated checkers, rejects line and then re-craters and re-palletisers) became significantly greater than NRBs because of the need for more processes and more space. Line efficiency reduced as more bottles had to be rejected.
- **The advent of PET bottles** - No storage issues and hygiene factors meant a growth in popularity for PET for soft drinks. Although originally Britvic imported them on lorries, it now has its own ‘blow’ plant on site.
- **Mould availability** - As glass suppliers supplied less RBs, they would not replace the glass moulds when they worn out, so RBs became less available. Towards the end, there was only one mould left in the UK.

As a result, the refillable system became more and more expensive to manage – less volumes, less economies of scale, more time spent sorting returned crates, greater loss of bottles, holding more stock etc.

The aforementioned 1991 Competition Commission report also gained the views of a number of small soft drinks manufacturers:

- **TJ Plummer Ltd** - *“The advent of the PET bottle had changed the whole industry drastically, as it meant that supermarkets could now deal in carbonated drinks to an extent not possible with the refillable bottle. Supermarkets prefer one supplier; a local manufacturer could not therefore compete in the market unless it was of sufficient size”*
- **Barraclooughs** - *“Some small producers of carbonated drinks in refillable bottles had left the market, and the retail market had become dominated by a small number of major multiples. Prices had become very competitive”*
- **SR Allen & Sons Ltd** - *“Some small manufacturers had left the industry because of the capital costs involved in re-equipping to package products in new materials such as PET. The giants had tended to lead the way, while smaller manufacturers had found that they could not afford to invest in the new technologies. In effect economies of scale had increased markedly in recent years”*
- **Wardells Soft Drinks Ltd** - *“Sales of carbonated drinks in refillable bottles had been seriously affected by pre and post mix dispense. It was unable to compete in the area due to the initial cost of equipment”*

A number of other countries follow a similar trend to that of the UK, including the USA, New Zealand and Portugal.



## USA

Table 3.6 shows the packaging mix for carbonated soft drinks in the USA. It can be seen that the market share of refillable glass bottles has dropped from 89% in 1963 to just 1% in 2000.

**Table 3.6** The packaging mix for carbonated soft drinks in the USA.

Packaging format	1963	1970	1980	1990	2000
Refillable glass bottles	89%	40%	29%	1%	1%
One-way glass bottles	3%	27%	16%	11%	0%
Metal cans	8%	33%	38%	54%	48%
PET bottles	0%	0%	17%	34%	51%

Source: [www.grrn.org](http://www.grrn.org)

Dichting reports<sup>70</sup> that the decline in refillable glass bottles in the USA was due to changing consumer lifestyles that demanded more 'convenient' packaging. However, small soft drink bottling companies claim the move to one-way containers was part of a concerted effort by larger one-trip bottling companies to dominate the market. From 1950 to 1973, the number of soft drink bottling plants in the United States decreased by 60% while sales in the industry increased by 276%. As a bottling company expanded its market share by increasing the geographic range of its distribution network, the convenience of one-way containers became more attractive. For large bottlers to compete in local markets where refillables had a cost advantage over one-trip bottles, small bottlers needed to be removed as a competitive force<sup>71</sup>.

From a retailer's perspective, in the 1950s the large supermarket chains saw a small but stable market for soft drinks in one-way containers and packaged their own label soft drinks in cans. Soon afterward, these supermarket brands conquered one fifth of the market, partly because their plants' productivity overcame the inherent cost of canning soda pop. The steel and can industries contributed to the growth with a US\$9 million campaign (equivalent to £57 million today) to promote the steel beverage can. The glass industry responded to the soda can with a campaign to promote one-way glass bottles. Coca-Cola and Pepsi followed by packaging their products in one-way bottles and aggressively promoting them<sup>72</sup>.

## New Zealand

In New Zealand it is reported that<sup>73</sup>:

*"Before 1960, locally owned and operated refilling systems were the standard way of delivering soft drinks, milk and beer in New Zealand. When purchasing a soft drink at the store, people would pay a deposit on the bottles. The store would refund the deposit when the bottle was returned and it would be returned to the bottling plant to be washed and refilled. A soft drink bottle could make 21 such trips".*

The 2005 report continues:

*"Lack of protection in New Zealand, along with the concerted effort by major manufacturers to introduce one-way packaging has seen the demise of locally owned and operated soft drink manufacturing and along with it the bottle washing industry".*

The report concludes that:

*"while legislation to promote use of refillable containers is the best option from a sustainability point of view, decline of the local soft drink industry means that on a national level we may have to look at the next best option, legislation to promote recovery for recycling as an immediate goal, while continuing to investigate options for re-introducing refillable containers"*

<sup>70</sup> Dichting Douglas, *Recycling: a commitment of the Coca Cola Company, a paper presented to the National Mayors Conference in Washington D.C. March 30 1990.*

<sup>71</sup> Scott Chaplin. *Institute of Local Self Reliance, Washington D.C. 1992.*

<sup>72</sup> [www.grrn.org](http://www.grrn.org)

<sup>73</sup> *Glass Mountains: Options for glass recycling in Otago. Envision New Zealand Ltd. December 2005.*

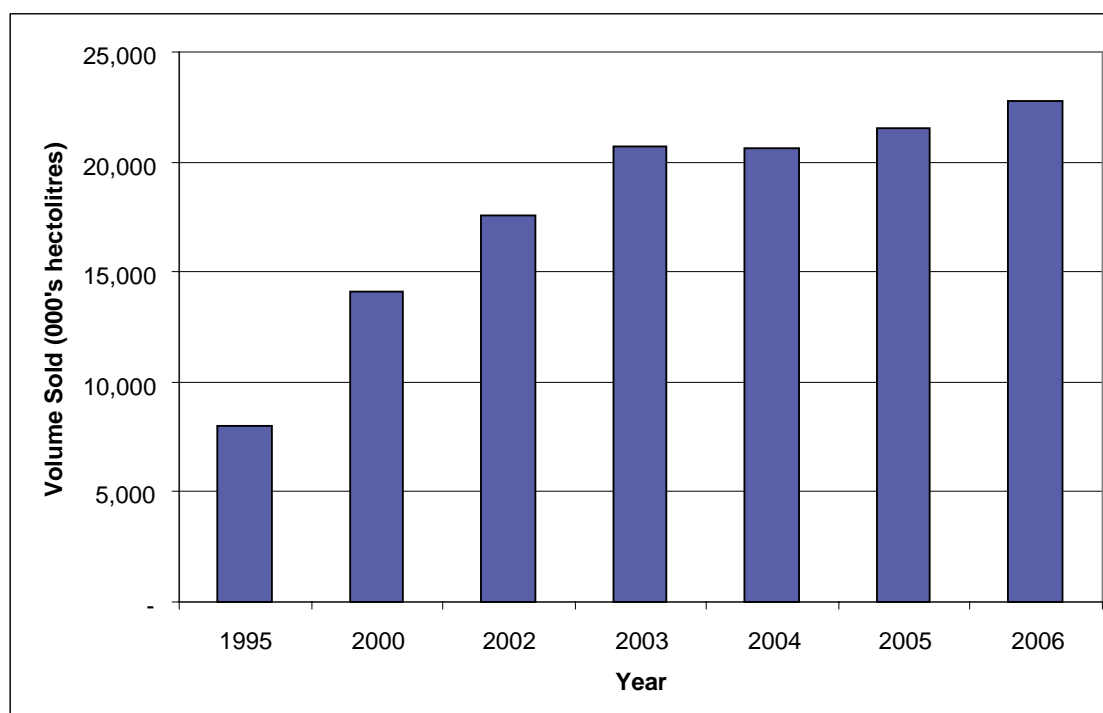
## Portugal

Until 1990, refillable bottles dominated the market in Portugal because they made packaged beverages affordable to more Portuguese and because most retailers were small stores. The arrival of supermarket chains and discounters during the 1990s accelerated a takeover by one-way containers, especially in the soft drinks market. These retailers have strongly resisted selling beverages in refillable containers and have been able to undermine refilling by selling cheap, canned soft drinks from other countries<sup>74</sup>.

### 3.3.3 Water

Figure 3.19 shows the sales volume for bottled water in the UK. This sector has seen significant growth over the past 10 years. 90% of bottled water is sold to the off-trade and 93% of water is sold in plastic bottles, with the remaining 7% being in glass or other formats. In UK restaurants the 750ml glass bottle became the *de facto* serving size in 2006.

**Figure 3.19** UK bottled water sales.



Source: BSDA 2007 Soft Drinks Report

Highlands Springs promote themselves as the “number one UK produced bottled water” and describe the reasons for the use of single trip packaging thus<sup>75</sup>:

*“Refillable bottles have to be robust and heavier to withstand the extra transportation and washing required of them, and as a result, more materials and energy are used in production of the bottle. In addition, when bottles are reused repeatedly they tend to scuff, which contributes to a weakening of the bottle (as well as detracting from its presentation).”*

*Furthermore, it's difficult to collect a high return of bottle in refillable schemes. A more effective and comprehensive system of collection is kerbside collection where bottles can be collected at the same time as other household waste is collected. However, under UK legislation governing Spring Water, the water must be bottled at source. This means that all the bottles to be refilled would have to be returned from all over the UK to the main plant in Blackford. We consider the logistics of this to be environmentally unsuitable, as it takes more energy, or fuel, to return the bottle from our customers.*

*To maintain our high standards of hygiene and quality, we would have to employ rigorous cleaning of all returned bottles with hot caustic washes and copious amounts of rinses to ensure no taint was left in the bottle. The*

<sup>74</sup> Andreas Golding. *Re-use of primary packaging (country by country report)* Brussels: European Commission, 1999.

<sup>75</sup> <http://www.highlandspring.com/about-highland-spring/faq.aspx>

*disposal of the cleaning solution would be an extra impact on the environment, as would the increased use of water.*

*Our belief is that bottles are more likely to be fit for purpose if they are 'single trip' rather than refillable. By using single trip bottles we can use fewer materials in production, and by a process of light-weighting we can use significantly less material to make both the glass and PET bottles. 348 Tonnes of PET were saved in 2006 due to reduced weight PET pre-forms. Glass bottles can be recycled and then incorporated into the glass for new bottles- this process uses less energy than making new glass."*

### 3.4 Milk

#### 3.4.1 Introduction

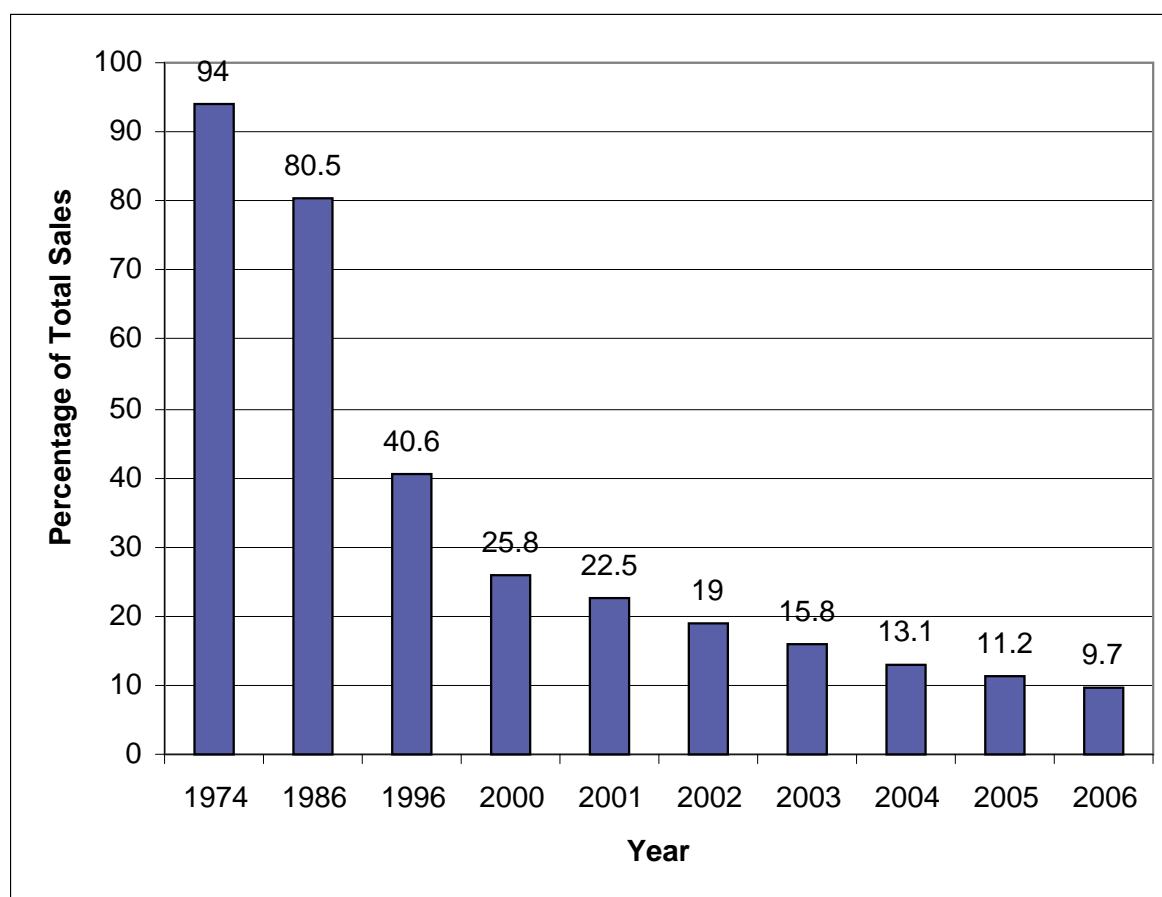
The glass milk bottle was introduced in the 1880s and up until the 1970s was the primary means of packaging liquid milk (Figure 3.20). However, since the 1970s a major shift has occurred (Figure 3.21) and refillable milk bottles have declined from over 90% of the milk market in the UK in 1974 to under 10% in 2006.

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**Figure 3.20** An example of the standard home delivery milk bottle



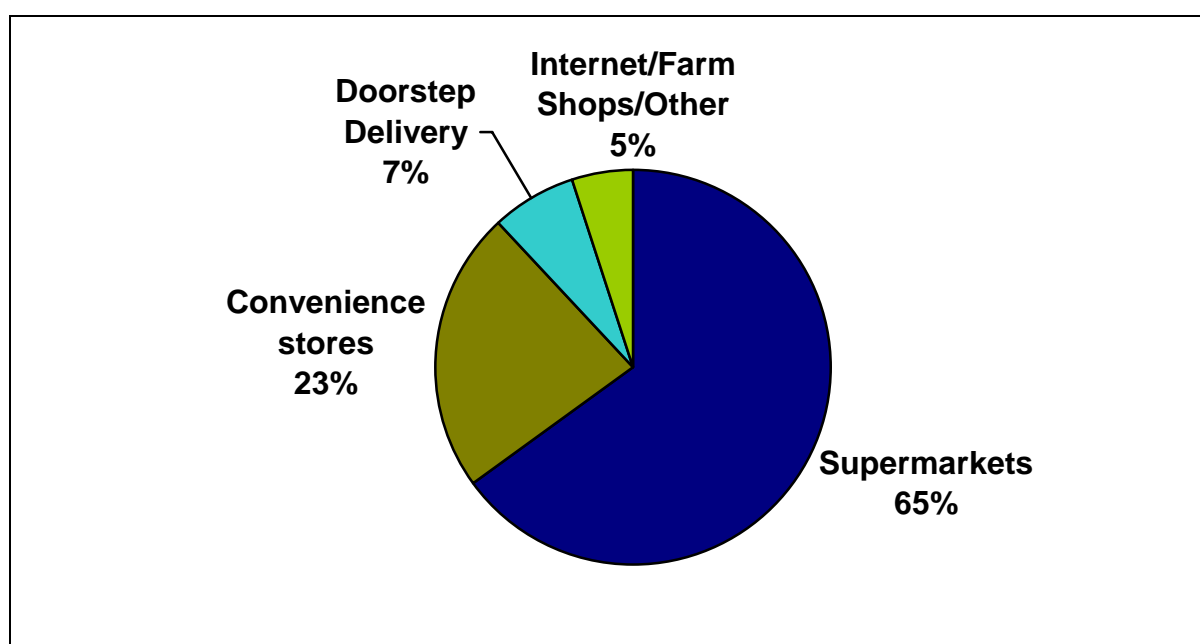
**Figure 3.21** Doorstep delivery of milk as a percentage of total UK sales.



Source: Dairy UK and INCPEN

Figure 3.22 shows the break down of milk purchases by outlet in 2007. This shows that doorstep delivery dropped to 7% and the retail outlets, namely, supermarkets and convenience stores, accounted for 88% of milk sales.

**Figure 3.22.** A breakdown of milk purchases by outlet in 2007



Source: DairyCo

One of the key reasons cited for the growth of milk sales through retail outlets is cost and Table 3.7 shows that the price of delivered milk is 59% higher than that of retail, due predominantly to the higher overheads incurred in delivering the milk.

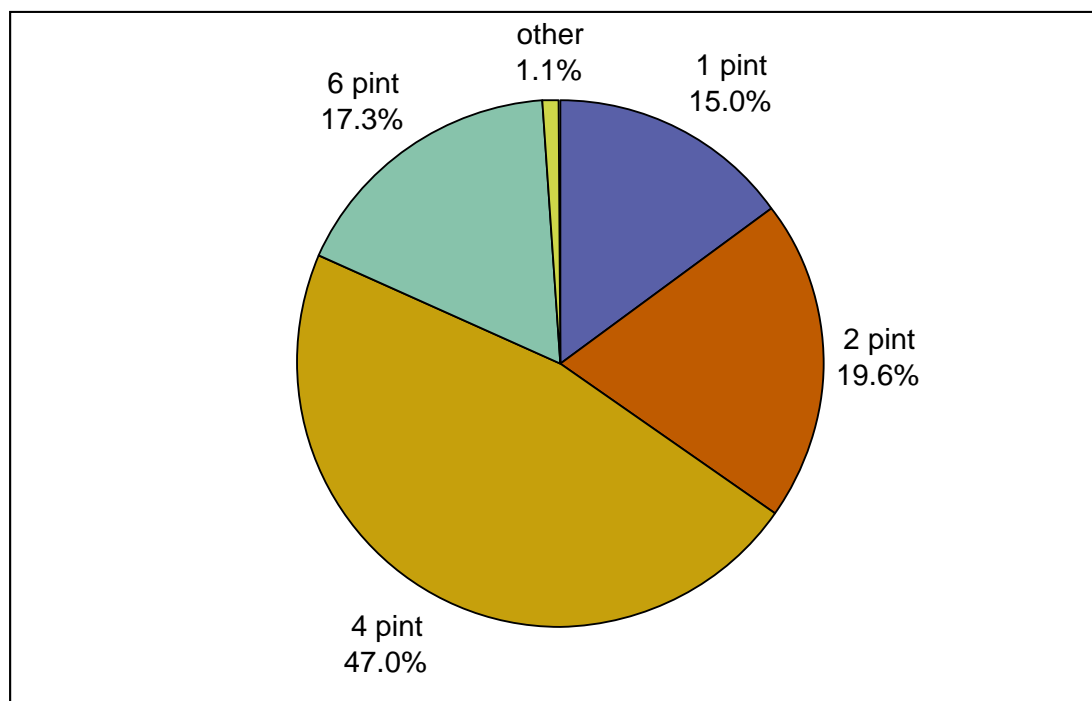
**Table 3.7** Cost comparison of retail versus doorstep delivery of milk in pence per litre.

	Jan 04	Jan 05	Jan 06	Jan 07
<b>Retail</b>	48.6	48.7	52.3	53.2
<b>Doorstep</b>	77.7	79.6	82.7	84.8
<b>Average</b>	52.8	52.2	55.3	56.0

Source: MDC: Dairy statistics: an insiders guide 2007.

The traditional one pint refillable glass milk bottle is not suited for the retail shelves. To accommodate the weekly frequency of shopping, the four-pint milk container is now the most popular packaging format (Figure 3.23). Accommodating this purchasing behaviour using glass refillable bottles would be extremely difficult.

**Figure 3.23** Milk sales in the UK by container size in 2006.



Source: Dairy UK

The recent Milk Roadmap describes the improvements that have been made in single use containers, reporting that<sup>76</sup>:

*“Over 3 billion high density polyethylene (HDPE) milk bottles are manufactured in the UK each year, using 12,000 tonnes of plastic. Over the past 10 years weights have been reduced by 10%. Over the next three years recycled material will be introduced reducing the quantity of virgin material used by 30%. Currently 37% of milk bottles are currently recycled compared with a total bottle recycling rate of 25%”*

### 3.4.2 Alternative refillable systems

One alternative refillable option is currently being trialled by Waitrose in conjunction with Calon Wen, the Welsh organic milk co-operative. Shoppers are able to buy a reusable milk jug that holds a one litre bag called an

<sup>76</sup> The Milk Roadmap, May 2008. The Dairy Supply Chain Forum's Sustainable Consumption and Production Taskforce.

'eco-pak' (Figure 3.24). The eco-pak uses 75% less plastic than a one litre milk polybottle, and the empty bag takes up a fraction of the space of an empty polybottle.

**Figure 3.24** An example of the Waitrose / Calon Wen Eco Pak.



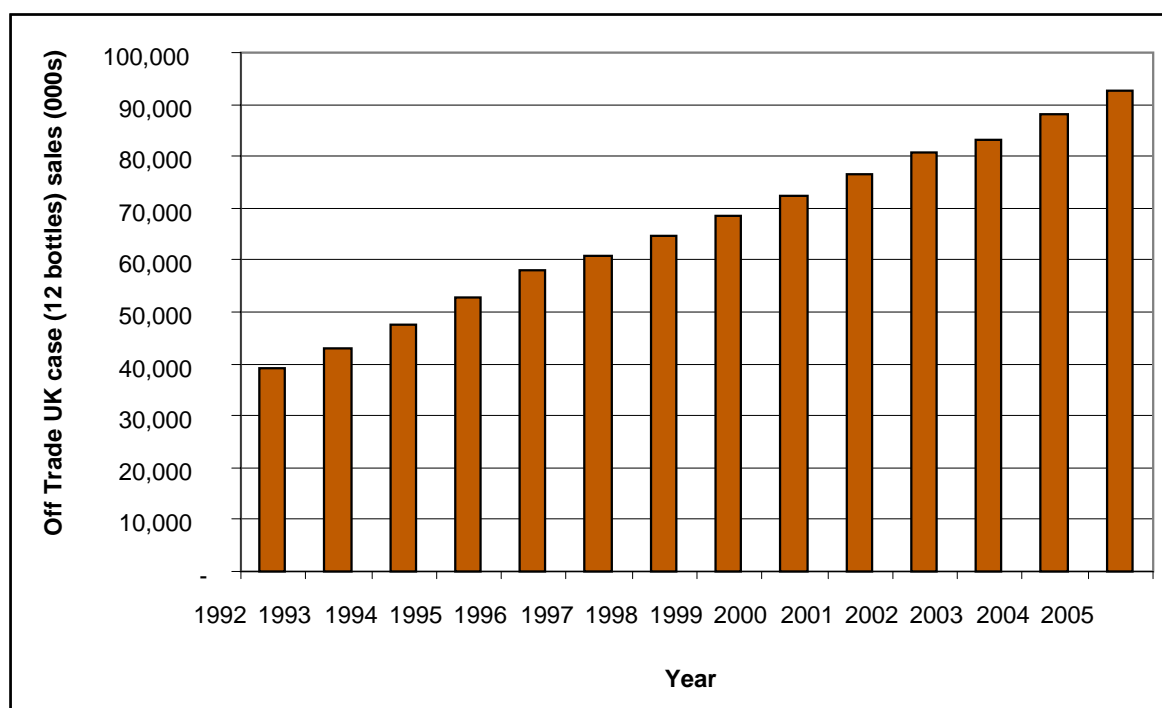
Source: Elen Morris Calon Wen

## 3.5 Wine

### 3.5.1 Introduction

The off-trade dominates wine sales in the UK accounting for 84% of all wine sold. Figure 3.25 shows a steady annual growth in sales, more than doubling between 1992 and 2005.

**Figure 3.25** UK off-trade wine sales 1992 to 2005.



Source: AC Nielsen

Table 3.8 shows the breakdown of UK on-trade wine sales by establishment type. This shows that sales are quite evenly distributed among the different types of establishment.

**Table 3.8** Analysis of UK on-trade wine sales by establishment type.

Type of establishment	Sales ('000s hectolitres)	% of on-trade sales
Managed pub chains	259.8	17.1
Leased / tenanted pubs	221.9	14.6
Independent pubs	162	10.7
Independent clubs	156.6	10.3
Independent hotels	235.1	15.5
Other bars	77.3	5.1
Restricted	407.2	26.8
<b>Total</b>	<b>1519.9</b>	<b>100.0</b>

### 3.5.2 The enablers to the use of refillable wine bottles

The enablers include:

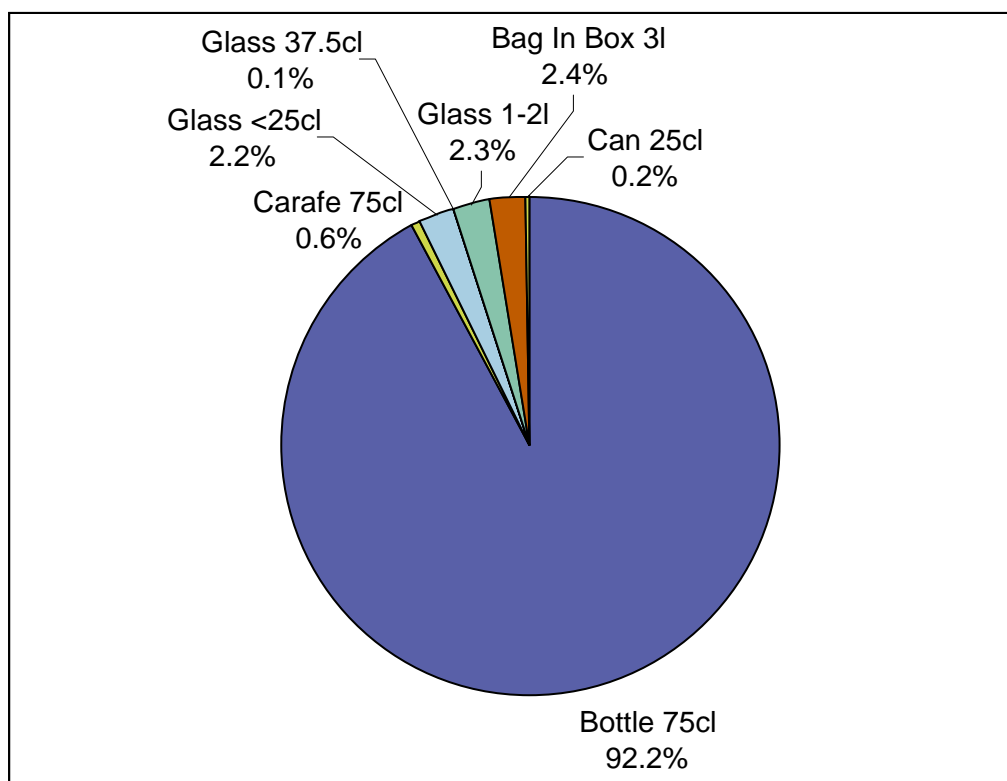
- the dominance of 75cl bottles;
- the growth in bulk importing;
- the heavy weight nature of some bottles; and
- bottle shortages.

#### The dominance of 75cl bottles

Approximately 97% of off-trade wine was sold in glass in 2005 and with the 75cl bottle accounting for over 92% (Figure 3.26) this provides significant scope for bottle standardisation.



**Figure 3.26** Analysis of UK off-trade wine sales by packaging format in 2005.



Source: AC Nielsen

A 2005 European Commission report assessed the viability of introducing a standardised refillable 'euro-bottle'. The report states<sup>77</sup>:

*"The idea is to make it easier for refillables to be used for beverages without giving rise to barriers to trade. Fillers from any country could, it is argued, sell drinks in standardised refillable bottles in any country without having to organise for their own empty bottles to be transported back for refilling. This arrangement would avoid the high economic and environmental cost of imports in refillables where the empty containers have to be transported over long distances for refilling"*

The cited barriers to the take-up of the euro-bottle were; the difficult in gaining consensus on the design of the bottle, bottle replacement cost (particularly high in countries with an existing system in place), impact on small companies, trade imbalance (which would inevitably mean the trans-frontier movement of bottles to high demand areas).

The study concludes that:

*"even if agreement could be reached on standard specifications, the commercial take up of a voluntary euro-bottle would not be good. If its adoption were regulatory, it would reduce the competitiveness of refillable beverage containers and hasten their decline"*

### The growth in bulk importing

A relatively recent development in the importation of wine has been the steady growth in bulk importing, whereby wine is transported to the UK in large Flexitanks or Isotanks and bottled in the UK. This approach is extremely cost-effective especially when importing new world wines (Australasia, Americas and South Africa). It is estimated that approximately 16% of imported wine is now bulk imported, equating to around 178 million

<sup>77</sup> European Commission. Study on the progress of the implementation and impact of directive 94/62/EC on the functioning of the internal market: final report 2005. Perchards.

bottles<sup>78</sup>. This approach means that more wine is being bottled in the UK nearer the point of consumption which supports the argument in favour of reuse.

However, Tesco reports that it bulk imports a significant volume of wine but for competitive reasons the bulk wine is not necessarily bottled in the UK. Instead a competitive tendering approach is used which includes bottling companies from the UK, Germany and France<sup>79</sup>. Brand owners such as Fosters (FGL) operate a similar approach. Hence although the increase in bulk importation can overcome the barrier of long-haul transportation of empty bottles this is somewhat dampened by the need for flexibility, which would require all bottling companies to have bottle washing provision, and the possible complexity of shipping empty bottles to neighbouring countries such as France and Germany for refilling. Note that Kingsland Wineries, who undertake most of the bottling for Tesco in the UK, currently have no bottle washing facilities<sup>80</sup>.

### **The heavyweight nature of some bottles**

The WRAP GlassRite Wine project has shown that 75cl wine bottle weights for still wines vary considerably from a 'best in class' of approximately 300g to over 900g. The 1999 EC report states that;

*"Most wine bottles end up in bottle banks and landfills even if they are technically fit for purpose"*

The wine bottles to the high end of the weight range would be likely to fall within this category of 'technically fit for reuse' however light-weighting the bottles will reduce the opportunity for reuse. This raises an interesting question that unfortunately goes beyond the scope of this project, namely, is it better to minimise the waste being generated and to recycle the remainder or is it best to maintain heavier weight containers for reuse?.

### **Bottle shortages**

During 2007 and 2008, bottle fillers in the UK and other parts of the world have suffered a bottle shortage. This led some companies, such as Corby Bottlers<sup>81</sup>, to have difficulty in sourcing new bottles, which has threatened their delivery schedules. This is considered to be a short term issue but such shortages, if continued beyond the short term, would increase the attractiveness of re-usable bottles.

### **3.5.3 The constraints and challenges to the use of refillable wine bottles**

The constraints and challenges to the use of refillable wine bottles include:

- the dominance of the imports market;
- the dominance of the multi grocers;
- packaging differentiation; and
- lightweighting.

#### **The dominance of the imports market**

The UK wine industry is dominated by imports with England currently producing only 1.4 million bottles of wine per year from its 400 vineyards<sup>82</sup>. This is eclipsed by the imports market which accounts for approximately 1.1 billion bottles. From a reuse perspective, backhauling wine bottles to the country of origin would not be economically or environmentally feasible and hence traditionally wine has been packaged in one-way containers.

#### **The dominance of the multiple grocers**

The multiple grocers account for approximately 70% of off-trade wine sales, with Tesco being the market leader<sup>83</sup>. As discussed previously, such retailers have historically been extremely reluctant to promote refillable beverage container systems.

### **Packaging differentiation**

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<sup>78</sup> WRAP GlassRite Wine Project and Mike Williams, *Trans Ocean Distribution Personal Communication January 2008*.

<sup>79</sup> Andy Gale, *Tesco, Personal Communication, September 2007*.

<sup>80</sup> Michael Forde, *Kingsland Wineries. Personal Communication. January 2008*.

<sup>81</sup> Philip Bailey, *Corby Bottlers, Personal Communication, January 2008*.

<sup>82</sup> Key Note, *Wine Report November 2007*.

<sup>83</sup> AC Nielsen.

As with beer and soft drinks the bottle represents a point of differentiation within the wine sector and hence there would be reluctance within the industry, especially among brand owners, to move to standard re-usable bottles. A 1999 EC report reported that glass producers make well aimed modifications to their bottles to bind fillers to their production<sup>84</sup>.

### Lightweighting

As a direct counterargument to the heavyweight nature of some bottles making bottles fit for reuse, discussed above, the trend towards the lightweighting of bottles favours single use.

#### 3.5.4 Existing UK refillable systems

Only one example could be found of companies operating refillable wine bottles in the UK: the Whole Foods Market is reported to sell wine in unbranded refillable containers through their London shops<sup>85</sup>. Unfortunately no details could be obtained on the system.

A company looking to set up a refillable system is Pebblebed Vineyards in Topsham, Devon. Pebblebed have undertaken a carbon labelling project<sup>86</sup> in which it was identified that most of the carbon emissions from their product is generated through the production of the bottle. As a result they are investigating the reuse of their wine bottles. The bottles are labelled "return to Cellar for reuse" and all customers are requested to save both bottles and cardboard boxes (which are not sealed, where possible, in order to allow reuse (Figure 3.27). The bottles are sold through a local store, "the Cellar", and currently 20% of bottles are returned to the Cellar and are currently being stored while a suitable method of cleaning is developed.

**Figure 3.27** An example of the re-usable bottles and secondary packaging used by the Pebblebed Winery.



Source: [www.pebblebed.co.uk](http://www.pebblebed.co.uk)

<sup>84</sup> Andreas Golding. *Reuse of primary packaging (main report)* Brussels: European Commission, 1999.

<sup>85</sup> [www.packagingnews.co.uk](http://www.packagingnews.co.uk) Refill and reuse to reduce costs 01 September 2007.

<sup>86</sup> Richard Lee, MBA research, Exeter University. *Project guided by Global Action Plan and part funded by Pebblebed Winery and Envision and supported by Devon County Council.*

### 3.5.5 International

#### USA

In 2006 the Los Angeles Times reported that<sup>87</sup>:

*“wine bottles are ideal candidates for reuse. They’re sturdy enough to stand up to numerous refillings, and they’re worth more than beer bottles, making them good economic fodder for a bottle-washing operation. But bottle reuse, not just in California but the entire United States, has almost completely disappeared”*

The report continues:

*“in the US, there is just one company left, Encore Glass of Richmond, California, that provides a bottle reesterilization service for wineries”.*

Encore themselves report that:

*“thirty years ago, when we started, the washing process was much easier. There were only four basic bottle shapes and three or four colours. The sorting operation was simpler. Once the vast proliferation of shapes, sizes and colours happened, sorting became a nightmare. For that reason, we are now having a problem sustaining the quality standards that customers demand”.*

Additional barriers to reuse cited by Encore are:

- In the United States, winemakers have overwhelmingly shifted to using pressure-sensitive labels, which can be difficult to remove from bottles. In Europe, the wine industry continues to use glued-on labels, which are easier to get off. (The pressure sensitive labels were introduced to overcome the issue with labels peeling off when wine was being chilled in ice buckets.)
- The move in the last few years away from sorted, recycled glass to ‘single stream’ programmes, with glass being mixed in with other recycled materials, has made it hard for aspiring bottle-washing companies to isolate a reliable supply of undamaged glass wine bottles.

Encore suggests that in order for reuse to recover, the larger wine companies would need to get onboard, mainly by standardising their bottle shapes and colours. However, even if wine bottles became easier to sort, bottle washing start-ups would still face initial costs of about US\$2 million (£1.02 million) to purchase machinery, rent properly equipped space, hire and train workers and transport used bottles from recycling centres and wineries.

Bryan Vineyard, a small wine producer in Washington State, has investigated the small scale reuse of their own bottles. They recapture approximately 15,000 bottles a year through their on-site restaurant and tasting room and could conceivably retrieve some portion of the bottles shipped out to 600 wine club members. Unfortunately they have been unable to find a small scale cleaning machine due to the complications involved in sterilisation and label removal.

It is important to note, Duchy Original in the UK use peelable labels on their preserve jars to enable customers to reuse the jars for home made jams, etc<sup>88</sup>.

#### Japan

Sake was previously only produced in 1.8 litre standardized bottles which could also be used for the bottling of soy sauce, sweet sake and vinegar. The system had no legislation to keep it regulated, but worked exceedingly well on economic grounds. The bottles were collected, washed and sold back to the manufacturers by bottle dealers. This meant the dealers were earning profit, whilst the manufacturers bought back their own bottles, for less than the price of new, yet with no effort on their part to collect and clean.

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<sup>87</sup> Los Angeles Times, May 17 2006

<sup>88</sup> Tim Appleton. Duchy Original. Personal Communication, January 2008.

After the oil crisis, however, sake bottles became smaller, being sold as 0.3 or 0.72 litre. These entered the market from a number of manufacturers and no standard bottles were created. Today the majority of sake is sold in these smaller, non-refillable containers.

### **Australia**

As discussed previously the Rewine and Sword refillable wine bottles are probably the most well known global brands. The closed loop nature of these systems whereby the original producers operate the refilling systems ensures that the bottles are fit for reuse and do not face the same barriers as seen in the USA.

### *3.5.6 Stakeholder perspective*

From a brand owner's perspective, Pernod Ricard report that they will never refill bottles on the grounds of food safety and that the cost, safety and environmental impact of removing labels before reuse is prohibitive. They stress that the only people that reuse their bottles do so to produce counterfeit goods<sup>89</sup>.

The Wine and Spirits Trade Association (WSTA) reported that the UK wine trade opposed the notion of EU legislation on refillable bottles some years ago, partly because it would have been a major burden on trade and partly because there was not the infrastructure in place in the UK to cope<sup>90</sup>.

### *3.5.7 Section conclusion*

Traditionally the bottled at source nature of the wine industry and the dependence of the UK on imports meant that very little opportunity existed for the refilling of wine bottles in the UK. However, the growth in bulk importation represents a possible opportunity for wine that is bottled in heavy weight standard bottles in the UK.

Additionally, champagne and sparkling wine bottles represent the most over-engineered bottles because of the perception that bottle weight is directly related to quality, i.e. the heavier the bottle the better the quality of the wine.

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<sup>89</sup> Paul Murray, Pernod Ricard, Personal Communication, March 2008.

<sup>90</sup> John Corbet-Milward, The Wine and Spirits Trade Association, Personal Communication, March 2008.

## 4.0 Viability Analysis

This section compares refillable glass systems against one-way packaging from the perspective of:

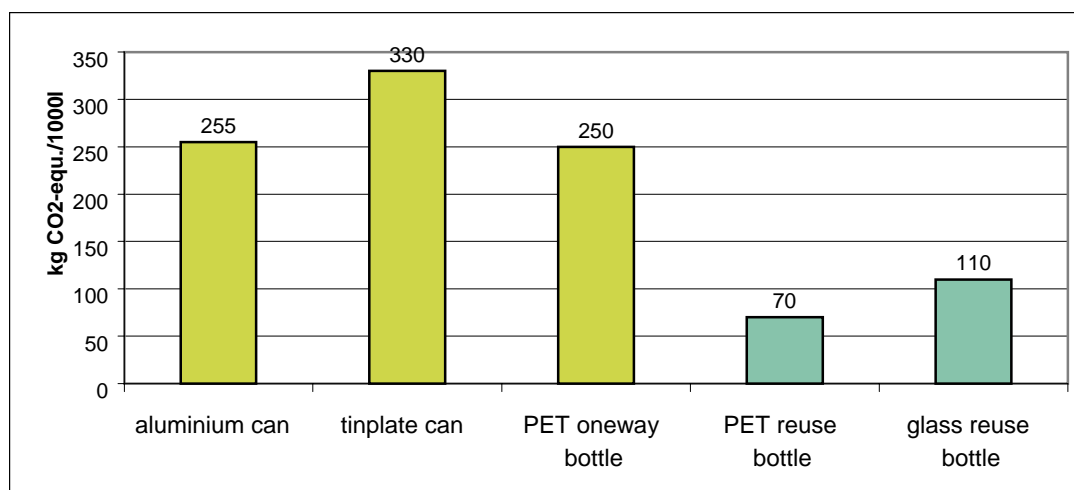
- environment;
- economics; and
- consumer perception.

### 4.1 Environmental Analysis

A number of Life Cycle Analysis (LCA) studies and reviews have been undertaken comparing the environmental impacts of refillable containers against those of one-way systems. However, many of the studies can be regarded as case sensitive and not directly applicable to the UK. For example:

- A study in 2002<sup>91</sup> tallied the outcomes of 11 different LCAs comparing refillable against one-way packaging (including glass). The study found that in terms of five types of air pollutants, the tallies indicated that the use of refillable containers was beneficial. Refillables were also found to generate less solid waste per unit volume of packaged beverage. Comparing refillables with one-way bottles, furthermore, revealed that refillables emit less water and use less energy. However, cans compared favourably to refillable glass bottles in respect of water pollution and energy use. Conversely, a study summarising the results of seven LCA studies of refillable glass versus aluminium showed that all LCAs favoured refillable packaging with a 47-82% reduction in water use<sup>92</sup>.
- The Institut für Energie und Umweltforschung (IFEU) in Heidelberg undertook an LCA on beer packaging in Germany and concluded that in terms of CO<sub>2e</sub> re-usable PET and glass bottles had the least environmental burden (Figure 4.1.) producing less than half the CO<sub>2e</sub> of the three one-way systems.
- The Beer Store Annual Report 2006/07<sup>93</sup> included LCAs provided by the Canadian Government. The Beer Store, which is responsible for 75% of all beer sold in Ontario, reported that on average each glass bottle is washed and refilled 12-15 times before being recycled. It calculates that re-using refillable glass bottles an average 15 times results in an overall energy saving of 2.4 million gJ and the avoidance of nearly 160,000 tonnes of greenhouse gases.

**Figure 4.1.** Results of the LCA undertaken on beverage packaging for beer in Germany.



Source: IFEU LCA III/2003 - relevant beverage packaging for beer

<sup>91</sup> Institute for Local Self Reliance (2002). *Environmental benefits of refillable beverage containers*.

<sup>92</sup> Jardine DE (No Date) *Container Regulations: PEI Perspective*, PEI Dept of Fisheries, Aquaculture and Environment, Prince Edward Island.

<sup>93</sup> The Beer Store (2007) *Responsible Stewardship 2006-2007: An Evolving Efficiency*, Ontario, Canada.

The conclusions from a study undertaken by the EC in 2005 are considered more representative of the position in the UK and with refillables in general. The study<sup>94</sup> included a review of LCA studies that compared refillables against one-way systems. The report found that no type of packaging was clearly always better or always worse for the environment, irrespective of the assumptions used. The report concluded that the findings of these studies were highly dependent on the product supply system, return rates, transport distances, control mechanisms, incentives such as deposits and electricity generation methods. The relationship between capture rate and transport distance was reviewed in detail and Figure 4.2 shows the findings from the analysis. The analysis shows refillables (glass) to be beneficial when the transport distance is below 100km and the capture rate is high and one-way containers to be beneficial when transport distance is high and capture rates are low. The study found that when refillable PET is used the transport distance in which refillable is beneficial increases to 350km.

**Figure 4.2** The impact transport distance and capture rate has on the environmental viability of refillables vs one-way systems.

Capture Rate	High	Refillables	Inconclusive	Inconclusive
	Low	Inconclusive	Inconclusive	One-way
		Low (below 100km)	Medium (between 100km and 1,000km)	High (above 1,000km)
		Transport distance		

Further studies<sup>95</sup> comparing 330ml refillable glass bottles with the same size one-way glass bottles have included the recycling rate of the one-way containers as a key factor alongside the two key factors identified in the EC 2005 study, namely, distance and trip rates. The high trip rates and the comparison simply with one-way glass containers extend the viable distances considerably (Table 4.1). This is particularly relevant to wine where one-way glass bottles have a significant market share and the market share of alternative packaging formats, such as PET bottles and cans, is extremely modest.

**Table 4.1.** Breakeven points for refillable glass versus one-way glass containers.

Distance (km)	Trip Rate	Recycling Rate
3,500	20	91
4,200	20	42
2,300	5	91
3,000	5	42

#### 4.1.1 Conclusions

The existing studies show that the environmental comparison of refillables versus one-way containers is not a simple one and that a number of factors need to be considered. Three key factors, cited in a number of the studies, are **transport distance**, **capture rate for reuse** and **collection rate for recycling**.

Brand owners have made similar conclusions and Diageo report that<sup>96</sup>:

<sup>94</sup> Ecolas – Pira (2005) *Study on the implementation of Directive 94/62/EC on Packaging and Packaging Waste and options to strengthen prevention and re-use of packaging*, final report 03/07884.

<sup>95</sup> APEAL, (2002) *Environmental Briefing: a contribution towards sustainable development from the European producers of steel for packaging*, Apeal, Brussels.

<sup>96</sup> Diageo Corporate Citizenship Report 2005.



*“where distribution distances are short, refillable bottles are environmentally preferable to single-trip packaging. This is the system we use for beer bottles in Africa where over 90% are returned for refilling. In Jamaica also, beer bottles destined for the domestic market are refillable and have an expected life of 20 fillings before being recycled. For export beer, it is environmentally better for bottles to be recycled in the country of use rather than in being returned along long supply lines. Export bottles contain 20g less glass than those sold in Jamaica to minimise the energy required to manufacture, transport and recycle them”.*

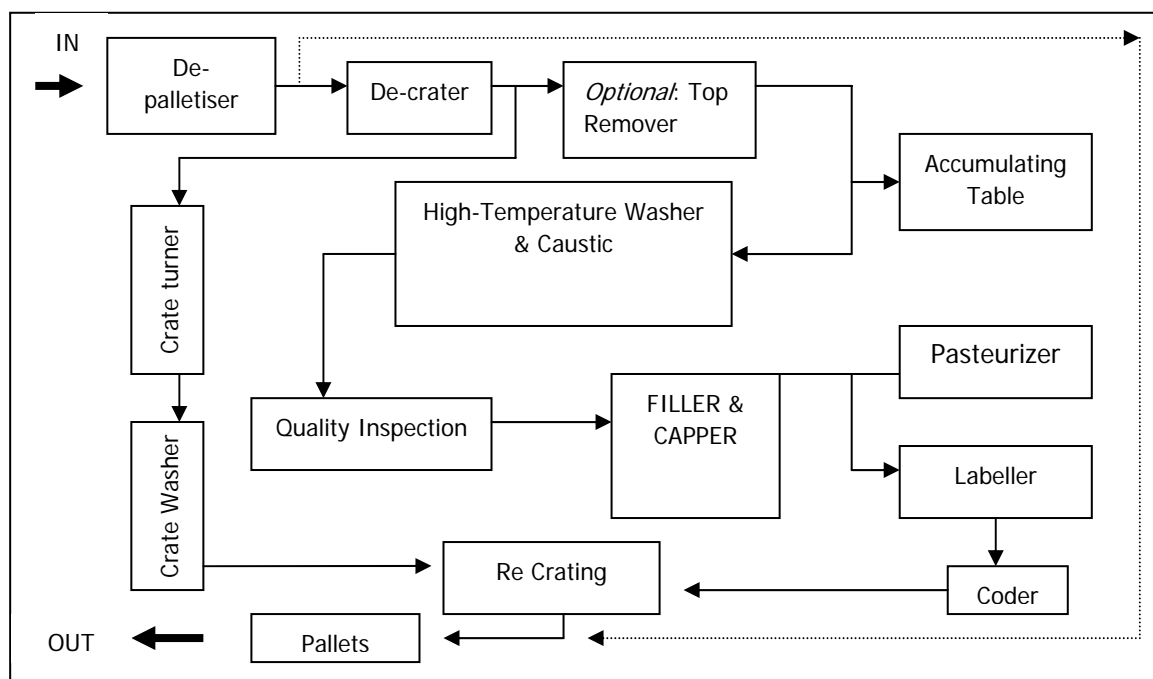
## 4.2 Economics

Assuming that a policy intervention could be agreed in the UK the conversion to refillable containers will impose capital investment costs on the beverage and retail sectors. It will also have secondary impacts on the transport, waste collection and recycling sectors.

### 4.2.1 Production costs

A schematic process flow of a typical glass bottle filling plant using refillables is shown in Figure 4.3. This shows that there are a number of additional processes required to set up a refillable line.

**Figure 4.3.** Glass filling plant using refillables, schematic.



In terms of sector level studies, in 2004 the Advisory Committee on Packaging (ACP) ReUse Panel prepared an estimate of the cost to the UK soft drinks sector of an enforced 100% conversion to refillables. The British Soft Drinks Association for the ACP estimated the cost of converting all production facilities and the supply chain as in the range of £4bn to £4.8bn (Table 4.2). It is noted that the £1,000 million associated with the implementation of the deposit collection system represents a retailer cost and not a production cost. To put this estimate into perspective, UK soft drink sales in 2007 were £8.5 billion<sup>97</sup>. The high cost of conversion is due to the centralisation that has taken place in the manufacturing base for soft drinks and the major change that would be needed in changing the PET and can lines, which now dominate the soft drinks sector, to refillable glass lines.

<sup>97</sup> Britvic 2008 Soft Drinks Report.

**Table 4.2** The estimated cost of converting the soft drinks sector to refillable glass bottles.

Activity	Cost (£ million)
Convert / renew 160 – 200 production lines at £15 million each	2,400 – 3,000
Additional transport (HGVs) 400 @ 100k each	40
Deposit collection systems at 100,000 outlets (£10k each)	1,000
20 – 30 new soft drinks manufacturing sites totalling 400 hectares at £20 million each	400 – 600
<b>Total</b>	<b>4,040 – 4,840</b>

Source: ACP Presentation by Paul Smith, Coca Cola Enterprises (2004).

Table 4.2 shows that the cost of converting or renewing lines accounts for £2,400 million to £3,000 million. This is based on an average cost per line of £15 million. In practice the cost per line would vary considerably. The lowest cost will be for those currently filling in glass (one-way) for the local market since volumes will be relatively modest and distribution infrastructures simple. The conversion costs would be not more than installing a depalletiser, decrater, quality inspection unit and high temperature wash. The associated costs of boiler installation and adaptations to the production area could, in some cases, add a further 30% to the capital cost. We estimate that the minimum capital investment cost for a conversion from one-way glass to refillable glass would be £2 million to £3 million. Conversely the highest cost will be the conversion of large volume, centralised manufacturing facilities<sup>98</sup>.

AG Barr were the last company to invest in a glass beverage refilling line in the UK and hence can be regarded as representative of a “typical” company investing in such equipment. AG Barr<sup>99</sup> estimated the capital costs and throughputs of three packaging systems; for refillable glass bottles, cans and PET (Table 4.3). This shows that from a capital perspective refillable glass bottle lines are both the most expensive and the slowest of the three packaging formats. However, Table 4.4 shows that each refillable bottle processed incurs an associated capital cost of only £0.003. Although this is higher than the two one-way packaging formats (£0.001) it can be regarded as economically viable and the difference between the respective packaging formats is relatively insignificant when other factors are considered.

**Table 4.3** Comparison of the capital costs of different packaging systems.

Packaging type	Capital cost (million)	Throughput (units/minute)
Refillable glass bottles with washer	£6-7	1,000
Can line	£5-6	2,000
PET line with blower	£4-5	1,500

**Table 4.4.** An estimate of capital cost per bottle.

Packaging type	Throughput / year (million) <sup>100</sup>	Cost per bottle (£) over 10 years
Refillable glass bottles with washer	224.64	0.003
Can line	449.28	0.001
PET line with blower	336.96	0.001

For example, from an operational perspective, one of the key benefits of using refillable bottles is the reduced cost of purchasing new bottles. The benefit is influenced by the trip rate and Table 4.5 shows the impact trip rates can have on the cost of bottles in the system. For instance, this shows that increasing the trip rate from three to six trips can provide a saving of 2.14p per bottle, which makes the 0.2p per bottle difference between refillable and one-way systems, described above, relatively modest.

<sup>98</sup> It is noted that the operators of the centralised manufacturing sites would need to decide whether to maintain their current centralised sites and incur high transport costs or to set up smaller, local sites incurring high relocation costs.

<sup>99</sup> Ray Helliwell, AG Barr. Personal Communication, February 2008.

<sup>100</sup> Calculation based on the following assumptions. 2 shifts per day, 260 days per year and a capacity utilisation of 90%.

**Table 4.5.** The impact of trip rate on mean bottle costs.

Trip rate of each bottle	Mean trips per bottle in system <sup>101</sup>	Mean cost per bottle in the system (purchase price (10p) / mean trips).	Mean cost per bottle as a % of purchase price.
20	10.5	0.95p	9.5%
10	5.5	1.81p	18.1%
6	3.5	2.86p	28.6%
4	2.5	4.00p	40%
3	2	5.00p	50%
2	1.5	6.67p	66.7%
1	1	10p	100%

It is important to note, this analysis uses information provided by Refresh UK and looks only at the purchase price of the bottles, and does not take into consideration the revenue gained from unredeemed deposits or the costs associated with washing, transportation, inspection, storage and material handling.

Table 4.6 shows the analysis assuming that 50%<sup>102</sup> of containers in the system will end their last cycle with an unredeemed deposit that can be used to offset the purchase price. This is compared against the cost of the equivalent NRBs which range from 6.5p to 8.2p per container. The analysis shows that at trip rates of 10 and 20 the cost differential between refillables and NRBs is significant, and even when the cost of washing, transporting, sorting and inspecting the refillable bottles is taken into consideration would leave significant benefits. The break-even point is estimated to be around four trips: below this, the cost differential between refillables and NRBs is insufficient to support or justify the additional operations associated with the use of refillables.

**Table 4.6** The impact of trip rate on process costs.

Trip rate of each bottle	Mean trips per bottle in system	Mean cost per bottle in the system = purchase price (10p) – 50% of the deposit (4.33p) / mean trips (p).	Mean bottle saving when compared against NRB (p)	
			with NRB purchase price of 6.5p	with NRB purchase price of 8.2p
20	10.5	0.54	5.96	7.66
10	5.5	1.03	5.47	7.17
6	3.5	2.24	4.26	5.96
4	2.5	3.13	3.37	5.07
3	2	3.92	2.58	4.28
2	1.5	5.22	1.28	2.98
1	1	7.84	(1.34)	0.36

An additional factor to be considered is the extra bottles needed in the refillables system to allow for the bottles held at each point in the distribution and reverse-distribution system. One study undertaken in the USA for beer and soft drinks estimated that the “float of bottles” accounted for 37% of glass in the system<sup>103</sup>. However, the Ecolas – Pira study reveals that half of this float can be assumed to be full bottles that are equivalent to full bottles in a one-way system and could therefore be ignored when comparing the differences between the two systems. The study concludes that for every 1 unit in a one-way system there are 1.14 units in the refillables system. The need to purchase the additional bottles to maintain the float is a potential working capital issue. Consol Glass in South Africa reports on the cost barriers to introducing a refillable system<sup>104</sup>:

<sup>101</sup> The “mean trips per bottle in system” is calculated by dividing the sum of the possible outcomes by the number of outcomes. For example, for a system with a trip rate of 10 the sum of the possible outcomes (trips undertaken by each bottle in the system is 55 (1+2+3+4+5+6+7+8+9+10) divided by the number of possible outcomes, which is 10. Hence the mean trips per bottle in the system is 5.5.

<sup>102</sup> 50% is considered realistic in the case of on-trade systems where examples of a high percentage of bottles being incorporated with NRBs in recycling or waste disposal systems are cited.

<sup>103</sup> Ecolas – Pira. Implementation of packaging directive, prevention and reuse (03/07884). April 2004.

<sup>104</sup> Bruce Williams, Consol Glass, South Africa. Personal Communication. March 2008.

*“the infrastructure and fixed costs of introducing and managing a refillable float are factors which make a refillable system challenging, and a present barrier to entry in markets where a refillable float is well established and efficiently functioning, but once in place there are long term cost benefits. From a capital investment point of view, obviously the initial investment in the float of bottles and crates is relatively large as well as bottle washers on filling lines, storage and distribution depots and trucks for collection and return of bottles and crates”*

#### 4.2.2 Retailer costs

The bottle collection infrastructure would require an investment in storage and receiving systems. In most international Deposit Return Systems (DRS) smaller stores are usually excluded. Where smaller retailers take part in collection and deposit refund, the additional transaction, storage and administrative costs are typically reimbursed through a handling fee of 0.4p to 0.6p per item. Greatest costs would be incurred at 7,000 multiple grocers where investment in new collection systems would be necessary and this may include for example Tomra-style Reverse Vending Machines (RVMs) at a cost of £10,000 per machine (Source: Tomra). RVMs have become very popular in countries operating such systems as they automate the process and move the burden from the checkouts. An example of the RVMs suitable for crates and individual bottles can be seen in Figure 4.4.

**Figure 4.4.** An example of the RVMs used to recover containers in Austria.



#### 4.2.3 A review of programme cost

Table 4.7 shows the cost breakdown for the deposit systems operating in the USA. It is important to note that the containers collected through these systems are recycled and not reused. This shows that the cost of recovering the containers using the deposit systems, namely “the weighted average, 9 traditional deposit states” is slightly higher than that of collection through traditional kerbside systems, i.e. 2.21 cents per unit compared to 1.72 cents per unit. However the overall recovery rates are considerably higher in the USA where such systems are in operation, i.e. an overall recovery rate of 71.6% compared with only 27.9% in non-deposit States. It can be concluded therefore that a degree of trade-off occurs in that it costs slightly more to operate the deposit systems when compared against the more conventional kerbside systems, but the recovery rates are far higher.

**Table 4.7** Beverage container recycling in deposit and non-deposit states: a comparison of programme effectiveness and per unit cost

	Program type	Overall recovery rate	Annual per capita recovery (units)	Net cost inclusive of revenues (Cents/unit)
Non Deposit States	Kerbside	18.5%	127	1.72
	Residential drop-off	4.5	31	0.3
	Other	4.8	33	Unknown
	<b>Subtotal 40 non-deposit states</b>	<b>27.9</b>	<b>191</b>	<b>1.25</b>
Deposit States	Weighted average, 9 traditional deposit states	61.6	422	2.21
	California redemption system	54.5	373	0.55
	Kerbside	9.5	65	1.72
	Residential Drop- off	1.6	11	0.3
	Other	1.8	13	Unknown
	<b>Subtotal 10 non-deposit states</b>	<b>71.6</b>	<b>490</b>	<b>1.53</b>
<b>Total, United States</b>		<b>40.6</b>	<b>277</b>	<b>1.31</b>

Source: Jenny Gittlitz and Pat Franklin. The 10 cent incentive to recycle. Container Recycling Institute. July 2006.

A recent study reviewing the German deposit scheme concluded that it was “among the most expensive measures for carbon dioxide abatement” at €1,300 (£1,028) per tonne<sup>105</sup>. Although the study was not critically reviewed within this work, this emphasises the need for caution in developing such systems and promoting the environmental merits of refillables.

#### 4.2.4 Conclusions

The analysis shows that the full scale implementation of refillable systems would incur capital costs running into the billions of pounds due to the need to shift from large scale centralised manufacture to more small scale local manufacture and the need to reintroduce glass packaging to replace the increasingly popular PET bottles and cans. However, Table 4.8 shows that capital cost drops significantly when focus is placed on converting the local, low to medium volume production lines.

**Table 4.8** Summary of capital costs

	Mean capital cost per production line (£million)
Minimum capital cost – converting a small scale local one-way glass production line to refillables.	2 – 3
Typical cost – investment in a new small to medium sized refillable production line.	6 - 7
Mean cost across the whole sector – average cost of converting all production lines to refillables	15

If introduced on a local scale or at product level then the reduced operating costs can offset the additional capital costs, but this analysis is highly sensitive to trip rates and hence it can be concluded that the cost comparison follow the same logic as the environmental analysis where **trip rate** and **transport distances** are the two key factors.

### 4.3 Consumer Perception

In 2006 Loughborough University investigated consumer perceptions of refills and refillable packaging. Table 4.9 shows the range of attributes identified leading to positive and negative experience of refills.

<sup>105</sup> [www.Packagingnews.co.uk](http://www.Packagingnews.co.uk) German deposit system “failing” 16<sup>th</sup> April 2008.

**Table 4.9** Consumer perceptions of refills and refillable packaging<sup>106</sup>.

The range of attributes leading to a positive experience of refills	The range of attributes leading to a negative experience of refills
<ul style="list-style-type: none"> <li>• Good product quality</li> <li>• Convenient delivery</li> <li>• Good value</li> <li>• Less packaging and or product waste</li> <li>• Easy to use</li> <li>• Clean and hygienic</li> <li>• Takes up less space</li> <li>• Light to transport</li> <li>• No mess</li> <li>• Cheap</li> <li>• Quick to use/refill</li> <li>• Incentives / rewards for use</li> <li>• Suitability for purpose</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive refills in giveaway parent pack</li> <li>• Inconvenience / requiring additional planning</li> <li>• Take up more space</li> <li>• Hassle of maintenance</li> <li>• Increased waste</li> <li>• Poor product quality</li> <li>• Bad delivery</li> <li>• Bad quality packaging</li> <li>• 'Fiddly' to refill</li> <li>• Concerns over how long refill will be available for</li> <li>• Incompatibility between systems</li> </ul>

The consumer questionnaire used for the Loughborough University study also identified four groups of reasons why people actively buy refills:

1. Practical:
  - People without cars report specifically buying refills because they are smaller, lighter and easier to carry home.
  - They take up less room.
  - Ease of use/delivery.
2. Brand related:
  - Product quality.
  - They have had a good past experience.
  - Already engaged with and like the brand being sold as a refill.
3. Environmental:
  - To reduce waste and/or actively reduce the amount of stuff they buy.
  - Altruism or the desire to be environmental as long as this is linked with product quality, and/or cost.
4. Other:
  - They are fun.
  - They are considered the 'norm'.
  - Cost as long as this is linked with product quality.
  - There is a clear reason why the product is sold as a refill.

The questionnaire and follow up focus group<sup>107</sup> also found that:

*"Refillable packaging was generally perceived as being better for the environment by the consumers interviewed and involved in the focus groups. The reasons they gave for this were that:*

- *they use less material,*
- *they generate less waste to go to landfill,*
- *there is less impact through manufacturing,*
- *they reduce the amount of different containers going into shops."*

<sup>106</sup> Lofthouse, V.A. and Bhamra, T.A. (2006) An investigation into consumer perceptions of refills and refillable packaging, Loughborough University, Loughborough.

<sup>107</sup> Lofthouse, V., Bhamra, T. and Trimmingham, R. (2007) Refillable packaging systems: Key Lessons for Industry, Loughborough University, Loughborough.

However, a study in 1998<sup>108</sup> highlighted the success of recycling may cause some difficulty to refills. Looking at the effect of recycling schemes on other pro-environmental behaviour, including the use of refillable packaging, it was suggested that consumers perceive the act of recycling as contributing enough to reducing waste problems, and are therefore less likely to engage in other initiatives.

In the case of milk bottles, consumer perceptions have been cited as<sup>109</sup>:

*“reuse is about both consumption and disposal and is maintained by a web of household practices, revealing the milk bottle as both a site of resistance to supermarkets and a site for the construction of collective and individual identities.”*

#### 4.3.1 Conclusions

A study<sup>110</sup> undertaken on consumer perceptions and marketing strategies classified the purchase of refills in the ‘why not’ category within their ‘green purchasing matrix’ implying that consumers are not averse to adopting this purchasing practice. This would appear to sum up the general consensus of opinion.

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<sup>108</sup> Thorgersen J (1998) Spillover processes in the development of a sustainable consumption pattern, *Journal of Economic Psychology* Volume 20, Issue 1, February 1999, Pages 53-81

<sup>109</sup> Vaughan, P., Cook, M. and Trawick, P. (2007), *A Sociology of Re-use: Deconstructing the Milk Bottle*. *Sociologia Ruralis*, 47:2, 120-134.

<sup>110</sup> McDonald, S & Oates, C (2006) *Sustainability: Consumer Perceptions and Marketing Strategies*, *Business Strategy and the Environment*, 15, 157–170



## 5.0 Conclusion and discussion

### 5.1 An overview of the history of refillables in the UK: why the decline?

Historically, the high cost of glass and the local nature of production and consumption favoured reuse. However, in recent years there has been a dramatic decline in the use of such refillable containers. The market share of refillable milk bottles has dropped from 94% in 1974 to 9.7% in 2006; meanwhile refillable beer containers dropped from 33% of the market in 1961 to just 0.3% in 2006, and for soft drinks the 1980s represented a particularly bad time for refillables falling from 45.5% in 1980 to 10.4% in 1989.

Reasons for the dramatic decline in refillables include:

- **The change in consumer behaviour.** Traditionally the majority of beer was consumed in the on-trade, namely pubs, clubs, hotels, restaurants, etc but the UK has seen a significant growth in popularity of the home market. In 1971, the on-trade accounted for over 90% of total beer sales but by 2006 this had dropped to 57.4%. Refillable systems have found it difficult to compete successfully against single trip containers (glass and cans) within the off-trade due to such factors as the reluctance of the supermarkets to participate, the open loop nature of consumption resulting in low trip rates and the focus on recycling.
- **The growth of the supermarkets.** The decline in the doorstep delivery of milk results directly from the growth in supermarket shopping where milk is cheaper in single trip packaging and offered in a range of different pack sizes, i.e. larger pack sizes to accommodate the move away from daily to weekly shopping.
- **Improvements in single trip packaging.** The soft drinks sector in the 1980s best demonstrates the impact the development of alternative packaging can have on a market. Whereas the market share of refillable glass containers dropped by 35%, PET (polyethylene terephthalate) bottles showed the opposite trend growing from 11% in 1980 to 43.7% in 1989. This growth was not only due to improvements in PET bottles but coincided with a change in consumer habits with the growth in away-from-home consumption of soft drinks, where lightweight packaging is favoured.

### 5.2 Barriers to the increased use of refillable glass beverage containers in the UK

The study has identified a number of barriers to the increased use of refillable glass containers in the UK. These include:

- **The case sensitive nature of the environmental merits of refillables.** The study has found that the environmental benefit of refillables when compared with one-way systems is dependent on such factors as the transport distances, trip rate of refillables and the recycling rate of the one-way systems. Refillable systems work best in local closed loop markets whereas for products, such as lager and carbonated soft drinks, which are typically produced in high volume, highly efficient, centralised manufacturing facilities single use containers are environmentally beneficial. This clearly affects the environmental benefits of introducing a national state refillables system.
- **The capital cost of setting up a refillables system.** The study has found that refillable filling lines are more expensive, slower and require more space than one-way systems. For example a 1,000 units per minute refillable glass line would have a capital cost of £6 - £7 million, a single use PET line producing 1,500 units per minute would cost £4-5 million and a 2,000 units per minute can line would cost £5-6 million.
- **The reluctance of retailers to engage in refillable systems.** The study shows that there has been a significant growth in the market share of beverages sold into the off-trade and more specifically the supermarkets who have, historically, voiced a reluctance to engage in refillable systems.

- **Packaging differentiation.** One way packaging provides greater flexibility in terms of packaging design, a key factor in fast moving sectors such as soft drinks.
- **The dominance of the imports market.** For wine especially, the high volume of imports favours one-way systems.
- **The market failure of voluntary schemes in affluent economies.** The analysis shows that, since the development of high volume, low cost one-way PET and can processing, it is difficult for voluntary refillable systems to maintain market share and capture rates in affluent countries where convenience is a prominent driver, i.e. one way containers place fewer demands on consumers and retailers.
- **Aesthetics.** Some brand owners perceive that scuffing and other blemishes and general wear seen on refillable bottles portrays a negative brand image.
- **European Law.** Although the Packaging and Packaging Waste Directive cites the encouragement of reuse (Article 5), the state laws implemented by a number of the member states, including Germany, Denmark and Hungary, that have specifically included incentivising the use of refillables have been challenged in the European courts. This is because such laws are interpreted as favouring local businesses and restricting internal markets.

### 5.3 Opportunities for the increased use of refillable glass beverage containers in the UK

The study has shown that high trip rates can reduce operating costs more than enough to off-set the higher capital costs associated with setting up a refillables line.

The study has also shown numerous examples of innovation and ingenuity within the field of refillables. For example:

- **Reverse Vending Machines.** RVMs have been introduced as a means of automating the recovery system and to reduce the burden of returns on the retailer. Figure 5.1 shows an example of an RVM in a major hypermarket in New York City. This demonstrates that in societies caricatured as being archetypal ‘throw-away societies’ such systems are currently in operation, albeit, capturing containers for recycling<sup>111</sup>.
- Systems involving the **home-filling** of re-usable water bottles to provide the ultimate in **close loop systems**.
- Utilisation of reverse haul systems as a means of **utilising refillable infrastructure overseas**.
- **Recovery and reprocessing of bottles by waste management companies.** It is important to note that although the Terranova system of recovering wine bottles in New Zealand failed, it is regarded as innovative and there is much that can be learnt from this such as the need for early engagement with stakeholders (manufacturers, etc).
- **Plastic coated glass bottles** to reduce scuffing and hence increase trip rates and bottle aesthetics.

<sup>111</sup> *In Europe retailers and fillers take responsibility for taking back and processing the bottles. However, to make the system even less burdensome for the retailers in the USA, the retailers expect the RVM providers to include this within their service offering. From a UK perspective this is interesting since, unlike in continental Europe, the supermarkets are very similar to those of the UK, namely, large with limited capability to manage refillables.*

**Figure 5.1** An example of the reverse vending machines used in retail outlets in New York.



In addition, the retail market is extremely dynamic and hence it is important not to assume that the move to 100% one-way beverage containers is inevitable. Changes to the retail market that may favour refillable systems include:

- **Home delivery vegetable box schemes.** This is considered to be a customer base that would be receptive to the benefits of refillables since schemes such as Abel and Cole promote the use of re-usable packaging (cardboard boxes, etc). Success in this area may encourage supermarkets to provide a similar service as part of their home delivery offering.
- **Local sourcing strategies.** The large retailers are adopting local sourcing strategies. For example, Tesco report that it is striving to stock more local products than any other retailer and has put its eight regional buying offices at the centre of its pledge. It is aiming to sell £400 million worth of local products this year, including fruit and vegetables, meat, dairy and drinks and this is expected to reach £1 billion by 2011<sup>112</sup>. Meanwhile, Figure 5.2 shows an example of the display of beers from a local brewery at a Budgens store in Aylesbury, Buckinghamshire indicating the significance such stores are placing on selling the 'local' message.
- **Carbon labelling.** As part of their climate change commitments, major supermarkets and brand owners are measuring the carbon impact of their products and pledging to reduce their carbon impact<sup>113</sup>. This may be the catalyst required for supermarkets to re-assess refillables in line with their local sourcing strategies, in cases where refillable systems show a distinct environmental advantage over one-way systems. It is important to note, PAS 2050<sup>114</sup> is currently being developed to standardise the reporting protocol.

<sup>112</sup> Tara Garnett, *Food Climate Research Network*. March 2008.

<sup>113</sup> <http://www.guardian.co.uk/business/2007/jan/19/ethicalbusiness.supermarkets>

<sup>114</sup> PAS 2050 is a Publicly Available Specification defining a standard method for measuring the embodied greenhouse gas emissions from products and services.

**Figure 5.2** An example of local product displays in retail outlets.



From a state law perspective the **carbon based eco-tax system** currently being developed in the Netherlands is considered to be the most interesting since it:

- has the potential to incentivise innovation for all packaging formats;
- provides a direct link between environmental burden and packaging type. It is not simply endorsing one packaging format over another, i.e. it is evidence based; and
- it compliments the current carbon agenda.

However the development of such a system would need to be undertaken carefully to prevent administration costs increasing out of hand due to the increased data and monitoring requirements. In addition, although carbon is considered an important deliverable, the EC Packaging Directive with which the UK must comply still uses weight based recycling / recovery targets.

A **state deposit law** would not of itself compel a beverage manufacturer to switch to refillables. It merely establishes a mechanism by which containers could be returned. However it is a possible option to supersede the current UK packaging regulations focussing on increasing recycling / recovery rates of hard to reach packaging formats, such as cans in the away from home market, but also targeting litter reduction and reuse.

It is noted that, to avoid breaching free trade rules it is considered beneficial to apply a standard deposit to both refillable and one-way containers. A detailed regulatory impact assessment would be required prior to the implementation of such a system in light of recent reports into the operating cost of the German deposit system, with estimates of cost per tonne of packaging recycled or recovered and cost per tonne of CO<sub>2</sub> saved being the two key measures.

**To conclude, the study has shown that there is probably little case for the wide-scale re-introduction of refillable systems. However, the study show-cases the innovation that has taken place and highlights the areas where refillables are advantageous and could be positively encouraged.**

## 6.0 Recommended Further Work

Areas of further work include:

- The investigation into the introduction of a standard re-usable 'eco' bottle. Countries with high refilling rates such as Germany, Sweden and Denmark typically have standard bottles operated through a national pool system. The objective here is to evaluate the potential benefit of developing a distinct re-usable bottle that becomes the industry standard to which brand owners wish to be associated. The objective is to overcome the issue of brand differentiation and to ensure consumers can distinguish between this re-usable bottle and the typical one-way bottles destined for recycling – the standard milk bottle is a good example. The bottles would be produced to exacting environmental standards (high recycled content, etc) and RVMs could be set up at retail outlets to process such bottles.
- The investigation into the wine sector revealed a technical constraint in that no low-volume sterilization equipment / machines could be identified for use by the small scale producers. The development of such a machine may enable more small scale companies within any of the beverage container markets to introduce reuse.
- Engaging in dialogue with the brand owners and producers on the topic of design for remanufacture may enable barriers to be overcome. For example, overcoming the issue of variability in the glues used during labelling which currently complicates the de-labelling process and concerns over the fraudulent reuse of containers. Such issues are common in markets where reuse is being developed.
- During the study it was observed that refillable PET bottles is gaining market share in countries such as Germany, Denmark and the Netherlands. Unlike refillable glass beverage containers, the UK has no experience of such systems and hence a follow up study focusing on refillables in this material format is considered advantageous.

## Appendix 1 Summary of International refillable systems

Country	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Austria	Law to make deposit regulatory	1992	PET bottles (non-refillables excluded)	30% PET 60% Cans	\$0.40		Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Belgium	Ecotaxes Act of 1993 Containers taxed \$0.52 per litre unless they have deposit.	1993	Beer, soda and soft drinks containers		\$0.12 <50cl \$0.24 >50cl		Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Croatia	Deposit-return plus 'incentive fee' to be paid by producer if 50% refill isn't met (5% paid still, if target is met).	2005	Glass, PET and metal containers for beer, soft drinks, water, wine and spirits.				Government	EUROPEN Report 2007
Denmark	Packaging Law. All beer and soft drinks must be sold in refillable bottles. Metal banned until 2002. Regulatory deposit for imported glass/plastic containers. Ecotax also.	1989 (amended 1991)	Beer and soft drinks containers. Deposits on some wine and spirit bottles dependent on retailer.	99.5 % (beer and soft drinks containers only)	\$0.27 <99cl \$0.78 >99cl  Tax \$0.14-0.33		Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Estonia	Deposit-return	2004	Beer, low alcohol drinks, carbonated/ non-carbonated soft drinks, water, juice, cider and perry.		Glass 1.0 kroon (refill and NRB) Metal and PET < 0.5 l 0.5 kroons PET > 0.5 l 1kroon	Retailers	Government	EUROPEN Report 2007



Country	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Finland	Tax on beverage containers Exemption from tax only if part of refillable deposit scheme.	1970s 1990	One-way beer and soft drink containers	Glass bottles 99% Cans 86%	Non-refillables \$0.11 \$0.45 for larger sizes Tax \$0.24 beer \$0.47 plastic \$0.71 glass	8,000 sites	Government	<a href="http://www.ymparisto.fi/download.asp?contentid=16253&amp;lan=EN">http://www.ymparisto.fi/download.asp?contentid=16253&amp;lan=EN</a>
Germany	<i>Einwegpfand</i> Deposit on one-way a standard amount, deposit on refillables manufacturer dependent, not legally specified, though tend to be similar.	2003	Not containers for wine, fruit juice or spirits	Quota- Glass 90% Alu. 90% Plastic 80%	Glass refillable- Beer € 0.08 Soft drink € 0.15 (many prices, not all listed)		Manufacturers	<a href="http://www.bottling.com/Container_deposit_legislation">http://www.bottling.com/Container_deposit_legislation</a>
Hungary	Tax linked to market share quotas.	2005	Beer, low-alcohol drinks, wine, mineral water, carbonated and non-carbonated soft drinks.	Quota- Beer 67% Low alcohol 28% Wine 20%				EUROPEN Report 2007
Iceland	Tax on non-refillable containers.	2008	Non-refillable glass, steel, aluminium and plastic.					EUROPEN Report 2007
Kiribati	Special Fund Act 2004	2004	Aluminium cans and PET drinks bottles		\$0.05 (\$0.04 returned)	Kaoki Mange operating centres.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Malta	Deposit Return System Previous ban of non-glass beverage containers, lifted							
Mexico	Higher tax on non-refillable bottles and cans.							
Fed. States of Micronesia	Kosrae Recycling Program (Deposit-return)	1991 (amended 2006)	Currently only aluminium cans, but glass and plastic expected to be added soon.	20,000 cans per day	\$0.06 (\$0.05 back)	Kosrae Island Resource Management Authority (KIRMA) sites		<a href="http://www.BottleBill.org">www.BottleBill.org</a>



Country	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Netherlands	Agreement deposit	1993	Soft drinks and water in one-way and refillable glass and PET containers	Refillable glass 98% Refillable PET 99%	PET and glass: \$0.16 <5l \$0.72 >5l		Industry	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Norway	Deposit on containers and tax dependent on return rate. Refillables only exempt if 95% return rate is achieved. Retailers (on site >25m <sup>2</sup> ) selling non-refillables, must also sell similar products in refillable.	1994	Most drinks excluding milk, vegetable juices and water	Wine/ spirits 60% Beer 98% Soft drinks 98%	\$0.16 <5l \$0.40 >5l (+Tax inversely proportional to return rate, but if above 95%, no tax)	Over 9000 establishments in the country, plus 3000 deposit machines where receipt is given	Tax is government driven, but recycling fee in place is retailer driven	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Peru	Deposit on some bottles		620ml size beer bottles					
Portugal	Fillers must ensure quotas met Retailers must sell refillables for all non-refillables sold.			Quotas- Beer 80% Wine (with certain exceptions) 65% Soft drinks 30%				EUROPEN Report 2007
South Africa	Deposit return system, voluntary i.e. manufacturer driven, not Government.	Around 1948	Approx. 75% beer, 45% soft drinks and some wine and spirits bottles		Between 8-15% of product cost (or 0.5-1% if wine/spirit)		Manufacturer	Consol
Spain				Return overall 87% Reuse beer 57%				<a href="http://www.erveceros.org/">http://www.erveceros.org/</a>

Country	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Sweden	Law requires rate of 90% recycling of aluminium cans, or complete ban. Industry implemented deposit system to avoid this. PET introduced later as well.	Deposit on one-way containers- 1984 for cans. 1994 for PET (refillables deposit already in place)	Aluminium cans and PET law. Deposit now on most beverage containers.	Recovery rate of 80-90% on one way containers	Voluntary Cans \$0.07 Refillable PET \$0.56 One-way PET \$0.14-0.24		Law government driven. Standard bottle and deposit brewer/bottler driven.	<a href="http://www.BottleBill.org">www.BottleBill.org</a> <a href="http://en.wikipedia.org/wiki/Container_deposit_legislation">http://en.wikipedia.org/wiki/Container_deposit_legislation</a>
Switzerland	Deposits required on all refillable drinks containers except cans, which have a voluntary tax of \$0.04.	1990	All above a certain weight (currently all!)	Refillable glass 95-98% Refillable PET 70%	Ref. glass \$0.16<6l \$0.40 >6l Ref and one-way PET \$0.40>1.5l		Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
South Australia	Container Deposit Legislation- deposit required on almost all drinks containers, with onus on manufacturer/ wholesaler to ensure convenient system in place for deposit of container/ refunds for customers.	1975 (integrated into Environment Protection Act in 1993)	Most included except wine (unless in plastic bottle), milk, pure fruit juice or flavoured milk >1l.	85% non-refillable glass 84% cans 74% PET	\$0.10 if refillable to retailer (rare) \$0.05 if refillable to collection depot (99.9% done this way)	Mostly collection depots, though some store refillables.	Government legislation with manufacturer/ wholesaler responsibility	<a href="http://www.BottleBill.org">www.BottleBill.org</a>

## Appendix 2 Countries in Europe with Container Deposit Legislation



## Appendix 3 Canadian Container Deposit Return Systems

Province	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Canada-Alberta	All containers sold in Alberta (including imports) must be registered through the Beverage Container Management Board (BCMB).	1972	All beverage containers regulatory except milk, which is under a voluntary scheme	Glass (AB Beer) 96% Glass (import beer) 92% Alu (beer) 89% Alu (soft) 79% Overall 78%	\$0.05 <1l \$0.20 >1l Beer \$0.10	215 independent depots and 78 retail outlets (for beer bottles and cans only)	Initially government, until 1997 when it was turned over to private sector	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-British Columbia	All containers must be refillable, and <i>none</i> collected can be landfilled or incinerated. Beer separate system, though still under legislation.	1970	All beverage containers except milk, soya milk, infant formulas, dietary or meal supplements, or other milk substitutes.	81.3%	Non-alcoholic \$0.05 <1l \$0.10 > 1l Alcoholic (not incl. beer) \$0.10 < 1l \$0.20 >1l Beer \$1.2 per dozen	Depots or retailers (all retailers obliged to take back as much as they sell). Beer back to retailer.	Industry	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Manitoba	Beverage producers given option of setting up deposit-return system, or adding a 2 cent per container levy. Only beer producers choose the former.	1995	Beer containers only	Refillable beer 95.5% Dom beer 74% Glass 34% Overall residential 31%	\$0.10	Retailer	Opportunity government driven, implementation producer driven	<a href="http://www.BottleBill.org">www.BottleBill.org</a>

Province	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Canada-New Brunswick	Deposits paid on all containers (bar milk), but whilst full paid back on refillables, only half paid back on non-refillables.	1992 (revised 1999)	All except milk	Refillable beer 96% Dom beer 75% Non-alcoholic 75%	<500ml \$0.10 >500ml \$0.20	89 depots around the province.	Industry	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Newfoundland	Half-back system, with manufacturers prohibited from selling containers other than recyclable or refillable for selected products. Beer operated separately, run by brewers. Only have to refund when customer buying (1 for 1), otherwise negotiable.	1997	Beverage containers smaller than 5l, excluding milk, dietary supplements and medicine.	Refillable beer 95%  Domestic beer 55%	Non-alcoholic \$0.08 (\$0.04 back) Alcoholic (excluding beer) \$0.20 (\$0.10 back) Beer varies -full refund when same number of beer bought as empties returned.	'Green Depots' run as businesses.  Beer returned to certain retail outlets.	Government, but brewers for beer system.	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Northwest Territory	Deposit-return system, with additional handling charges for different products/materials in container.	2005	All beverage containers except milk.	Very new system, so no certain figures yet. Approx. 72%	Wine or spirit \$0.25 Other \$0.10 Plus additional \$0.05-0.10 handling fee	18 government depots or 26 community depots.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada- Nova Scotia	Half-back deposit system. Full refund on refillables, half on non-refillables.		All beverage containers except milk.	Refillable beer 96% Dom. beer 70%	Non-alcoholic \$0.10 Alc. refillable < 1l \$0.10 > 1l \$0.20 Alc. non-refillable <500ml \$0.10 >500ml \$0.20	83 province-wide depots.	RRFB-Resource Recovery Fund Board  Government and industry.	<a href="http://www.BottleBill.org">www.BottleBill.org</a>

Province	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Canada-Ontario	Deposit-return system on alcoholic drinks containers only. Use of 'Industry Standard Bottle'.		Alcoholic drinks containers	Refillable 'industry standard bottles' beer 97%	Containers up to 630ml, or metal containers up to 1l \$0.10 Over those sizes \$0.20	Beer store only	Brewers	<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Prince Edward Island	Non-refillable drinks containers for beer or soft drinks banned since 1977. Wine <i>may</i> have half-back system in place.	1977 ban, 1984 deposit	Soft drinks and alcoholic drinks. Wine <i>may</i> be included.	Refillable beer 96% Wine/ spirit 59% Soft 98%	Non-al <500ml \$0.15 500ml-1l \$0.30 >1l \$0.70 Alc. \$1.20 per dozen, or \$.07 each	Mainly retailers (inc. supermarkets and convenience stores), also 15 depots		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Quebec	Return-to-retail deposit system, with industry required to fund kerbside collection for containers not part of the system.		All beer and soft drinks containers (not juice, water and iced tea)	Refillable beer 98% Dom. beer 76%	Soft drinks and beer cans \$0.05 Beer bottles \$0.10 Beer bottles and soft drinks >450ml \$0.20	Retailers (including depanneurs - small convenience stores not usually included in Canada).		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
Canada-Saskatchewan	Deposit-return system plus environmental handling charge (EHC) for non-refillable containers, for recycling, and beer bottle deposit system for refillables.	1973- Litter Control Regulations (unclear, appears the deposit system introduced to this in 1998)	All beverage containers apart from milk (under voluntary system).	Refillable beer 92% Dom. beer cans 95% Alu. cans 95% Glass 83%  Overall 86%	Deposits vary widely for diff. materials and sizes Non-ref. glass \$0.40-1.00 Metal cans \$0.10-0.20	Beer bottles can only receive full refund if returned to 10 specific sites, but can be returned for less at retailers. Other returns at 71 SARCON site	Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>  <a href="http://www.sarcsarcan.ca/sarcan/faqs.php">http://www.sarcsarcan.ca/sarcan/faqs.php</a>

Province	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
Canada-Yukon	No kerbside collection. Deposit-return system, with 'recycling club' for children offering 'prizes' as well as refund if certain numbers reached. Refillables not charged recycling fund fee, all others are.	1998	All beverage containers except milk.	Refillable bottles 103% Non-refill. bottles 113% (?) Liquor containers <200ml 99% 1L 90% >1L 79% (includes refillables)	D=deposit, R=refund Liquor ref. D=\$0.10 R=\$0.10 Liquor non <500ml D=\$0.15 R=\$0.10 >500ml D=\$0.35 R=\$0.25	22 depots or four Liquor Commission outlets	Government	<a href="http://www.BottleBill.org">www.BottleBill.org</a>



## Appendix 4 Canadian States-Prince Edward Island



## Appendix 5 American Container Deposit Return Systems (Bottlebills)

State	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
USA-California	California Beverage Container Recycling and Litter Reduction Act Deposit-return system on non-refillable containers	1987 (Expanded 2000 to include all non-carbonated and non-alcoholic drinks excluding milk.)	Non-refillable drinks containers, inc. beer, spirits, carbonated, fruit drinks and some vegetable juices. Not milk.	Alu 73% Glass 58% PET 46% HDPE 51%  Overall 61%	Under 24oz \$0.05 Over 24oz \$0.10	Redemption centres (not retailers)		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA-Connecticut	Beverage Container Deposit and Redemption Law Deposit-return system.	1980	Beer, malt, soft drinks and mineral water.	Not recorded. In 2004 CRI estimated recycling rate to be similar to Massachusetts of 69%	\$0.05	Redemption centres, or retailers (but only for brands /products they sell).		<a href="http://www.BottleBill.org">www.BottleBill.org</a>  <a href="http://www.ct.gov/2005/rpt/2005-R-0836.htm">http://www.ct.gov/2005/rpt/2005-R-0836.htm</a>

State	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
USA-Delaware	Beverage Container Legislation Deposit-return system	1982 Wholesale  1983 Retail	All non-aluminium beer, malt, carbonated, mineral water and soda water containers less than 2 quarts (approx. 1.9L).	Not recorded.	\$0.05	Retail stores, but only for brands they sell.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA-Hawaii	Deposit Beverage Container Law Deposit-return system	2002	All beverage containers excluding milk and dairy derived products, except tea and coffee or liquor containers.	Not recorded.	\$0.05	Redemption centres or retailers (if not within 2miles of red. centre in highly pop. areas, or if under 5,000sq ft of retail space		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA-Iowa	Beverage Container Deposit Law Deposit-return system.  Deposit containers banned from landfill in 1990.	1979	Beer, soft drinks, soda water, mineral water, wine, liquor and wine coolers.	93%	Not less than \$0.05	Redemption centres or retailers (who can refuse if they have an agreement with former).		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA- Maine	Maine Refillable Beverage Container Law Deposit-return system	1978	Beer, soft drink, wine cooler, mineral water. Expanded to include wine, liquor, water and non-alcoholic drinks in 1989.	Not recorded.	Wine and liquor \$0.15  Other \$0.05	Redemption centres or retailers (who can refuse if they have an agreement with former).		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA-Massachusetts	Beverage Container Recovery Law Deposit-return system	1983	Beer, soft drinks and carbonated water.	69%	\$0.05	Any retail establishment that sells the container.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>

State	System	Year of Intro	Containers Covered	Capture Rate*	Deposit	Redemption Site	Driver	Reference
USA- Michigan	Michigan Beverage Container Act Deposit-return system	1978	Beer, soft drinks, carbonated and mineral water. Wine coolers and canned cocktails in 1988.	97%	\$0.10	Retail stores		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA- New York	New York State Refillable Container Law Deposit-return system	1983	Beer and other malt drinks, carbonated soft drinks, wine coolers, mineral and soda waters.	Soft drink 62% Beer 77% Wine coolers 65% Overall 70%	Minimum of \$0.05	Retail stores and redemption centres.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA- Oregon	The Beverage Container Act Deposit-return system  Only US deposit law with no handling fee.	1972	Beer, malt, carbonated soft drinks, mineral and soda water and (as of 2009) water and flavoured water. Bottles and cans under 3L	Overall 84%	Standardized refill bottles \$0.02 Non-standardized and non-refillable \$0.05	Retail stores.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>
USA- Vermont	Beverage Container Law  Deposit-return system	1973	Beer, soft drinks, malt, soda and mineral water, mixed wine and liquor (added 1987).	Overall 90-95%	Liquor above 50ml \$0.15  Other \$0.05	Retail stores and redemption centres.		<a href="http://www.BottleBill.org">www.BottleBill.org</a>

\*Capture rate includes containers returned for recycling as well as refilling. Separate figures were not so readily available.

NB. Unless specifically listed as something else, the monetary unit is American dollars. The only exception is Canada where the Canadian dollar is used.

Percentages given for US capture rates are taken from various sources, often telephone conversations by the Bottle Bill researchers. For more detailed references see [www.BottleBill.org](http://www.BottleBill.org)

## Appendix 6 American States with Bottlebills



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**Waste & Resources  
Action Programme**

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