

4. Deposit-refund systems: Design and implementation

Deposit-refund systems (DRS) can be employed to ensure high rates of recovery of certain tightly defined and specific products, where the mechanism of charging deposits and paying refunds can be operated at an acceptable cost relative to the gains from achieving high rates of return of the products concerned. However, despite the relative simplicity of the concept, implementation of a DRS may involve considerable complexity and high costs of operation which may act as a burden on producers, distributors or retailers. This section discusses key decisions and practical steps to be taken in introducing a DRS, such as commodity coverage, the choice between a single-producer and a common industry-wide scheme, treatment of smaller producers and importers, setting the level of the deposit, and the need for government intervention in a DRS.

4.1 Incentives for behavioural change

Deposit-refund systems aim at changing consumers' behaviour by incentivising the return of product packaging or end-of-life products. Typically, legislation establishing a DRS mandates specific actions on the part of producers and retailers, and may set up new institutions to handle the collection and processing of returned products. Apart from ensuring compliance with these requirements, deposit-refund systems do not generally seek to stimulate significant behavioural change on the part of producers.

DRS can be used very effectively to ensure high rates of recovery for certain categories of packaging and end-of-life products:

- End-of-life products or packaging to be collected for re-use or recycling (such as bottles, cans and other drinks containers);
- Products or materials that would be hazardous or excessively costly if discarded in the general waste stream, to be collected for specialist safe disposal (e.g. batteries or waste motor oil); and
- Products containing valuable materials to be re-used or recovered.

Public policy generally needs to address only the first two of these three categories. If manufacturers of printer cartridges or other sophisticated and costly products wish to recover used items for re-use on a commercial basis, there is no need for legislation to regulate the operation of their deposit-refund arrangements. There is a need for policy intervention only where there is an important and identified reason for separate recovery of items that would not otherwise happen on a commercial basis.

The mechanism involved in a DRS is generally straightforward. For example, a deposit is charged by the seller when a battery is sold, and then refunded when the used battery is returned to an approved collection point. High rates of return for re-use or recycling can be achieved because the refund provides consumers with an incentive to return items through appropriate channels rather than discarding them in general waste.

However, despite the relative simplicity of the concept, implementation of a DRS may involve considerable complexity and high operational costs which may act as a burden on producers, distributors or retailers. Some or all of these costs may then be passed on to consumers in higher product prices, resulting in a burden on consumers that needs to be weighed carefully against the system's aspired benefits. If the costs of operating a DRS are very high, this could encourage producers, retailers or consumers to shift towards packaging or products that lie outside the scope of the system, which tends to encourage imported products at the expense of locally-produced products.

The key issues relating to policy design and practical implementation that need to be addressed in the introduction of a deposit-refund system are the following:

- The scope, in terms of products to be covered;
- Institutional arrangements, in particular the choice between producer-based and industry-based DRS;
- Setting the rate of deposit and refund, which governs consumer behaviour and return rates; and
- Arrangements for monitoring and enforcing compliance.

4.2 Design issues

4.2.1 Commodity coverage

Deposit-refund systems need to be applied to tightly defined categories of products so that it is clear which products the deposit would be charged on, and so that refunds are paid only for products where the deposit had previously been levied at the appropriate rate. The refund arrangements are usually operated by individuals collecting the returned items, so it needs to be clear to them which items are eligible for a refund. It should be possible to identify items eligible for refund quickly through visual inspection or by some prominent and distinctive marking on the product. This issue is important not only for the smooth functioning of the product return arrangements, but also for the financial control and prevention of fraud within the retail sector.

In practice, successful DRS have been implemented for drinks containers such as glass bottles, cans and cartons. Some countries have been able to specify other products on which a deposit should be paid and subsequently refunded, e.g. batteries and motor vehicles. In each case, these are easily identifiable commodities, with little doubt whether a particular item lies within the scope of the system or outside it.

However, it is *not* possible to operate a satisfactory DRS on the following types of products:

- Products that have “blurred boundaries” – in other words, where the definition of the item is vague, as for example “packaging”, or where the definition reflects characteristics which are a matter of judgement, such as “green” or “sustainable” products.
- Products that cannot be identified by simple visual inspection. This rules out, for example, a DRS for batteries of a particular type (e.g. nickel-cadmium batteries), unless the batteries can be easily distinguished from other types not subject to the system through clear and distinctive marking, as has been done in Denmark (Section 2.2).
- Products of some producers but not others, unless products within the scope of the system can be clearly and distinctively marked in a way that has effective legal protection. (A distinctive logo could be used to mark products within the system, but legislation would be required to prohibit producers outside the system from using the logo, and resources would need to be devoted to ensuring effective enforcement of this.)
- Products that can be reconfigured or sub-divided so as to increase the number of refunds to be paid.

4.2.2 Single-producer or common industry-wide scheme?

A key policy choice in designing a DRS concerns the balance between individual and collective responsibility that the scheme will impose on producers. Deposit-refund systems can be operated separately by each producer or entirely or partially by the industrial sector.

Producer-based DRS

A system operated by individual producers would require, for example, battery producer A to levy a deposit on the batteries it sells, and then to collect its own batteries, returning the deposits which had previously been paid by its own customers. Producer B would likewise charge a deposit on its batteries and refund the deposit on those of its batteries that are returned. Each producer would be required to operate a similar DRS, but the systems would operate independently. Each producer would face targets for the percentage of its products that it should recover, and would be liable for penalties if it failed to operate the required scheme or to achieve the required rate of recovery.

A producer-based DRS imposes unambiguous and straightforward obligations on individual producers. However, it can be complicated for consumers, who may have to return similar products to a range of different collection points, depending on their manufacturer, which may lead to lower rates of return than in a simpler scheme.

Industry-based DRS

Under a collective industry-wide scheme, all producers of a particular product would charge the same deposit and would then be required to make refunds to all items returned to them, regardless of the original producer. An industry-based DRS is often used to recover single-use packaging for recycling. If an industry-based system is to be employed for items which are to be re-used, such as beer bottles, for example, these would need to be of a common design.

An industry-based DRS is less complex for consumers, who have a wider choice of collection points and who do not need to concern themselves with finding a collection point that will take the products of a particular manufacturer.

In practice, manufacturers rarely make sales directly to the public. Most sales are made through retail outlets, and these may handle the products of more than one producer. If deposit-refund arrangements are organised separately by each producer, retailers may need to collect, store and make arrangements to return items to each producer, and to keep separate accounts of the deposits returned on each producer's items, making the system's operation exceedingly complex. A collective industry-wide scheme is much easier for retail outlets to operate and involves less bureaucracy and lower storage requirements.

Recent technological changes have made it possible to automate many of the processes involved in collecting drinks containers, making refunds, and accounting for quantities collected and payments. Some designs of "reverse vending machine" are able to handle many different designs of drinks container and to make different refunds for different items. The costs of reverse vending machines will, however, only be warranted in locations where large numbers of items are being collected, which creates a reason to try and reduce the number of collection points, so as to be able to make the maximum use of automation. A further implication of these technological advances is that they reduce the need for easy-to-operate systems and make it possible to operate with much more complicated deposit and refund arrangements compared to the manual processing of refunds by small-scale shops and other outlets.

Most deposit-refund systems need to accommodate considerable asymmetry between the pattern of deposits collected and refunds paid out, especially where a single industry-wide scheme is in operation. Since customers can return items to *any* retail outlet, and not just the retailers selling the brand they purchased, customers may choose to return items

to the retail outlet that is most convenient to them, even though they may have initially bought the product elsewhere. Retailers in residential areas or those with good car parking facilities might be expected to collect more items than they had originally sold.

Some arrangements are needed to ensure that appropriate deposit income is transferred to the locations making higher levels of refunds. It cannot be simply assumed that their costs of collection will be covered by the price they charged for the initial sale, because the sale was made by someone else.

4.2.3 Treatment of smaller producers and importers

The costs of operating a producer-based deposit-refund scheme are a disproportionate burden on firms with a small volume of sales, especially if it is spread over a large number of retailers. Such producers will need to make arrangements to collect returned products (e.g. bottles) from all of the retailers through whom their products are sold, but will not gain the economies of scale which are available to producers with a higher volume of sales. The result is that the cost of operating the DRS will be higher per unit sold for small producers, which will either reduce their profitability compared to larger producers or make their products less attractive for retailers to stock. A producer-based DRS can thus act as a barrier to market entry for small firms and can give an undesirable competitive advantage to large firms, which can spread the costs of the DRS over many more units sold. By contrast, small-scale producers could participate in an industry-based DRS on a more or less equal footing with their larger competitors.

Since many importers typically are selling premium or niche brands with small market share, importers tend to be disadvantaged relative to large domestic producers under a producer-based DRS. However, small-scale importers are also at a disadvantage under an industry-wide DRS, if this imposes requirements for uniform product packaging (e.g. a standard bottle design or a label with a distinctive logo) that differs from the packaging or labelling used when selling the same product in other markets. Importers would then need to produce products in the required product packaging in order to sell in this particular market, which will add to their costs of production.

4.2.4 Setting the level of the deposit

In a conventional DRS, a fixed deposit is charged when the product is sold (e.g. 10 cents per bottle). When the product or its container is later returned, an amount equal to the deposit is refunded to the individual making the return. If all items sold are later returned for refund, all the money collected in deposits is later returned through refunds.

A crucial policy decision to be made in introducing a DRS concerns the level at which the deposit and refund should be set. The amount refunded for each item returned is the key element in the system which governs consumer behaviour and hence the likely effectiveness of the system in achieving a high rate of return. The following factors should be taken into consideration in setting the level of deposit and refund:

- **Achieving a high return rate.** The higher the amount of the deposit and refund, the stronger the incentive for consumers to return the product for refund. Efficient operation of a DRS requires that a high percentage of products be returned in order to justify incurring the high fixed costs of the separate collection arrangements. This is particularly important when the DRS seeks to ensure the return of hazardous items. It is difficult to make an accurate forecast of the rate of return that will be achieved by any given deposit/refund level, but international

experience provides a useful benchmark, and the legislation needs to provide scope for the deposit and refund rates to be adjusted in the light of the return rates achieved.

- **Costs of non-return.** If the deposit and refund are set at a low level, the incentive for consumers to return items will be low, and many may be discarded in the general waste stream or elsewhere. This implies that a second consideration in setting the rate of the deposit/refund should be the costs that would be incurred if the product were not returned for refund. With a glass bottle, for example, this would include the higher cost of replacing the bottle with a new one than re-using the returned bottle, plus the waste management costs of collecting bottles in the general waste stream and/or the environmental damage caused if the bottle is discarded as litter. The refund should be set at least as high as the total of these costs incurred if the bottle was not returned.
- **Balancing financial effects on firms.** With an industry-based scheme, it is important that the scheme not confer disproportionate benefits on producers who happen to receive a high share of returned items, nor should it impose disproportionate costs on them. Some producers will find that they get more bottles back than others, and if the refund they have to pay for each bottle is significantly lower than the value of the bottles, this would create a significant benefit for them. Equally, if the refund greatly exceeds the value of the bottles, producers might be tempted to discourage consumers from returning bottles to them. Setting the refund at a level roughly equal to the value of recovered items to the producer would tend to avoid disputes between firms about unfair benefits to some participants from the system's operation.
- **Avoiding complexity.** It is desirable to avoid unnecessary complexity in the structure of deposit and refund rates. While it may be tempting to propose a sophisticated tariff structure, there are practical reasons for simplicity. For example, a single rate per glass bottle is much easier to operate than multiple rates for different sizes of bottles.
- **Inflation provision.** An important issue in setting deposit and refund rates is covering the effect of inflation. If the scheme aims at maintaining the incentive for the return of bottles, the rates of deposit and refund must be increased periodically, in line with the inflation. Whenever the rates of deposit and refund are increased, it is inevitable that some returns will receive a refund which differs from the deposit previously charged. More important than the brief unfairness of giving some consumers refunds that are higher than the deposit they paid is the danger that the uprating of deposit and refund rates creates incentives for speculative hoarding of items in anticipation of higher refund rates. This is potentially disruptive to the logistics of the collection and waste management operations and particularly costly for firms relying on the returned items for re-use. From this perspective, frequent adjustment of the refund rate in small steps in line with inflation is better than occasional large changes which would allow hoarders to make substantial profits.

4.3 Legal and institutional issues

The requirements for legislation for DRS depend on the underlying reason for introducing the DRS. Where DRS is being used to manage items which generate

hazardous wastes; the need for legislation and procedures for compliance monitoring is much more extensive than in other cases (Table 4.1.).

Deposit-refund systems to collect items of significant value for re-use or materials recovery could be introduced by firms on a purely commercial basis. Such commercial arrangements require no legislative underpinning or public policy intervention. However, legislation is normally required to underpin a DRS introduced to achieve waste management policy objectives – either to achieve high rates of recycling or to ensure a high rate of recovery of items or materials which would be hazardous within the waste stream. The costs of operating a DRS are likely to be substantial for the producers and retailers involved, and legislation will then be needed to establish which firms are covered by the requirement to operate a DRS, what their obligations are, what performance targets they are required to meet, and what sanctions will be applied for non-compliance.

Table 4.1. Need for government intervention in DRS

	DRS to recover items of value	DRS for waste management	DRS for managing hazardous items
Purpose of DRS	Save resources by re-using collected items	Prevent littering; enable higher rate of re-use and recycling	Ensure safe disposal
Examples of products	Beer bottles, computer print cartridges	Single-use drinks containers	Batteries
Need for legislation	No, if recovered value exceeds operating costs of DRS	Legislation essential to institute a DRS, but not necessarily to specify subsequent treatment of collected items	Legislation needed to establish a DRS and to govern disposal practices for hazardous materials collected
Enforcement and monitoring required	Little or none	Monitoring of deposits and collection	Monitoring of collection and subsequent disposal
Need for public financial support	Negligible: participants benefit from recovery.	Low, as long as the system covers all relevant firms. Some subsidy may be needed to avoid “unfair” burdens on smaller firms.	Public importance of safe collection and disposal may justify public funding of subsidy for return, which could exceed initial deposit.

Where a DRS is to be operated on an industry-wide basis, with firms collecting items that had been produced and sold by other firms, the legislation will need to establish a central co-ordinating institution for the system. This could take the form of an industry-owned non-profit organisation (a model which has been employed successfully in many of the European countries that have introduced deposit-refund systems for single-use drinks containers). Alternatively, the role of co-ordinating institution could be performed by a public agency. The key tasks of the co-ordinating institution would be:

- To establish the operating rules of the system (product coverage, marking of products to show deposits paid, obligations on firms to take back, etc.);
- To require firms to account for deposits collected and refunds made and to make appropriate financial transfers between firms to compensate possible imbalances between deposit revenues and refund payments; and
- To monitor compliance by firms with the system’s requirements, particularly to avoid systematic fraud.

The costs of a central co-ordinating institution could either be borne by the public sector or shared between participating firms, with contributions to the operating costs

levied on firms in proportion to the value of sales, the volume of production or some other appropriate formula.

It is possible that negotiated agreements between the public authorities and industry representatives may be sufficient to establish and maintain well-functioning deposit-refund arrangements for certain products without the need for formal legislation. The threat of legislation may be sufficient to induce industry representatives to agree to implement a scheme on a voluntary basis. They may, for example, fear that legislation would impose a more inflexible system, with higher costs, more bureaucratic audit, or the threat of onerous penalty regimes for non-compliance.

International practice includes a number of examples where deposit-refund systems (and EPR schemes) have been introduced on a voluntary basis by industry bodies. It is clear that the threat of onerous legislation can be a strong motivation for members of an industry organisation to agree to co-operate on a collective voluntary system. However, the experience of such agreements also indicates that there is a risk that such schemes may deliver less than they promise once the pressure for legislation has subsided. This danger can be reduced if the voluntary commitment is sufficiently clear and concrete about what practical arrangements will be put in place and what quantitative targets will be achieved. This creates a realistic opportunity to monitor compliance with the agreement and, if the agreement proves to be ineffective, to justify the introduction of legislation.

References

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