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Working Papers

THE ECONOMICS OF DUTY-FREE SHOPPING

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THE ECONOMICS OF DUTY-FREE SHOPPING

Abstract

In 1999 the EU abolished duty-free on intra-EU travel, whilst other countries still retain duty-free shopping for international travellers. We address several aspects of duty-free trade, including effects on consumption, revenue and price-setting. From a global perspective we identify the distortions generated by duty-free trade. We review, and dismiss, various arguments that might conceivably support a role for duty-free in promoting global economic welfare. The existence of duty-free trade is explained as a phenomenon that individual countries find in their national self interest as seen both from the arrival and the departure end, i.e. countries have reasons both to admit duty-free goods and to permit their sale to departing passengers.

JEL Classification: H0.

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1. Introduction¹

There can be few more arbitrary, and transparently wasteful, economic phenomena than duty-free sales to travellers. International travellers are singled out - for no obvious reason - to be given a tax privilege, in the form of the opportunity to buy limited quantities of goods free of tax and duty. It would seem no less arbitrary to permit duty-free sales to individuals attending football matches or opera performances, or staying overnight in a hotel. At the same time, the tax privilege is evidently not costless from the point of view of the world economy as a whole, since resources are wasted in the pursuit of the duty saving. An altitude of 30 000 feet is hardly the most efficient location for trade in perfumes and spirits. The international ferries and cruise ships which are kept afloat by the profits from duty-free are a visible manifestation of this economic waste - a floating deadweight loss, advertising the diversion of resources from more productive uses.

Duty-free trade raises a number of issues that are interesting from the perspectives of positive and normative economics. Are indeed the duty savings wasted through real use of resources or do the savings accrue as rents to consumers, duty-free sellers or owners of the premises? Do governments allowing duty-free lose revenue or are they able to recoup the loss of tax money by appropriating rents accruing to the holders of duty-free trade concessions? What are the considerations governing the price setting of duty-free sellers? Should governments give concessions creating duty-free shops that are monopolies or is competition in the duty-free market to be encouraged?

In 1992 the EU agreed to abolish intra-EU duty-free, with effect from 30 June 1999. Duty-free sales on intra-EU travel had increasingly been recognised as anachronistic, and inconsistent with the principles of the Single Market. Air travellers between member states benefited from duty-free, whereas travelling the same distance by air within a single member state did not give rise to any entitlement to make duty-free purchases. Quite apart from this, the system of duty-free treated journeys within the EU made by different modes of transport in different ways - no duty-free sales were, for example, made at land frontiers, or on the Eurostar rail link between London and Paris.

The abolition of duty-free was controversial, and the impending deadline led to a vigorous and well-resourced lobbying campaign by the duty-free industry. Much of the focus of this was on the alleged employment consequences. A widely-quoted figure was that 140,000 jobs were "at risk" from the abolition of intra-EU duty-free. Despite the pressures on the governments of many member states from this lobbying effort, however, the 1992 decision was carried through in 1999. A decision to reverse or postpone the end of duty-free would have required a unanimity among member states; a tall order for the lobbyists, despite the resources expended on the industry's campaign.

The abolition of duty-free has brought about major changes in the duty-free markets. The amount of duty-free trade has declined and quite dramatically in certain segments of the duty-free market within the EU, while the trade has expanded in countries outside still retaining the duty-free arrangement. Ferry operators have changed their sailing routes and new expensive harbours have been built in order to include ports of call within areas still accepting duty-free sales. What has from a global perspective been a partial abolition of duty-free trade has generated new inefficiencies. We shall elaborate on the changes that have happened towards the end of the paper.

Despite the fact that the EU has now abolished duty-free for travel between member states, the topic remains of policy interest:

- (a) The EU member states still retain duty-free on external travel. Should this remain, or should this also be abolished?
- (b) Many other countries, including the US and countries in Eastern Europe and the Far East, also operate duty-free shops.

¹ Previous versions of the paper have been presented to the ESRC Public Economics Working Group at the Institute for Fiscal Studies, to the CESifo Area Conference on Public Economics and at the European University at St. Petersburg. Comments by Marko Köthenbürger and seminar participants are gratefully acknowledged.

- (c) Non-EU countries such as Norway face choices about how to respond to the EU decision. Should Norway follow the EU, and abolish duty-free on travel between Norway and the EU countries, or should it retain duty-free?

In addition to the remaining policy questions regarding the future of duty-free, there is also interest looking back at the economics of the abolition of intra-EU duty-free. Was this decision one which in fact maximised Community welfare, or not?

There appears to be a minimal economic literature on the phenomenon of duty-free. That which exists is mainly concerned with employment aspects of the abolition of duty-free. A study by the ifo Institut (Parsche, et al, 1998) provides a comprehensive bibliography of such studies, and argues that the substantial "job losses" predicted should be viewed with considerable scepticism. The ifo study itself provides a careful account of the macroeconomic and fiscal significance of duty free and its abolition, including possible effects on the costs of air travel and route frequencies. While its analysis suggests that there may be interesting issues about consumer behaviour and pricing policy in duty free markets and the markets for related commodities such as travel, these are not analysed systematically. The present paper aims to fill this gap in the literature by analysing consumer and producer behaviour in duty free markets. Then, drawing on this behavioural framework, we analyse the consequences of duty free from the standpoint of national interest, and the wider perspective of the global economy.

To complete the background for our discussion of duty-free trade we shall give a brief account of the legal framework below. Following this introduction the analysis of the paper is in three main sections. As usual in analysing tax policy the welfare and revenue consequences of duty-free are governed by the effects on producer and consumer behaviour. The paper accordingly begins, in Section 2, by outlining the ways in which duty-free may affect consumer behaviour, and the decisions of suppliers. Section 2 begins with a very simplified "benchmark" case, which abstracts from the international dimension of duty-free, and which assumes very restricted effects of duty-free on consumer purchasing. This case introduces a number of key ideas, and some clear-cut results. The restrictive assumptions about consumer behaviour made in the benchmark model are then relaxed, to consider cases where duty-free affects marginal commodity demand and travel. Section 3 considers the welfare consequences of duty-free, again concentrating on the global perspective (ie global economic efficiency), rather than the inter-country distribution of gains and losses. How does duty-free affect the efficiency of taxation systems? In what way is duty-free liable to impose additional costs of raising tax revenues, in terms of distortionary effects? Part of this issue concerns what we might mean by distortionary costs in this context. Section 4 then shifts the perspective to that of the policy choices for an individual country. Individual countries have the power to control duty-free, both from the departure end (eg airport duty-free shops) and at the arrival end (by restrictive travellers' allowances). When might it be in the interests of a single country, acting without international co-ordination, to take action to control duty-free at either point?

We pay virtually no attention in this paper to the issue which has been most prominent in public debate, and was emphasised most by duty-free lobbyists - the "job losses" at stake if duty-free is ended. This is because we regard these as fundamentally transitional issues of adjustment, rather than long run, permanent, consequences of ending duty-free concessions. We also suspect that they can be greatly overstated. One of the observations we make is that duty-free is less likely than often supposed to involve major increase in overall consumption of the types of commodity (alcohol, tobacco, etc) which are sold by duty-free shops. In consequence, the abolition of duty-free may affect the volume of sales of these commodities by much less than it affects the profits of operators, or the revenues of airports, ferry companies and governments.

The legal framework

Commodities can be sold duty-free in air space and international waters outside the zone in which a state has jurisdiction. Firms can also be entitled by special authorisation to sell certain specified commodities duty-free in airports. In order to be able to avoid duties the firms must also be allowed to obtain goods duty-free in some sea or air port. Thus the preconditions for a firm being able to sell goods at prices that include no duty is that the firm can obtain goods duty-free and can sell them outside the zone of national jurisdiction or as duty-free goods in airports. The exact legal rules seem to differ somewhat between countries.

In Norway there exist official lists of commodities that can be obtained by firms duty-free for sale at airports and on board aircraft and ferries. Within the Norwegian 4-miles zone the Norwegian duty and

customs rules apply. Goods that can be sold duty-free at airports are alcoholic beverages, cigarettes and tobacco, chocolate, sugar, perfumes, and toilet articles². The same list applies for goods taken on board ferries in Norway for sale on so-called longer sea routes, while a truncated list is valid for so-called shorter sea routes. Firms selling duty-free goods are commercial firms like airlines, ferry companies or firms running duty-free shops in airports³.

Firms registered in a country (called the home country) can obtain goods without paying the taxes of that country in two ways. Firstly, the transactions may be tax exempt in the home country because the goods are on the official list of duty-free goods as explained above. Secondly, the goods may be taken on board in some other country. This is an attractive option if duties and taxes are lower or non-existent in the foreign country. If put on sale outside the national jurisdiction the goods are sold free of home country duties and taxes. For instance, in Norway there is a tax on alcoholic beverages served in restaurants. No such tax can be levied in international waters. International agreements can be used to prevent firms from taking goods on board abroad to avoid taxes. Among the Nordic countries (Finland, Sweden, Norway, Denmark, Iceland) there is an agreement that harmonises the rules allowing goods to be taken on board free of tax.

2. Consumer and producer behaviour

There are three typical contexts in which duty-free sales take place:

- (a) airport duty-free shops, which permit departing passengers to buy a range of goods free of tax and excise duty
- (b) duty-free sales on board ships (and, less extensively, aircraft), for consumption after the journey
- (c) duty-free sales on board ships for consumption during the journey.

There are some interesting differences between the three cases, which we highlight at relevant points in the subsequent discussion. To begin with, it may be useful to think in terms of case (a), sales of duty-free goods at airport shops. With the growth of air travel, this has become the most significant part of the overall duty-free industry, although in some countries maritime duty-free remains a significant policy issue.

In this section we consider how producers and consumers would be likely to behave when the opportunity of making duty-free purchases is available. At this stage we are not concerned with whether permitting duty-free is in the interests of individual countries, or indeed, in the global interest. We consider these issues later, in the light of our analysis of the impact of duty-free on consumer purchases, and on the pricing and other decisions of suppliers.

Two initial observations identify distinctive features of the duty-free market, which play a key role in shaping the analysis:

1. Duty-free purchases are essentially **joint purchases** of two goods, the duty-free commodity and travel, since duty-free goods can only be purchased by people who make the qualifying journey. This feature potentially has implications for both consumer and producer behaviour. Duty-free is liable to distort consumer choices, both towards the goods typically sold duty-free, and towards excessive travel which has to be purchased jointly with duty-free. Faced with consumers making joint purchasing decisions, there will be cases where producer decisions about pricing and other aspects of supply of the two commodities are also interdependent
2. Most of the interesting aspects of the analysis of duty-free arise because of **transactions costs** and **quantity restrictions** on duty-free purchasing. If all those who travel can purchase unlimited amounts of duty-free goods, and experience no inconvenience or other transactions costs in making duty-free purchases, then duty-free and high street purchases would be perfect

² The specifications are in fact more detailed, but we do not go into that.

³ In Scandinavia SAS Trading owned by the Scandinavian Airlines is an important retail dealer in airports.

substitutes. All travellers would buy all their alcohol and cigarettes duty-free, and duty-paid high street sales would only be made to non-travellers. If most consumers are travellers, the power to collect duty on high street sales would effectively disappear. Since we do not observe this in practice, transactions costs and/or quantity restrictions on duty-free purchases must be a key element in the duty-free story.

In most of our discussion we shall assume that duty-free purchases are subject to quantity restrictions as is clearly the case for highly taxed commodities like tobacco and alcohol. We should also recognise that there are commodities of which duty-free purchases are not subject to special allowances. There may be no quantity restriction or the restriction may be of a much more general nature, e.g. in terms of a ceiling on the total value of a basket of goods that can be imported without being liable to VAT. Assuming no quantity restriction it still seems likely that in most cases there is an inconvenience cost limiting the amount of duty-free goods purchased per trip. There may be a cost of carrying the goods or, if journeys are infrequent, there may also be a cost of storing the goods or a decay in quality if the goods (eg chocolate) are stored too long. If journeys are made sufficiently frequently and the inconvenience cost is not too high the entire consumption may come from the duty-free market and the marginal benefit is equated to the total price including the duty-free price and the marginal inconvenience cost. But if journeys are less frequent and the inconvenience cost is sufficiently high only part of the consumption will come from duty-free purchases and the consumers will top up in the high street. The marginal unit bought duty-free will then be as costly as the high street units allowing for the sum of duty-free price and the inconvenience cost. The number of journeys is determined by allowing for the fact that the benefit from a marginal journey is the pleasure it gives plus the value of the entitlement to buy duty-free which is the saving obtained net of inconvenience cost.

We observe that in principle the situation with an inconvenience cost, but no quantity restriction, is not very different from the situation in which duty-free shopping takes place subject to certain allowances. We shall therefore stick to that regime in most of the paper.

We start the analysis, and illustrate the ways in which transactions costs and quantity restrictions affect the duty-free market, by looking at a simple "benchmark" case, in which the availability of duty-free is assumed to have no effect, either on consumption of the commodities sold duty-free, or on travel. We then relax these restrictions in turn.

2.1 A simple case: fixed commodity demand and travel

Let us start by considering the simplest possible case we can conceive of. We assume a single country (so as to abstract, for the time being, from questions of the distribution of effects across countries), and this country permits duty-free sales to air travellers. There is a single airport, with a single duty-free shop. The airport has a local monopoly on air transport, and transport demand is assumed to be fixed (ie the number of journeys that individuals wish to make is unaffected by the availability or the price of duty-free goods). The duty-free shop faces a fixed number of potential purchasers (the travellers who pass through the airport), and has a monopoly in the sale of goods on duty-free terms, although it faces competition from local "high street" retailers who offer identical goods, but must pay duty on their sales. In these circumstances, the pricing decisions and revenues of the duty-free operator, and the purchasing decisions of travellers will be governed by the quantity restrictions on duty-free purchasing, and by the relative transactions costs of duty-free and high street purchases.

Some clear-cut conclusions can be drawn in the case where there are equal transactions costs on duty-free and high street purchases, and where the duty-free allowance (the maximum amount of duty-free goods that a traveller can buy on one journey) is so small that it constrains the duty-free purchasing of all travellers who buy duty-free goods. This does not necessarily mean that all travellers always buy the full duty-free allowance; some may never do whatever the price. However, what it does mean is that the demand function for duty-free goods will be entirely inelastic at prices below the high street price. The operator will price duty-free goods marginally below the prices of the same goods in high street shops, and can gain nothing by reducing duty-free prices further; this simply reduces the rents earned on duty-free sales.

In this case the duty-free shop earns super-normal profits. If the unit costs of duty-free sales are equal to the unit costs of high street sales the supernormal profits made by the duty-free operator will equal the duty per unit multiplied by the number of duty-free sales (fixed by the duty-free allowance). Where the

rents from duty-free trading will end up will depend on how the rights to operate a duty-free shop are assigned. If the government simply allows the duty-free shop to trade, the supernormal profits will accrue to the shop. However, the government could capture these profits by a competitive auction of the duty-free franchise. In this case, the government would gain auction revenues exactly equal to the duty revenue foregone on duty-free sales. Then the implications of duty-free will be negligible. Consumers will buy at prices not significantly different from high street prices, the government will experience no revenue loss, and there will be no economic inefficiency (since duty-free is assumed not to affect consumption patterns, and the costs of duty-free and high street sales are equal).

Some other cases follow straightforwardly, and are summarised in Table 1. If doing trade at a duty-free location is more costly than doing trade in the high street, franchise auction revenues would be reduced, and there is also a deadweight loss from duty-free trade, both equal to the excessive cost per unit multiplied by the number of units traded in the duty-free market. Likewise if consumers are not indifferent between high street and duty-free purchases, but incur an inconvenience cost from buying and carrying around goods during journeys, then, so long as this inconvenience cost (plus any higher unit cost of supply in duty-free shops) does not exceed the excise duty in the ordinary market, it will still be profitable to sell duty-free goods. However the duty-free price must be lowered to compensate consumers for the inconvenience of making purchases during journeys rather than in the high street. The deadweight loss is then the sum of the excessive cost and inconvenience per unit times the number of units purchased in the tax free market. This excess burden is independent of whether the rent from duty-free shopping accrues to the traders, the airport owners or the government.

Table 1. Summary of the simple benchmark model	
Assumptions	Implications
Case 1. <ul style="list-style-type: none"> • Many identical consumers. • "Small" duty-free allowance, less than consumers' high-street purchases • No difference in transactions costs (inconvenience etc) between high street and duty-free purchasing • Individual travel demand unaffected by duty-free • Duty-free shops and high street shops have the same costs • Monopoly duty-free shop 	<ul style="list-style-type: none"> • Duty-free has no effect on marginal consumption decision • Duty-free shop sets prices equal to high street prices • If duty-free franchise auctioned, government reaps franchise rent equal to foregone tax revenue on high street sales • Duty-free involves no inefficiency
As Case 1 but <ul style="list-style-type: none"> • Unit cost of duty-free sales higher than the unit cost of high street sales 	<ul style="list-style-type: none"> • Efficiency cost equal to difference in cost per unit • Franchise auction revenues reduced by corresponding amount
As Case 1 but <ul style="list-style-type: none"> • Duty-free purchasers incur transactions costs (inconvenience) not present in high street sales 	<ul style="list-style-type: none"> • Duty-free prices equal high street prices minus transaction cost • Efficiency cost equal to transactions cost per unit • Franchise auction revenues reduced by corresponding amount
As Case 1 but <ul style="list-style-type: none"> • Many competing duty-free shops 	<ul style="list-style-type: none"> • Duty-free prices equal high street prices minus duty • Income effect for consumers equal to foregone tax revenue

The final case shown in Table 1 abandons the assumption of a single duty-free shop with a monopoly franchise. Suppose instead that entry is unrestricted; there are many competing duty-free shops at the airport. In this case, the benefits of the duty-free status of these shops accrue to the consumers, in the form of an income transfer equal to the duty-free saving. Again, if there is no difference in transactions or supply costs between the high street and duty-free, there will be no efficiency loss, so long as consumption of duty-free goods remains constrained by the travellers' allowances on duty-free purchasing.

One important feature of duty-free not reflected in the above analysis is that it occurs in the context of international travel. In other words, more than one country is available in which travellers could alternatively purchase the commodities which they buy duty-free. For a traveller to purchase duty-free goods they must be advantageous compared both to high street purchase in the country of departure and to high street purchase in the country of arrival.

In the simple benchmark case summarised in Table 1, if there is no difference in the inconvenience cost of purchasing in the departure country, purchasing duty-free, and purchasing in the arrival country, then a monopoly duty-free shop will set prices at the level ruling in the high street where purchases would otherwise take place. In other words, a monopoly duty-free shop will price at the lower of the two high street prices, and will earn its operator monopoly profits (or will generate a franchise auction rent) equal to the revenue foregone in the low-tax high street. We note in passing that the tax revenue and franchise rent may now accrue to different governments, a fact which will be relevant for policy, if not for consumer behaviour.⁴ Also, as before, competing duty-free shops would price at cost, and revenue would be lost equal to the duty on foregone high street sales.

Where there are travellers departing to many different destinations (and where the tax rate of the departure country is sufficiently high to rule out the option of high street purchase before departure), a duty-free shop might ideally wish to be able to offer different prices for travellers to different destinations. If this is impracticable, a duty-free shop has to choose between making sales to many destinations, at a relatively low price, or setting duty-free prices relatively high, and selling only to travellers to high-tax destinations. Which of these strategies will maximise profits will depend on the number of travellers to each destination, and the corresponding high street prices. With enough travellers to high-duty destinations, and a sufficiently high differential in duty, it may be worthwhile for a duty-free shop to set its prices so that they are only attractive to travellers to high-tax destinations, and to price at a level well above the high street prices in the low-tax destination.

The analysis is complicated further if we introduce inconvenience costs. A particularly interesting case arises if we assume that inconvenience costs are greater for "cross-hauling" (ie duty-free purchases on the outbound journey, which are then brought back for consumption at home) than for duty-free purchase for consumption in the country of destination. The duty-free shop could then choose one of two pricing strategies: (a) setting prices relatively high, which would sacrifice cross-hauling sales but would permit a higher price on the remaining duty-free sales, or (b) setting prices sufficiently low to make cross-hauling of duty-free purchases attractive, despite its higher inconvenience cost.

We consider the following situation depicted in Figure 1. There are two countries, each with a high street shop and an airport duty-free shop. The tax rates applying to high street sales differ between the two countries; we denote the country with the higher tax rate by the index H, and the lower-tax country by L. High street prices (including tax) are denoted by capital letters, P^H and P^L respectively, and airport shop prices by lower case, p^H and p^L respectively.

Each traveller might in principle make purchases in three locations: (i) in the high street shops of the country of departure, (ii) in the duty-free shop operated by the country of departure, or (iii) in the high street shops of the country of arrival. We assume that high-street purchases in the country of arrival have the lowest inconvenience costs, and then measure against this the inconvenience cost associated with purchase in locations (i) and (ii). We denote by c_1 the inconvenience cost of purchasing duty-free rather than in the country of arrival, and use c to represent the inconvenience cost of high street purchase in the departure country rather than in the arrival country. We assume that c is greater than c_1 , which might reflect the greater distance that bulky commodities have to be carried if they are bought before the journey to the airport rather than at the airport duty-free shop.

⁴ Note that there may now be a greater likelihood of income effects on consumption than in the single-country case.

In order for travellers to wish to purchase anywhere other than the country of arrival, the price saving they must make must at least cover the additional inconvenience cost they incur. So, duty-free prices must lie below the arrival country's high street prices. However, it is possible that duty-free prices could exceed the price in the country of departure (since c is greater than c_1), but by no more than the difference between c and c_1 .

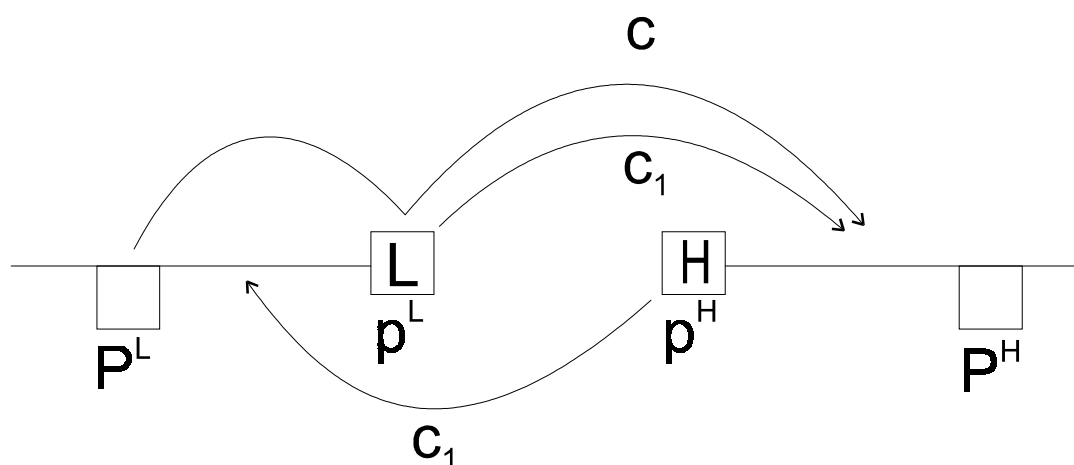
Formally, the reservation price of a customer from the high-tax country entering the duty-free shop of the low-tax country is

$$R^H = \min [P^H - c_1, P^L + c - c_1].$$

The reservation price of a customer from the low-tax country at the high tax country's airport shop is

$$R^L = P^L - c_1$$

Figure 1 High street and duty-free prices and inconvenience costs.



We can distinguish two cases. In the first case the countries set tax rates that are fairly similar, so that the tax differential is less than the inconvenience cost of making high street purchases abroad (ie $P^H - P^L < c$). Then, in order to attract business, the airport shops will set prices lower by c_1 than the price in the country of arrival, ie

$$p^L = P^H - c_1 \text{ and } p^H = P^L - c_1$$

We note that $p^L / P^L = P^H / P^L - c_1 / P^L$. It is not obvious whether the duty-free price of L is set above or below the domestic high street price, since the maximum value of P^H is $P^L + c$ and the minimum value is close to P^L . The airport price of the high tax country will, however, definitely lie below its high street price, and even below the high street price of the low tax country.

If there is a substantial difference between the two countries in the rates of tax on high street sales, (ie if $P^H - P^L > c$), then the duty-free prices will be

$$p^L = P^L + c - c_1 \text{ and } p^H = P^L - c_1$$

We note that the airport shop of the low tax country may set a price above the domestic high street price in the simple world we have described. However the airport shop of the high tax country will set a price below that of the domestic high street. We see that the duty-free prices are likely to converge as compared to the high street prices. A lesson we learn from this simple story is that duty-free shops in high tax countries are constrained by the prices of lower tax countries.

Our simple theory suggests a number of predictions that we might hope to observe in data on duty-free pricing in different countries. Regardless of the market structure for duty-free, we would expect to see duty-free prices on average below high street prices, both because duty-free operators must offset the

inconvenience costs of purchasing and transporting duty-free, and because it is the high street prices of the low tax country which primarily constrain duty-free pricing. If duty-free shops operate in a competitive environment, these effects would, of course, be strengthened. We would expect to see greater similarity (ie lower variance) between duty-free prices in different countries than in high street prices, and other things being equal (especially the degree of monopoly enjoyed by duty-free operators) a tendency for high tax countries to pass on more of the duty-free saving to the consumer.

In reality, of course, there are many countries, and this complicates the decisions that duty-free operators must make. High-tax countries face competition both from countries which set similarly-high-tax rates, and from others with much lower tax rates. Even a country normally considered a low tax country may have higher tax rates than some even-lower-tax country. The significance of different countries' tax rates in determining duty-free pricing will depend on the volume of travel to different destinations. A country with very low tax rates may exert little competitive pressure if few travellers go there. The sellers of duty-free have to make a commercial judgement about which lower-tax and duty-free prices they will compete with, and may choose to price themselves out of sales to very low-tax destinations if few travellers are involved.

High-tax Scandinavian countries may, for example, decide to set duty-free prices so that they only make sales to other Scandinavians, or to price duty-free lower and make sales, in addition, to lower-taxed Britons (but at a lower profit per unit sold), or to price duty-free still lower so that even travellers to low-tax Italy will choose to purchase duty-free. There is a tradeoff between capturing more customers and losing revenue from inframarginal customers. Travel patterns and tax rates both matter, and we should not expect a uniform pattern of duty-free pricing in relation to domestic duty levels.

2.2 Duty-free prices and duty levels

This section looks at some illuminating (albeit somewhat limited) empirical evidence on duty-free pricing, based on data on duty-free and high-street price levels for typical duty-free goods collected by the British Consumers' Association in 1996. The data allows us to explore the relationship between duty-free prices and domestic and foreign high-street prices for the same commodities, and to calculate the proportion of the potential duty saving in duty-free shops that was actually passed on to duty-free customers in each country.

Tables 2 and 3 show, for a typical bottle of spirits and packet of cigarettes respectively, the pattern of duty-free and high-street prices in 13 EU countries in January 1996. In both tables, the data are presented in index number form, with both duty-free and high street prices shown as a percentage of the lowest high-street price. In Table 2, the lowest high-street price for a bottle of whisky was observed in Spain, and all the prices in Table 2 are shown as a percentage of this price. There is substantial variation in high-street prices, and the highest high-street price, found in Sweden, was 326% of the high-street price in Spain. The duty-free prices in Table 2 show much less variance. The highest duty-free price (in the UK) is only 43% above the lowest (in Spain), and most duty-free prices are clustered together, within quite a narrow band, close to the Spanish high street price. The prices in other markets (either the duty-free market abroad or the duty-paid market abroad, we cannot tell which) evidently exert significant competitive pressure on duty-free pricing in all member states.

It will be noted, also, that duty-free prices in Spain and three other member states actually lie *below* the high-street price in Spain. There may be a number of possible reasons for this, and again the data do not permit us to tell which applies. Duty-free prices in Spain might, perhaps, be affected by competitive pressure from even lower duty-free or high-street prices outside the EU area. Another possibility is that there may be some inconvenience associated with duty-free purchase which does not apply to high-street sales, so that Spanish duty-free shops have to offer prices significantly lower than in the Spanish high-street in order to make any sales at all. A third possibility is that the four countries compete directly with each other *in the duty-free market*, driving duty-free prices down below the high-street price observed in any country.⁵

⁵ It should also be borne in mind, here and throughout this section, that the data are probably not based on sample sizes sufficiently large to ensure a high degree of statistical precision, or the statistical significance of some of the price comparisons.

Combining the data on high-street and duty-free prices with data on tax and duty levels in each member state allows us to estimate the proportion of the potential tax and duty saving which was passed on to customers. Figures 2 and 3 present this analysis, plotting the calculated proportion passed-on on the vertical axis. Both Figures (for spirits and cigarettes) show considerable variation between EU countries. In some countries more than two thirds of the duty saving accrued to consumers, while, at the other extreme, there are some countries where duty-free shops passed on one third or less of the duty saving. The latter cases, at least, suggest that some duty-free sellers have considerable monopoly power.

Interestingly, the proportion of the duty saving which is passed on appears, from the limited data summarised in Figures 2 and 3, to be positively related to national tax and duty levels. There is a tendency for high tax countries to pass on more of the duty-free saving to the consumer. This suggests, that duty-free prices or duty-paid high-street prices (or both) in other countries are a significant element in the degree of competition facing duty-free operators in member states, supplementing whatever competition there is within individual countries between duty-free operations at different airports, or different duty-free operators within airports. We return to the multi-country aspects of duty-free later in the paper.

Table 2. Duty-free and high street prices for spirits in 13 EU member states, January 1996

	<i>Duty-free price as percentage of lowest high street price</i>	<i>High street price, as % of lowest high street price</i>
Sweden	120	326
Denmark	104	265
UK	133	246
Ireland	109	222
Belgium	96	143
Netherlands	100	130
France	117	143
Germany	96	157
Austria	104	148
Greece	100	126
Italy	104	113
Portugal	96	126
Spain	93	100

Source: Authors' calculations, based on "Holiday Which?" survey data on airport duty-free prices for Johnnie Walker Red Label Whisky (litre bottle).

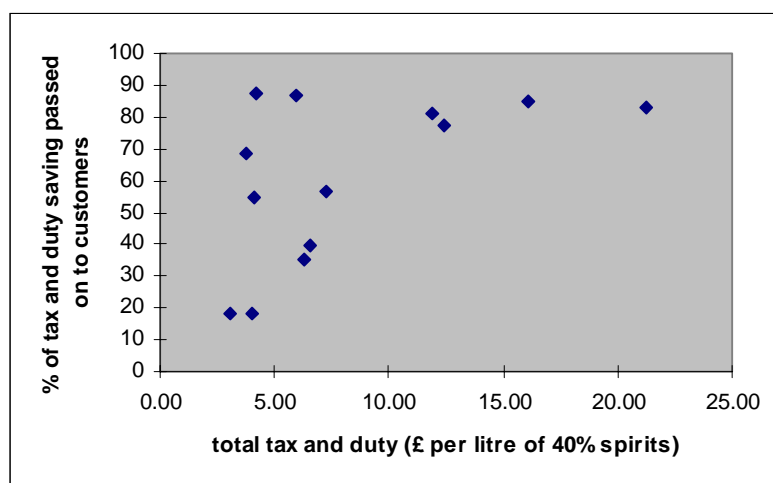
Table 3. Duty-free and high street prices for cigarettes in 13 EU member states, January 1996

	<i>Duty-free price as percentage of lowest high street price</i>	<i>High street price, as % of lowest high street price</i>
Sweden	111	229
UK	100	229
Denmark	86	218
Ireland	89	213
Austria	80	150
Belgium	116	146
Italy	100	139
France	89	132
Germany	86	130
Netherlands	82	127
Portugal	89	118

Spain	81	101
Greece	82	100

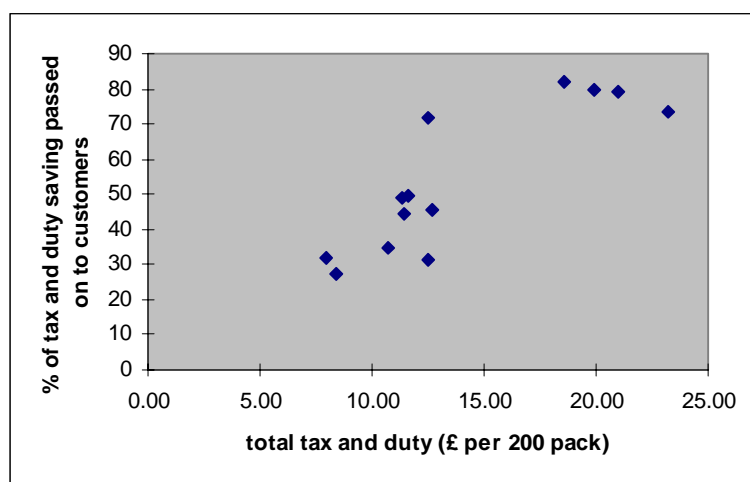
Source: Authors' calculations, based on "Holiday Which?" survey data on airport duty-free prices for Benson and Hedges Special Filter Cigarettes (200-pack)

Figure 2. Tax and duty levels on spirits and the percentage of tax and duty savings passed on to duty-free customers in 13 EU member states, January 1996



Source: Authors' calculations, based on "Holiday Which?" survey data on airport duty-free prices for Johnnie Walker Red Label Whisky (litre bottle), and OECD data on tax and duty rates

Figure 3. Tax and duty levels on cigarettes and the percentage of tax and duty savings passed on to duty-free customers in 13 EU member states, January 1996



Source: Authors' calculations, based on "Holiday Which?" survey data on airport duty-free prices for Benson and Hedges Special Filter Cigarettes (200-pack), and OECD data on tax and duty rates.

The simple data-plots shown here can only be suggestive of the pricing strategies of duty-free operators and the constraints imposed by market structure, inconvenience costs, and the pricing of competing goods. There are a number of different circumstances which may introduce some elasticity into the demand schedules faced by sellers in the duty-free market, and may then lead to pricing below the duty-paid, high-street, price level, and these cannot be separately distinguished with the data shown here.

First, as just noted, if there is competition among duty-free sellers each will face a downward sloping demand curve.

Second, if the inconvenience (in terms of a money equivalent) is not the same for everybody, an increasing number of consumers might switch from high street to duty-free purchasing as the duty-free price is reduced. Even though consumers might still buy a fixed amount of alcohol, each might switch their purchasing from the high street to duty-free at a different duty-free price. Duty-free suppliers with some monopoly power could then increase their sales volume by lowering their prices; whether this increases or reduces profits will depend on the number of additional business attracted, and on the profits foregone on existing duty-free business.

Third, as will be discussed in Section 2.4, if the number of travellers and journeys is affected by duty-free prices, so is the amount of goods purchased duty-free.

2.3 Effects on marginal commodity consumption

Until now we have assumed that the availability of duty-free goods does not affect consumers' total purchases of the goods that are offered duty-free. Consumers simply switch from buying taxed spirits in the high street to buying duty-free spirits at the airport, but do not increase the total quantity of spirits consumed. This has been a simplifying assumption in order to allow us to look at various issues using some straightforward, uncomplicated, models. However, it is clearly restrictive, for three main reasons. First, if duty-free prices are below high street prices, there are a range of ways in which total consumption of the commodity, by at least some consumers, may be affected. Second, the goods sold duty-free are not homogeneous commodities; a consumer may choose to buy different varieties of the commodity at duty-free prices and at high street prices. Third, even if the duty-free allowance is small, so that all travellers (except non-consumers of the duty-free good) buy the full allowance whenever they travel, consumers can increase the amount they buy duty-free by making more journeys. We look at the first two issues in this section, and the third in Section 2.4.

2.3.1 Changes in consumption of homogeneous commodities

To begin with, consider a simple regime in which the consumer buys a number of homogeneous units of a commodity, "spirits", which is offered for sale in the duty-free market and in the high street. The duty-free allowance plays a role in governing the effects of duty-free on aggregate consumption of spirits. Where the allowance is "large" relative to the consumption of some consumers, these consumers will buy all of their purchases of spirits duty-free and will face a price for marginal consumption of spirits which reflects, but may not be equal to, the duty-free price⁶. The availability of duty-free may then encourage additional consumption by these individuals.

If the utility function is quasi-linear the consumption is fully determined by the marginal price and, if the duty-free allowance is small relative to consumption for all individuals, the availability of duty-free will have no effect on total consumption. However, in the absence of quasi-linearity, the income effect arising from the tax saving on intra-marginal units purchased in the duty-free market will have an income effect on total consumption. However, it is implausible to assume that there would, overall, be an income effect from duty-free within the global context⁷ that we have been considering; the income effect arises from

⁶People who buy their entire consumption in the duty-free market face a marginal price for spirits equal to the duty-free price if their purchases are made on an intra-marginal journey. However, if purchases are made on the marginal trip the marginal journey is made entirely or at least partly in order to buy the allowance. Then one has to add the net cost of making the journey which is the fare and other costs minus (the money equivalent of) the benefit from the journey. We can conclude that these consumers face a marginal price that can range from the price of the allowance in the duty-free shop to a total price of acquiring the allowance, which at most can equal the high street price of the allowance. It may not appear plausible that a major purpose of an expensive air flight is to buy duty-free. However the situation may be quite different in the case of cheap, off-season ferry crossings.

⁷With multiple countries, income effects are more likely to arise, because the revenue loss from duty-free purchases may not be experienced by the purchaser's own country. For example, revenue losses from duty-free goods sold to British residents on cross-channel ferries may have been experienced by the French government (if, instead of duty-free goods, these travellers would have bought goods duty-paid in the French high street). British residents would then have experienced an income effect from duty-free, although the size of this would have been given by the (rather smaller)

revenue losses, and these need to be considered in a balanced-budget context. Revenue losses from duty-free would need to be balanced by other fiscal changes, such as offsetting changes in income taxes, VAT or other taxes.

Income effects are likely to be ambiguous as there will be winners and losers if the revenue effects of duty-free are offset by other tax adjustments. Consumers experiencing a positive income effect will be those who make purchases of duty-free goods that are overly large for their income bracket - those with a particularly high propensity to travel and buy duty-free. If the same people also have the higher marginal propensity to consume the duty-free commodity the net effect will be an increase in total consumption. It is an open question how it will be allocated between the duty-free and the ordinary market.

Domestic sales of the goods in question will decline as a consequence of duty-free sales. Those who face an unchanged marginal price will buy the same total amount (neglecting income effects), but will transfer some of their purchases to the duty-free market. Those who increase their purchases as a result of facing a lower marginal price, will shift the whole purchase from the domestic to the duty-free market. We can conclude that duty-free sales will reduce domestic sales.

2.3.2 Changes in the pattern of consumption

Duty-free goods consist of different goods for taking home as well as goods that are consumed on the spot such as food and beverages in ferry restaurants and bars. There is a whole range of duty-free goods, many of which are close substitutes possibly of different quality. One can think of different kinds of alcoholic beverages, different brands, different vintages, etc. Even though the tax exemption makes the whole range of items cheaper, there may be substitution because the relative prices of the various items are different in the duty-free market since taxes in the ordinary market differ across items. The effect may be a substitution towards the more expensive items. This is particularly obvious if the more expensive items are found to be prohibitively costly in the ordinary market.

2.4 The "variable travel" case

Duty-free purchases require a joint decision, since duty-free goods can only be purchased by people who make the qualifying journey. In effect, the consumer buys a "bundle" of the journey and duty-free goods. The attraction of a journey will then depend on the total price of the journey and the duty-free allowance which is made up of the travel fare and the prices of the duty-free goods. Both may be affected by the duty-free arrangement depending on how the various prices are being set in the market. Three possible impacts on travelling can then be identified:

- The frequency of travelling. One may want to travel more often to benefit from duty-free purchases.
- Choice of modes of travel. Since one has to travel by sea or air to buy duty-free it seems plausible that duty-free sales will discourage people from travelling by land (car, coach, train). In the case of ferry crossings they appear to be substitutes not only for other modes of travel, but also substitutes for hotels, restaurants and conference venues on shore.
- The choice of itinerary. If some sea or air ports sell duty-free goods at significantly lower prices than others, going via these places may become more appealing. A Scandinavian may have to fly via some major European airport (Heathrow, Schipol, Frankfurt) to travel to some distant part of the world and duty-free offers might make a difference. A related decision will be the choice of airline or ferry company.

We can consider the choice of joint purchase as a decision in two steps. First the consumer decides for all, possible numbers of journeys how many duty-free allowances to buy and in particular whether to buy

difference between French duty-paid prices and duty-free prices, rather than between British prices and duty-free. Section 4 analyses the implications of duty-free in a cross-country context.

an allowance on the marginal journey. As a next step the consumer chooses how many journeys to make.

We can interpret the duty-free purchase as adding a benefit to that of the journey itself. Whether an allowance is bought on the marginal journey depends on the marginal benefit of the duty-free good and the duty-free price. If a sufficiently small number of journeys is made, a consumer will only be able to buy part of her consumption in the duty-free market, and will top up in the high street⁸. All the allowances purchased are inframarginal units which simply replace purchases made in the high street, the value of which is equal to the high street price, p_H . Denoting the duty-free price by p , a duty-free allowance adds a net benefit $p_H - p$ to that of the journey itself. For lower price levels, some or most consumers may buy duty-free to increase their consumption beyond their previous high street purchases. We may note that the latter outcome does not necessarily require a duty-free price substantially below the high street price if the travel fare is sufficiently moderate. For a sufficiently large number of journeys all the units consumed will be purchased duty-free and the benefit derived from a marginal allowance is equal to the marginal benefit of consumption, which now falls below the high street price. The additional net benefit from a duty-free purchase is then the benefit over and above the duty-free price, which eventually falls to zero as at some point the marginal utility of buying a unit no longer justifies the price. It is obviously true that the number of journeys on which a duty-free purchase is made will decline as the duty-free price rises.

The chosen number of journeys can now be determined by equating the total benefit of a marginal journey to the fare. The total benefit is the benefit derived from the journey itself plus the net benefit from the duty-free allowance. (As a special case the marginal benefit may be derived solely from the journey or the duty-free allowance.) It may not appear plausible that a major purpose of an expensive air flight is to buy duty-free. However the situation may be quite different in the case of cheap off-season ferry crossings.

The lower the duty-free price and the higher the benefit from duty-free purchases the larger is the number of journeys on which a duty-free allowance is bought, and the larger is the number of journeys actually made. Lowering the travel fare will also increase the chosen number of journeys and the amount of duty-free purchased by those making use of the allowance on the marginal journey.

2.5 Price-setting and market structure

It is likely that duty-free sales will make the journey/duty-free bundles cheaper and induce more travelling by modes of transport that offer duty-free sales. To what extent each part and the whole bundle is made cheaper will depend on the pricing behaviour in the various parts of the duty-free market. This in turn will depend on the degree of competition in the supply of duty-free and of transport; it will also be affected by the relationship between duty-free sellers and transport operators.

As a polar case we can imagine an atomistic market for, say, sea travel. A large number of boats may be crossing between two destinations. The normal price structure of the atomistic market will be that prices are pushed down to marginal cost. We will expect this to be true, separately, for the travel fare and the duty-free price. However, we can imagine cases in which everybody will buy the duty-free goods on all sailings provided the duty-free price falls below some level. Then each separate price is arbitrary (provided the duty-free price is not set too high). The only thing that matters is that the competitive price of journey and duty-free allowance equals the corresponding composite marginal cost. Purchases will be the same for all possible composite prices.

Normally one will expect the gain obtained from duty-free purchases to induce more travelling, but in general it will depend on the demand and cost structure whether the total consumption of duty-free goods increases, but in most cases it may seem the more plausible outcome. Quantitatively there is even less we can say at the general level.

⁸ We assume here that the consumer has a positive level of demand for the commodity sold duty-free, and disregard the case of consumers with zero demand for the duty-free commodity

Transport markets are rarely perfectly competitive. As an opposite case one can assume that there is a monopoly. Often the duty-free shop and transport operator are vertically integrated. This is typically the case with duty-free on ships, while national airlines often have a significant interest in national airports. One extreme case is where duty-free and transport are supplied by a single operator, with a monopoly in both markets. If all passengers on all journeys buy the full allowance of duty-free goods if only the duty-free price is moderately below the high street price, the company will set a duty-free price that is not above that level in order to profit from the tax relief. Apart from that it is only the total price of the journey and the duty-free allowance that matters. The pricing of each item is arbitrary as long as the price of the bundle is given. The price of a bundle will then be determined by the standard monopoly pricing rule allowing for the price elasticity of demand. There is a higher mark-up over marginal cost the less elastic the demand for the travel/duty-free bundle.

In general the items may not be purchased in fixed proportions, and there may be a demand for each good (journeys and duty-free goods) that depends on both prices in a less rigid way than above. The monopoly will then consider the demand elasticity for each commodity. If demands for the two goods were independent the good with the less elastic demand would get the higher mark-up rate. However, the price setting will be modified by the fact that the goods are likely to be complementary. A low travel fare will induce travelling and generate more opportunities for duty-free purchases. A low duty-free price makes travelling more attractive. The travel fare is a payment not only for the right to travel, but also for the entitlement to buy duty-free. This complementarity will make the monopoly more cautious when setting prices on two grounds. A price increase will not only discourage purchases of the same commodity, but also the demand for the other good. A special case is the one in which the passengers can be divided into non-buyers and buyers who want the full allowance. The latter will buy a composite good. The travel fare is then determined by the demand elasticity of the non-buyers only, while the duty-free price is determined as part of the price of the composite good. The composite price is determined by the elasticity of the demand for the composite good with the implicit assumption that the resulting duty-free price is sufficiently low to induce duty-free purchases. Only if the two elasticities coincide do duty-free goods and journeys get the same mark-up rate.

Various kinds of intermediate cases between an atomistic market and a monopoly are conceivable. As an example we may consider a duopoly case in which there are two boats of identical size sailing between two ports. In the short term each boat faces a capacity constraint limiting the number of passengers it can take on board. We can further assume that, given the capacity, the ship-owner incurs a fixed cost per passenger admitted on board, and similarly there is a constant marginal cost of selling duty-free goods, while we neglect the possibility that duty-free sales are capacity constrained. Each boat sets a fare and a duty-free price.

Assuming that there are both buyers and non-buyers of duty-free one may consider the possibility of a segmented market. One boat does not sell duty-free while the other boat also offers duty-free goods for sale at a price below the high street price. This will only be an equilibrium if the boats earn the same profit; if not the boat with the lower profit would rather replicate and slightly undercut the more profitable one. The non-buyers only care about the travel fare and will choose the non-duty-free boat if only it charges the lower fare. But the boat without duty-free will certainly earn a lower profit if it takes the same number of passengers, charges a lower fare and obtains no profit from the sale of duty-free. We have to search for a pooling equilibrium in the sense that both boats take on board both buyers and non-buyers or in general buyers of larger and buyers of smaller quantities of duty-free goods.

In this situation each boat will set the price of duty-free goods equal to marginal cost. To see why, suppose on the contrary that the price exceeds marginal cost. Then the boat obtains a larger profit from a buyer than from a non-buyer, or in general a larger profit from a bigger buyer. The mixture of passengers on each boat may be perceived as random and will be expected to be the same on both boats when they charge the same prices. A boat can then increase its profit by infinitesimally lowering the price of duty-free and infinitesimally increasing the travel fare. Such a price policy will deter the non-buyers and sufficiently small buyers and attract those who are sufficiently large buyers, and a more favourable mixture of passengers is obtained. A finite number of low-profit passengers are substituted by high profit passengers while the effect on profits from remaining passengers is a second order effect. We get the Bertrand outcome that the duty-free price is competed down to marginal cost. The fare may be assumed to clear the passenger market for the pre-set capacities, while capacities are supposed to be determined by Cournot behaviour at a previous stage. This model may be considered as an extension of the single commodity model of duopolies choosing capacities and prices in a two-stage game. For further details and a discussion of underlying assumptions, the reader is referred to Tirole (1988). By imposing a

capacity constraint on the duty-free sales or assuming a more complex cost structure the Bertrand result may no longer hold [cf. Tirole (1988, 212-216)], and the duty-free price may exceed marginal cost. A further discussion of these industrial organisation aspects is beyond the scope of the present paper. The important lesson is that the price setting in the duty-free market is sensitive to the nature of competition and strategic interaction in the market.

With perfect competition the duty saving is passed on to the consumers while the travel fare is unaffected by the duty-free offer. However since the benefit from a journey increases as duty saving is added to the pleasure from the boat trip as such, we will expect people to travel more. The purchase of the duty-free goods shifts from the high-street to the duty-free market and the total consumption of the good increases if the marginal price is reduced. In the duopoly case considered above the duty saving is also passed on the consumer and again duty-free purchases replace high street purchases, and the total consumption of the good in question depends on the marginal price impact. The duty and tax relief induces a shift in travel demand, which affects the choice of capacities and is likely to induce more travel in the longer term. Even with a monopoly the impact on the purchases of the duty-free good is of the same qualitative nature. We expect more travel as a result of the positive demand shift and the advantage of attracting more passengers to recruit duty-free customers.

3. Welfare effects

3.1 What deadweight losses are created and how?

As always when tax concessions are given to selected activities there will be a tax inducement to excessive pursuit of these activities. The location of trade will be distorted with too much trade being located at airports and on board ferries and air planes. Bottles, cigarettes and other commodities will be transported around and carried by passengers not because that is part of an efficient trade pattern, but in order to make purchases eligible for tax exemptions. One can save money by buying a good duty-free only if one buys the commodity jointly with a journey. The result is that people will make too many journeys. Airports get too large. There are too many and too large boats and ferries.

Observing the extent to which modern ferries on certain destinations have become huge floating premises for shopping, accommodation, and dining out, one is led to believe that subsidies in terms of duty-free shopping are having a strong impact. As is well known to any economist a subsidy generates a dead-weight loss (unless of course they internalise positive externalities). The fleet of 'shopping ferries' may indeed be perceived as a floating dead-weight loss. To see why, a simple illustration may be of help. Assume the cost of transporting a passenger on a ferry is 100, whilst the passenger's willingness to pay is 80. Both from a private and a social perspective the journey is not economical and should not be undertaken. The resources worth 100 should rather be put to an alternative use. Suppose, however, that the ferry company can sell a tax free good. The production cost of the good is 20, but the good is sold in the ordinary market at a tax inclusive price of 60, which is then the passenger's marginal willingness to pay. Hence there exists a willingness to pay for a the basket consisting of a ferry trip and a tax free quota, which is equal to 140, while the cost of providing the bundle is 120. Any total price in the interval 120-140 will then make the sailing profitable from a private point of view and it will take place. However, it is still not economical from a social perspective. The willingness to pay for the journey is still below the cost. The journey becomes privately attractive only because of the indirect subsidy that comes along when the journey is linked to a tax favoured transaction. It is as if the state grants to the ferry company and the passenger a subsidy equal to the tax concession. The subsidy will give an incentive to allocate too many resources to activities that are provided jointly with duty-free sales. A misallocation is induced. There is a waste of resources per passenger equal to the difference between the cost of transporting the passenger and the benefit from travelling, which in the numerical example is $100-80=20$.

Also the passengers will incur private costs in terms of the time they give up to travel and other expenses that are needed to make a journey and that contribute to the waste of resources expended just to obtain a tax relief. In the numerical example we can take this aspect into account by assuming that after deducting other expenses the net willingness to pay for the journey is reduced to 75. Moreover, we have not allowed for the extra cost of transporting the tax free goods out at sea to let them change hands before being taken back on shore. The tax relief induces an inefficient trade pattern since it favours trade at particular locations (airports, ferries, etc.) discriminating against other sellers. It also stimulates unnecessary transportation of commodities to make them eligible for tax relief. The Norwegian association of air pilots

has been concerned with the extra load of duty-free goods for safety reasons. Let us assume that the transport cost of a duty-free allowance is 5, which adds to the private and social cost. The total cost is then 125. With a net willingness to pay of 135 for the journey and duty-free bundle, a price between 125 and 135 will imply private profitability while there is a social waste - a deadweight loss- of 30. (The cost of a trip exceeds the benefit by 25 and the cost of supplying the duty-free allowance exceeds the cost of supplying the same goods on land by 5.)

But the assessment of the effects of duty-free on welfare is quite complex, since the situation is not one where, except for duty-free, the first-best situation applies. What can we say about optimal taxation in the second best context?

3.2 Optimum tax considerations.

There are several optimum tax considerations that are relevant for setting commodity taxes. For the moment we leave on one side considerations relating to externalities, which we discuss in the next section. The Ramsey arguments are based on the assumption that the set of feasible taxes is severely restricted. Only commodity taxes or possibly commodity taxes and a linear income tax are available. With the available taxes confined to a set of distortionary taxes the problem is to choose the tax structure that minimises the total deadweight loss from the distortions. (See e.g. Myles (1997, ch. 4)). A more modern approach assumes that the government has at its disposal a non-linear income tax for collecting revenue and achieving a certain redistribution, but the tax design is restricted by the information constraint that the government does not know the identity of low wage and high wage people between whom redistribution should take place. Taxes must be designed subject to the self-selection constraint that high wage people are not induced to mimic low wage people and vice versa. In such a regime the use of commodity taxes (or subsidies) alongside the income tax may be desirable to alleviate the self selection-problem. (See Edwards, Keen, Tuomala (1994)) The trade-off between income and commodity taxation can also be affected by the concern with the distortion of the intertemporal allocation of consumption. While a general income tax will distort the intertemporal allocation, an expenditure tax for instance in the form of uniform commodity taxes (sales tax or VAT) will not. From this perspective the commodity tax level will be affected by the extent to which it is desirable to limit the intertemporal distortion. (See Brett (1997), King (1980))

From an efficiency perspective it is desirable to make as much use of lump-sum taxes as possible. In a second best world lump-sum taxes are ruled out or at least individualised lump-sum taxes are not feasible, and one has to resort to distortionary taxes. We may note that a commodity tax on inframarginal units is like a lump-sum tax. If one could tax inframarginal units only and leave the marginal units untaxed one would have a non-distortionary tax. It is therefore interesting to note that for many consumers a duty free scheme does exactly the opposite. For those who buy duty free goods and top up in the ordinary market, it is the inframarginal units that are left untaxed while the marginal units are taxed. This runs counter to the basic idea that priority should be given to lump-sum and equivalent taxes. If it were the case that everybody bought the same amount of duty-free goods, the tax exemption would be like a uniform lump-sum transfer, and the effect could be neutralised by imposing a uniform lump-sum tax. In practice different types of people will not do the same amount of cross-border shopping, and an interesting question is then to what extent the missing taxation of inframarginal units mimics the redistributive pattern one would have liked to achieve by means of individualised lump-sum taxes.

Consider the standard two-type Mirrlees model where skill levels are only private information. See Stiglitz (1987). It is assumed that there is redistribution from the high-skilled to the low-skilled type. The problem is that the high-skilled type may mimic the low-skilled type, and hence the tax policy must be designed subject to the self-selection constraint that there is nothing to gain by mimicking. The mimicking more able type is distinguished by the low-skilled type by enjoying more leisure and, of course, by being more skilful. It follows that to deter mimicking one would like to tax commodities of which more is consumed by persons with more leisure or higher skill. Assume that the mimicker is the larger consumer of the good in question. Then in the absence of duty-free shopping there is a case for taxing the good. However, if there is duty-free shopping, and the mimicker does more duty-free shopping to such an extent that he has the smaller consumption that is liable for taxation, the whole case for taxation has been eroded. If shopping when travelling is positively related to skill or leisure there is a case for taxing these purchases rather than giving them a tax relief. If duty-free shopping is mainly work-related and not much dependent on skill, there may appear to be a case for a low (or no) tax. But to determine whether this is the case one has to take into account the interaction between the ordinary and the tax-free market. If the effect of

the tax-free market is to undermine the case for taxation in the ordinary market this may not be a valid argument.

In practice there are many types of work, and it is not at all clear that we would like to subsidise in particular labour that involves travelling and thus distort the choice of occupation.

Some of those who travel to do duty-free shopping are not work active. Casual observations suggest that going abroad on a ferry crossing is a popular pastime of many pensioners. It is hard to see any case for distorting the consumption bundle of these people. Also there is no reason why redistribution in their favour should take the form of tax exemptions related to particular goods since they already receive cash transfers from the government through the public pension scheme.

3.3 Auctioned duty-free franchises as an approximation to welfare-improving tax discrimination

Systems of revenue-raising commodity taxation typically suffer from the limitation that the same tax structure is offered to all consumers, whatever their demand characteristics. It might be possible to improve the efficiency of taxation if different groups of consumers, with different characteristics, could be taxed differently. It is conceivable, if consumers were sufficiently different, that exempting one group of consumers entirely from taxation might permit required revenues to be raised at lower welfare cost than through a uniform tax rate applied to all consumers. It is perhaps more plausible that lower, but non-zero, taxes for some groups might reduce the aggregate costs of raising revenues. If duty-free consumers constitute a group that it would be desirable to tax at a lower rate than other consumers, an auctioned monopoly duty-free franchise could approximate the effect of the optimally-differentiated tax structure.

We observed in Section 2.1 that if duty-free consumption is fixed, an auction of a monopoly franchise would exactly replace duty revenues foregone. If, however, some duty-free sales are marginal consumption, reducing the duty-free price could increase the total quantity consumed. (For example, people who never normally buy perfume may choose to buy duty-free perfume if the price is set lower than in the high street shops). The holder of the duty-free monopoly franchise thus faces a downward sloping demand curve, and (if the demand curve is sufficiently elastic) would maximise profits by setting a lower price than in the high street. The rents earned from holding the duty-free franchise would then rise, and auction revenues would thus be higher than in the fixed case above. Aggregate revenues (duty plus auction revenues) could rise, even though less revenue per unit is collected on duty-free goods than on high street sales of duty paid goods.

Effectively what is happening is that it allows a different (lower) tax rate to be set on marginal units to that set on non-marginal units. It is possible that the aggregate excess burden of raising a given revenue is then reduced⁹. However, the tax per unit implicitly levied through the franchise auction will generally differ from the optimal, welfare-maximising rate, because the franchise holder will maximise profits rather than social welfare. The divergence between these objectives could imply implicit tax rates higher or lower than the optimal rate. Typically, setting prices to maximise revenues rather than welfare would lead to implicit tax rates that are too high relative to the optimum, but in this context the profit-maximising duty-free monopolist might also pursue profits at the expense of government duty revenues elsewhere, by reducing prices to attract sales away from the high street. All that can be said unambiguously is that the implicit tax rate will be positive, and lower than the duty rate.

3.4 Competitive versus monopoly duty-free markets

We have observed that by auctioning a monopoly franchise for a duty-free shop the government can raise revenues equivalent to the duty revenues foregone, but that with competing duty-free shops the benefit of the duty exemption will accrue entirely to customers through lower prices. Does this suggest that a government with revenue needs should prefer monopoly to competition in the duty-free market?

⁹ The argument is potentially applicable beyond the case of conventional duty-free. Carefully-targeted auctioned franchises to sell free of tax to certain categories of consumer might actually increase revenues and reduce deadweight losses more generally.

Not necessarily. Indeed, it may sometimes be possible for the government to do better in terms of revenue, if it can find a way of appropriating the gain in consumer surplus made by consumers, which may be larger than the monopoly profit that it could appropriate by auctioning licenses. If all consumers are identical, for example, and have fixed travel demand, but some elasticity in their duty-free demand (perhaps because of inconvenience costs), then the consumer surplus on competitively-supplied duty-free could be appropriated by the government through a flat-rate charge on travel (such as a landing fee or embarkation tax), and the revenue obtained would exceed the revenue from auctioning a duty-free monopoly franchise. In effect the government uses the landing fee to implement a two-part tariff, consisting of the flat-rate landing fee (as, in effect, an admission charge to the duty-free shop), plus marginal cost prices for duty-free goods, enforced through competition between duty-free suppliers. Indeed, the sum of consumers' and producers' surplus is maximised by the competitive regime equating price to marginal cost so that appropriating the aggregate surplus would maximise revenue.

The problems with this line of argument have to do with differences between consumers. (Broadly the same reasons account for the fact that we do not observe duty-free shops themselves operating two-part tariffs for their customers.) Some consumers may want to buy relatively small amounts of the duty-free good - or none at all - and charging an entry fee, in the form of a flat-rate levy per journey, may deter some individuals from travelling at all. The welfare consequences of distorting journey decisions in this way need to be weighed against the welfare benefits in terms of extra consumer surplus from competitive pricing in duty-free shops. The monopoly duty-free market raising revenue through an auctioned franchise will tend to be preferable in welfare terms to the competitive market with an equivalent levy on travel when demand for duty-free goods is relatively inelastic (as, for example, where most consumers are constrained by the duty-free allowance), and the greater the amount of variation across individuals in demands for travel and/or duty-free goods.

3.5 Pigovian taxation.

A well-known case for commodity taxes is that the commodities in question generate external costs that will not be reflected in the prices consumers pay unless taxes are imposed. The idea is that by imposing a tax which reflects the marginal external cost, the consumers will consume the commodity to the extent that the benefit from a marginal unit justifies its full social cost including the externality. The external cost has been internalised, and social efficiency is achieved.

The externality motivation for commodity taxes is an efficiency argument which is fully compatible with accepting consumer sovereignty, but in practice it is not always easily distinguished from paternalistic arguments and the notion that demerits are attributed to certain goods (Musgrave (1976)). For instance consumption of alcohol has negative external effects to the extent that excessive consumption harm other people and society at large. But politicians may also believe that people do not realise that excessive drinking is bad for them and hence taxes should be imposed to discourage them from drinking too much. From a similar perspective, taxes on alcohol, tobacco, etc. have sometimes been labelled sin taxes.

It is unnecessary for our purpose to elaborate on the distinction between the externality correcting case and arguments of a paternalistic nature. We will assume that certain goods generate negative external effects. To the extent that paternalistic arguments are accepted, they can be treated as similar to the externality argument. In the following we will only use the externality concept while leaving open whether it is to be interpreted in a strict sense or in a broader sense which includes paternalistic considerations.

According to the Pigovian argument the price should reflect the social cost at the margin. Let us assume that the ordinary market price has this property. What the marginal price is under duty-free shopping depends on various circumstances. There are people who don't do duty-free shopping because they don't travel, and many people top up their duty-free purchases in the ordinary market. In either case the consumers will face the ordinary price at the margin, and hence they will bear the full marginal social cost.

Those who buy marginal units in the duty-free market can face different marginal prices. A travelling consumer who does not exhaust his full allowance, faces a cost at the margin which equals the duty-free price (and possibly the inconvenience cost of carrying the goods around). A relevant example may be people who travel frequently for other purposes than shopping, i.e. business, pleasure or visits.

For a traveller who does buy his full allowance it is harder to determine what the marginal price is. Since a journey and duty-free goods are purchased jointly, the marginal cost of another allowance is the price of

the allowance in the duty-free shop plus the cost of the journey net of the benefits it yields. If buying the duty-free goods is the sole purpose, there are no benefits from travelling as such. On the contrary there may be a disutility from giving up the time needed to travel. Depending on the circumstances the marginal cost of acquisition in the duty-free market varies from the pure duty-free price in the shop to a composite cost which may be close to the price in the ordinary market. This range is narrower the closer the price in the duty-free market approaches the regular price. We note that if the sellers in the duty-free market are able to sell at a price close to the price charged in the high street, the externality is still internalised even in the duty-free market due to monopolistic price-setting.

If at least part of the population buy their marginal units duty-free at a price below the marginal social cost, we face a violation of the Pigovian principle. This seems to be a plausible situation. We can conclude that the externality problem is more serious the more people who buy marginal units in the duty-free market, and the lower the price is set in that market.

3.6 Other arguments concerning duty-free

Looking beyond the arguments about the distortion of consumer decisions, and the loss of government revenues, some conceivable arguments could be constructed in favour of duty-free sales. But in each case, duty-free is not the first-best policy instrument, and if the first best instrument is available, none of these arguments remains as a particularly strong justification for duty-free. We review three lines of argument in turn.

Below we consider three potential cases for permitting duty-free purchases. All the examples are based on arguments for tax exemptions or subsidies that find some support in economic theory. We want to explore whether these arguments also constitute admissible cases for permitting duty-free shopping. First, we consider whether duty-free trade may be justified qua export. Second, we consider whether an old argument for using transport subsidies to improve the frequency of departures can be brought to bear on duty-free purchases. Finally, we discuss if imperfect competition in transport markets may justify duty-free sales.

Two tests of the validity of these arguments are made. First, to have a valid case for duty-free purchases they should have the desired effect on the objective that one is pursuing. Second, conditional on the former test being passed, the duty-free scheme should not be less efficient than other available instruments in promoting the objective. As our discussion will reveal we find that the potential cases we have come up with are likely to fail passing these tests.

3.6.1 The case for tax free exports

A potential case for permitting goods to be sold duty-free may be that the goods are considered as being exported. Absence of taxes on exports is a central feature of the tax systems of most industrialised countries. Within the prevailing VAT regime exports are zero-rated. Even foreign consumers who buy goods in high street shops can have the VAT paid on their purchases refunded on leaving the country. The perception of duty-free purchases as export transactions may be supported by the fact that goods cannot be purchased duty-free upon arrival in a country¹⁰.

Leaving exports untaxed can be justified on the basis of the production efficiency result due to Diamond and Mirrlees (1971). Their result states that under certain conditions an efficient tax regime should not lead to inefficiencies in production even if other distortions are unavoidable in a second best world. The result extends to an economy with international trade in which the availability of goods depends both on domestic production and exchange of goods on the world market. In an open economy there are two ways in which a commodity can be transformed into another commodity. A pint of beer can be transformed into food either by cutting back the domestic production of beer and using the resources that are released to produce food, or the transformation can take place by exporting the beer to finance food imports. Taking world market terms of trade as fixed, suppose a pint of beer can be exchanged for two units of food. Then the rate of transformation in domestic production should be the same to achieve efficiency. In a competitive equilibrium where the domestic producer price of beer is two units of food efficiency is achieved. Now suppose that a tax equal to one unit of food is levied on the export of beer.

¹⁰ An exception is Iceland.

From the point of view of a beer exporter a pint can only be exchanged for one unit of food net of tax. The domestic production allocation will then have to change to one in which the rate of transformation is equal to unity so that producers are indifferent as to whether to produce another unit for export. But this new situation is inefficient. If there is a reduction by one unit in food output, and an additional pint of beer is produced for export, the country will still earn foreign currency which can be exchanged for two units of food. The amount of goods available for consumption has increased by one unit of food.

However this insight does not imply that beer should be sold duty-free to departing passengers in airports and on board planes and ferries. Let us assume that the buyers are foreign citizens who would pay a tax on beer in their home country equivalent to say one unit of food. If the foreigner is now willing to pay a price for a pint of beer equal to or at least close to two units of beer there is no reason why one should exempt the foreigners from the tax. There is no efficiency reason for giving away a pint of beer to get back only one unit of food when in fact it is possible to get approximately two units of food in return. We have to distinguish between sales to foreign importers who will sell to foreign consumers liable to pay tax and sales directly to these consumers. The idea that the latter type of exports should be left untaxed *qua* exports is flawed.

3.6.2 Transport subsidy and service frequency

An old case for transport subsidies is due to Turvey and Mohring (1975). The argument is that in a market left to itself, departures will be too infrequent from a social perspective. The idea is that since departures will take place at discrete intervals, there are consumers who will not find a departure at their preferred time. From a social efficiency perspective one will have to trade off the inconvenience of travelling at non-preferred times and the cost of frequent departures. The benefits from more frequent departures are not duly allowed for by suppliers of transport in a competitive market, which is therefore biased towards too infrequent departures.

There are two ways in which duty-free shopping can serve as a transport subsidy. The passengers get cheaper transport because of what they save by joint purchases of transport and duty-free goods, or the services become more profitable for the suppliers of transport as they now make a profit from the sale of duty-free goods. The tax saving is somehow shared by passengers and transport companies and expanding the services becomes lucrative. Even if the concern with frequency is a valid argument for a subsidy, the use of duty-free sales is a poorly targeted instrument. The availability of cheap duty-free goods is a subsidy to journeys rather than to departures. Airlines or ferry companies may respond by using larger aircraft or ferries rather than by increasing the frequency of departures. Even if the former option is ruled out, the opportunity for duty-free shopping has the unwarranted side effect that it induces unproductive transport of duty-free goods and a corresponding inefficient location of trade. There may be a positive effect on departure frequency, but only at a cost in the form of inefficient transport and trade. Finally, it is not always true that transport services become more profitable. If duty-free goods are sold in airports at prices close to normal high street prices, there is no significant effect for the transport companies at all. There is only a relocation of trade and a profit accruing to shop-owners.

3.6.3 Imperfect competition

Transport markets are in many cases imperfectly competitive. An imperfectly competitive market is characterised by a too low output from a social perspective. Producers cut back production in order to maintain high prices. In principle, permitting duty-free shopping may be a means to induce a larger transport output and move it closer to the social optimum. For several reasons this may not be an appropriate case for duty-free shopping. There is hardly any evidence to suggest that a subsidy is a common instrument for the purpose of promoting competition or alleviating the effects of limited competition. The normal approach is to impose a price cap or to stimulate the entry of new firms. A subsidy is however a conceivable instrument, but then one would like to have a subsidy targeted directly at the transport services rather than at a complementary good. Just as in the case of a concern with frequency one would rather avoid the side effects of stimulating unproductive transportation of bottles and boxes as well as mislocation of trade.

4. Options and strategies for a single country

Whatever the merits of the arguments concerning global welfare, individual countries will tend to make decisions based primarily on national interest. The existing international institutions are not capable of ensuring that all fiscal policies that promote global welfare will be implemented even where individual countries lose out. In this section we consider the policy assessment that an individual country might make about the promotion or abolition of duty-free. We begin, first, with the relatively simple case where the country can take as given the pattern of duty-free policies in the rest of the world. We then move to cases where trading partners may respond to the duty-free policy that the country adopts.

Apart from the rather sad cases of the boats which sail to international waters solely in order to operate as duty-free bars for the benefit of passengers who have no interest at all in travelling¹¹, the existence of the duty-free phenomenon is dependent on policy decisions in two countries - the country of departure and the country of arrival. It is necessary both that the departure country should be willing to permit duty-free sales to departing travellers, and that the country of arrival should be willing to permit goods purchased duty-free to be brought into the country without payment of duty. Only if both requirements are met do we have a phenomenon of duty-free sales, as distinct from cross-border shopping in duty-paid goods.

4.1 Duty-free from the arrival end

Why do countries allow goods purchased duty-free to be brought into the country without payment of duty?

Viewed simply as a matter of revenue-raising, allowing duty-free goods to enter the country seems likely to reduce the level of tax revenues that the country would raise.

- Some duty-free goods imported might substitute directly for domestic, taxed, sales of the same goods. Thus, for example, imports of whisky and other spirits might reduce domestic sales of whisky and other spirits, and thus the revenue from spirit duty.
- Duty-free goods imported might also substitute for domestic, taxed, sales of other goods. Thus, people might buy duty-free whisky in preference to spending the money on domestic cinema tickets. The revenue loss to the government would then be the tax foregone on the domestic cinema tickets.
- If tax rates on some goods in the foreign country are lower than those at home, then it is also possible that some imports of duty-free goods might substitute for imports of similar goods, purchased in the foreign country and bearing the foreign country's tax. From the domestic country's point of view, there is then no revenue loss from duty-free, although there is a revenue loss suffered by the foreign country.

The story is in fact more complicated than this, for at least two reasons.

- (i) One is that there are the usual income and substitution effects to be taken into account. If consumers can buy whisky duty-free then they are better-off than if they have to pay the domestic heavily-taxed, price. There may be also relationships of complementarity and substitutability between the goods purchased and other taxed commodities which mean that the changes in consumer purchases of, for example, cinema tickets, affect tax revenues from popcorn and ice cream sold in the cinema intervals.
- (ii) Another is that duty-free goods are a joint purchase with some form of travel, and the existence of duty-free may encourage more spending on travel with implications both for the pattern of household spending, and for consequent tax revenues. (Some travel such as rail travel is untaxed, and a

¹¹ Also passengers who do take an interest in travelling may benefit from duty-free consumption on board. There is evidence that the duty-free purchases on ferries vary much less over the year than does the number of passengers. The traffic peaks in the summer and reaches an intermediate level around Easter and in the autumn. The total sale/number of passengers ratio is low when the traffic is at its highest. This might indicate that travelling is perhaps less motivated by the availability of duty-free goods in periods when people travel to go on holiday.

shift in consumer spending towards rail travel would reduce tax revenues; other travel, such as private motoring is heavily taxed, and a switch in consumer spending towards motoring could raise revenues from motor fuel duty.)

However, disregarding these complications, allowing duty-free import seems likely to reduce tax revenues in the home country.

Assuming the government could costlessly make up for the loss of tax revenue by increasing other taxes a loss of tax revenue might not in itself have welfare implications. However, with a marginal excess burden to collecting additional tax revenue that is going to be different, and maintaining the government revenue by increasing other taxes will inflict a deadweight loss on society. On the other hand the citizens buying duty-free abroad do of course experience a gain from a private perspective otherwise they would rather refrain from making the purchases. These gains may however be rather small for at least two reasons. First, the prices the consumers have to pay abroad may not be substantially below the prices they would otherwise have to pay in the domestic high street (even if they can be). Second, the consumers will incur various kinds of costs in pursuit of the tax savings. There is the inconvenience cost from carrying the goods, from giving up the time needed for doing the shopping when travelling, or even the cost of making trips that would not be undertaken in the absence of the opportunity to benefit from the duty saving.

There is a real cost from using up real resources, and no gain, possibly a loss, from consumers saving taxes at the expense of the public purse.

The effect may be slightly modified though by one qualification. Some purchases may be made of duty-free items (e.g. perfume or expensive liquor) that would otherwise not be made. Suppose a consumer has a willingness to pay 99 for an item sold at 100 in the domestic high street of which 50 is a tax, and 50 is a real cost. Suppose furthermore the duty-free price is 60. The duty-free retailer has earned a profit of 10. The consumer has then made a gain of 39. If not buying this item he might have bought a commodity carrying a tax of say 30 at a price equal to marginal benefit. In this case of duty-free purchase the private gain for consumer and retailer (39+10) exceeds the loss of tax revenue (30) and there is no social loss.

There will also be distributional effects as people doing more than an average amount of travelling will be net gainers, while those travelling very little, or having weak preferences for duty-free goods, will be net losers.

The revenue and welfare effects taken together seem to suggest that duty-free imports are undesirable. Why, then, might countries allow duty-free goods to be imported?

One line of argument could be that there may in practice be substantial costs to enforcing an outright ban on duty-free import. Countries may then choose to set a non-zero "allowance" for duty-free imports, and concentrate their enforcement efforts on restricting imports in excess of this allowance.

Their policy problem would then be to minimise the sum of enforcement costs, revenue losses, and private welfare losses. The duty-free import allowance is a parameter that the country can vary in order to achieve the optimal outcome. Reducing the duty-free allowance would tend to reduce imports per trip (and hence revenue losses per trip). It could have an effect on the number of trips undertaken, although this will presumably be of ambiguous sign. (Consider reducing the duty-free allowance steadily from infinity to zero. The number of trips would first rise, as consumers had to spread their duty-free shopping across a number of journeys, but the duty saved per journey was still sufficient to cover the journey costs. Eventually, however, the allowance would fall to such a low level that the duty saving no longer covered the cost of journeys, and duty-free imports would fall). And it might have implications for the externality effects; as the allowance falls, and journeys for the purpose of purchasing duty-free goods become an increasing part of the total costs of purchase, the effective marginal price of goods purchased duty-free will rise. There may be some finite allowance that minimises the total net social cost of purchases outside the country.

If the allowance is zero, duties will have to be collected on numerous small purchases made abroad. This is administratively costly. Domestically the sellers act as tax collectors. Collecting the tax is part of selling the commodity and charging a price. This is obviously much more economical than having customs officers serving as tax collectors along the borders. If there is a fixed cost of collecting duties from each

traveller it is costly to levy duties on those who bring only small amounts of goods into the country. This argument appears to establish a case for having non-zero allowances.

Moreover, it may be that people consider a zero allowance as "unreasonable", and this attitude may induce smuggling by otherwise law-abiding people. One may rather like to avoid such instances of disrespect for the law as it is often feared that it may set a bad example and become more widespread affecting other areas regulated by law. This argument strengthens the case for a strictly positive allowance.

4.2 Duty-free from the departure end

We also need to consider why countries permit duty-free sales. The duty-free status of sales on-board ships may be a matter of long-established international custom (and conceivably might lie outside the jurisdiction of any individual country). However, why do governments choose to permit duty-free shops to be located at airports? This seems to be a matter where governments do face a clear policy choice, and if they decided not to permit duty-free shops at airports, it would substantially eliminate this type of trade. A certain proportion of the duty-free airport sales might be displaced to duty-free on-board sales to passengers, but this would be severely limited, since aircraft do not have the capacity to carry the amount and range of stock that airport duty-free shops can offer.

There are a number of possible explanations that might be given for the prevalence of airport duty-free shops.

Historically, it seems that airport duty-free shopping has developed as a result of competition between airports for "mobile" business. Shannon airport in the Republic of Ireland is said to have used duty-free sales to build up a share of cross-Atlantic passenger business. Whilst much of the demand for transport is in the form of a demand for transport between two fixed points, passengers sometimes have a choice of which local airport to use (eg Paris-based passengers can choose Orly or Charles de Gaulle airports for some destinations), and there is a significant amount of competition for "transit" business, in which passengers travelling from A to B change planes at an intermediate third location, C. This is common in inter-continental air traffic, where, for example, airports in London, Frankfurt, Paris and Amsterdam compete for a large part of the total cross-Atlantic market, including the business of passengers beginning their journeys in other European cities.

Governments might wish to promote the position of national airports in this international airport market for a number of reasons. They may, of course, view this simply as a matter of competitive subsidy of national businesses, although this kind of quasi-protection may actually decrease rather than increase national welfare. However, there may also be more solidly-based reasons for governments to promote national airports. Arguably, there is a position of natural monopoly to be contested; an airport with many connections and frequent flights is more attractive to passengers than one with fewer, and, other things being equal, the market might be expected to settle at a single "hub", enjoying much lower unit costs, and hence higher profits, than other airports. There may also be significant externality benefits to the national community from having a major international airport; travel times are reduced, and the country may become an attractive location for all sorts of mobile business activity.

All these arguments might warrant (or, at least, explain) government subsidy of airports and/or air travel from particular locations. Permitting airports to offer duty-free sales may be one way of delivering such a subsidy. However, it remains to be seen whether it is the most efficient way of delivering the subsidy, or indeed, what paying subsidy in this way costs in comparison to a direct subsidy with equivalent impact to that of the duty-free concession¹².

¹² One reason for non-equivalence between subsidy paid through the fare and through duty-free is that, in the case of business travel, the individual traveller may choose the itinerary, while the fare is paid by the firm. Unless the firm actively makes sure that the cheapest fare is obtained, the traveller's choice of airport is affected by the availability and prices of duty-free items, but not (within reasonable limits) by the fare. In this sense cheap fares and cheap duty-free commodities may not be "perfect substitutes" for the purpose of attracting traffic to an airport.

One consideration for governments will be the net revenue impact of duty-free sales at airports. Viewed simply from the perspective of its impact on public finances, how much does the duty-free concession actually cost? And are there conceivable circumstances in which the net public finance impact might actually turn out to be positive?

To simplify matters, begin by assuming that duty-free sales to departing passengers are consumed outside the country, and not reimported. This might be because the departing passengers leave for good, and do not return to the country of departure. Or it might be that it is sufficiently inconvenient to carry duty-free sales for the duration of the whole trip that duty-free purchases are never made on the outbound journey, with the intention of re-importing.

It should be noted that this is a simplification. Many trips are comparatively short (eg business trips without an overnight stay), and if it is worthwhile carrying duty-free goods on one leg of the journey, it would be unreasonable to suppose that the inconvenience of carrying duty-free purchases out and back is prohibitive in every case. Countries would presumably be able, if they wished, to prevent re-import of duty-free goods by some simple expedient such as distinctive marking of goods sold duty-free in their airports¹³. This does not seem to be done, and some cross-hauling does appear to happen in practice. Nevertheless, it is convenient to begin by disregarding this possibility.

It further simplifies matters if we begin by assuming that effects on the welfare of departing passengers (arising through their low-price purchases, etc) can be disregarded. It might be assumed, for example, that the purchasers of duty-free goods are foreign nationals, in whose welfare the home country has no interest.

Viewed purely from this rather restricted public finance perspective, permitting duty-free sales to departing passengers would appear undesirable, in that no tax revenue would be earned on the sales made of duty-free goods, and at least some tax revenue might be lost on sales of taxed goods that might otherwise be made to departing passengers.

Indeed, if we expand the range of possible tax rates to be applied to sales to departing passengers, there would appear to be intermediate options that would be more attractive, from the point of view of maximising revenues, than setting a tax rate of zero, as with duty-free. Consider the case of two countries, the home country H and a foreign country F. If H has a tax rate for normal, internal, sales of t_h , and if t_h is higher than the corresponding rate t_f for internal sales in F, then no departing passengers would buy taxed goods in H, and H would receive no revenue from sales to departing passengers. H could, however, offer goods at a price attractive to departing passengers by setting a special tax rate for "low-duty" sales, at a rate lower than t_f . If carrying such purchases involves no inconvenience to the passenger and is costless, then the revenue-maximising tax rate for H to set would lie marginally below t_f . However, if carrying these purchases involves some inconvenience, and if the cost of this inconvenience varies across passengers, then revenue will be maximised by setting a tax rate for low-duty sales on departure below t_f (although strictly above zero).

In practice we do not observe low-duty shops at airports, but instead there is extensive use of duty-free shops, which appear to forego the possibility of tax exporting through sales to departing passengers. However, governments can achieve the effect of setting an intermediate tax rate by auctioning the franchise to run duty-free shopping facilities at airports. Whilst no tax may be collected on duty-free sales, the seller of duty-free goods will not necessarily pass on all of the tax saving to the customer, by pricing at the domestic price minus the domestic tax. Instead, the seller would be expected to price at the level which maximises profits, and this, assuming a constant unit cost of each sale, will imply maximising net revenues. If there is a single (profit-maximising) duty-free seller, the price chosen by the seller would be the same as the price that would result if the government were to set the revenue-maximising rate of tax for sales to departing passengers. The excess profits accruing to the duty-free seller pricing on this basis would in turn determine the price at which the duty-free franchise could be auctioned, and hence the revenue that the government could expect to raise from the franchise auction. In this case, taxing sales to

¹³ In the Scandinavian countries a "24 hours rule" is imposed. One is only allowed to bring a duty-free allowance into the country if one has been abroad for at least for at least 24 hours.

departing passengers at a low rate would be equivalent to auctioning a duty-free franchise, both in its effects on the prices at which purchases are made, and in its effects on government revenue.

The picture changes where there are multiple duty-free shops. Then these may each seek to expand their sales at the expense of other duty-free franchise-holders, and the rents accruing to franchise-holders (and the auction revenues accruing to government) would be bid down, below the revenue-maximising level.

Except where cross-hauling takes place, the pricing of duty-free goods will be governed by domestic and overseas high street prices. Disregarding inconvenience costs, duty-free will be priced at the lower of domestic and foreign high street prices. Where foreign high street prices are high, the auction franchise rent that can be appropriated from a monopoly duty-free shop will equal the duty foregone on domestic sales. Where foreign high street prices are low, the country can make sales to departing passengers that substitute for foreign high street sales, and the potential franchise auction rent is governed by the difference between duty-free and foreign high street prices. (This is revenue that would not be earned by the home country in the absence of duty-free.)

Where a country has travellers departing to many destinations, it would be optimal (though complicated) to charge different duty-free prices to travellers to different destinations. In the absence of duty-free travellers to high-tax countries would pay a price equal to the home country's high street price, but travellers to lower-tax countries would pay a price equal to the high street price in the destination country. If all travellers have to face the same duty-free price, it may be in the national interest to deny duty-free sales to passengers to high tax destinations to induce substitution towards taxed high street sales (so no revenue would be lost). One would then charge a lower price on duty-free sales to the remaining (low-tax) destinations without foregoing revenue on sales to not so low-tax destinations. This strategy will expand overall revenues, by targeting duty-free on those travellers who would not purchase at high street prices. (The duty-free traders will not do this if they have the option of selling duty-free to travellers from high tax countries; they may maximise profits, but not overall public revenues, by inducing travellers from high-tax countries to substitute away from high street sales).

4.3 Policy interdependence

We have seen that in terms of global economic efficiency or welfare it is difficult to find robust and generally-applicable arguments for having duty-free shopping. Collectively, countries (and their citizens) would tend to be better off if this phenomenon did not exist. The tax base would be broader, and the tax rates needed to raise given revenues consequently lower. Consumption choices would no longer be distorted towards excessive consumption of duty-free goods and excessive travel, and resources would no longer be wasted in the pursuit of duty-free. We have identified circumstances in which some of these arguments might not hold (eg where duty-free permits greater revenue-raising efficiency through differentiation of the taxes paid by different groups of citizens, or where it provides a welfare-improving subsidy to public transport that could not be paid more directly), but these generally take the form of special cases, or even theoretical *curiosa*. In the main, coordinated abolition would improve global welfare, although side payments might be needed to ensure that all participating countries benefit. The EU's abolition of duty-free on internal travel might perhaps be seen as an example of just such a coordinated abolition – in the interests of the EU countries collectively, if not individually.

In the absence of a framework for co-ordinated decision-making, however, countries will decide whether or not to retain or abolish duty-free on the basis of their individual national interest. Some may retain duty-free, while others may find it worthwhile to abolish duty-free, depending on the pattern of national costs and benefits. How plausible is it that countries might unilaterally abolish duty-free for departing passengers, without an agreement by the destination country to do the same in return? And where a country decides to do this, does it increase or reduce the likelihood that the other country would also decide to abolish duty-free?

This issue critically depends on the extent to which cross-hauling of duty-free goods takes place. If travellers experience no greater inconvenience in buying duty-free on the outbound journey than on the return journey, then the duty-free shops of the home and foreign country compete head-to-head. There is no point in unilaterally closing the home country's duty-free shop; the only effect would be to divert duty-free business (and consequently all the available rents) to the foreign country. With extensive cross-hauling, coordination is indispensable to abolition.

On the other hand, without cross hauling, unilateral abolition is conceivable. There are conceivable asymmetric equilibria, in which the home country chooses not to offer duty-free sales to travellers to the foreign country, even though the foreign country sells duty-free to travellers in the opposite direction. A low-tax country, for example, might gain nothing from offering duty-free sales, if all departing travellers would instead buy the same goods duty paid in its high street, and auctioning a duty-free franchise might generate lower revenues than the duty on high street sales if the unit costs of duty-free operators are higher than in the high street.

Often, of course, in the absence of cross-hauling, it will be in the national interest for both countries to operate duty-free shops, if an agreement to coordinate their abolition has not been made. If two countries have identical duty rates, for example, both gain from selling duty-free to departing passengers, and while they lose a greater amount because arriving passengers bring in duty-free goods, they do not reduce this loss by closing their own duty-free shop.

Is it possible, however, that the home country's decision to close its duty-free shop might prompt an equivalent (and wholly-rational) response from the foreign country? Are the costs and benefits of abolition of duty-free always independent of the decisions of other countries whether or not to abolish their duty-free shops, or are there cases where the existence of a duty-free shop abroad increases the benefits from having a shop in the home country?

One source of interdependence between the duty-free decisions of two countries (even in the absence of any cross-hauling of duty-free goods) arises because of the interaction between duty-free and domestic tax rate decisions. It is clear that the tax rate in the home country will affect the case for the foreign country to allow duty-free sales. At the same time, however, if the home country introduces duty-free for departing travellers this can alter the constraints on the home country's tax rate decisions. Duty-free, in effect, allows countries to set a different tax rate for cross-border shoppers to that which they set for domestic sales. In cross-border shopping models (eg Kanbur and Keen, 1993) competitive considerations relating to cross-border shopping induce countries to set tax rates lower than they would otherwise choose. In the current context, duty-free allows countries to attract revenue by offering attractive tax rates to cross-border shoppers, while no longer suffering the revenue loss that is entailed in taxing their own citizens at the same rates¹⁴. Thus the duty-free decisions of the two countries are related through decisions about tax rates.

An example may help to clarify the mechanisms involved. Consider two small countries, F and G, between which cross-border shopping can take place. F initially has the lower tax rate, and attracts some high-street cross border shopping from G. If its tax base were immobile, F would raise the tax rate to finance higher public spending, but it chooses not to do so because it would lose the revenue from cross border shoppers. Opening a duty-free shop to sell to cross border shoppers cuts through this dilemma. F can raise additional revenue from higher taxes on domestic sales, while continuing to offer the original prices to cross border shoppers (and raising equivalent revenues through a franchise auction) in the new duty-free shop.

This domestic policy change in F opens up new opportunities for G to operate a duty-free shop. Suppose that initially F's tax rates had been sufficiently low, relative to the inconvenience costs of duty-free shopping, that G could not operate a duty-free shop. The higher tax rates that F now charges its own citizens could make it profitable for G to sell duty-free to travellers from F. The revenue loss from such sales experienced by F might be too small to reverse the gains for F from the policy. In this example it is clear that the duty-free decisions of the two countries are related. If F abolishes its duty-free shop it will need to make domestic tax policy adjustments that undermine the case for a duty-free shop in G.

Which countries would like to abolish duty-free?

¹⁴ We can infer some predictions about the countries most likely to operate duty-free from the results about the pattern of tax rates in the cross border shopping literature. Thus, the distinctive result in Kanbur and Keen that small countries will tend to undercut the tax rates in larger countries (since the latter have more to lose, in terms of foregone revenue on domestic sales, if they cut tax rates) presumably translates into a prediction that duty-free shops are more likely to be operated by large countries than by small countries. At least some small countries will do as well by setting a low rate of duty on all sales as by selling duty-free, while larger countries cannot make gains from offering low taxes to cross border shoppers unless they can separate this from their domestic tax decision.

As we have discussed above, from the perspective of a single country it may be desirable to sell duty-free to departing passengers because this may be a way to collect a tax or extract a rent from foreigners. Such a transfer of resources may be valued by the home country whether it accrues to private agents or is appropriated by the government, or possibly landing fees may be raised to capture the consumers surplus earned by the passengers in the case of competitive duty-free shops. Even if a country may not unilaterally wish to abolish the operation of duty-free shops the question is whether it would favour participating in collective abolition of duty-free among a group of countries. This would indeed be the kind of decision actually made by the EU in 1999. It is evident that because of the various kinds of deadweight losses inflicted by operation of duty-free trade (inconvenience costs to passengers, mis-location of trade, excessive transport capacity, costs to consumers of journeys otherwise not undertaken, etc) there is a collective social gain from abolishing duty-free. If side payments are possible, this collective gain could be achieved by agreement on coordinated abolition of duty-free among groups of countries. The side payments would ensure that individual countries all shared in the collective gain.

If countries are identical all countries will of course achieve the same gain even without side payments being available. Without side payments the collective gain from abolishing duty-free will not accrue equally to non-identical countries and some may lose out and therefore be against abolishing duty-free. Two factors will govern the pattern of national interests in this case: the duty levels of the respective countries, and the pattern of travel. To consider the latter assume for the sake of the argument that the world consists of the EU and the USA and imagine that only Americans travel. Then the EU can benefit from selling duty-free to the Americans returning home, while there are no European travellers to whom the US can sell duty-free. The EU has no reason to abolish duty-free as no EU citizens incur a deadweight loss, and it benefits from its duty-free sales to American travellers.

Assuming a balanced pattern of travel a country with somewhat higher prices than another country can benefit from selling duty-free to passengers on their return journeys. If the other country is extremely cheap there is little to gain from selling duty-free to its travelling citizens of that country as they will have to be offered a very low price. In the absence of any duty abroad there is obviously no gain. Nor is there much to gain if the country itself is a low-tax country. For the lowest price country the only reason to operate a duty-free shop in the airport must be that departing passengers may find it advantageous to buy in the airport rather than in the high street, and an airport shop may be able to appropriate some of the extra benefit from making the purchases in the airport. We can conclude that if a country faces competition from a country that is very much a low tax country or if the country is itself a very low tax country there is little to gain from operating duty-free shops prior to taking deadweight losses into account. For these countries there can be no strong case for retaining duty-free.

Not all countries may incur the same deadweight losses. Some modes of travel may generate more serious excess burdens. It may be that the volume of ferry traffic is more influenced by duty-free trade than is air transport. Excess ferry capacity may be a potentially serious deadweight loss to which countries with a lot of sea traffic are more susceptible than countries with non-coastal borders. Moreover, it will be true that citizens of high-tax countries will have stronger private incentives to incur inconvenience cost in order to acquire duty-free goods. This concern may at least partially offset the stronger case for offering duty-free goods to departing passengers in high-tax countries.

4.4 Extending abolition of duty-free beyond the EU

How far should the EU seek to extend the abolition of duty-free to travel between EU countries and non-EU destinations? Should the EU, for example, open negotiations with non-EU countries such as Norway, with aim of agreeing jointly to eliminate duty-free in both directions? What are the characteristics of the countries with which such an agreement would be most beneficial?

In broad terms, the greatest joint gains from abolishing duty-free will be between high-tax countries, since the revenue losses and potential for distortion will generally rise, the higher is the duty rate. From the EU's own perspective, too, the priority should be to eliminate duty-free on travel between the EU and high-tax countries. Travellers from Norway to the EU who currently buy Norwegian duty-free would substitute towards EU high street sales, while travellers from the EU to Norway might buy taxed goods in the EU if duty-free was not on offer. There would be less to be gained for the EU in negotiating bilateral abolition of duty-free on travel to lower-tax countries, since this may simply induce substitution towards taxed sales abroad (which might be more costly), and would eliminate the only opportunity for the EU countries to make sales to travellers from low tax countries. (Of course, if foreign prices are sufficiently

low the existence of duty-free makes virtually no difference. The same argument, of course, would apply in reverse to Norway's interests in a possible negotiated deal with the EU. Norway would want to retain duty-free if its citizens would always buy abroad, and there would be a lower resource transfer abroad if these purchases were made at duty-free rather than high street prices. The conditions for Norway also to wish to abolish duty-free would be that the resource costs (in terms of distortions, excessive travel, etc) of duty-free purchases by Norwegian residents would need to outweigh the resource transfer and any revenue gain from Norwegian duty-free sales to departing passengers. For any country (or group of countries) an argument for removing duty-free is that duty-free sales may substitute for domestic duty-paid sales and thus reduce domestic tax revenue. Ferry services may be operated between Norway and Sweden only because Norwegian passengers travel to buy duty-free on board. The private costs incurred by passengers and ferry companies may be privately justified only by inflicting a loss of revenue in the public coffers

Should Norway follow the EU, or retain (or expand) duty-free?

As a result of the abolition of duty-free for travel within the EU, it may be appropriate to reassess the rules under which duty-free operates in Norway.

For certain types of journey, the EU's change in policy leaves Norway unaffected. Norwegian travellers, and EU visitors to Norway, are treated in an unchanged way in single-leg transit to and from the EU. Both categories of travellers still have the opportunity to purchase duty-free, either in Norway or in EU airports (which can still sell duty-free to travellers to non-EU destinations.)¹⁵

For other journeys, then EU's abolition of duty-free on internal EU travel changes the competitive conditions facing Norway's duty-free operators. Norwegians and EU residents travelling on two-stage journeys to or from the EU can no longer buy duty-free on any intra-EU stage. Norway's duty-free shops face a significant reduction in competition. From the Norwegian point of view, the higher duty-free price that can be charged, due to the loss of competitive pressure, transfers resources from EU residents to Norway (assuming that the profits earned on Norwegian duty-free shops eventually accrue to Norway). The effect on Norwegian residents is largely offset by a higher revenue to Norwegian duty-free businesses (except for a loss of consumer surplus suffered by those who do not purchase the full duty-free allowance at the higher price).

The most drastic change concerns intra-EU journeys involving transit via Norway. An example would be a journey from London to Helsinki, with an intermediate stop-over in Oslo. Such journeys may now become more attractive to travellers, relative to single leg journeys, or journeys via EU stopovers, due to the ability to purchase duty-free in Norway. Here the opportunity arises for Norwegian duty-free operators to maximise revenues by raising duty-free prices, and/or for the Norwegian government to appropriate this additional profit by raising a profit levy on duty-free operators, or by setting a positive revenue-maximising tax rate in "low duty" (rather than duty-free) shops.

4.5 What has happened since the EU abolition of duty-free ?

Since the abolition of duty-free trade within the EU there have been a number of noticeable changes in duty-free markets. Sales on-board aircraft travelling within the EU of goods previously sold duty-free have declined sharply, although some airlines still offer such goods on a duty paid basis. A variety of changes have taken place in airports. Some airport shops still try to maintain prices at pre-abolition levels, but have to record the destinations of the buyers as sales to passengers for EU destinations are no longer duty-free. Some shops have got separate departments selling at different prices to passengers for EU and non-EU destinations. Other shops have abolished duty-free sales of certain items which are sold at the same non-duty-free price to all passengers, or they sell certain commodities only to non-EU passengers at duty-free prices¹⁶. Airport retailers are probably still in a period of adjustment and transition, and further changes can be expected.

Since the abolition of duty-free trade the sales on ferries within the EU dropped by 44 per cent when comparing the year prior to and the year after the abolition. The corresponding figures for aircraft and

¹⁵ One qualification is that some EU airports may have too few departing passengers to third territory to find it worthwhile retaining the same duty-free offers and range of stock as before.

¹⁶ Arlanda airport in Stockholm sells a limited selection of tobacco and alcohol only to non-EU passengers.

airports are 34 per cent and 19 per cent, respectively. The impact on the sales of tobacco and alcohol has been particularly strong with a decline in sales of 56 per cent. For comparison we may note that duty-free trade in non-EU Norway increased by 15 per cent in the same period¹⁷. The figure for Norway may reflect both a normal trend and possibly a boost from the abolition within the EU. Passengers travelling from Norway on changing planes within the EU may now buy at Norwegian airports rather than in transit.

As long as duty-free trade is not abolished outside the EU duty-free trade is still possible even on journeys between EU countries if going via a third country is an option. A possible response from ferry companies is to find new sailing routes that allow the companies to continue selling duty-free. Such examples do indeed exist, and we shall mention two. In the Nordic region of Europe the ferry crossings of the Silja Line and the Viking Line between Finland and Sweden have for a long time provided popular opportunities for duty-free purchases. In the 90s two events threatened to put an end to this flourishing trade. Both countries joined the EU, and duty-free trade within the EU was abolished. However duty-free trade was saved by the autonomy and special legal status of Åland - the island located in the Baltic between Finland and Sweden. According to the Åland Protocol the island is exempted from the harmonisation of indirect taxation within the EU, and Åland is in this context treated as third territory implying that there is no legal barrier to the sale of duty-free goods between Åland and EU countries. While most crossings prior to 1999 were direct crossings between Turku and Helsinki on the Finnish mainland and Stockholm in Sweden the response to the abolition of duty-free was to redirect all crossings via Åland, and a huge investment was made to construct a new harbor on Åland. A very similar response was made by Stena Line sailing between Sweden and the UK when deciding to dock at Kristiansand in non-EU country Norway on the way to Britain or Sweden.

There is good reason to believe that some of the deadweight losses we have highlighted, have been removed as a result of the abolition of duty-free within the EU. On the other hand some new distortions and costs have been created by the adjustments and efforts made to retain duty-free sales by taking advantage of journeys via third territory. Longer sailing distances and upgrading of harbors are notable examples.

5. Conclusions

This paper has been motivated by the EU decision to abolish duty-free on intra-EU travel, while various kinds of duty-free regimes remain in place between lots of other countries and between the EU and outside territory. This was a natural opportunity for raising a number of questions about the effects of duty-free trade and the arguments for having or not having a duty-free arrangement. It appears that from different perspectives a variety of merits and demerits are attributed to the duty-free trade. It is sometimes perceived as a sweetener of an otherwise harsh tax burden and an alleviation of tax distortions, but also as a source of new deadweight losses and erosion of government revenue. It is considered as a price-reducing scheme, but also as a source of business profit at the expense of consumer welfare. The purpose of this paper has been to address a wide range of such questions and, above all, to shed light on the conditions that are conducive to the various potential effects of duty-free shopping.

From the perspective of the common consumer the main interest is probably in the price effect of allowing goods to be sold duty-free. It often appears to be a popular expectation that duty-free prices will undercut high street prices by a margin corresponding to the tax. We have argued that there is no simple relationship between duty-free prices and domestic high street prices. In high-tax countries one would rather expect duty-free prices to be influenced by *foreign* high street prices as duty-free retailers selling to departing passengers will face competition from the foreign rather than the domestic high street. In low-tax countries however competition from local high street can be of a major influence. In a multi-country setting there will be a complicated interaction between prices in several countries depending on the travel pattern between destinations and the weight given to competition from high street and duty-free prices in various countries. An airport shop may choose to sell at a high price to get a high profit margin on each sale, foregoing sales to passengers departing for low-price countries, or it may choose a low price to sell at a larger scale, but at a lower mark-up per unit.

In general there is no single duty-free market and no unique pricing rule in these markets. As in most other markets one can find a variety of competitiveness and strategic interactions. If we consider the very simple case in which there is a fixed potential demand for duty-free goods and no inconvenience from

¹⁷ The sources of these data are Generation Forecast and Dagens Naeringsliv 1 August 2000.

buying duty-free there is a price cap given by the high street price. A duty-free monopoly will then charge that price, while competitive retailers will see the price competed down to marginal cost. An important feature is that the pricing of duty-free goods and journeys are in many cases interrelated. Suppose there is a monopoly ferry facing some demand elasticity. The ferry may have to price duty-free goods below the high street price as at least some consumers will not otherwise be willing to incur the inconvenience cost or the travel expenses. As consumers now buy bundles of travel and duty-free, a higher duty-free-price as well as a higher travel fare will deter travelling as well as duty-free purchases. Setting either price one will have to allow for the responses of both demands, and the monopoly mark-up over marginal cost will allow for the direct as well as the cross elasticity. In a duopoly ferry market one can imagine cases in which the duty-free-price is competed down to marginal cost (the Bertrand outcome) while the presence of duty-free affects the travel fare as well as the ferry capacity. For fixed capacities the travel fare does not only buy a journey, but also includes a price for the right to buy duty-free. This bundling will increase the travel fare for fixed capacities, but will also induce the companies to expand capacity.

Duty-free sales may be suspected of providing a major stimulus to consumption of the goods in question. Such a suspicion is hardly well founded. If the marginal unit of goods is purchased in the ordinary market, the marginal price is the high-street price even when duty-free goods are available, and we expect no major demand effect of duty-free sales. The possible effects are income effects which may be small if there are offsetting changes in other taxes, even if some income effects may result from redistribution since some groups benefit more from duty-free than others. We do expect some stimulus of demand though since some people will be induced to buy the entire consumption in the duty-free market, and there are goods for which allowances are generous or not really restrictive. The demand responses to the existence of duty-free-goods depend on the price-setting, the duty-free allowances and the demand schedules. The quantitative response will depend crucially on the extent to which the tax relief is passed on to the consumers. Our data suggest that the percentage of the tax saving passed on to the consumers varies a lot, but is typically significantly below a hundred per cent.

A tax relief to a particular activity can have two entirely different effects. First, a tax saving can accrue to those people who would otherwise be liable to pay a tax on their activity. A seller of a fixed amount of goods at a given price will simply earn a rent if his tax liability vanishes, other things equal. Second, the tax relief can enable agents to engage in activities that would not be economical in the presence of the tax liability. The activity, say selling bottles of spirits at an altitude of 30 000 feet, may be so costly that a tax privilege is needed to break even. The tax saving will finance a cost that would otherwise not be there. Any combination of the two effects is of course possible; resources may be put into activities that would otherwise be unprofitable, but there may also be market agents reaping a benefit at the expense of the public purse. Moreover, the gain from a tax relief can in various ways be passed to others than those immediately relieved of a tax burden. Assume there is a fixed unit cost to selling duty-free, and assume that a fixed amount is purchased. If there is free entry into the market the immediate profit generated by the tax exemption will induce new sellers to undercut the prices of the incumbents to win customers over, and such a process will continue until the profit has been competed away. The resources used are the same as before, but competition has shifted the tax saving from the sellers to the consumers. Alternatively the rent might accrue to the landowner or owner of the premises if such agents are in a position to increase the rent they charge from the duty-free retailers.

With variable duty-free purchases and travel activity there are several ways in which duty-free can affect behaviour and divert resources to otherwise uneconomical uses to produce deadweight losses. The consumers may incur costs in pursuit of the tax relief by making journeys they wouldn't otherwise make, by suffering the inconvenience of carrying bags of bottles and boxes they would otherwise obtain more handily from the local high street, or by choosing less convenient routes or modes of transport. Businesses may incur higher costs by transporting goods around, by selling them in awkward market places out at sea or up in the air, or by expanding transport capacities. The excessive cost can be divided between various parties in several ways. The costs may be borne by the businesses as a cost of acquiring the duty and tax exemption. Alternatively the cost as well as the tax saving may be passed on to the consumers, e.g. the duty-free prices may fall by the amount of tax, while travel expenses increase because the consumers travel more or at higher travel fares reflecting the extra cost. Businesses incurring extra costs will suffer a loss of rents which in turn may deprive the government of revenue from auctioning off the duty-free concessions. Businesses, consumers and the government may all have to share the deadweight burden.

In our discussion we have dismissed several conceivable arguments in favour of duty-free. First we have argued that the efficiency theorem of Diamond and Mirrlees and the implicit case for untaxed exports lend

no support to duty-free sales. Moreover we have argued that the well-known argument for subsidising transport to get a socially improved frequency of departures cannot be invoked as a valid argument for duty-free sales on journeys. The instrument is poorly targeted, has negative side-effects, and may lead to a larger number of passengers on each departure rather than improved frequency. Also in the case of imperfect competition in transport markets we dismiss duty-free as a badly targeted means of bringing the output level closer to the socially desirable level.

The existence of duty-free appears to present us with a puzzle. If duty-free implies serious deadweight losses and is an inappropriate instrument for correcting possible imperfections in the transport market, why does duty-free trade persist in a large number of countries? To resolve this puzzle we note that with the exception of the EU it is the decision of individual countries to operate a duty-free regime. Maintaining duty-free sales may be in the national self-interest of each country, but why that is so requires a further explanation. We emphasise that the existence of duty-free trade between two countries presupposes that both countries are willing to accept the scheme. Duty-free must be endorsed from the departure end, i.e. the authorities of one country must allow goods to be made available free of duty and taxes for sale to departing passengers, and it must be accepted at the arrival end, i.e. the other government must accept duty-free goods being brought into the country.

Arguments at both ends require some reflection. At the departure end we draw particular attention to two factors that we believe to be important. Historically, it seems that duty-free at airports has developed as a means of attracting mobile business. It has been a way of making airports attractive in competition with other airports. One may doubt whether that is any longer a major reason for maintaining duty-free. Often prices are not particularly favourable, and with increasing air traffic and pressure on many airports other attributes are important for the reputation of airports. On the other hand, duty-free may be a way of taxing foreigners as they will normally constitute a large share of duty-free customers. By letting a monopoly maximise its revenue from the customers and appropriating the profit for instance by auctioning off the duty-free concession the government does in fact tax foreigners. This phenomenon is also easily reconciled with the observation of "high" prices which may simply be the revenue-maximising prices. At the arrival end the enforcement cost of an outright ban on even small quantities of duty-free goods would be excessive and would probably be considered "unreasonable", or even at odds with what is viewed by the public as a legitimate interference with private freedom. We conclude that at both ends there may be a case for accepting duty-free based on national self-interest and possibly more pragmatic considerations.

For a country considering a unilateral abolition of duty-free the following circumstances matter. By abolition it will lose revenue on sales to foreigners unless duty-free sales do not only crowd-out duty-paid sales from domestic high-street. The potential for profitable duty-free sales to foreigners is larger the higher are foreign prices, the lower is the inconvenience cost to passengers, and the lower is the cost of selling duty-free. If prices abroad are very low, duty-free prices will have to be very low to be competitive and virtually no rent is obtained. Also private agents or the government must be in a position that makes it possible to charge foreigners by pricing duty-free goods above cost or by appropriating the tax relief through e.g. landing fees. If high street prices are favourable to foreigners, duty-free sales are not desirable if duty-free retailers have to or do undercut high-street prices. If domestic high-street prices are sufficiently low there is no gain from duty-free. If domestic high-street prices are at or below a level which already maximises the revenue from foreigners there is no further gain from duty-free. Finally, domestic citizens substituting duty-free for domestic high-street purchase is conducive to abolition.

Suppose two countries consider mutual (collective) abolition of duty-free. The interesting case is obviously the one in which unilateral abolition is not warranted so initially there is a net gain from selling duty-free to foreigners. If both countries are similar there is a gain from abolishing duty-free because deadweight losses are removed and the gain is higher the higher is the tax relief to be pursued by duty-free activities. The willingness of a country to accept a mutual agreement, is obviously stronger the weaker is the case for unilaterally retaining duty-free. A country is also more willing to abolish duty-free if there is more to gain from the other country giving up duty-free. A country will gain more if abolition shifts much of the duty-free purchases abroad to the domestic market. Domestic citizens will have less to lose from abolition of duty-free abroad the higher the foreign duty-free prices (due to a rent to foreigners or transaction costs) and the higher the inconvenience cost. The government will have more to gain the higher the domestic tax rate.

There are several ways in which a duty-free scheme will affect government revenue and interfere with tax policy. The immediate impact seems to be that a government allowing duty-free trade will forfeit tax

revenue. The government may then have to adjust fiscal instruments such as increasing other taxes to offset the immediate loss of revenue. However it may be that the government is in a position to appropriate a smaller or larger share of the tax saving immediately obtained by duty-free retailers. This can happen through the rent set by the government as owner of airports, by auctioning of the duty-free franchise or by taxing the rent accruing to the beneficiaries from duty-free.

A puzzle of the typical duty-free scheme is why governments seem to favour monopoly retailers even if it is in a position to recapture the tax relief by auctioning off the franchise or by similar devices. The puzzle originates from the fact that if the purpose is to maximise revenue (e.g. because it is derived from foreigners) the appropriate approach would seem to be to try and capture the sum of producers' and consumers' surplus which is known to be maximised in the presence of competition rather than a monopoly. Making use of landing fees or charging an entrance fee to the duty-free shops might be a possible procedure. The problem is that if there is a wide diversity of heterogeneous consumers small consumers will be discouraged from travelling (as much) if landing fees are increased.

In general the problem with a commodity tax is that it distorts the price consumers are facing at the margin. A tax on infra-marginal units would be harmless for efficiency. From this point of view the perverse property of duty-free purchases is that for many consumers buying marginal units in the high street, it is only the inframarginal units that get a tax relief. Modern theories of indirect taxation justifies non-Pigovian commodity taxes by the information asymmetry restricting the government to set taxes subject to the self-selection constraint that high income people should not find it in their interest to mimic low income people. If potential mimickers would buy a large quantity compared to the low income persons, a commodity tax is warranted as a way of discouraging mimicking. Duty-free shopping may then erode the basis for this device if the mimicker has a stronger propensity to shift his demand to the duty-free market. If the potential mimicker gets the larger tax relief (in the duty-free market) perverse incentives are created.

Several commodity taxes are Pigovian taxes imposed to confront the market agents with a tax-inclusive price at the margin that also reflect the external cost of using the commodity. Duty-free sales may seem to erode this policy, but there are some reasons why this may not be true. Since one can only buy certain allowances of most duty-free goods, lots of customers will have to top up by purchasing additional quantities in the high street. Then it is the tax-inclusive high street price that is the marginal price even when duty-free goods are available, and the external cost is being internalised. There may also be customers who face an effective price at the margin exceeding the price in the duty-free shop since duty-free goods are purchased jointly with journeys. If the benefit derived from the journey itself falls short of the travel price some of the fare is in fact an additional price paid for the duty-free goods. Finally, the duty-free price is not necessarily a low price that falls short of the ordinary price by approximately the tax that is imposed in the high street. A monopoly mark-up may serve as a quasi-Pigovian tax. In spite of these qualifications one can clearly imagine cases in which there are consumers being faced with a price well below the Pigovian level.

The abolition of intra-EU duty-free trade has had substantial negative effects on the sales of former duty-free goods in contrast to the growth witnessed outside the EU. Different responses of retailers are observed at different airports with duty-free sales being scrapped for certain commodities, certain commodities no longer being sold to passengers for EU destinations, or commodities being sold at different prices to EU and non-EU passengers. Some ferry services have been seen to change their sailing routes so as to include docking in non-EU territory to be able to retain duty-free sales.

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