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**NORTH-SOUTH TRADE IN RECYCLABLE
WASTE: ECONOMIC CONSEQUENCES OF
BASEL**

Nicholas Berger

**CENTRE FOR INTERNATIONAL
ECONOMIC STUDIES**

**University of Adelaide
Adelaide S.A. 5005
Australia**

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NON-TECHNICAL SUMMARY

During the 1980s, domestic landfill sites in some advanced industrialised countries (the 'North') began to reach their limit and countries turned to international trade to solve their wastes disposal problems. The growth in North-South waste trade led to concern over the dumping of hazardous wastes in developing countries (the 'South') resulting in the UNEP mandating the Global Convention on Transboundary Movements in Hazardous Wastes. The Basel Convention provided for a system to monitor and control the transboundary movements of hazardous wastes. It was unanimously accepted by the 116 states represented on the 22 March 1989.

Further developments to the Basel Convention gave rise to numerous controversies. A number of developing countries were refusing to tolerate the use of their countries as dumping grounds for the hazardous wastes of the North. Meanwhile, industrialised countries were not willing to accept measures that would adversely affect their trade in hazardous wastes with other industrialised countries, especially in cases where that waste material had an economic value. UNEP adopted the position that a complete ban on the international trade in hazardous wastes would not be the best solution from an environmental viewpoint, since it would preclude cases where waste disposal in a country other than the country of origin was more environmentally sound. In March 1994, the Conference adopted Decision II/I2, which bans immediately all traffic in hazardous wastes destined for *final disposal* from OECD to non-OECD countries, and provided for the phase-out of traffic in hazardous wastes destined for *recycling* or *resource recovery* from OECD to non-OECD countries by 31 December 1997.

Taking the used lead battery market as a case study, this paper provides an analytical framework for examining the global and regional implications of the ban now in place on recyclable waste trade between the North and South. It shows that, when considering standard economic welfare, the acceptance of Decision II/I2 necessarily reduces global welfare. However, once environmental externalities associated with resource recovery and the dumping of used batteries in landfill are

taken into account, global welfare results are less clear. The North necessarily loses economic welfare as a result of the Decision while the South may gain or lose welfare. Global welfare is enhanced if and only if the environmental welfare gains in the South more than offset the standard welfare loss in the South plus the combined standard and environmental welfare losses in the North.

The paper concludes by arguing, firstly, that the international ban on North-South trade should be removed as international trade is not the source of the environmental externalities associated with recyclable hazardous wastes and could be reducing rather than raising global social welfare. Secondly, recyclable waste importing countries should be able to determine their individual solutions to national environmental externalities based not on a globally enforced ban, but rather on their national economic challenges, environmental conditions, resource endowments and social preferences.

ABSTRACT

North-South Trade in Recyclable Waste: Economic Consequences of Basel

The Basel Conventions adoption of Decision II/I2 provides for a global ban on the North-South trade in recyclable wastes from the end of 1997. Taking the used lead battery market as a case study, this paper provides an analytical framework for examining the global and regional implications of the ban now in place. It shows that, when considering standard economic welfare the acceptance of Decision II/I2 necessarily reduces global welfare. However, when environmental externalities are taken into account, the global welfare results are less clear. Global welfare is enhanced if and only if the environmental welfare gains in the South more than offset the standard gains from trade loss in the South plus the combined standard and environmental welfare losses in the North. The paper concludes by arguing, firstly, that the ban on North-South trade should be removed and secondly, recycling waste importing countries should be able to determine their individual solutions to national environmental externalities based not on a globally enforced ban, but rather on their national economic challenges, environmental conditions, resource endowments and social preferences.

Key words: recyclable wastes, Decision II/I2, externalities, optimal policy

JEL Codes: Q28, F13, F14, D60, D62

Contact Author:

Nicholas Berger

School of Economics and

Centre for International Economic Studies

University of Adelaide

Adelaide SA 5005

Phone: (61 8) 8303 4712

Fax: (61 8) 8223 1460

nicholas.berger@student.adelaide.edu.au

North-South Trade in Recyclable Waste: Economic Consequences of Basel

Nicholas Berger

1. Introduction

During the 1980s, domestic landfill sites in some advanced industrialised countries (the 'North') began to reach their limit and countries turned to international trade to solve their waste disposal problems. Transboundary trade in hazardous waste boomed during the late 1980s, provoking concern over the dumping of hazardous wastes in developing countries (the 'South'). Among the well-publicised cases were the 'Philadelphia fly ash' deposited on Kassa Island (Guinea) and the illegal deposit of Italian hazardous waste in the port of Koko (Nigeria). None, however, created more global awareness than the epic voyage of the vessel *Khian Sea*: set sail in 1986 from Philadelphia loaded with municipal incinerator ash for what turned out to be a two-year odyssey, wandering the oceans in search of international dump sites (Kummer, 1995). This voyage alone provoked an outcry against such practices and raised global public awareness dramatically in the late 1980s.

Such incidents resulted in the Governing Council of United Nations Environment Programme (UNEP) authorising a working group of experts to develop guidelines on the environmentally sound transport, management and disposal of hazardous wastes. These guidelines became known as the Cairo Guidelines which were approved by the Governing Council of the UNEP in June 1987. Drawing on the Cairo Guidelines, a joint proposal by Switzerland and Hungary mandated that the Executive Director of the UNEP convene a working group to elaborate a global convention on the control of transboundary movements of hazardous wastes. In Basel in March 1989 the 'Working Group' submitted the final draft of the Global Convention on the Control of Transboundary Movements of Hazardous Wastes. The Basel Convention provided for a system to monitor and control the

transboundary movements of hazardous wastes. It was unanimously accepted by the 116 states represented on 22 March 1989.

Further developments of the Basel Convention gave rise to numerous controversies. A number of developing countries with the help of Greenpeace were refusing to tolerate the use of their countries as dumping grounds for the hazardous wastes of the rich industrialised world. Meanwhile, industrialised countries were not willing to accept measures that would adversely affect their trade in hazardous wastes with other industrialised countries, especially in cases where that waste material had an economic value. UNEP adopted the position that a complete ban on the international trade in hazardous wastes would not be the best solution from an environmental viewpoint, since it would preclude cases where waste disposal in a country other than the country of origin was more environmentally sound. In March 1994, the Conference adopted Decision II/I2, which bans immediately all traffic in hazardous wastes destined for *final disposal* from OECD to non-OECD countries, and provided for the phase-out of traffic in hazardous wastes destined for *recycling* or *resource recovery* from OECD to non-OECD countries by 31 December 1997 (Kummer, 1995).

Hazardous waste is considered a byproduct of modern technological developments and is classified as either recyclable or non recyclable. Non recyclable hazardous waste is self defined in the sense that, given current market conditions - which include the price of substitutes, available technology, government regulations, etc. - the financial cost of recovery exceeds the value of the recovered material (Pearce and Turner, 1990) branding non recyclable hazardous wastes unequivocally of negative economic value. On the other hand, recyclable hazardous wastes may have a positive economic value as, by definition, once recycled the secondary materials can be sold as inputs into future production processes. Nonetheless, from the Second Law of Thermodynamics, recycling of secondary material cannot take place such that 100 percent of the primary material is recovered. The resultant byproduct of the recycling process is non recyclable and imposes private and social costs as inferred above. This begs the empirical question: will the world be better or

worse off from the ban now in place on recyclable waste trade between the North and South and how will the welfare effects be distributed among countries?

The present study seeks to shed light on the issue by examining the market for used lead acid batteries. In the following section, the effects of Decision II/I2 on the markets for such batteries in OECD and non-OECD countries are analysed, first excluding and then including environmental externalities. Section 3 then considers the policy implications of the Decision. The used lead acid battery market was chosen because it is one of the more significant recyclable hazardous waste exports and one for which trade data are more readily available. The final section draws implications from this case study for the aggregate welfare effects of the Basel Convention.

2. The Market For Used Lead Acid Batteries

The ban on transboundary movements of OECD country hazardous wastes destined for recycling or recovery in non-OECD countries from 31 December 1997 is going to have a significant impact on the global market for such items as used lead acid batteries.

The supply of used batteries each year depends overwhelmingly on automobile usage. Used batteries are collected from garages and battery retail outlets by collectors who sell them to scrap metal merchants. The scrap metal merchants then sell the used batteries to domestic recyclers or export them. Therefore, there are three possible destinations for spent batteries: they are either (1) recycled domestically (once collected by scrap metal merchants), or (2) exported to OECD and/or non-OECD countries for recycling or simply dumping, or (3) are dumped without recycling in domestic landfill.

Even though used batteries have an intrinsic economic value once collected, the private cost of collection is non-trivial. As the price of spent batteries falls, battery collectors' profit margins fall and they are less willing to collect used batteries due to the labour/leisure trade-off and/or other sources of employment appearing more attractive. The reduction in

the collection rate increases the quantity of used batteries being sent to a domestic landfill rather than being recycled.

Used lead acid batteries contain on average 58 per cent lead which is recoverable in secondary smelters and is an almost perfect substitute for primary lead¹. The bulk of this recovered lead is used to produce new lead acid batteries. The demand for used lead batteries thus depends heavily on the price of refined lead: as the price of refined lead rises the demand for used batteries increases, making recycling more profitable.

Analytical framework

Differentiating between OECD and non-OECD countries, the following analysis shows how countries' demand for and supply of used lead acid batteries can affect the environment and markets of other countries. The autarkic price of used batteries in non-OECD countries is assumed to be priced above that of OECD countries. This is not so much because OECD and non-OECD countries have different tastes and preferences for goods and services, but rather because non-OECD countries' incomes are lower and the demand for a clean environment is quite income-elastic. That is, people in developing countries are less prepared to trade-off greater consumption for a cleaner environment (Stigler and Becker, 1977; Anderson, 1992).

(i) assuming no environmental externalities

Figure 1 depicts the international market for recyclable batteries and, for simplicity, is based on the following assumptions. Firstly, there are no environmental externalities (relaxed in the next sub-section). Secondly, the substitutability of used batteries is independent of origin. Thirdly, recyclers demand used batteries solely for the purpose of lead recovery. It is also assumed that the used battery market is characterised by no scale economies, no technical innovation and no illegal traffic in used batteries. The maximum number of used batteries available per year for recycling is Q_{Ti} ($i = 1, \dots, N$). Hence in Figure 1 there is a perfectly inelastic supply of used lead batteries available for recycling at Q_{Ti} . The proportion of Q_{Ti} that is recycled, as distinct from sent to landfill, is a function of the price received from recyclers.

¹ Personal communication with Australian Refined Alloys, Australia's principle battery recycler.

OECD countries are net exporters of used batteries (BIE, 1995). Their export supply schedule is represented by ES_2 in Figure 1(b). The intersection of the import demand schedule of non-OECD countries, ID_2 , and the export supply schedule determines the equilibrium price in the international market, P^* . The total quantity of OECD exports, C_1Q_1 , equals the quantity of non-OECD imports, $Q_{N1}C_{N1}$, both of which are equivalent to the quantity of international trade, O_2Q_2 , at the price P^* .

In OECD countries, scrap metal merchants benefit from international trade as the price they receive for used batteries is raised from P_O^* (the autarkic price) to P^* . Trade causes the quantity of used batteries demanded for domestic recycling to fall from Q_{a1} to C_1 to allow used battery exports of C_1Q_1 . Consequently, the trade ensures the quantity of used batteries being sent to landfill falls from $Q_{a1}Q_{T1}$ to Q_1Q_{T1} (a reduction of $Q_{a1}Q_1$). Scrap merchants gain a producer surplus of $P_O^*abP^*$ which comprises a redistribution of surplus from OECD recyclers, $P_O^*acP^*$, and the standard economic welfare gain from trade, abc .

Domestic recyclers in non-OECD countries also gain from this international trade, as it allows them to purchase used batteries in the international market at a price below the non-OECD autarkic price of P_N^* . Under free trade, non-OECD recyclers increase the quantity of used batteries they recycle by $Q_{aN}C_{N1}$ units per year. However, the increase in recycling is the result of an increase in imported feedstock, $Q_{N1}C_{N1}$, at the expense of recycling $Q_{N1}Q_{aN}$ domestic used batteries. This reduction in the recycling of non-OECD spent batteries increases the quantity of used batteries being sent to landfill in those countries from $Q_{aN}Q_{TN}$ to $Q_{N1}Q_{TN}$. Non-OECD recyclers gain a producer surplus of $P^*efP_N^*$, of which def is the region's net gain from trade and $P^*dfP_N^*$ is a redistribution of surplus from non-OECD scrap metal merchants.

The implementation of Decision II/I2 in effect eliminates the import demand and export supply schedules for used batteries through banning international trade between OECD and non-OECD from the end of 1997. The Decision acts to drive up the price of used batteries in non-OECD countries, eliminating the gains from trade, def , and redistributing

surplus back in favour of non-OECD scrap merchants as recyclers are forced to accept the higher autarkic price, P_N^* . In OECD countries, the price of used batteries falls to P_O^* , increasing the surplus received by OECD recyclers at the expense of scrap metal merchants and reducing the North's economic welfare by abc .

The demise of international trade between OECD and non-OECD countries does not rule out the scope for trade among OECD members (nor among non-OECD countries). In fact the ban will expand trade within these two groups of countries. Within the OECD group, depicted in Figure 2, there are OECD exporters and OECD importers. Under free global trade in used batteries, the quantity of OECD exports, $C_X Q_X$, exceeds the quantity of OECD imports, $Q_M C_M$. The excess supply of used batteries at the global free trade price, P^* , is represented in Figure 2(b) by the quantity of used batteries, $Q_1 C_1$, which is equivalent to the export to non-OECD countries under free trade of $O_2 Q_2$ in Figure 1(b). The ban on trade between OECD and non-OECD countries will cause the intra-OECD trading price to fall to P_O^* .

As discussed in Figure 1, scrap metal merchants in OECD countries lose surplus with the acceptance of Decision II/I2. In OECD exporting countries, the lower intra-OECD trading price reduces the quantity of batteries exported, from $C_X Q_X$ to $C_X' Q_X'$, reducing scrap merchants' surplus by the area $P_O^* ebP^*$. The reduction in battery exports is not fully compensated by the increase in domestic recycling activities, $C_X C_X'$, such that there is an increase in the quantity of batteries being sent to landfill from $Q_X Q_{TX}$ to $Q_X' Q_{TX}$. Of the scrap merchants' lost surplus, area $P_O^* dcP^*$ is redistributed to recyclers in the form of a lower used battery price, and $debc$ is the loss from restricting trade with non-OECD countries. Much of that welfare loss (ignoring externalities - see next sub-section) is distributed to recyclers in OECD importing countries, $defg$, and the remainder is a deadweight welfare loss, dgc plus ebf , incurred through the adoption of Decision II/I2.

OECD importing countries benefit from Decision II/I2 as the lower intra-OECD trading price, P_O^* , causes a movement down their import demand schedule, ID_1 , increasing the quantity of used batteries imported from $Q_M C_M$ to $Q_M' C_M'$. The fall in the price of batteries

reduces the quantity of domestic feedstock used in recycling operations from $O_M Q_M$ to $O_M Q_M'$ units increasing the quantity of used batteries being sent to landfill from $Q_M Q_{TM}$ to $Q_M' Q_{TM}$. OECD importing recyclers gain an economic welfare surplus equal to the area $P_O^* i l P^*$ of which $P_O^* h k P^*$ is a redistribution of surplus from scrap metal merchants and $h i l k$ are the gains from trade. The net gain in OECD importing countries is, in effect, a redistribution of trade losses incurred by scrap merchants in OECD exporting countries.

The above analysis has not shown the effects of trade among non-OECD countries. That intra-regional trade would expand too, but its conventional welfare gains would be less than the loss from banning trade with OECD countries and it would also generate winners and losers within that country group.

(ii) including environmental externalities

It is widely recognised that recycling processes result in less than 100 per cent resource recovery: inevitably there will be some byproduct pollution associated with the recycling process. The main byproduct of recycling used batteries is battery acid which constitutes on average 42 per cent of the weight of a used lead battery. Battery acid tends to be disposed of at landfills, resulting in external costs to the production process (assuming that the nominal landfill tonnage fee does not reflect the full social cost associated with that means of acid disposal). Also, any positive externalities associated with the lead recovery process, in the form of reduced demand for primary lead extraction (ie reduction in lead mining which is itself polluting) and reduced demand for substitute chemicals for use in batteries such as nickel-cadmium and sodium-sulphur ones (Cox, Beil and Neck, 1994), are assumed to be more than offset by these negative externalities. The net negative externality associated with recycling is such that the marginal social demand for recycling curve in OECD exporting countries, $D1'$, lies below the marginal private demand curve, $D1$, as shown in Figure 3(a). The reduction in the intra-OECD price of used batteries, from P^* to P_O^* , due to the acceptance of Decision II/I2, increases the quantity of domestic recycling in OECD exporting countries by $C_X C_X'$ units causing an additional welfare loss, namely $fgdc$, which is society's valuation of the damage to the environment caused by recycling $C_X C_X'$ more units of used batteries domestically.

Aside from the recycling negative externality, there is a negative externality associated with the failure to collect domestic spent batteries for recycling or export, as these batteries are sent to landfill. The disposal of spent batteries in landfill sites results in battery acid entering the environment. As long as the disposal sites are well chosen and appropriately designed, they pose virtually no concerns for underground water streams, lakes and the surrounding soil, and human health (Cox, Beil, and Neck, 1994). In practice, however, there are typically still some external costs of landfill in OECD countries which are not internalised by domestic collectors, so there is a divergence between the social and private supply curves, $S1'$ and $S1$, respectively in Figure 3(a). The degree of divergence between the social and private outcomes is a function of the rate of recycling (number of batteries collected divided by the total number of spent batteries per year). The fall in the OECD trading price due to Decision II/I2, from P^* to P_O^* , results in a decrease in the rate of recycling from Q_X/Q_{TX} to Q_X'/Q_{TX} and an additional welfare loss $ebhj$ representing the value society places on the failure to recycle the extra $Q_X' - Q_X$ units of batteries per year.

OECD importing countries are likely to face similar externalities associated with recycling and used battery collection. Assuming no environmental externalities, the previous section showed that OECD importing countries gained welfare of $klst$ in Figure 3(c) from the adoption of Decision II/I2. The welfare gains were a result of greater recycling of imported batteries as the price of used battery imports fell from P^* to P_O^* . However, when account is taken of externalities, the increase in domestic recycling results in an increase in the byproduct externality associated with the recycling process, reducing welfare by $qrts$ which is the value that society places on recycling $C_M - C_M'$ more units of used batteries. The reduction in the OECD trading price also reduces the recycling rate of domestic used batteries in OECD importing countries as imported feedstock is substituted for domestic spent batteries. The area $ktuv$ is the additional welfare loss in OECD importing countries as a result of $Q_M' - Q_M$ fewer batteries being recycled.

In summary, relative to the initial world price, P^* , Decision II/I2 has reduced OECD exporting countries' welfare by the foregone gains from trade with non-OECD countries $debc$, plus the environmental externalities $fgdc$ plus $jebh$ in Figure 3(a). Thus OECD

exporting countries unambiguously lose from their and other countries' acceptance of and compliance with Decision II/I2. OECD importing countries, on the other hand, may gain or lose welfare from the Decision depending on whether the surplus received by recyclers from scrap metal merchants in OECD exporting countries, $klst$, exceeds or falls short of the social environmental costs $qrls$ plus $ktuv$ in Figure 3(c). As well, any environmental costs associated with mining more lead in OECD countries, because of less recycled lead being available, need to be added to the above externalities.

This analysis assumes the OECD countries do not have policies in place to offset the two types of environmental externalities shown in Figure 3 (the toxic byproduct from recycling, and the dumping of used batteries in landfills). If appropriate policies were in place, the loss to OECD exporting countries would be less and the probability of OECD importing countries gaining on net would be greater.

When taken in aggregate, OECD countries are faced with similar welfare effects to the OECD exporting countries case in Figure 3(a). Those welfare effects for the OECD as a whole are shown in Figure 4(a). Their acceptance of Decision II/I2 reduces the price of used batteries in the OECD to the autarkic price P_O^* , reducing the standard economic welfare of the North by abc . When account is taken for environmental externalities, the OECD loses additional welfare represented by the areas $cdea$ and $abfg$ in Figure 4(a). The OECD unambiguously loses welfare from its acceptance of Decision II/I2.

What about the effects of Decision II/I2 on non-OECD countries' welfare? To justify a ban on North-South trade in used batteries and other recyclable wastes, proponents of this policy must demonstrate two things. Firstly, that the welfare loss which results from recycling an increased stock of recyclables in non-OECD countries exceeds the welfare loss from a reduction in recycling which eventuates when North-South trade in recyclables is banned; and secondly, that there is no more cost-effective policy which yields the same environmental outcome.

Assuming that, as in OECD countries, there is a divergence between the private and social costs of recycling in non-OECD countries. This is represented in Figure 4(b) by the gap between S_N and S_N' . In that case the increase in the non-OECD intra-regional trading price due to Decision II/I2, P^* to P_N^* , increases the rate of recycling from Q_{N1}/Q_{TN} to Q_{aN}/Q_{TN} , resulting in a welfare gain lqv which is the value society places on recycling $Q_{N1}Q_{aN}$ more units of domestic spent batteries per year.

Demand-side externalities in non-OECD countries may be greater than their OECD counterparts due to the prevalence of small scale 'backyard' recycling operations (Elmer 1996). These 'informal' sector recyclers tend to have lower environmental standards than recycling plants in the 'organised' or 'formal' sector. The social costs associated with the disposal of battery acid may also differ between non-OECD and OECD countries as the less-careful development and choice of sites for landfill in non-OECD countries may result in greater environmental and human health dangers than those in OECD countries, in the form of greater battery acid and lead exposure. The damage is mainly due to lead and battery acid seeping into the water table. The contaminated water has been shown to result in increased blood pressure, nausea and kidney trouble (Moyers, 1990). Assuming there is a significant divergence between the marginal social demand, D_N' , and marginal private demand, D_N , for recycling as in Figure 4, the value that society places on the reduction of $Q_{aN}C_{N1}$ units of batteries recycled is $stmq$. Non-OECD countries national welfare may increase or decrease with Decision II/I2, under the given assumptions. It would increase if and only if the environmental and social gains, $stmq$ plus lqv , exceed the conventional economic welfare losses from banning trade with OECD countries, lmq (i.e. if $tmxs + lqv > lxq$).

Hence the global welfare effects can be summarized in the following way. When considering standard economic welfare the global acceptance of Decision II/I2 necessarily reduces global welfare. However, once the environmental externalities associated with resource recovery and the dumping of used batteries in landfill are taken into account, the global welfare results are less clear. The North necessarily loses welfare as a result of the Decision while the South may gain or lose welfare. Global welfare is enhanced if and only if

the environmental gains in the South more than offset the standard gains from trade loss in the South plus the combined standard and environmental welfare losses in the North. The question now arises as to whether Decision II/I2 provides the optimal policy outcome.

3. Other Policy Options

Externalities can, in the absence of a domestic producer, be the sole result of the international importation of some product. However, in the presence of a domestic producer and a foreign import source, and externalities on the consumption side of the market as well, the optimal policy intervention requires regulation of all products, not just foreign imports. The effect of a ban on imports with no change in the regulation of domestic recycling activities will result in a distortion in domestic and foreign production and purchasing decisions.

Battery recyclers in an unregulated market maximise their individual private profits, independent of the social costs associated with their production decisions. This creates a market failure with the possibility of too many batteries being recycled. The socially efficient solution occurs where the marginal social cost of recycling is equal to the marginal social benefit. The benefit function includes both the value of the recycled lead and the social costs associated with the pollution byproduct. The socially-optimal adjusted solution has the property that the optimal quantity of pollution generated is, in general, non zero.

In an unregulated market the privately optimal quantity of used batteries recycled is a decreasing function of the price of used batteries. The acceptance of Decision II/I2 increases the price of used batteries in non-OECD countries reducing the marginal externality associated with recycling the privately optimal quantity of batteries. However, the North-South trade ban is sub-optimal as private agents are still not forced to internalise the social costs of their production decisions. The optimal intervention in non-OECD countries would be taxes on both sides of their markets to ensure that the quantity demanded is reduced to C_N^* and the quantity supplied is Q_N^* in Figure 4(b). Similarly, in OECD countries the optimal intervention would result in the quantity demanded and quantity supplied reducing to C_O^* and Q_O^* in Figure 4(a) respectively.

The first best policy instrument used to achieve the socially optimal level of pollution in the recycling process is a tax on the generation of waste. The optimal tax is directed at the source of the externality, at a rate ensuring recyclers take into account the full social costs of their recycling. Other instruments which do not directly impact on the source of the externality will be sub-optimal. The optimal tax may also provide the incentive for firms to invest in new technology to reduce the marginal externality associated with recycling, thereby reducing the marginal tax paid per unit of recovered lead.

Environmental externalities are also associated with the failure to collect the socially optimal quantity of used batteries. Consumers purchase batteries and the externality associated with battery disposal arises from the market understating the social costs of disposal decisions (following Tietenberg, 1996). As consumers are only concerned with the private costs of disposal, they may dump batteries surreptitiously rather than bear the costs of proper disposal if the effort cost of returning a battery is greater than the scrap value of the battery (Sigman, 1995).

A deposit/refund system is an economically preferable intervention as it increases the private costs associated with failing to recycle. Individuals are forced to include the refundable deposit in their private disposal decision - the opportunity cost of failing to obtain a refund. The refund should be set at such a level that the socially optimal quantity of batteries are collected for recycling at the point of purchase of a replacement battery. Although a deposit/refund system is not a waste-end tax, it effectively taxes waste disposal resulting in the socially optimal quantity of used batteries being collected and thus acts as a Pigouvian tax.

The above analysis implicitly assumes that efficient taxation and trade law compliance structures are in place in all countries. The implementation of Decision II/I2 may still be highly inefficient as the higher price paid for recyclable batteries in non-OECD countries increases the incentives to smuggle used batteries in from OECD countries. The enforcement efforts of Decision II/I2 will be mainly in preventing illegal waste trade

leaving OECD countries, as OECD detection systems presumably are more effective than those of non-OECD countries. If the ban in trade between OECD and non-OECD countries is not enforced equally across all OECD countries, new inefficiencies and inequities arise. An approach to this problem that is gathering increasing support is to levy a bond on the recycler (importer) which specifies conditions of use or disposal of toxic byproducts. If there is a breach of the conditions of the bond, the importer loses his/her funds². The bond is seldom paid upfront, and usually involves paying a premium to either a bank or insurance company for a contingent loan.

4. Conclusion

While international trade in used lead batteries is only valued at US\$62 million (Berger 1997, p. 32) the OECD estimates the total amount of recoverable metals or metal bearing waste subject to international trade (not just batteries) was valued at US\$16 billion in 1989 (Kummer, 1995). Although this estimate represents an upper limit on the value of trade that may be affected by the Decision, it can be clearly seen that the global implications of Decision II/I2 are significantly greater in magnitude than this particular case study suggests.

At a time when the emphasis of the World Trading Organisation (WTO) is on reducing barriers to international trade in support of a non-discriminatory global trading environment, the Basel Convention and Decision II/I2 is doing the opposite. In particular, the Basel Convention contravenes the WTO's 'most favoured nation' (MFN) rule of non-discrimination. Since parties to Basel are obliged not to trade with non-parties.

Technical considerations aside, the WTO must stand firm in its efforts to reduce the impediments to international trade and address the problems of Decision II/I2. Firstly, the international ban in trade between OECD and non-OECD countries should be removed as international trade is not the source of the environmental externalities associated with

² The bond is seldom paid upfront; instead, it usually involves paying a premium to either a bank or an insurance company for a contingent loan.

recyclable hazardous wastes and could be reducing rather than raising global social welfare, according to the above analysis. Liberalising world trade in hazardous wastes allows non-OECD countries to attain the gains from international specialisation in recycling and resource recovery and prevents the distortion of investment decisions in OECD countries. Secondly, recyclable waste-importing countries should be allowed to determine their individual solutions to national environmental externalities based not on a globally enforced ban, but rather on their national economic challenges, environmental conditions, resource endowments and social preferences. The only sense in which there is an international issue is if there were to be spillage on the high seas, for which shipping regulations to reduce that risk would be the optimal intervention.

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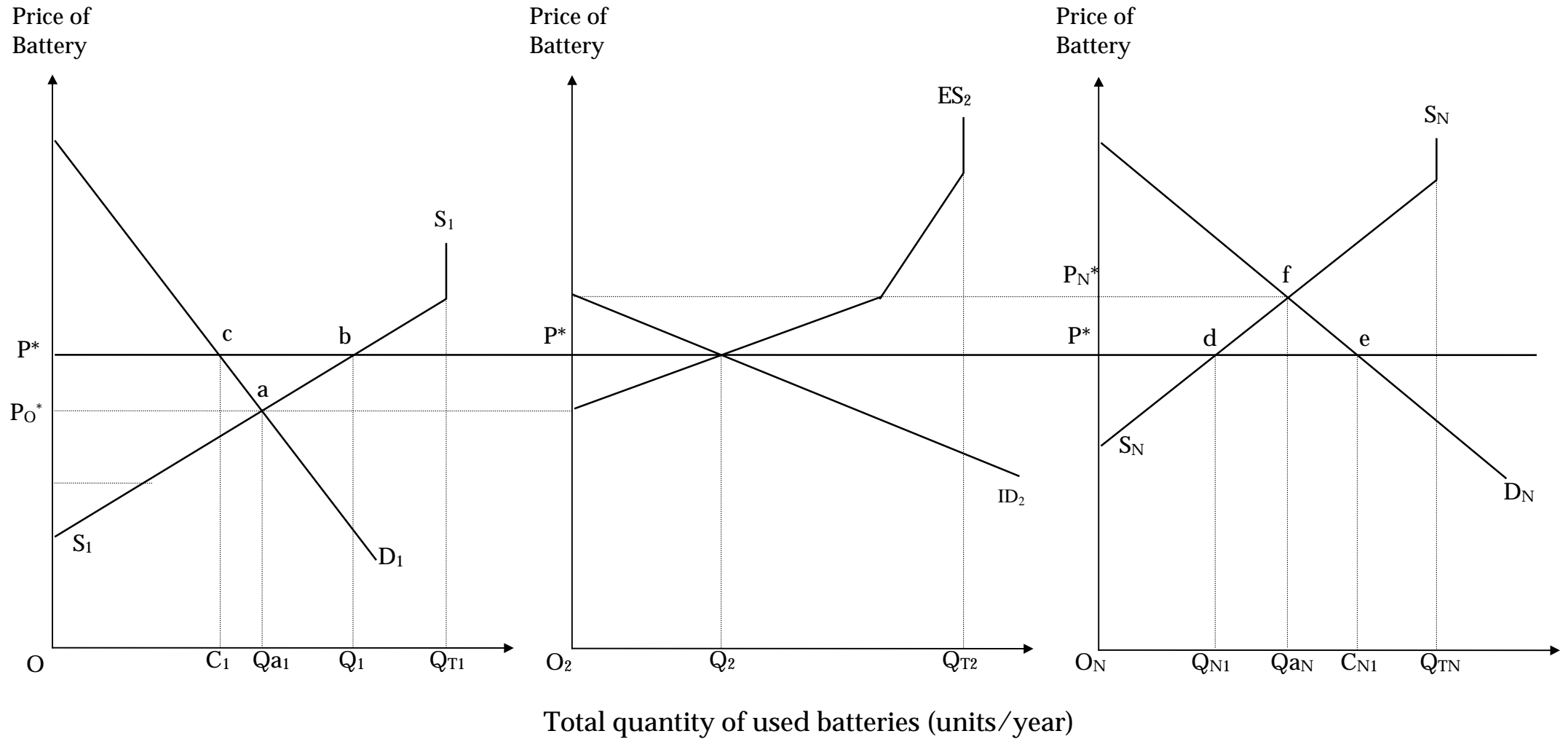
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Figure 1: Effects of Decision II/I2 on the global used lead acid battery market (ignoring environmental externalities)

(a)
OECD countries

(b)
International Market

(c)
non-OECD countries



**Figure 2: Effects of Decision II/I2 on the OECD used lead acid battery market
(ignoring environmental externalities)**

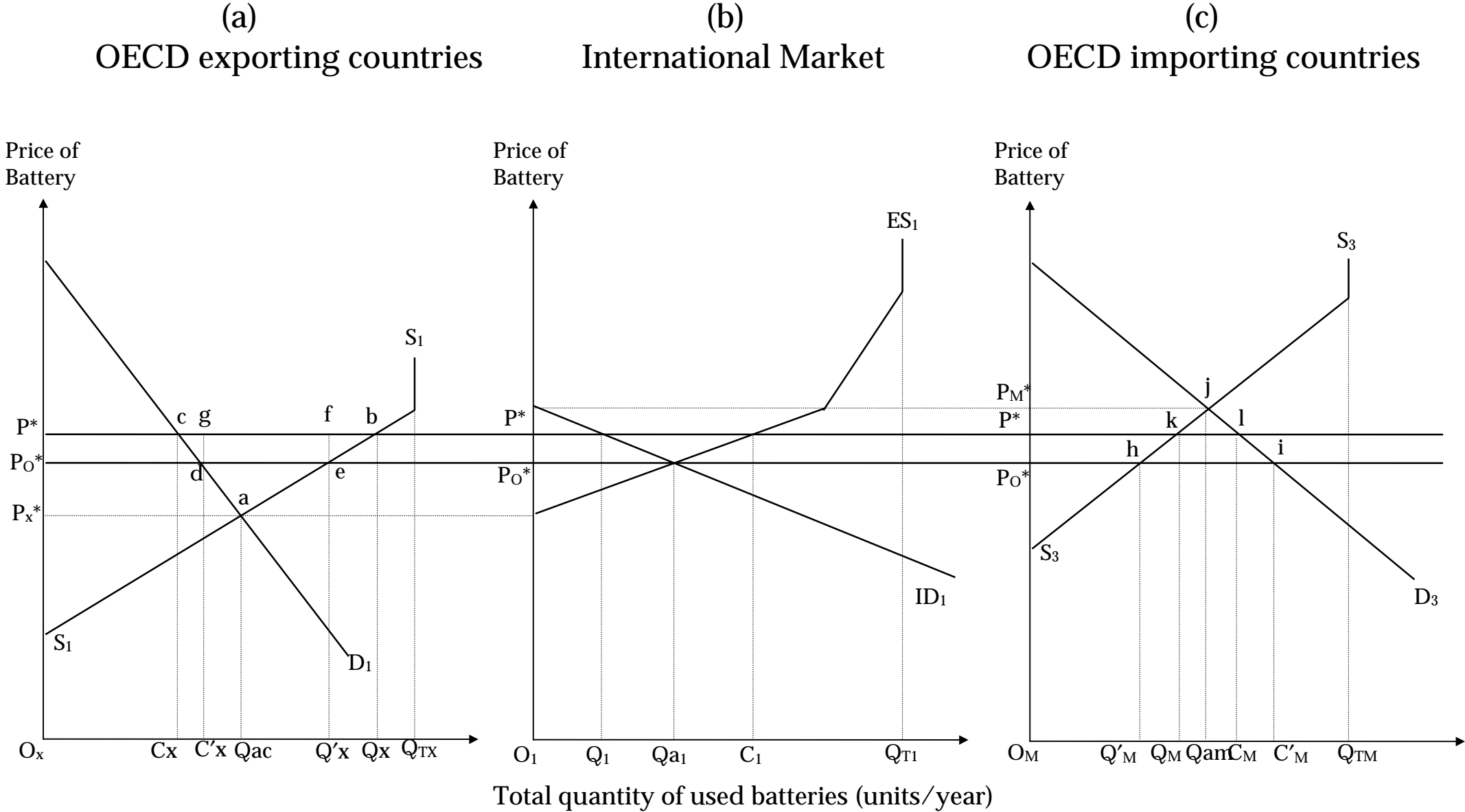
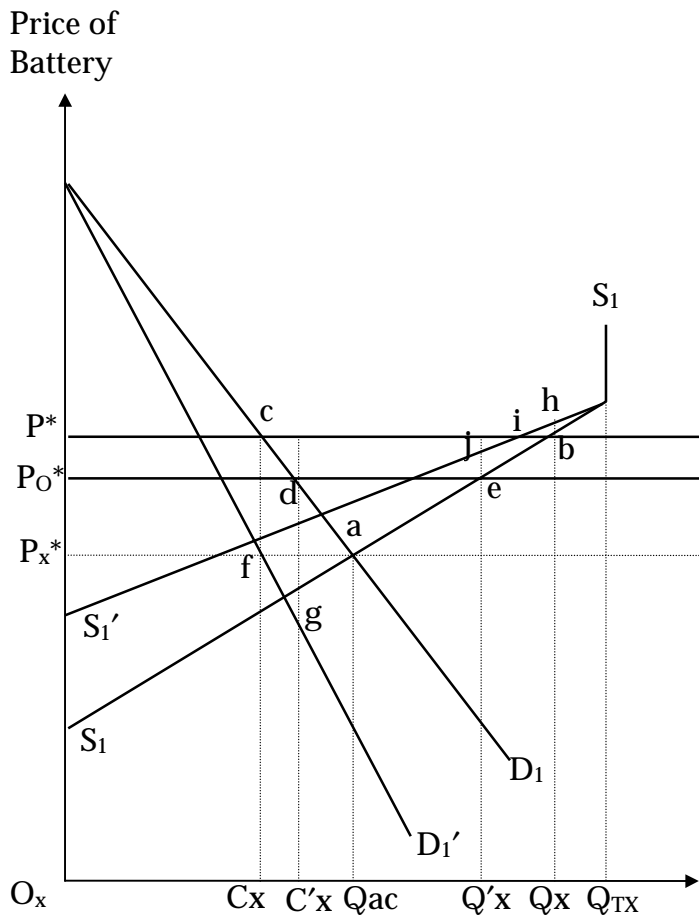
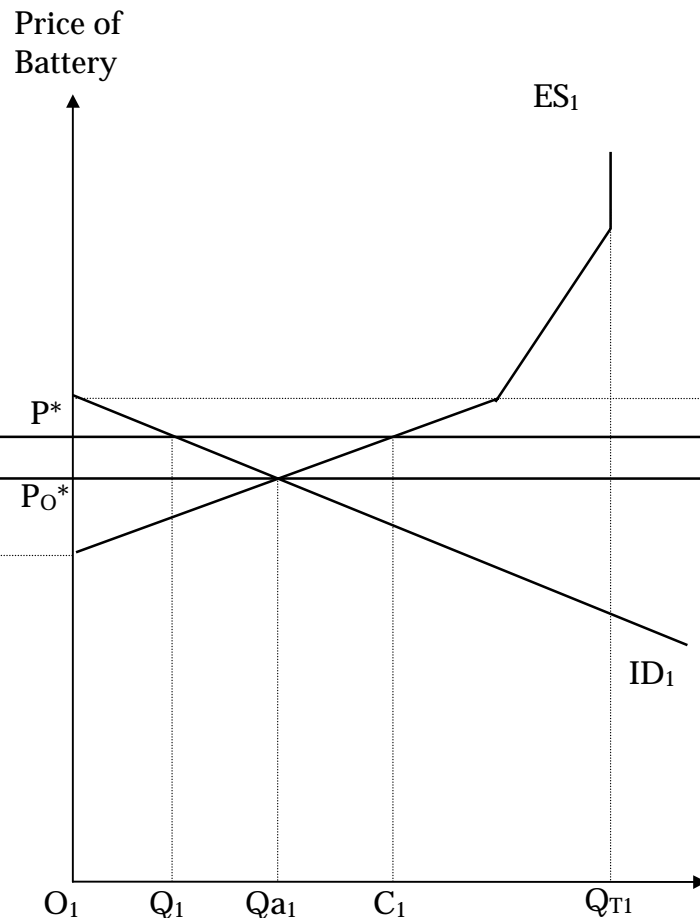


Figure 3: Environmental externality effects of Decision II/I2 in OECD countries

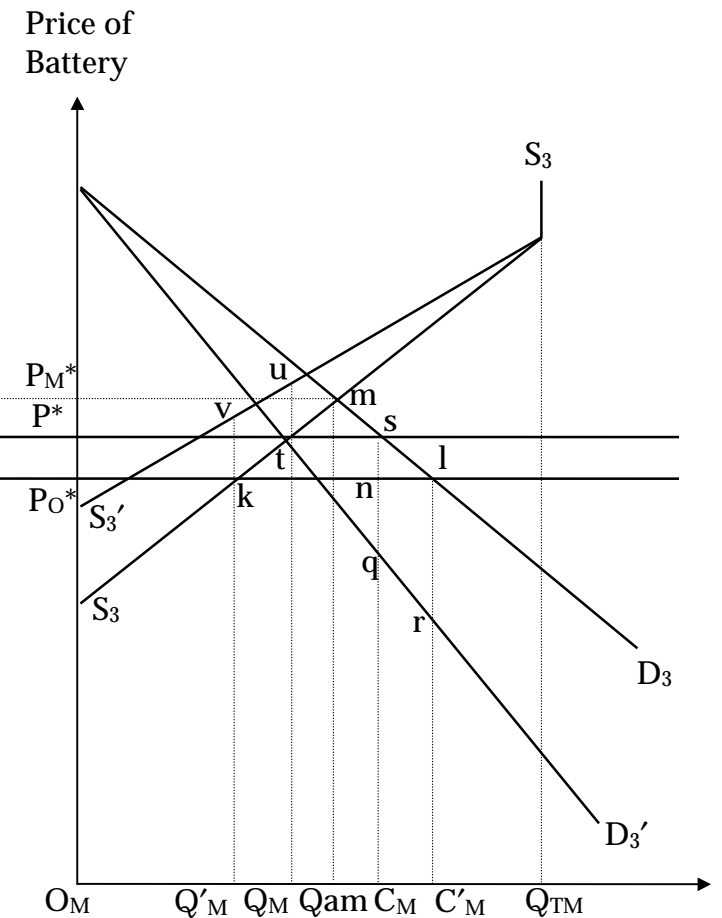
(a)
OECD exporting countries



(b)
International Market



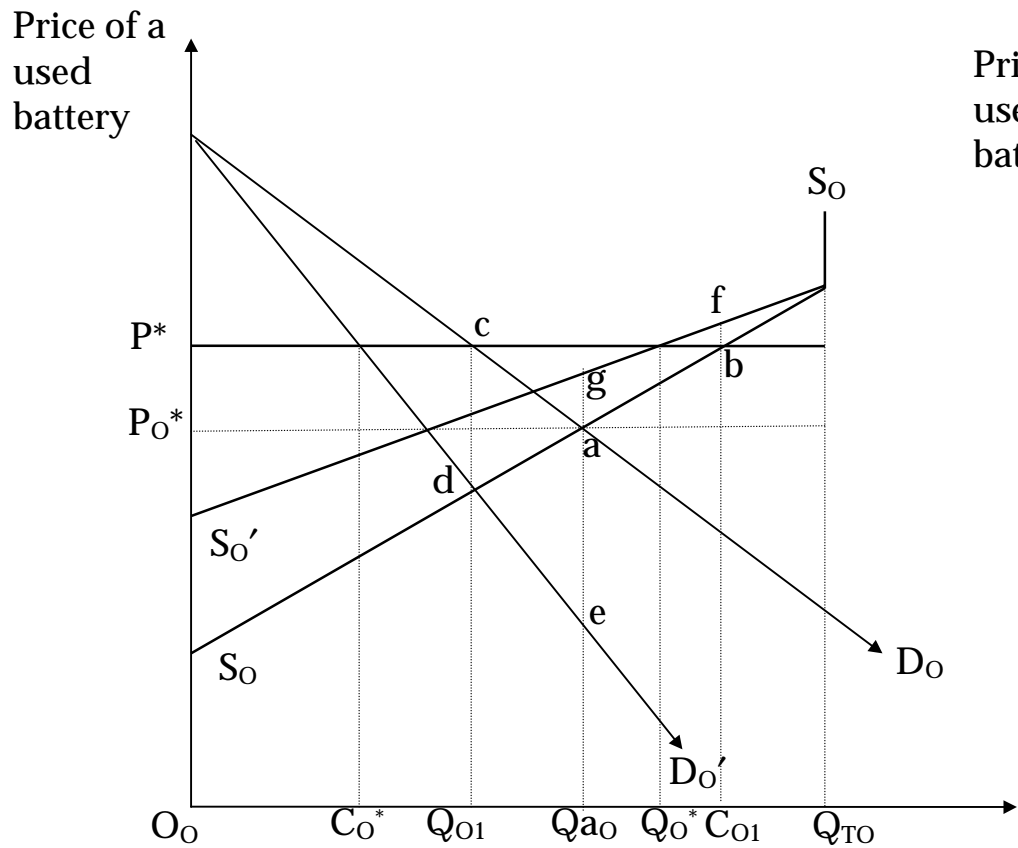
(c)
OECD importing countries



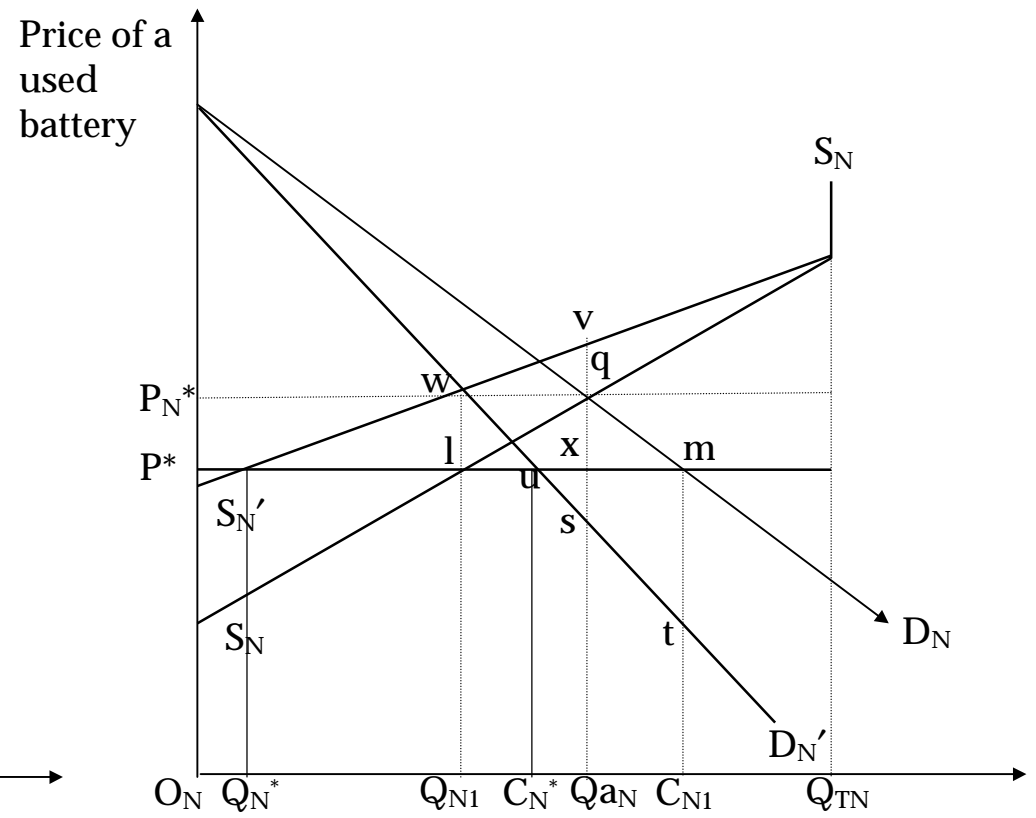
Total quantity of used batteries (units/year)

Figure 4: Welfare effects of Decision II/I2 for OECD and non-OECD country groups (including externalities)

(a) OECD countries



(b) non-OECD countries



Total quantity of used batteries (units/year)