

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Journal of Environmental Economics and Management

journal homepage: www.elsevier.com/locate/jeem

North–south trade in reusable goods: Green design meets illegal shipments of waste

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ARTICLE INFO

Article history:

Received 1 March 2012

Available online 6 November 2014

JEL classification:

F18

L10

O13

Q53

Q56

Keywords:

Waste

Second-hand products

Environmental regulations

Extended producer responsibility

Trade

Green design

Illegal market

WEEE

ABSTRACT

In a stylized model of international trade, firms in the North indirectly export second-hand products to a representative firm in the South to be reused as intermediate goods, with potential trade gains. The level of reusability of waste products – or green design – is a crucial choice variable in the North. This is because, in the presence of imperfect international monitoring, non-reusable waste can be illegally mixed with reusable waste. I explore the driving forces for illegal waste movement, with a particular focus on local waste regulations such as the EU's Directive on Waste Electrical and Electronic Equipment. Under mild conditions, it is shown that increasingly stringent regulations in the North can induce Northern firms to reduce product reusability. Consequently, the flow of non-reusable waste to the South increases, magnifying the pollution haven effect.

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Introduction

The scarcity of traditional landfill capacity combined with growing amounts of post-consumer waste has become a major concern for industrialized countries. Accordingly, governments have introduced new regulations, called extended producer responsibility (EPR) regulations, which make producers accountable for waste disposal costs and establish recycling and reuse objectives. The European Union's directives on Waste Electrical and Electronic Equipment (WEEE) and End of Life Vehicle (ELV), which entered into force in 2003 and 2000, are examples.

The present paper examines the effect of more stringent EPR regulations, or higher disposal costs, in the presence of an international second-hand goods market. According to the type of contract, the EPR program may or may not foster green design for greater reusability. EPR contracts are detailed in the section “Contracts under extended producer responsibility”. In a North–South model, a representative firm in the South can purchase second-hand products from a firm in the North as

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intermediate goods. Due to imperfect monitoring, illegal shipments of non-reusable waste are mixed with the exported goods. The model explores the driving forces of illegal waste movement and pollution, with a focus on differences in local disposal costs. The impact of improved international monitoring is also considered.

The wealth gap between industrialized and industrializing economies explains the greater demand in developing countries for many types of e-waste, used vehicles, and recycled materials.¹ However, two important sets of regulations govern transboundary waste movement. Both the Basel Convention and the EU regulations restrict waste shipments and disposal. Non-OECD countries often have low-cost, albeit environmentally inadequate, facilities. For instance, exported e-waste often ends up incinerated in open fires, an unsafe practice for both the environment and human health [EEA, 2009]. Under the above-cited international regulations, exporting hazardous waste from OECD to non-OECD countries is prohibited. Note however that under the Basel Convention, the so-called Ban Amendment comes into force on a voluntary basis. Ratification by 17 additional parties is needed for the Amendment to enter into force. Moreover, the US did not ratify the Basel Convention. Consequently, US waste shipments are generally legal.

In order to minimize the cost of complying with EPR programs, firms may undertake both legal and illegal waste shipments. Few numbers exist on the illegal waste shipment. The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) had performed several inspection periods between 2008 and 2010. In 21% of the cases, violations were detected [IMPEL, 2011]. These illegal activities take different forms: transporting waste on the black market, mixing different types of waste, or declaring hazardous waste as non-hazardous. This study focuses on yet another illegal practice: classifying waste as second-hand goods. When products are classified as second-hand goods, they are no longer governed by international waste regulations, and can be traded to developing countries. Bads turned into goods constitute an economic incentive for misclassification. For instance, it costs about £5 to recycle a 'visibly undamaged' PC monitor in the UK, whereas traders are willing to pay up to £3 on the international market [Czarnomski et al., 2006]. Such misclassifications have been observed for e-waste, used vehicles, used clothes, car tires, and other types of waste,² and hence testify to *imperfect international monitoring*.³

The current paper is at the crossroads of the literature on EPR, green design and international trade. The literature on EPR programs has grown substantially in recent years.⁴ For instance, Fleckinger and Glachant (2010) are concerned with the fact that these programs are designed precisely for producers to fulfill their obligations as they see fit. They examined a duopoly of producers and compared scenarios where producers managed their waste on their own or colluded through a producer responsibility organization.⁵ They concluded that this type of collusion could lead to suboptimal outcomes, justifying government intervention. Similarly to the current model, some authors have considered the potential impact of EPR on green design. Runkel (2003) studied the influence of four instruments on product durability and welfare. He explored different competitive environments and showed that EPR programs applied under imperfect competition can lead to reduced welfare. Subramanian et al. (2009) underlined the importance of coordination and contracts between producers and consumers for EPR to improve products green design. Other noteworthy contributions on policies for green design include Fullerton and Wu (1998) who showed that the social optimal level of recyclability can be achieved either when consumers pay the social cost of disposal or when the optimal design is subsidized. Eichner and Pethig (2001) studied recyclability as the choice of material, considering material flow and balance through the value chain. In the case of market failure for embodied material per output, they proposed a policy combination of consumption tax and subsidy on material demand. In a dynamic model that includes the recyclability level, Eichner and Runkel (2005) showed how the optimal allocation is obtained through a deposit-refund system.

Few authors have studied the trade in waste and used products. From a theoretical perspective, Copeland (1991) studied international trade in waste disposal services. He found that in the presence of local illegal waste disposal, trade restrictions may improve welfare. Kinnaman and Yokoo (2011) proposed a North–South model of trade in waste reuse. They found that Pareto optimality is reached when the difference in e-waste taxation rates between the two countries is equal to the difference in their respective external marginal cost of e-waste. Empirically, Bond (1983) developed a model based on differences in factor prices and technologies to explain trade in used equipment between firms. Frazer (2008) explained the decline in apparel production in Africa due to used-clothing donations,⁶ and Clerides (2008) described the gains from trade in used vehicles.

Several works corroborate the pollution haven hypothesis (PHH), which stipulates that larger differences in environmental regulations between two countries induce polluting industries to delocalize where the standards are weak. This is

¹ See Janischweski et al. (2003) and Beukering and Bouman (2001). Janischweski et al. (2003) showed that countries in East and West Africa import more second-hand vehicles than new ones. These cars are of a particularly poor quality, and are often more than 15 years old.

² See EEA (2008, 2012), Czarnomski et al., (2006), and Janischweski et al. (2003). Czarnomski et al. (2006) observed that a significant amount of what is considered WEEE in OECD countries is illegally exported to West Africa as second-hand goods. In addition, Janischweski et al. (2003) noted that transactions where vehicles exported in 'top condition' turn out to be 'cars without an engine' are so common that they call it the Lemon Rule.

³ Yoshida and Terazono (2010) analyzed the reuse of second-hand TVs in the Philippines. Their survey of 113 Filipino consumers showed that around 40% of TVs exported from the EU were defective. They proposed that a systematic electrical testing (or perfect monitoring) would reduce by approximately half the shipment of second-hand EEE.

⁴ In addition to Walls (2006), see for instance OECD (2004) and Ino (2007).

⁵ See the role of producer responsibility organization in the section "Contracts under extended producer responsibility".

⁶ Similar to food aid, used-clothing imports harm local producers. Used-good imports as an obstacle to economic development is also discussed in detail by Janischweski et al. (2003).

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