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# An economic analysis of the Packaging waste Recovery Note System in the UK

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### ABSTRACT

In order to cope with the increasing scarcity of final dump sites for household wastes, the UK recently introduced an environmental policy targeted at the firms that produce and sell products that generate packaging wastes. This policy requires such businesses to hold predetermined numbers of tradable credits called “Packaging waste Recovery Notes” (PRNs). This article provides insights into the economic implications of such a policy through a simple analytical model of a recyclable product and the PRN markets. Our analysis yields two particularly interesting results. First, an increase in the required recycling rate dampens the output and landfill waste levels, while the effect on the level of recycling activities is ambiguous. Second, an increase in the landfill tax always leads to an increase in the landfill waste. We also discuss how the socially optimal landfill tax in the presence of the PRN market should be chosen.

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## 1. Introduction

Among the EU member states, there has been a major push toward diverting wastes away from landfills and promoting recycling as the concern over the shortage of landfill space has been mounting for a while. Since the 1990s, the UK, whose waste management heavily depended on landfills that absorbed over 80 percent of its waste (OECD, 1999), has introduced several policy measures to reduce and recycle wastes. Among them is the approval of tradable credits, called “Packaging waste Recovery

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Notes” (PRNs), to meet individually specified recycling obligation for firms that produce and sell products that generate packaging wastes. The PRNs are issued by accredited reprocessors according to the amount of waste actually recycled, and traded among regulated firms and recyclers in an open market.

Since, through the purchase of the PRNs, the original producers and sellers become somewhat responsible for how the waste originating from their products are treated, the PRN system is often categorized within so-called “Extended Producer Responsibility (EPR)” policies. The EPR policies have attracted the attentions of economists mainly for the following two reasons. The first is to provide incentives for producers to “design for environment” (DfE), i.e., to make design changes that reduce waste, such as improving product recyclability and reusability, reducing material usage, and downsizing products (Fullerton and Wu, 1998; Calcott and Walls, 2000, 2005). The second is to evade the occurrence of illegal dumping by households with significantly high collection fees for their waste. Without charging households for waste collection, the information on the cost of waste treatment will not be transmitted back into the prices in original product markets as in a typical Pigouvian story. Based on such a concern, several studies come up with a set of optimal taxes/subsidies that involve policies that now falls under the EPR umbrella (Fullerton and Kinnaman, 1995; Walls and Palmer, 2001; Ino, 2011). This paper also supposes that households will not be charged for waste collection service as is currently practiced in the UK, where the service is financed by the general council taxes. Furthermore, we consider that producers or sellers are not directly held financially responsible for the waste disposal, but the implementation of the PRN system aims to force them to take into account the cost of treating the eventual by-products in an indirect way. While existing studies mainly focus on policy mixes to achieve optimal allocations, we presuppose an exogenously given recycling target as this approach is consistent with the existing state of how the policy is implemented in the UK.

In this paper, we construct a simple analytical model of a product market and the PRN market so as to gain insights into this new policy instrument. Particularly, we conduct a series of comparative statics analysis to examine, first, how an increase in a target recycling rate affects the equilibrium recycling and landfill waste levels. Another policy effect we explore is that of an increase in the landfill tax, which is simultaneously implemented in the UK. There are two notable results from our comparative statics analysis. First, an increase in the required recycling rate dampens the output and landfill waste levels, while the effect on the recycling activity is ambiguous, partly due to the existence of the PRN market. Second, an increase in the landfill tax (or the price of recycled material) actually raises the amount of landfill waste. In particular, as it becomes increasingly difficult to raise the recycling rate further, a constant rise in the landfill tax can start exacerbating the shortage of landfill sites. This result at least casts some doubt on the effectiveness of implementing the PRN scheme and landfill tax concurrently, as is recently practiced in the UK.

After describing the PRN scheme and other relevant policy environment in the UK in the next section, we present the structure of our model in Section 3. In Section 4, we conduct a series of comparative statics analysis in order to examine how the equilibrium outcomes react to marginal changes in respective policy instruments. In Section 5, we briefly discuss how the socially optimal level of the landfill tax needs to be adjusted to a change in the social cost of landfill waste.

## 2. Background information

Waste management of the UK has been largely driven by the EU Directives’ objectives and targets. In 1994, the EU council issued the Directive 94/62/EC that required member states to pass legislation at the national level to reduce packaging waste. Since 1997, the Producer Responsibility Obligations (Packaging Waste) Regulations (PWRegs) has regulated businesses with an annual handling of more than 50 tonnes of packaging or annual turnover of more than £2 million. This covers close to 90 percent of all packaging handled by UK businesses (Department for Environment, Food, and Rural Affairs (Defra), 2006a).

In large, there are three types of agents regulated under the PWRegs: output producers and retailers, reprocessors/recyclers, and “compliance schemes”. Compliance schemes act as middlemen between the first two types of agents, and guarantee to output producers and retailers that required amounts of

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