The dynamics of landfill diversion: Economic drivers, policy factors and spatial issues
Evidence from Italy using provincial panel data

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ARTICLE INFO

ABSTRACT

Waste disposal is an issue that is becoming increasingly important in policy terms in the European Union, and in Italy, a country showing strong geographical heterogeneity in waste management. This paper analyses the process of decoupling/delinking between economic growth and landfilling trends in a framework where economic, policy, geographical elements and spatial issues are all considered as drivers behind the phenomenon. We exploit an original and very rich provincial panel dataset over 1999–2005 for the 103 Italian provinces. Evidence shows that the observed 'absolute' decoupling between economic growth and landfilling is driven by a mix of structural factors. Among the main factors, population density, more than the provincial income level, emerges as a crucial driver: local opportunity costs and landfill externalities matter in shaping waste policies and local commitment to a transition away from landfilling of waste (landfill diversion). However, not only structural factors are relevant. If on the one hand landfill taxes are not a significant driver of the phenomenon, waste management tools, such as separated collection for recycling, and the tariff system connected to waste services, bring about significant effect on the amount of landfilled waste. Moreover, regarding the analysis of spatial interrelations across provinces, we note that the presence of incinerators in nearby provinces increases landfill diversion, due probably to free riding behaviour or intra-provinces 'agreements' on waste management; this is not true for nearby landfill sites, that cause for a given province a strong lock in effect. Future research could strengthen the analysis of policy effectiveness at regional level, focusing on policy endogeneity, and the full investigation of spatial correlations in waste disposal performances.

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1. Introduction

Reducing landfilling and promoting other form of waste disposal is a primary objective of European environmental policies. The effectiveness of European policies is to be achieved by a sound implementation at decentralised level, where waste is generated and disposed of and policies are implemented. At European level, efforts towards reducing landfilling have been a priority according to the EU waste hierarchy[1]. As a consequence, one of the pillars

of the EU waste strategy is the 1999 Landfill Directive (EEA, 2007) that is then operatively implemented at decentralised member state level in association to national actions regarding waste management.

Very recently, for example, some areas in Southern Italy have being experiencing a collapse in waste management performances that has still to be resolved, mainly due to a set of different factors

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[1] Landfill diversion is currently the main pillar of the Waste strategy. We note that landfilling, though on average the worst social disposal option may be environmental and economically preferable in some specific situations (areas with low population, large amount of available land). Evaluation should be carried out to analyse the relative economic and environmental benefits and costs of different disposal options (incineration, landfilling, and even recycling; see Pearce, 2004; Dijkgraaf and Vollebergh, 2004). We further note, looking at current and future policy actions to which this paper may provide relevant evidence, that even the revised 2008

Waste Framework Directive, which was at some time expected to include some per capita targets for MSW generation, although it explicitly reassesses the objective of delinking and the necessity for using economic policy instruments to tackle waste externalities according to relative social costs, does not ultimately fix waste prevention targets. Article 9 on waste prevention sets future actions only in terms of stating that by the end of 2014, waste prevention and decoupling objectives for 2020 will be presented, and article 29 indicates that countries should prepare waste prevention programmes by 2013 (the EEA is required to report annually on this evolution from 2008 to 2013), with delinking performance to be evaluated every 6 years. It would seem clear that absolute delinking is not present for MSW generation and EU member countries have managed to postpone specific waste generation per capita targets.
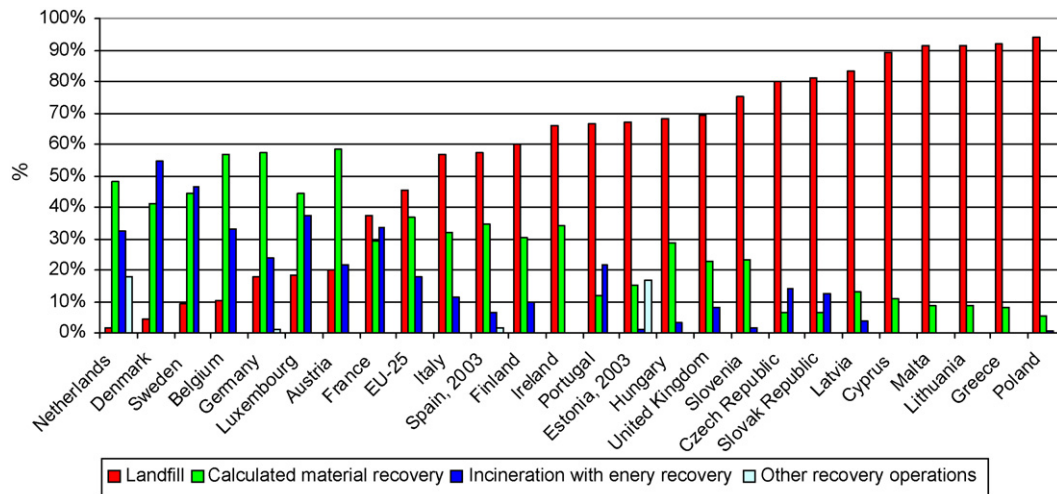
Source: EEA (2007), Eurostat Structural Indicators on municipal waste generated, incinerated and landfilled, supplemented with national statistics.

Fig. 1. Use of landfilling, incineration and material recovery as treatment options in 2004.

such as low separated collection, absence of serious alternatives to landfill siting, increasing scarcity of land in a densely populated area, failures in local policy implementation and property right enforcement. The problem with waste management and correlated externalities that arise at landfill stages is that waste stock accumulates and is difficult to reverse the process when the sustainability balance between inflows of waste generated and outflows of waste treated is broken at some time.

Waste generation and waste disposal are issues that are becoming increasingly prominent in the environmental arena both from a policy perspective and in the context of decoupling/delinking analysis[2]. Waste generation is in fact still increasing more or less proportionally with income (Mazzanti and Zoboli, 2008; Mazzanti et al., 2008), and economic and environmental costs associated to landfilling are also increasing. We thus may affirm that waste management, from production to disposal, is an environmental issue not less relevant than water scarcity or climate change. It also presents some interlinks with an issue like climate change, since incineration, recycling and landfill possess diverse greenhouse gas potentials. Diversion of waste away from landfill (landfill diversion) is also one option to reduce greenhouse gas (GHG) emissions (EEA, 2007).

In this context indicators of 'decoupling' are becoming increasingly popular in detecting and measuring improvements in environmental/resource-efficiency with respect to economic activity. Extensive research on decoupling indicators, for reporting and policy-evaluation purposes, is being carried out by the Organisation for Economic Cooperation and Development (OECD, 2003, 2002). Various decoupling or resource-efficiency indicators are included in the European Environment Agency's state-of-the-environment reports (EEA, 2003).

Landfilling is still the predominant treatment option for the EU's municipal waste, and Italy is a country under pressure and constant monitoring and evaluation of performances. In 2004, about 45% of the total municipal waste was landfilled while 18% was incinerated. However, there are significant differences in how dependent countries are on landfilling. Fig. 1 clearly shows that several countries – the Netherlands, Denmark, Sweden and Belgium – have already arrived at very low landfilling rates.

Those countries not only have a substantial level of incineration; they also have a high level of material recovery. In general, there seems to be two strategies for diverting municipal waste from landfill: to aim for high material recovery combined with incineration, or to aim for material recovery which includes recycling, composting and mechanical biological treatment (EEA, 2007).

For what concerns Italy, our case study, though northern Italy is rapidly evolving towards high level of recycling, composting and incineration strategies, the average figure for the country is still dominated by landfilling as recent dramatic news from southern areas, like Campania, have confirmed. Nevertheless, even some northern regions suffer from landfill criticalities given the increasing lands scarcity in physical and economic terms (opportunity costs) and the non-decreasing, at least stabilised, trend for waste generation. A clear map of the current situation in Italy is well shown in Figs. 2–4, representing the differences in waste management and disposal across Italian provinces. This rich geographically based heterogeneity is a value added and a major applied interest of the paper. We stress that the Italian case study presents a high degree of generalisation, given many other EU countries and not only EU, present highly heterogeneous (and federal) socio-economic and policy settings. The 'average' national picture then is insignificant in providing clear evidence of real dynamics occurring at regional levels. In addition, the data source we exploit is to our knowledge the richest one at EU level; at the moment we are not aware of other countries presenting such a long and rich panel dataset (7 years, 103 provinces) as we investigate here.

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[2] The EU policy 'thematic strategies' on both resources and waste, entail reference to 'absolute' and 'relative' delinking indicators (EC, 2003): the former being a negative relationship between economic growth and environmental pressures (here landfilling), the latter a positive but decreasing, in size, association (a positive lower than unity elasticity in economic terms). The reasoning surrounding decoupling can be framed by reference to the EKC model, which describes the state of the dynamic relationship between environmental pressures and economic drivers. This model proposes an inverted U-shaped relationship between per capita income and environmental pressure. The model implies that in the first stage an increase in income leads to an increase in environmental pressure. In the second stage, above a certain level of income, the environmental pressure will decrease as the economy is better able to invest in less polluting technology, consumers reallocate expenses in favour of greener products, there are more awareness raising campaigns, ad hoc environmental policies, etc. At a later stage, there might be a potential recoupling, observed for some pollutants, where environmental pressure grows in spite of increasing income. The scale effects of growth again will outweigh improvements in the efficiency of resource use and management. A recoupling could thus emerge even in well-organised waste management systems, if the pressures from the production of goods and final disposal economic and environmental effects are taken into account, following a life cycle approach (LCA) perspective.