

Economic Evaluation of Environmental Policy Instruments: The Case of Voluntary Cooperation Agreements in Flanders

Introduction

The purpose of this contribution¹ is to show how the effectiveness of policy measures can be evaluated *ex post*. The general approach is illustrated by a case involving voluntary environmental cooperation agree-



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ments between the Flemish environmental authorities and individual municipalities. These agreements aim at reducing the non-recyclable part of collected household waste.

Methodologically, we apply a dynamic difference-in-differences estimator to a dataset of residual waste and socio-economic variables covering all 308 Flemish municipalities for the period 2000-2004. The method tries to assess

whether municipalities subscribing to the voluntary agreement achieved a greater reduction of residual waste than what could be expected on the basis of their own performance prior to subscription and the performance of the non-subscribers.

Voluntary agreements between the environmental authorities and municipalities

Under the Belgian constitutional system, the three regions (the Flemish Region, the Brussels-Capital Region and the Walloon Region) enjoy considerable responsibilities and autonomy in respect of environmental policy. In many environmental policy domains, the regions can set their own targets and implement a variety of policy instruments such as standards, taxes or subsidies. They are also responsible for the inspection and enforcement of these environmental policies.

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The basis of the Flemish regional waste management policy is the decree of 2 July 1981 concerning prevention and management of waste materials, known in Dutch as the 'Afvalstoffendecreet' and the coordinated ruling known as VLAREA ('Vlaams Reglement inzake Afvalvoorkoming en Afvalbeheer', 17 December 1997). The Public Waste Agency of Flanders (OVAM or 'Openbare Afvalstoffenmaatschappij') is responsible for preparing and implementing regional waste management policy. Important instruments in this context are the current and past versions of the implementation plan for the treatment of household waste. In practice however, local municipalities and city councils organize the collection and disposal of household waste. They decide on the practical details of the collection system (frequency of collection, payment schemes, e.g. *per capita* tax, payment per bag, etc.), recycling strategies and the disposal of collected waste. However, the policies chosen by these local authorities are to be in line with the principles of the higher level environmental authorities.

Against this complicated legal background, the Flemish regional government has set up a system of voluntary cooperation agreements with the local municipalities to assist them in the implementation of the regional environmental strategy in general and waste management strategy in particular. Municipalities can subscribe to the agreement on a voluntary basis. By subscribing, the municipalities commit themselves to performing certain tasks and to meeting well-defined goals. In exchange, they receive financial support if all targets are achieved. The cooperation agreement consists of eight different clusters and three ambition levels (level 1: entry, level 2: advanced and level 3: ambitious) and each participating municipality is to a large extent free to select the clusters and corresponding ambition levels to which it wants to subscribe.

We focus on the solid waste cluster ('Vaste Stoffen' in Dutch) of the voluntary agreement for the period from 2002 to 2004. The strategic goal for this cluster is to reduce the amount of solid waste generated by households and it specifies a detailed time frame and quantitative policy goals for what is called *residual waste*, which basically includes all non-recyclable household waste. To be eligible for a grant, subscribing municipalities are to reduce their residual waste production to 200 kg *per capita* per year for ambition level one and to 150 kg per capita per year for ambition level two. In return, they receive grants that amount to €0.90 per inhabitant for level one and €1.60 per inhabitant for level two. Although final goals were to be met in 2004, transitional achievements are evaluated by means of specific intermediate targets.

As mentioned before, municipalities can enter into the cooperation agreement at three different ambition levels. However, the residual waste targets for level one are not very strict, meaning that the overall waste production for level one participants is quasi-identical to that of non-participating municipalities. Hence we pooled non-participating municipalities and participating municipalities at the lowest ambition level into one group: the non-subscribers. Municipalities which decided to subscribe at level two are hereafter referred to as subscribers. No municipality subscribed to level three for the solid waste cluster for the period under consideration. According to this classification, about 27 per cent of municipalities can be labeled subscribers.

Figure 1 displays the evolution of residual waste over time. It reveals considerable differences between subscribers and non-subscribers before and after signing the voluntary agreement. Both in absolute and in relative terms, non-subscribers have reduced their *per capita* residual waste more than subscribers between 2001 and 2004.

Difference-in-differences methodology

By comparing average residual waste levels one might conclude that subscribers perform better than non-subscribers because their waste level is substantially lower. However, from this observation we cannot conclude that the difference in performance is due to the voluntary agreements. In particular, we observed in Figure 1 that subscribers were already on a lower level before the date of subscription. This might point to so-called *endogeneity problems*, meaning that the observed subscription behavior is correlated with some unobserved latent characteristics such as, for instance, the ‘green’ preferences of the inhabitants of the municipalities. If subscribers have more favorable unobserved characteristics, the effect of the voluntary agreements would be overestimated by simply comparing average residual waste levels of subscribers and non-subscribers because subscribers can be expected to perform better, even in the absence of the voluntary agreements, see Blundell and Costa Dias (2000) or Verbeek (2000).

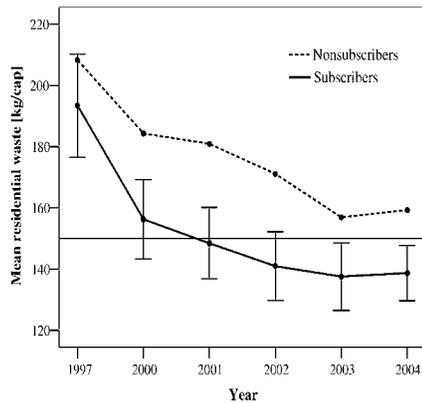


Figure 1: Evolution residential waste
Legend: error bars denote +/- 2 times standard error

The real evaluation challenge is therefore: what would have been the performance of the subscribers, had they not signed the voluntary agreement? In other words, is the currently observed situation significantly different from the hypothetical situation without voluntary agreements? To answer this question, one needs to make assumptions on the counterfactual or business-as-usual scenario without voluntary agreements.

Figure 2 is a stylized graph of a possible evolution of residual waste over time for subscribers and non-subscribers. It illustrates how the dynamic difference-in-differences technique (for an introduction, see Moffitt 1991) constructs the counterfactual scenario. It uses information on the pre-treatment period to extrapolate a trend (dotted line in Figure 2) that the subjects would follow in the absence of the voluntary agreement. This counter-

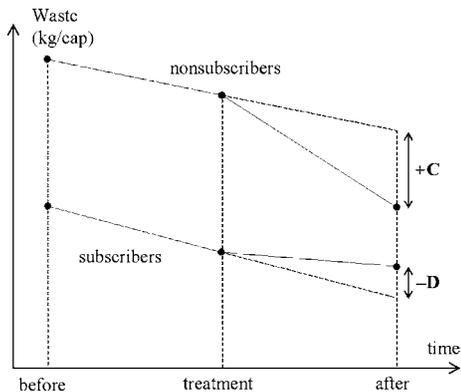


Figure 2: Difference-in-Differences

factual value is compared against the actual achievements. For instance, the subscribers' progress is measured by distance minus D, which is negative since they produce more residential waste than what could have been expected based on the extrapolation. For the non-subscribers, progress is measured by C. As a final step, the progress of the treated waste is corrected by deducting the progress of the non-treated waste to obtain the real treatment effect: $-D - C$ in the case of Figure 2. The negative treatment effect means that the subscribers did worse, instead of better, after treatment taking into account their own pre-treatment trend and the performance of the reference group. The treatment should therefore be considered unsuccessful.

In De Jaeger and Eyckmans (2006), we implemented the dynamic difference-in-differences approach in a statistical regression framework in the same way as Bratberg et al. (2005) to test for statistical significance of observed differences in performance between subscribers and non-subscribers.

Results and conclusion

Considering the whole time horizon of the program, our results indicate that municipalities subscribing to the voluntary agreement were, on average, characterized by less reduction in their residual waste levels than what could have been expected on the basis of their own performance prior to subscription and the performance of the non-subscribers. Sensitivity analysis has revealed that this negative result needs to be qualified since we did detect positive agreement effects for the very last year of the agreement. It might require more time before the positive effect of the agreement filters through to the data.

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