Germany's waste treatment market: Competition will bring fees down

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Abstract

This paper describes a realistic deregulation scenario for the German municipal solid waste treatment industry. In major areas of today's market, competition has effectively been prevented by two pieces of legislation. Under the first, regional administrations can first exploit their own capacity to the full and thus do not have to hold public tenders. The second piece of legislation enforces the treating of non-recyclable waste in the nearest appropriate plant, preventing operators from offering their capacity outside their own region. As a result of these two pieces of legislation, local monopolies dominate the market and are able to set individual cost-plus fees.

In the coming years, we believe that the impact of regulation on the market will diminish. The privatization of public capacity and the political desire for full waste recycling will result in a situation in which all capacity operators are able to compete on an equal footing for waste input.

For this reason, we build several market models, using new cost data gathered by us. This allows us to determine future price levels and their financial impact on market players. Overall, the paper aids strategic investment decisions in this market by investigating future regulatory issues.

1 Introduction

Since June 2005, when the latest German landfill regulation came into effect, municipal solid waste no longer fulfills the requirements of direct depositing [21]. Operators are now forced to treat mixed waste components thermally or biologically, separating the treatment out as an additional part in the waste management value chain.

Prior to this legislation coming into force, disposal fees showed different levels in different regions. The 2004 EUWID survey reported increasing fees from north

to south Germany as well as enormous fee variation within federal states [6]. As an extreme example, some operators were charging eight times as much as others (see Figure 1). Consequently, the German Advisory Council on the Environment (SRU) reported many illegal waste shipments: claiming they were carrying out material recycling, holders regularly shipped waste across Germany in order to enjoy lower disposal fees [13].

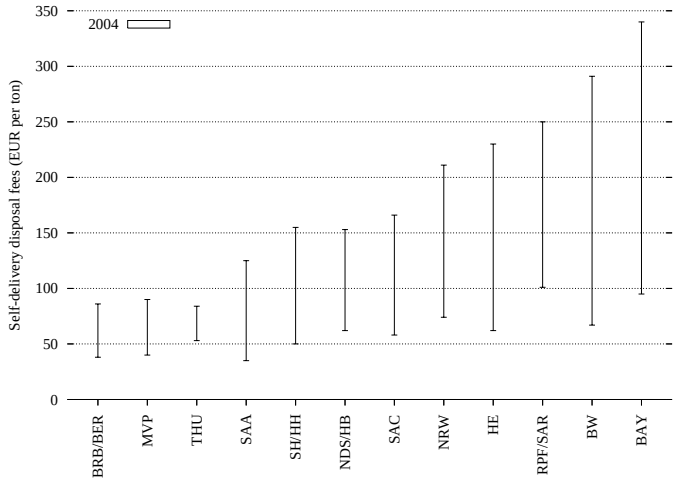

Figure 1: Disposal fees in German federal states, 2004

One factor behind the fee variation were the different methods of disposal used: while some regions continued landfilling, others were already treating waste in costly incineration plants.[1]

In this paper we suggest, however, that a much more important factor driving fee variation were the competitive restraints. Unit costs of waste management plants vary inherently, even if they use similar technology. In an earlier paper we discussed widely ranging unit costs of German mass-burn waste incinerators, finding inadequate size and complex emission control technologies particularly in plants with high unit costs [11]. In the absence of competition, plant operators

[1] As an example, landfilling was the dominant method of disposal in Brandenburg; in Bavaria, all waste accumulations were incinerated.

can simply pass individual unit costs on to their captive customers, who have no choice but to accept them. As a result, the investors in treatment facilities and their operators do not feel any cost pressure. The system lacks a penalty mechanism for bad business management, and widely ranging fee levels are the inevitable consequence.

To test the truth of this assertion, we build an allocation model for German waste streams under the new regulative conditions, calculate the appropriate disposal fees, and compare them to the actual 2004 fees. This paper reports the results of this analysis.

Further, we examine regulations that guarantee the shift of cost disadvantages from plant operators to their customers. We believe that these pieces of legislation will lose their power in the medium term. In place of the local monopolies, a national oligopoly will develop where plant operators have to compete for waste input by setting attractive prices. Finally, using two other market models, we determine the market price of waste input and forecast its potential impact on plant profitability.

2 Municipal solid waste management

2.1 Methods of treatment

German regional administrations have two legal options for waste treatment. The first, waste combustion, has dominated for many years; more recently, biological treatment is clearly growing in importance.

Waste combustion reduces the volume of waste input and destroys many of its toxics. During the incineration process, energy and steam are recovered and potential recyclables separated. Purified slags can be used in street and

landfill building, while hazardous substances have to be shipped to underground deposits. The 1996 Federal Immission Control Ordinance Number 17 forced German plant operators to tighten up their air pollution control [19]. Today, German mass-burn waste incinerators produce emissions that are well below the legal limits.

Biological treatment uses various methods to decompose or stabilize organic fractions for subsequent landfilling or combustion. Recyclable materials are separated during an additional mechanical process step. During this step, plant operators also sort out all high-caloric fractions for energy recovery. These materials can then be shipped to incinerators or used as secondary combustibles in fossil power plants and other industry facilities.

2.2 Restraints on competition

2.2.1 Status quo

Rather than defining general restraints on competition, the German legislation distinguishes municipal solid waste accumulations in terms of their source (household versus non-household) and their recyclability (recyclable versus non-recyclable). For each of the four different combinations possible, there are different limitations on competition. Household refuses, and similar waste mixtures from sources other than households are currently classified as non-recyclable material, whereas the high-caloric fractions released during biological treatment are considered recyclable matter (see Figure 2).

The primary aim of the competitive restraints is to give control of waste streams entirely to the regional administration: under the legislation, all waste fractions must be surrendered to a public disposal authority. The 1996 Closed Substance Cycle and Waste Management Act suspended this obligation for recyclable non-

household waste, but upheld it for all household and non-recyclable waste [17].

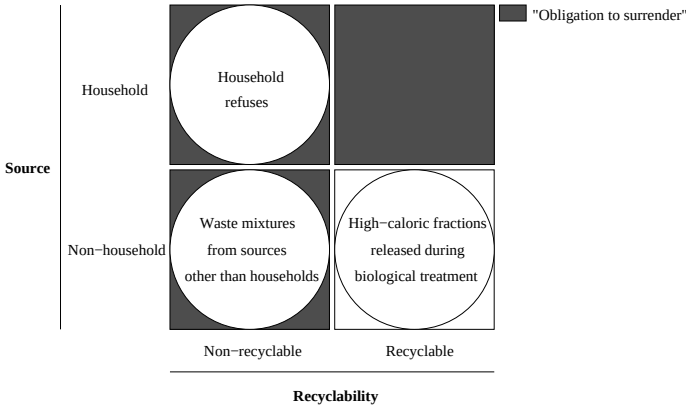

Figure 2: Current municipal solid waste classification

The situation in Germany contrasts with that in neighboring Poland. Poland has canceled all obligation to surrender waste fractions and thus allows holders to choose their waste management organizations themselves. We may call this "competition in the market". In Germany, there are no legislative efforts to remove this obligation. What is more, two other pieces of German legislation constrain even "competition for the market", whereby plant operators have to battle for local concessions (see Figure 3).

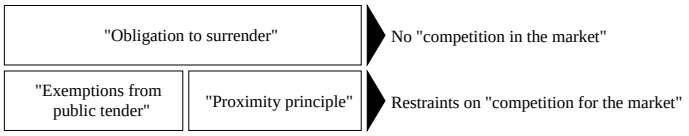

Figure 3: Current restraints on competition

Under the first piece of legislation ("exemptions from public tender"), regional administrations do not need to expose their own waste management facilities to competition. They are allowed to feed their own plants to the full with waste surrendered to them. Today, public institutions hold stakes in two-thirds of total capacity, thus only a minority of all waste treatment assignments are won in public tenders.

Under the second piece of legislation ("principle of proximity"), disposal waste is subject to rigorous transport limitations. A principle of proximity applies: waste may only be treated in the immediate vicinity of its production [4]. Moreover, several state laws prohibit shipping waste between federal states. Plant operators thus take part in local tenders, but not in ones outside their own area.

Together, these two pieces of legislation mean that the lion's share of waste accumulation is exempt from public tender, and where tenders do occur, only a few operators are allowed to compete.

2.2.2 Evolution

We believe that, in the medium term, both restraints on "competition for the market" will weaken their impact on market players' conduct.

"Exemptions from public tender" In the coming years, a higher percentage of plant operators will have to take part in public tenders. The European Court of Justice has ruled that a regional administration may not assign waste input to plants held in public/private partnerships, even if it owns the majority share [5]. The privilege of priority assignment is thus reserved for purely public facilities. Moreover, the number of such plants continues to fall: for financial reasons, none of the seven mass-burn waste incineration plants starting up in 2005 had public majority shareholders. As a result, in 2006 only 40 percent of total capacity will be under sole public control.

"Principle of proximity" Transport limitations will cease to apply to municipal solid waste. Recently, the German Federal Ministry for the Environment announced that incineration is to be reclassified as a "method of recycling" rather than a "method of disposal", as long as the facilities allow for energy

recovery [9].[2] Accordingly, shipments of municipal solid waste will no longer be affected by the restrictions on non-recyclable matter, but will fall under the free movement principle for recyclable materials. This status will give regional administrations the possibility of holding nationwide tenders for waste treatment.

We believe that, ultimately, the bulk of regional concessions will be allocated by public tenders and all national plant operators will have the opportunity to bid. Regions that have public plants could form an exception to this rule, but more likely these few local monopolies will also be geared to free market performance.

3 Market models

In the following, we use three models to forecast market performance in different terms. The first model ("local monopolies under cost-plus regulation") contains the current restraints on competition and thus takes a short-term perspective. The second model ("national oligopoly with price competition", static model) looks at the market in the medium term: it allows a "competition for the market", but ignores the impact of capacity investments in the long term. Finally, the third model ("national oligopoly with price competition", dynamic model) includes the option for capacity investments and thus takes a long-term perspective.

3.1 Local monopolies under cost-plus regulation

We model the current market structure as local monopolies under cost-plus regulation, assuming all primary wastes to be disposed in the nearest appropriate plant. For the allocation of waste streams, we use a linear optimization method.

[2] All German mass-burn waste incineration plants fulfill this requirement.

The model contains both legislative restraints on "competition for the market" discussed above. We presume that all public institutions hold investments in the nearest appropriate treatment facilities and that a direct assignment of waste inputs without tender is applicable only there. We also assume that the proximity principle applies strictly, with waste inputs shipped to the single nearest appropriate plant.

The efforts made by some federal states to maintain self-sufficient disposal systems are not explicitly considered in our model. In fact, this would only be necessary where a plant in a neighboring state is located nearer to a waste holder than any appropriate plant in the holder's own state, leading to a conflict of the proximity and the self-suffiency principles. In the model, we assume that all public authorities approve shipments to different states in this situation, as does indeed often occur.

Taking these local monopolies, we model cost-plus regulation to simulate the actual pricing behavior. We assume that all operators are able to pass their individual unit costs on to local waste holders requiring treatment capacity. The model assumes that these operators prorate fixed costs including all costs of capital to the actual processed load, in accordance with the current fee legislation. We do not consider any agios: fees always reflect exactly the individual average total costs.

High-caloric waste fractions that are separated during the biological treatment process and then re-treated as secondary wastes form an exception to local monopolies. This is reflected in our model. These fractions are traded as recyclable materials on a free, Germanwide market. Operators supply unutilized capacity at a marginal cost price; the market price is set by matching free capacity with secondary waste accumulations in a static equilibrium.

3.2 National oligopoly with price competition

After the erosion of restraints on "competition for the market", plant operators will have to compete for waste inputs by setting competitive prices in a market whose structure is oligopolistic. We use a static model to analyze the medium-term market performance, and a dynamic model to estimate the performance in the long term.

In the coming "competition for the market", capacity supply will have an oligopolistic structure. To set up an efficient waste management plant requires an investment of over EUR 100 million. This represents a significant barrier to market entry and results in just a few players dominating the market. The demand for waste treatment services will be rather fragmented. The free market in the US exemplifies this.

Such a market structure will bring strong price competition, we believe. Our cost model implies constant marginal costs and thus decreasing unit costs in each plant. Operators will therefore naturally try to exploit their capacity to the full. At the same time, we assume perfectly homogenous services: operators can acquire a maximum of waste input simply by offering their free capacity at a competitive price. Thus players will set prices as low as necessary to ensure full utilization of their plants, limited only by their operational unit costs.

We use the static market model to determine the medium-term market price. The supply curve reflects waste management plants setting their prices at the level of their own operational unit costs. Fixed operational costs are prorated on the whole plant capacity. We calculate only the costs of operation: capital costs from past investments are considered to be sunk and thus do not influence the pricing of future contracts. The demand curve reflects the total waste accumulation.

To determine the long-term price, we model the impact of capacity investments - i.e., a third, dynamic model is required. Investors will be willing to replace outdated facilities only when the expected market price covers the investment in a new plant and its operations in full. A long-term market price will oscillate around this level. Accordingly, we analyze the cost positions of all new facilities in 2004 and 2005, assuming that the plant with the second-lowest average total costs is replicable all over Germany. We ignore the lowest-cost plant as we believe its cost structure is unlikely to be copied.

For the sake of simplicity, we ignore all shutdown costs, supplier switching costs as well as transport costs for primary waste. However, we consider transport costs for secondary waste fractions globally so as to avoid a systematic bias in favor of biological waste treatment.

3.3 Data

For the purposes of the analysis, we assembled a complete database for waste accumulations, transport distances, plant capacities, and treatment costs for all districts and waste management facilities in Germany. The data apply to 2006; for the medium- and long-term models we assume that they will remain constant.

Waste accumulations Our source for the forecast data on German waste accumulations for the 439 German districts ("Gebietskoerperschaften") is the industry report published by Prognos [1]. This publication synthesizes data from the Federal states' official waste balance sheets with forecasts for 2006. To arrive at the total demand for treatment, we combine the figures for non-recyclable mixed household waste, non-recyclable bulky household waste, and

non-recyclable mixed commercial waste.[3] We calculate a total national waste accumulation of 19.3 million tons.

Transport distances We constructed a database containing the geodetic co-ordinates for all German districts. This allows us to calculate the distances between regions and hence transport costs.[4] Shipments within a single district are ignored.

Plant capacities We based our information on the list of all German waste management plants published by the Federal Ministry for the Environment [8]. This we updated, giving a final figure of 66 mass-burn waste incinerators and 44 biological waste treatment plants active at the beginning of 2006, with a total approved capacity of 21.3 million tons per year, and a forecast further three million tons of co-combustion capacity. We assume that all operators have the technical equipment necessary for them to make the whole approved capacity available to the market.

Costs of incineration plants We take the data for indivdual incineration costs from our previous industry cost analysis for 2006 [12]. In this work, we first identified the significant cost elements in incineration plants and their most important influencing factors. We took most of the data from the official balance sheets of materials and energy.[5] In addition, we asked all plant operators how many employees they had and how high total recent investments were. Assuming global factor prices, we were thus able to calculate marginal costs, operational unit costs, and average total costs for each plant.

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[3] These three types have to be surrendered to public disposal authorities and subsequently treated either in a mass-burn waste incinerator or a biological waste treatment plant. [4] We calculate transport costs by multiplying the distance by the volume of waste shipped and by a constant transport cost unit rate of EUR 0.07 per kilometer and ton. [5] Specific output ratios of slags, hazardous residuals, energy, steam etc.

Costs of biological treatment plants Since the overwhelming majority of biological treatment plants began operations in 2004 or 2005, we can use cost data of standardized, new treatment facilities. We take the data from the cost structure report on various disposal methods, published by the Federal Environmental Agency [2], and adjust them to the individual size of each plant.

4 Results

4.1 Market price

Figure 4 shows the self-delivery disposal fees for 2006 as calculated in our model of local monopolies, and compares them to the actual 2004 EUWID data. Overall we expect enormous fee variation over the coming years. Some holders will be forced to pay fees six times as high as their counterparts in low-fee districts. We forecast average disposal fees for the whole of Germany of approximately EUR 110 per ton.

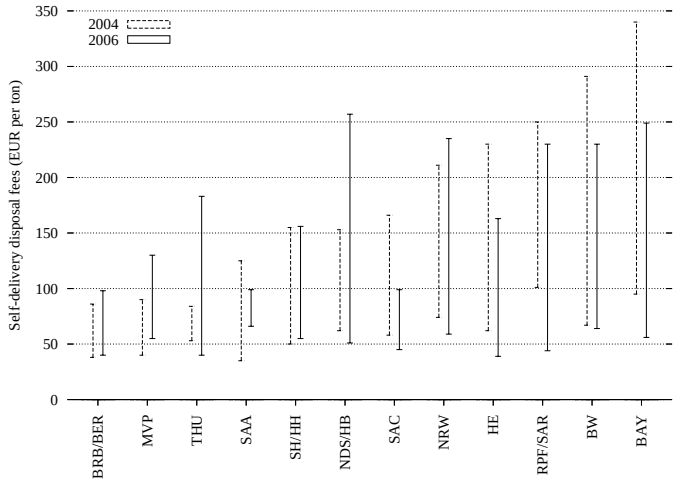

Figure 4: Disposal fees in German federal states, 2004 vs. 2006

Once restraints on "competition for the market" weaken, we expect regional fees to level out to a consistent national market price. Figure 5 shows the results

of our static market analysis. The aggregated supply curve specifies the total sum of capacities offered for different hypothetical prices. Clearly, some facilities will have to shut down as soon as the market price falls below EUR 121 per ton. The other plants will follow gradually, until no operator is willing to keep his plant working at a price of EUR 22 per ton. At this point, an equilibrium is reached, where the market price guarantees just enough free capacity to match the total waste accumulation. We forecast this to occur at a level of approximately EUR 78 per ton.

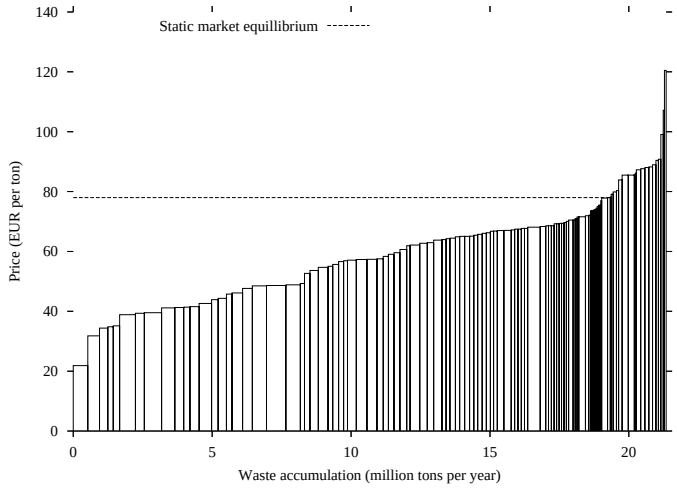

Figure 5: Static model of a national oligopoly

Although this calculation gives a good indication for the medium-term market price, capacity expansions will significantly influence market performance in the long run. A third, dynamic model is thus required to achieve a reasonable long-term price forecast. We expect the market price to oscillate around the level at which potential suppliers are undecided whether to enter the market or not. Accordingly, Figure 6 shows the average total costs of waste management plants beginning operations in 2004 or 2005. Taking the second most efficient plant as the benchmark we derive a long-term market price of roughly EUR 80 per ton.

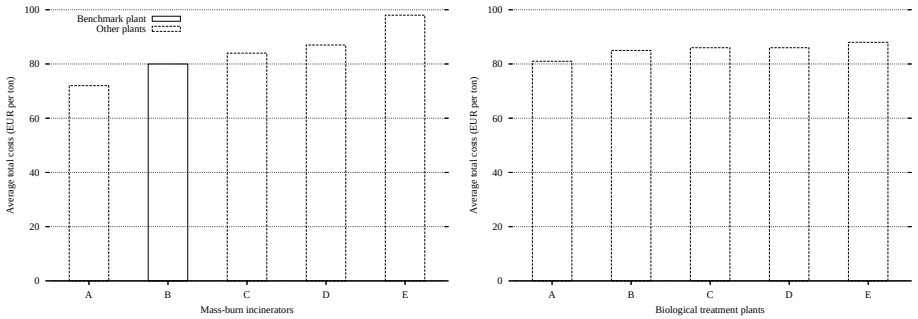

Figure 6: Average total costs of plants starting operations in 2004/2005

4.2 Market power

Most discussions of waste management in Germany take the federal states as the basic regional unit; this was the case, for example, in the recent Federal Cartel Office investigation of the RWE Umwelt takeover by its former competitor Remondis [7]. Where a national oligopoly arises, however, potential market power should in fact be evaluated at a national level.

Today, the four biggest plant operators in Germany have enough treatment capacity to deal with almost half of Germany's total waste accumulation (see Figure 7). If a situation of nationwide competition developed, Remondis and E.ON in particular would likely enjoy enormous market power, as each of them controls more capacity than the total oversupply.[6] All other facilities taken together would still not be able to satisfy the demand for waste treatment and, as a result, Remondis or E.ON would be able to enforce higher market prices than those forecasted in our static oligopoly model. However, from a dynamic point of view, the higher market prices would then attract investments in new capacity, bringing prices down to the forecast level again long term.

[6] Since we assumed price-insensitive demand and thus price-insensitive oversupply in our static oligopoly model, we use "control of oversupply" in place of more common concentration measures (e.g. Herfindahl-Hirschmann Index) to evaluate market power.

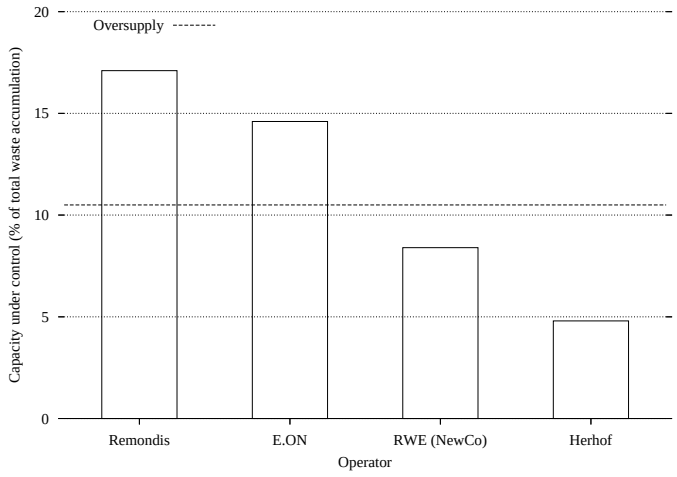

Figure 7: Market share of the four biggest plant operators

4.3 Plant profitability

In a system consisting of local monopolies, plant operators can pass their full costs on to holders and thereby always at least break even; there is absolutely no financial risk. The development of competition would impact dramatically on both the market price and the operating profitability of many plants. Depending on their average total costs, plants could experience anything from shutdowns to huge profits.

We have already seen (in Figure 5) that future competition on price will inevitably lead to a market price below the operating unit costs of 16 waste management plants. For these plants continuing operations would generate a negative profit contribution: shutdown is the best option economically.

Other plants will generate positive contributions to capital costs and will therefore continue operating as long as possible. Depending on their particular capital cost contributions ratio and their capital costs, they will experience either a profit or a loss overall. Over time, the number of plants suffering losses will decline, as capital costs decrease. If we assume that all currently operating waste

management plants will continue to be used for the next 20 years, at least, we can now forecast the development of such losses over time. Figure 8 shows the financial results in the first year of competition for each of the 94 plants (left) and their development over time from a cumulated industry perspective (right); total losses after 20 years will be approximately EUR 5.1 billion.

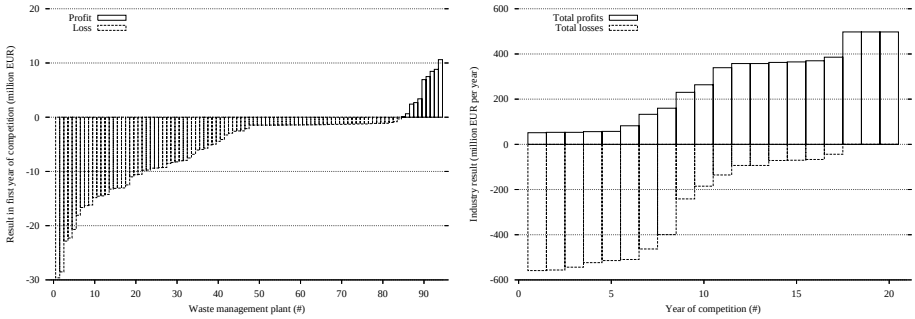

Figure 8: Financial results in a national oligopoly

5 Discussion

In the discussion below, we examine the effects of a relaxation of competitive restraints in the German market, based on the data from the models. This discussion is divided into four parts: we look first at the short-term perspective and then turn immediately to the long-term perspective, as they mark the beginning and the final state of our scenario. Only after this do we turn to the medium-term perspective, as we can then look at the transition period. This is followed by a discussion of implications for firms.

Short-term perspective Our model of local monopolies reflects current restraints on competition and is thus able to forecast the regional disposal fees

in 2006. These cover the same wide range as in 2004.[7] The main issues of ineffective local monopolies remain in the short term: as long as the market lacks a mechanism whereby economically inefficient business decisions are penalized, the huge range of fees will persist.

Two assumptions are important in this model. First, we assume that the proximity principle applies strictly, with waste inputs shipped to the single nearest appropriate plant.[8] Second, we ignore any price premium in our model.

Long-term perspective The erosion of restraints on "competition for the market" would, as it were, put the market back on its feet: the total costs of waste disposal would fall sharply, waste streams would be allocated to plants with the lowest marginal costs ("static efficiency"), and capacity investment and divestiture decisions would be based on nationwide efficiency criteria ("dynamic efficiency"). Our oligopoly models indicate that increased efficiency could result in a drop in average fees from EUR 110 to EUR 80 per ton.

The long-term market price forecast is based on two important assumptions. First, it takes a mass-burn waste incineration plant with just EUR 80 per ton average total costs and assumes that it is possible to replicate this plant all over Germany.[9] Second, the forecast assumes that potential investors would build additional facilities when the market price exceeds the average total cost of a new plant.

Medium-term perspective The market price in our static oligopoly model is roughly equal to the long-term price forecast. For this reason, we expect a rapid

[7] Allowing for the effects of the ban on direct landfilling, which both removes the option of this cost-saving method, and reduces the average total costs of treatment facilities by increasing their utilization. [8] Compared to "shipped to a plant in the immediate vicinity". [9] This is the waste management plant with the second-lowest cost position overall.

price drop during the transition period from local monopolies to a national oligopoly, followed by oscillation around a stable level.

The static model is based on certain important assumptions. First, it assumes perfect price competition. Since two particular companies each control oversupply, they could enforce a higher market price than that forecast by us. In this case, we would expect the competition authority to fight this as an abuse of market power. Second, on the supply side, the model assumes that all waste management plants are technically able to make their approved capacity available to the market. Third, on the demand side, the model considers three specific categories of waste and excludes any other fractions. Finally, it uses much forecast data on waste accumulation and operating unit costs.

Implications for firms The German solid waste management market is currently going through a phase of capacity ownership restructuring. The former market leader, RWE Umwelt, has sold its major activities to a competitor. Several public waste treatment plants have either been brought into public/private partnerships or replaced with private facilities. Companies currently active in the area of waste collection are expanding into waste treatment, and private equity funds also appear interested in acquiring of treatment capacities.[10]

We believe that managers and potential investors should now pay special attention to the gradual removal of competitive restraints in the market. The transformation process will probably begin, when waste incineration will have been reclassified as a "recycling method" rather than a "disposal method".

A new, market-based price would impact dramatically on the profitability and enterprise value of many plants. In a market consisting of local monopolies, plants were guaranteed break-even results; in a new, competitive environment,

[10] Following KKR's takeover of the dominant German recycling organization DSD.

only efficient capital expenditures can bring a positive financial result.

Most investment decisions in the past have not satisfied efficiency criteria. The lack of economic incentive led many investors to put their money into inefficiently sized plants that were over-equipped with emission control technologies. When competition begins, such plants will inevitably suffer financially: our model predicts the closure of 10 percent of total capacity and EUR 5.1 billion accumulated losses over the next 20 years. On the flipside, plants enjoying cost advantages stand to benefit substantially from national price competition, now being able to raise their price to the level of the market.

Our results show how important it is to avoid inefficient investments in this market as of today. Where good business making was a minor matter in the past, it is essential to look for competitive unit costs in the future.

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