

Waste Management and Financial Performance: Evidence from Italian Companies

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Abstract. This article deals with Italian companies operating in collection, treatment and disposal of municipal solid waste. The aim is to analyse the profitability of these companies and try to understand whether this relates to waste management best practices, in particular separate collection. The empirical analysis carried out on a population of 298 Italian companies enabled us to study the profitability of this sector. However, combining this information with that concerning separate waste collection, a clear relationship – both positive and negative – is not identifiable.

Keywords: waste management, financial performance, Italian companies

1 Purpose of the research

The production and management of waste is a strategic issue for all countries, since it has social, economic and environmental implications. It would be desirable to combine responsible social behaviour, economic feasibility and environmental sustainability, but various parties are involved (citizens, firms, public administrations), often with conflicting needs.

This article deals with Italian companies operating in the collection, treatment and disposal of municipal solid waste (MSW). The aim is to analyse the profitability of these companies and try to understand whether this is related to waste management "best practices", in particular separate collection (SC). European Directives 2006/12 and 2008/98 encourage member countries to base their own legislation on control of the entire waste cycle, from production to disposal, applying the so-called "hierarchical principle", which identifies prevention of negative environmental impacts deriving from waste production as the primary objective, followed, in order of priority, by reuse, recycling, recovery of another type (such as energy production) and, lastly, disposal. It will therefore be attempted to identify whether greater environmental sustainability can produce positive effects on the economic-financial results of companies operating in said sector.

The article is organised as follows: the first paragraph analyses the literature on the issue in question; the third paragraph outlines the research method; the fourth paragraph analyses the results of the empirical analysis performed; the final paragraph contains the conclusions.

2 Analysis of the literature

There are numerous studies analysing the relationship between environmental management and company performance, but they almost never examine companies operating in the MSW sector. There are many articles in the literature that examine the issue in general terms, but they rarely refer to a specific production sector.

Contributions on this issue tend to support the existence of a positive relationship between environmental sustainability and economic-financial performance. In particular, certain studies claim that a greater focus on the environment produces competitive advantages and therefore improves company profitability (Klassen and McLaughlin 1996; Sharma and Vredenburg 1998).

Despite the difficulties linked with identifying the economic-financial effects produced by more responsible environmental management, which therefore risk being underestimated, certain authors claim that adopting pollution prevention systems can help to improve a company's operational efficiency and profitability (Russo and Fouts 1997). They verify their research hypothesis, based on the resource-based view, by using the return on assets (ROA) as the dependent variable. The results show that the best environmental performances are associated with the highest economic-financial performances and that the positive nature of the relationship becomes even more evident when the sector is experiencing growth.

King and Lenox measure company performance in two ways: return on assets (ROA) and Tobin's Q (King and Lenox 2002). Their results show that reducing environmental pollution through prevention of waste is profitable (albeit moderately), unlike ex-post waste treatment, to which they attribute no positive economic effect. Similar results were obtained by Hart and Ahuja (1996), who conclude that adopting pollution prevention systems positively influences company performance (return on sales and return on assets) (Hart and Ahuja 1996).

Guenster et al suggest that eco-efficient firms have higher returns on equity, proving the existence of a positive relationship, although not linear, between Tobin's Q and environmental performance (Guenster and Bauer 2011).

Other authors claim that adopting policies directed towards social responsibility may improve company competitiveness by improving image (Davis 1973), quality (Bowman and Haire 1975) and technological innovation (Porter 1995). Social responsibility of firms produces advantages in terms of reputation, which can lead to an increase in sales when customers are sensitive to the company's attitude to the environment (Vandermerwe and Oliff 1990).

Ameer and Othman (2012) observe the relationship between environmental sustainability and economic-financial performance in a population of 100 companies considered as among the most sustainable in the world. They identify better results for these firms (growth of sales, ROA, pre-tax profits and operational cash flows), but only when they operate in particular production sectors, so the results cannot be extended to the entire population, but solely to certain companies operating in specific sectors. An important aspect emphasised by Ameer and Othman is the bidirectional nature of the relationship between environmental sustainability and company performance. Both the direction of the link between environmental investments and profitability and the independent variable of said relationship are unclear.

Hart and Ahuja (1996) and Waddock and Graves (1997) also identify a link between certain economic-financial performance indicators, including the ROA, and others of an environmental type; however, these authors also express doubts over the direction of the link. Is it the firms focusing

greater attention on the environment which are more profitable or, vice versa, the ones with the best performance which invest in environmentally sustainable structures?

In contrast with what was reported previously, certain authors emphasise the absence of a positive impact of environmental management on economic-financial performance. Watson et al. (2004) analyse the impact of several Environmental Management Systems (EMS) on company performance, using both accounting and market indicators. They conclude by stating that there is no proof of a positive relationship between adoption of an EMS and economic-financial performance. Other authors emphasise that environmental management causes high management costs and risks which could lead to deterioration of economic-financial results (Friedman, 1994). Furthermore, there is also scientific evidence demonstrating how different effects on economic-financial performance correspond with different environmental indicators, in both sign and value (Iwata and Okada 2011). Jaffe et al. (1995) state in their article that there are numerous reasons why the effects of new environmental regulations on company performance may only be modest and, in any case, difficult to identify.

However, it must be specified that Italian firms in the MSW sector are often different to those considered in the aforementioned literature (private firms, often manufacturers, dealing with customers who can choose where and what to buy, every day). In fact, the companies in question supply services to a specific category of customers, generally located in a specific geographical area, after signing an agreement with local public institutions, which may or may not be sensitive to environmentally friendly waste management. Even though eco-compatible waste management should not be a discretionary choice, since European Directives provide clear indications on this – and Italy is one of the countries which pays the highest penalties due to waste management which does not satisfy said Directives – local political choices often depend on whether or not it is possible to invest money in waste management plant and structures with a low environmental impact (recycling plants, new generation thermal incinerators, etc.).

3 Research methodology

In order to obtain the knowledge indicated above, an empirical analysis was conducted on a population of Italian companies in relation to the four-year period 2010-2013.

In view of the need to analyse economic-financial information, the AIDA (Bureau van Dijk's) database was used, from which information on joint-stock companies with registered office in Italy and operating in the MSW collection, recovery and disposal sector was extracted. In particular, companies with ATECO codes 38.11 (collection on non-hazardous solid waste), 38.21.01 (production of compost) and 38.21.09 (treatment and disposal of non-hazardous other waste) were selected. After eliminating several firms for which not all the economic-financial information of interest to us was present, 298 companies remained, with registered offices in 81 different Italian provinces, and went on to form the reference population for our study.

Economic-financial analysis was performed on these firms by calculating several balance sheet indicators (Marchi, Paolini and Quagli 2003). In particular, the ROI and a further two indicators into which said ROI can be broken down, namely the ROS and the working capital turnover ratio, were chosen. As known, the ROI (return on investment – given by the ratio between operating income and invested capital) expresses the return on the capital invested in operation of the company, irrespective of the sources of financing; the ROS (return on sales – given by the ratio between operating income and total revenues from sales) expresses the percentage return on the amount of sales made in the company year considered; the working capital turnover ratio (ratio between revenues from sales and the capital invested), also called the return on invested capital, basically expresses the capacity to produce revenues. In summary, considering not only the ROI, but also its breakdown, it is possible to

verify whether, with the same return on invested capital, a company is more profitable or more efficient.

Analysis of the company data was followed by analysis of the provincial data, dividing the various companies by province and calculating the arithmetic average of the company values referring to the same province, in relation to the aforementioned four-year period.

For SC, on the other hand, the source of data was the ISPRA – Istituto Superiore per la Protezione e la Ricerca Ambientale – from whose website the percentage value of SC was obtained, given by the ratio between the quantity of MSW treated with this method and the total MSW produced in each province, again for 2010-2013.

The ranking technique was chosen to check for the possible existence of a relationship between profitability of the companies considered and SC. The 81 provinces were placed in decreasing order with respect to SC and to each of the three economic-financial indicators described above, in order to give each province a ranking value for SC and one for profitability. Three scatter graphs were then created, with SC as the independent variable (x) and with the economic-financial indicator as the dependent variable (y), in order to check for the existence of any relationship between SC and ROI, SC and the working capital turnover ratio and SC and ROS.

Subsequently, to obtain more detailed analysis and a better understanding of the phenomenon, the provincial values (both economic-financial and relating to SC) were divided into three groups based on geographical location of the provinces: northern, central and southern Italy (the criterion used by the ISTAT, which includes the islands in the "southern Italy" group, was used to create the groups). Descriptive statistics applications were then applied to them, such as calculation of the average, the median and standard deviation.

4 Analysis of the results

4.1 Separate collection in Italy

The data on SC, as indicated in the previous paragraph, is available by province; for the period in question, the national average is 41.78%, a value not far from the central position assumed by the data with the median, equal to 44.94%, from which it may be concluded that there are more provinces with SC values higher than the average value than those with lower values.

If it is then considered how low the minimum value of the average by province is (6.75% of SC for the province of Siracusa) and how high the maximum value is (76.19% for the province of Treviso), it is clear that the sizeable standard deviation – 17.39 – led us to disaggregate the national phenomenon.

Table 1: SC and economic-financial indicators

	RD% 2010-2013	ROI% 2010-2013	ROIC 2010-2013	ROS% 2010-2013
AVERAGE	41.78	5.19	101.47	8.36
MEDIAN	44.94	5.03	98.90	5.43
MIN	6.75	-8.57	18.04	-83.27
MAX	76.19	18.50	248.18	316.92
STD. DEV.	17.39	4.15	38.63	36.93

4.2 The economic-financial indicators of companies which manage MSW in Italy

The average ROI of companies operating in the SC sector in Italy is 5.19% and the median is 5.03%. The values are low but aligned with each other, even though the minimum value of the ROI of the 81 provinces is negative (- 8.57% for the province of Ascoli Piceno) and the maximum value is in the two-figure range (18.50% for the province of Matera¹).

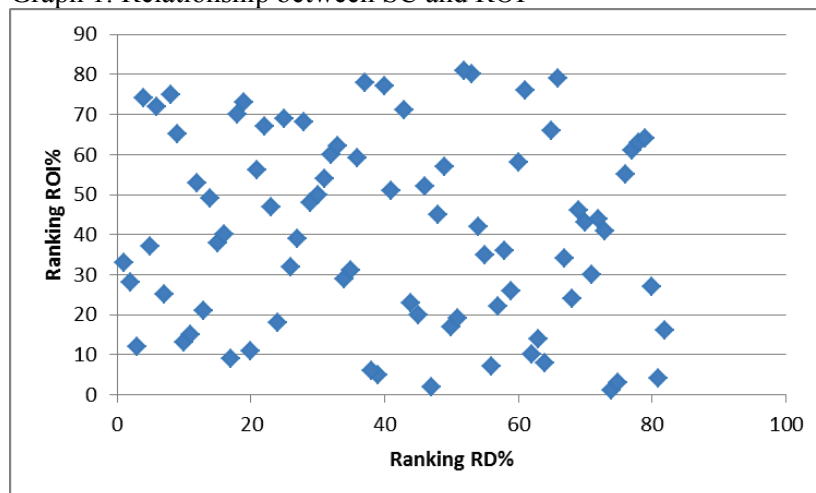
The average working capital turnover ratio is a full 101.47, while the median is 98.90. These are important figures which lead to the conclusion, albeit in terms of average values, that companies in the sector are highly efficient. However, we wonder whether the amount of invested capital is low and therefore relatively easy to regenerate through revenues on sales. The minimum value of the average working capital turnover ratio is 18.04 (province of Lecco) and the maximum value is 248.18 (province of Pesaro Urbino).

The average ROS is 8.36%, the median is 5.43%. These are medium-low values, considering that many companies do not exceed the average value. So is return on sales of SC low? In the four-year period, there is once again a negative minimum value of -83.27% (province of Grosseto), and also a very high maximum value: 316.92% (province of Medio Campidano)².

4.3 Analysis of the ranking

Calculation of the rankings for the 81 provinces, as described above, and the related representation on a scatter graph, showed that, for the population of companies analysed, it is not possible to identify a clear and evident relationship, positive or negative, between SC and each of the three economic-financial indicators chosen.

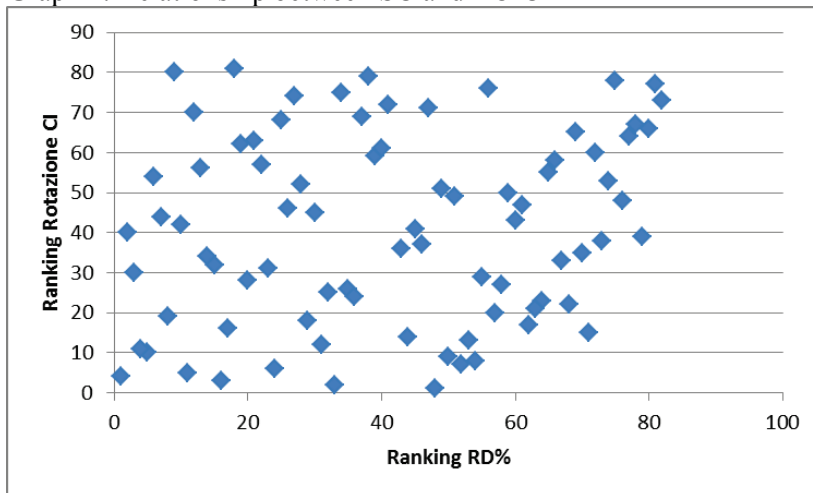
Graph 1: Relationship between SC and ROI



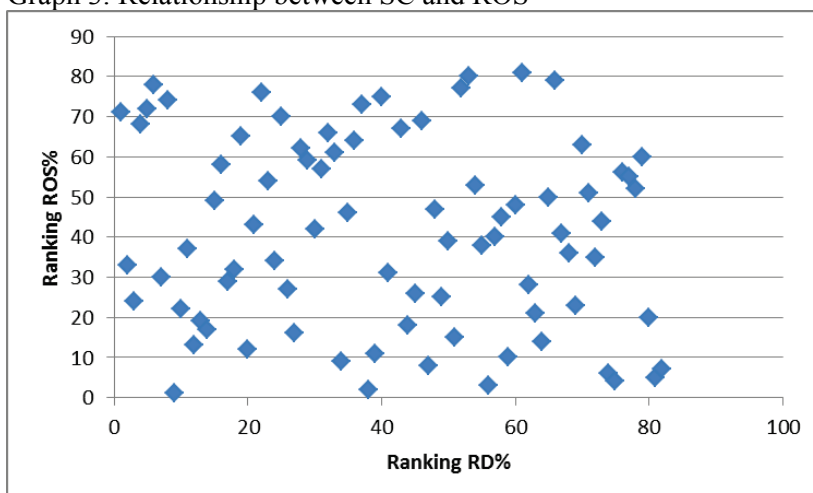
¹ Consider that the average of SC in Matera is just 15.84%.

² It was decided not to eliminate particularly misaligned values compared with the average (in both positive and negative sense) in this stage of the analysis. We will examine anomalous cases further on and consider whether or not to remove them from the analysis in a subsequent phase.

Graph 2: Relationship between SC and ROIC



Graph 3: Relationship between SC and ROS



It is clear from the three graphs that the widespread scatter of points makes it impossible to identify a single performance, traceable on a line, which outlines a possible relationship. We therefore focused attention on analysing the information obtained through descriptive statistics calculations.

4.4 Collection of MSW in northern, central and southern Italy

Dividing Italy between north, centre and south, the SC situation would appear to reflect the general economic situation of the country as a whole.

In northern Italy, the average and the median of SC are higher (respectively 52.91% and 55.98%) than the national figures. The maximum value of the average for a northern province is clearly the national one (the aforementioned 76.19% of Treviso), while the minimum value of 23.27% refers to the province of Trieste.

Central Italy has an average value well below the national average at 36.12%, with a median of 37.68%. Taking standard deviation into account, the provinces of central Italy differ to a minimal extent from each other, compared with the other geographical areas. The best value is the average for

the province of Macerata (58.89%), while the lowest (15.35%) is the one for the province of Frosinone.

Southern Italy has a decidedly low average for SC of 27.95% and a median of 25.74%. In this case, it emerges that the median positioning is lower than the average value, there-fore - negatively - there are fewer provinces which have an SC value above the average. Consistent standard deviation indicates a highly fragmented territory as far as concerns SC, to the extent that the gap between the minimum value (the aforesaid 6.75% of Siracusa) and the maximum value (55.87% of the province of Benevento) is high. It must be emphasised that, with values decidedly close to the maximum, the provinces of Salerno (55.68%), Nuoro (53.67%) and Avellino (52.05%) show a "patchy" situation for southern Italy.

Table 2: RD in northern, southern and central Italy

	RD% northern Italy 2010-2013	RD% central Italy 2010-2013	RD% southern Italy 2010-2013
AVERAGE	52.91	36.12	27.95
MEDIAN	55.98	37.68	25.74
MIN	23.27	15.35	6.75
MAX	76.19	58.89	55.87
STD. DEV.	12.17	11.58	16.52

4.5 The economic-financial indicators of companies which manage MSW in northern, southern and central Italy

As for SC, the economic-financial indicators were calculated with division of the country into three parts.

Starting with northern Italy, the average ROI is 5.47% and the median is 5.30%; these values are fully aligned with the national ones, although standard deviation, which is the lowest, confirms a greater uniformity in the return on invested capital of companies operating in northern Italy. The minimum value of the ROI is - 1.43% (province of Ferrara) and the highest value is 12.92% (province of Brescia).

The average working capital turnover ratio, again in northern Italy, is 107.03 and the median is 103.55, higher values than the national ones already discussed. The minimum value of the working capital turnover ratio is the national one of 18.04 (province of Lecco), while the maximum value is 193.73 (province of Como): in this case, territorial continuity would appear to count for very little.

The average ROS of companies in northern Italy is 5.99% and the median is 5.48%. In the four-year period, the minimum value is negative (-9.20% of the province of Novara), while the maximum value is 29.32% (province of Forlì-Cesena). As for the ROI, a low value of standard deviation is reconfirmed, and therefore a return on invested capital boosted by a uniform return on sales.

Table 3: Economic-financial indicators northern Italy

	ROI% northern Italy 2010-2013	ROIC northern Italy 2010-2013	ROS% northern Italy 2010-2013
AVERAGE	5.47	107.03	5.99
MEDIAN	5.30	103.55	5.48
MIN	-1.43	18.04	-9.20
MAX	12.92	193.73	29.32
STD. DEV.	3.40	39.05	7.02

Analysis of central Italy shows an average ROI of 4.00% (lower than northern Italy and also, as will be seen, southern Italy); the median of 4.44% is, on the other hand, higher than the average; unlike northern and southern Italy; the companies in central Italy somehow manage to be more similar in collection and also in performance. Despite this, the maximum and minimum values are very distant: the minimum value of the average ROI is -8.57% (the national value of the province of Ascoli Piceno) and the maximum is 13.03% (province of Frosinone³).

The average working capital turnover ratio, again for central Italy, is 107.29, while the median is 100.93. These figures, which are higher than the national ones already discussed and fully aligned with those for northern Italy, linked to the low value of the ROI (which, it must be remembered, contains the working capital turnover ratio) leads us to conclude that the return on sales will be extremely low. The minimum value of the average working capital turnover ratio is 49.18 (province of Frosinone⁴) and the maximum value is also the national one of 248.18 (province of Pesaro Urbino).

The average ROS of the companies in central Italy is just 0.59% and the median is 4.70%, a considerable difference. In the four-year period, the minimum negative value, which is also the national one, is for the province of Grosseto, while the maximum value is 25.77%, yet again for the province of Frosinone.

Table 4: Economic-financial indicators central Italy

	ROI% central Italy 2010-2013	ROIC central Italy 2010-2013	ROS% central Italy 2010-2013
AVERAGE	4.00	107.29	0.59
MEDIAN	4.44	100.93	4.70
MIN	-8.57	49.18	-83.27
MAX	13.03	248.18	25.77
STD. DEV.	4.46	46.36	22.13

For southern Italy, the average ROI is 5.64% (higher than northern Italy and the national average) and the median is 5.03%, coinciding with the national one. There is a large gap between the maximum and minimum values: the minimum value is -3.13% (province of Caserta) and the maximum value is the national one (18.50% of the province of Matera).

The average working capital turnover ratio in southern Italy of 88.82 is significantly lower than in northern and central Italy and the median is also lower, at 85.47. Basically, this situation could be caused by a high invested capital and/or a lower return on said capital. The ROI of southern Italy, like central Italy, is aligned with the national average, but it is the return on sales in southern Italy which contributes to the return on invested capital, while the working capital turnover ratio contributes the most in central Italy. The minimum value of the average working capital turnover ratio is 22.73 (province of Medio Campidano) and the maximum value of 137.70 is the one for the province of Caserta (note that this is the province with the lowest ROI of southern Italy).

The average ROS of companies in southern Italy is 17.54%, which is very high if compared with the figure for the other geographical areas, while the median of 5.68% is aligned with the national value, but far from the average value: basically, very few companies in southern Italy have an ROS higher

³ As in the case of Matera, Frosinone, which has the lowest SC value of central Italy, is the province with the highest return on invested capital in this geographical area.

⁴ Frosinone therefore either does not have a huge amount of invested capital or it is not well used, but, as will be seen, it has the highest return on sales.

than the average. In the four-year period, the minimum value of the ROS is -26.70% of the province of Caserta (as evident from the previous comments) and the maximum value is the 316.92% for the province of Medio Campidano already mentioned.

Table 5: Economic-financial indicators southern Italy

	ROI% southern Italy 2010-2013	ROIC southern Italy 2010-2013	ROS% southern Italy 2010-2013
AVERAGE	5.64	88.82	17.54
MEDIAN	5.03	85.47	5.68
MIN	-3.13	22.73	-26.70
MAX	18.50	137.70	316.92
STD. DEV.	4.90	29.35	63.10

5 Conclusions

As already said, the results of the analysis performed do not show a clear and evident relationship, positive or negative, between the profitability of companies operating in the sector of collection, treatment and disposal of MSW and SC. The results which emerged are therefore similar to those studies which, equally, emphasise the absence of an impact of practises aimed at protecting the environment on economic-financial performance of the companies.

In particular, certain signals which we will discuss later do not allow us to formulate general and single considerations for the sector examined.

In the case of SC for the period 2010-2013, the weak position of Italy already mentioned is confirmed, since less than half of MSW is subject to separate collection and consequent treatment. There is a wide divergence in situations throughout the country (with some provinces having separate collection for up to 76.19%) and the analysis conducted at geographical macro-area level (northern, central and southern Italy) confirms that management of MSW is organised according to different rationales which are not always based on the principles set forth by European Directives.

The economic-financial analysis shows that a particularly significant element is the very high value of the ROS in southern Italy (17.54%) compared with the value for northern Italy (5.99%) and central Italy (0.59%). This aspect may be surprising if it is compared against the SC value, which is just 27.95% in southern Italy, but 52.91% in northern Italy and 36.12% in central Italy. These values of the ROS, which, as known, reflect on formation of the return on invested capital, tell us that with virtually the same ROI (5.64% in southern Italy and 5.47% in northern Italy), it is the return on sales which contributes most in southern Italy, but productivity/efficiency of the invested capital (turnover ratio) in northern Italy.

The principal limit of this study relates to the fact that economic-financial data on the individual companies was cross-checked against physical and technical data on SC relating to the provinces in which said companies have their registered offices. This critical aspect is the consequence of the major difficulties encountered in obtaining data on SC relating specifically to the individual companies.

Another limit to emphasise is the effective possibility that companies with a legal status other than a joint-stock company, and therefore not entered in the database used, may have their registered office in the various provinces analysed.

In view of these critical aspects and the fragmented nature of the behaviour found, an-other research method is currently being used (analysis of company cases) to examine further and seek to understand those situations which, considering the average values, would appear to be “anomalous”.

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