

The Ecological Impact of the European Industry and its relation to the cost of debt.

Milan, February 7th, 2014

The existence of a strong link between economic health of an industry and its ecological footprint has been brought dramatically to the fore by the Ilva Taranto case, where the courts have asked the termination of the plant due to the unacceptable and persistent level of pollution damage on the community of Taranto at large. The finance of the company are in dire straits, and a tradeoff between economic survival of the firms and the level of health in the community is dramatically evidenced.

How pervasive is this link between pollution, health and finance? Is it the case that economics and ecology must be considered alternative goals? Is it there another way out?

We think it is. We show that corporations that pollute less have a lower cost of debt. Hence, aside from the impact of regulation, there is an economic benefit in being more friendly to the health of the local community, which is going to ease the “not in the backyard” approach of people and local politician to the choice of location of potentially polluting plant.

We contribute to the debate here by following our first exploration of the ecological footprint of the largest corporations worldwide, Advantage Financial is currently refining the search for a robust link between the ecological footprint of EU corporations and the cost of debt, by exploiting the data on air pollution collected by the European Environmental Agency for the most ecological intensive industries and plants located in its territory. ¹

Historically, the most contentions ecological impact event in Italy as related to dioxin contamination in, Seveso, Lombardy ². Given the restructuring of many manufacturing sectors, and the exit of our country from some of the high capital intensive industries such as the chemical-pharmaceutical industry, steel is probably the most polluting industry located on our premises (Ilva, Thyssen-Krupp). The other sensitive area is that of power plants, which are scattered across the country. The ongoing dispute between Enel and Greenpeace on the planned start of new Enel coal power plants is one of the most notable ones. ³ Projects by Croazia, for Deepwater oil Search in the Adriatic sea, are another notable development.

We show that it is possible to exploit the information collected by the EEA to study the impact of the ecological footprint on the cost of debt. Here is how we proceed. Firms belonging to these sector must collect data on air pollution by source and transmit them to the EEA, which publishes the data on its

¹ Source: EEA, “Revealing the costs of air pollution from industrial facilities in Europe”

² See it.wikipedia.org/wiki/Disastro_di_Seveso

³ See www.greenpeace.it/enel for coverage of this controversy

website. On its website, the EEA publishes data on airborne emissions in tons as well as in terms of economic damage, measured in terms of the average life lost due to pollution agents.⁴ The last criteria allows us to compute an aggregate measure of ecological footprint. We then matched data at the plant level with economic account on a consistent sectorial and geographical basis (in the case of the largest concerns owning more than a plant, we aggregated the impact data).

Measures of the ecological impact in the EEA data base

The database edited by the European Environmental Agency (EEA) contains a census of air pollution at individual plant level, both in terms of CO₂ emissions and of highly toxic gases and metal particles, in the areas that the EU Commission considers as having high environmental impact (metals, minerals, cement, wood, oil and chemical industry, energy utilities). All EU companies belonging to these sectors must collect and report these data. For our country we are talking about 62 installations (factories) in total. The EEA has identified the following sectors as ecologically intensive: Minerals, Metals (Steel Industry), Oil and Energy, Cement and, most importantly, Power. These industries are not only energy intensive, but they are also, as a consequence, capital intensive. Aside from the financial sector, these industries are the most important issuers of corporate bonds to the market.

The sectors that are considered high environmental impact are also other content of fixed assets, and so they need access to capital markets. In fact, outside of the financial sector, are major issuers of bonds, so it makes sense to look at how their pollution level impact the cost of debt.

Unlike the ESG voluntary disclosures of companies, which are limited to listed companies and that are reasonably complete only for companies that are solicited to join the Carbon Compact Initiative on the detection of greenhouse gases, the database of the EEA provides not only data on CO₂ and other greenhouse gases (which mostly impact global climate) but also on toxic air pollution and fine dust and pollutants which are those that do more direct damage to the environment and people's health.

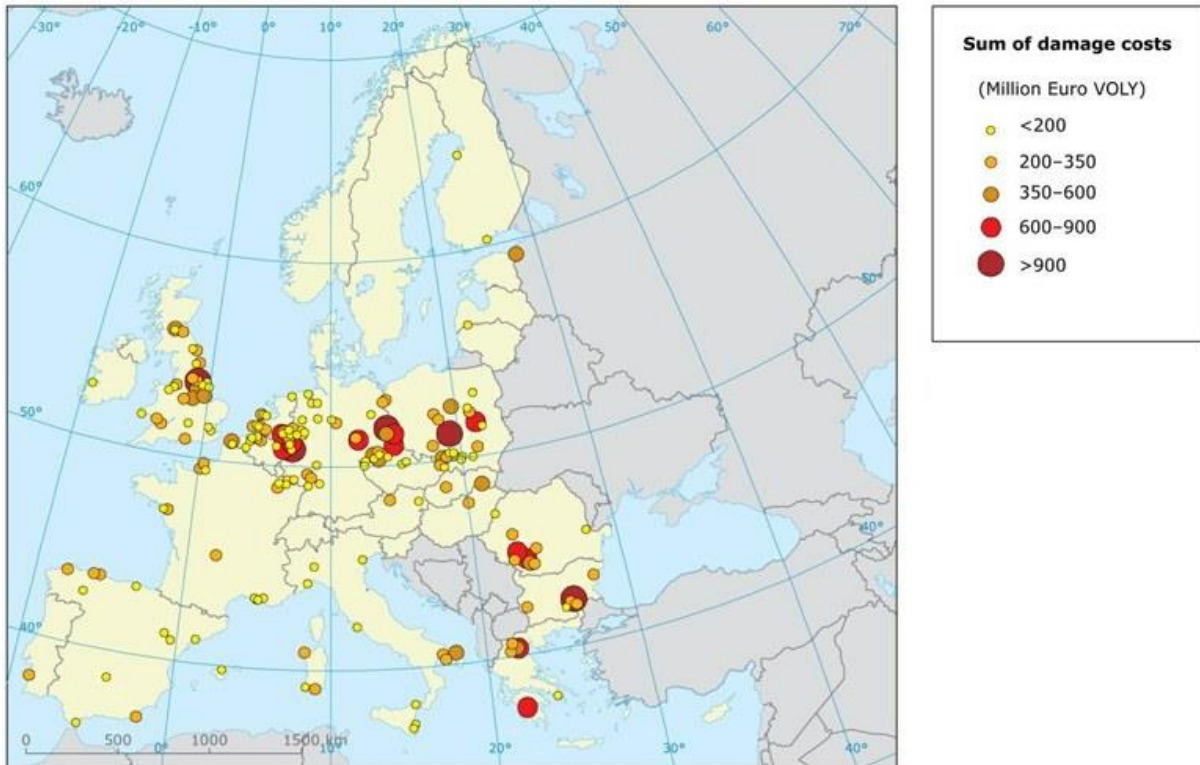
The EEA calculates two types of indicators, the emission of toxic substances in tonnes and value in terms of the Euro equivalent to the expected loss of human lives caused by such pollution. This last criterion allows us to aggregate a significant impact of all measures, and thus solves the problem of weighting the data that was presented Bloomberg with sample analyzed in the previous study. The EEA indicator of ecological footprint is not devoid of criticism by experts, but it does have the advantage to allow for weighting of the impact on human health of different Measures of air pollution. It is an ex ante indicator, given that pollution That takes time to impact human health. If anything, in the cases where the potential health hazards have materialized in the Measured loss of human health, the indicator could be too optimistic.

Chart 1 below, from the EEA, visualize where the most polluting plants are located. For Italy, the most polluting plants are in the Taranto area, where Ilva is located. The estimated impact of Ilva pollution costs

⁴ Source: http://ec.europa.eu/environment/archives/cafe/activities/pdf/cafe_cba_externalities.pdf

from the EEA dataset are, if any, conservative as compared with the ex post observed impact of Ilva on the health of people in the local community.⁵

Chart 1. Ecological Footprint (Air Pollution) of Manufacturing Plants in Europe



Source: EEA

Cost of debt measures

The main problem that needs to be addressed in order to calculate the cost of debt is put at the individual plants with parent companies and finding the balance sheets of these companies.

Matching plants date with corporate accounting date is not perfect. Generally speaking, a one-to-one matching is possible only in specific cases. Even if the Amadeus database contains data on subsidiaries rather than consolidated group balance sheets, it is possible that an individual subsidiary does own blackberries than a plant. We account for that by aggregating all data for an individual plant location. In

⁵ In this respect, a comparison of the two main steel plants still operating in Europe is instructive. These are the Thyssen Krupp Plant of Duisburg, Germany, and the Ilva plant in Taranto, Italy. Since 2006, Thyssen Krupp invested more than 300 million Euro annually to abate environmental impact of the Duisburg plant, whereas Ilva is lagging on this respect. Expert estimates of how much investment is required from Ilva amount to up to 2 billion Euros (see "Ilva. Taranto a lezione da Duisburg", (Ilva, Taranto learns from Duisburg" by Rosanna Lampugnani. Italia/Puglia Special Report, Corriere della Sera, Thursday, November, 14 2013.

Additions, That it is possible revenues from the subsidiaries do not account only for production, but Also from sales activity, Which tend to deflate our pollution / sales indicator.

Sometimes it was possible to find a unique match between the implant and the Company, other times the parent company that produces financial statements include more plants database EEA between its assets. In some cases it was not possible to locate a parent company significant because the first parent that produced a budget was too "distant" from the manufacturing assets, both in terms of the chain of control in terms of business lines in addition to those of interest.

Another methodological problem concerns the calculation of a scale variable to deflate the data on toxic emissions. E 'was used as the turnover, as in the previous study. It would probably be best to go to production figures in tonnes, or on installed capacity (for power), but these data should be obtained to part with an extra effort.

We measure the cost od debt with the coverage ratio, the ratio between interest expenses and operating profits. In order to make our results more easy to understand, we convert the coverage ratio into an implicit cost of debt value. This is measured as credit spreads, using the correspondence table available on the website of Prof. Aswath Damodaran of NYU.

Comparisons with our previuos study

This is our second work analyzing the impact of ecological footprint on the cost of debt. Our previuos study (Advantage Financial Ecological Footprint, by Stephen J. Brown, Spring 2013), worked on a sample of corporations listed on the stock exchanges of America and Europe.

Here are the main differences in sample and methodology across the two studies.

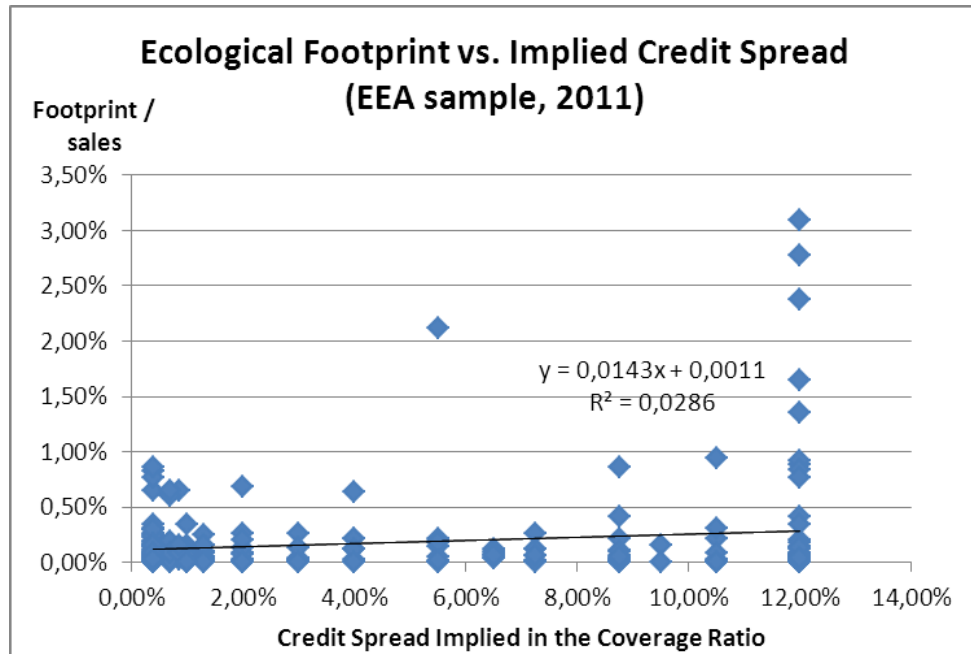
- The two studies consider two different samples. Our previous study focused on global listed companies which report their carbon footprint on a voluntary basis, European. This study, which is based on EEA official data, covers all EU plants belonging to sectors with high environmental impact. Furthermore, the EEA data utilized in this study are inclusive of the location on the territory of the contaminant rather than the location of the company headquarters directive (as in the sample Bloomberg).
- The two studies contain two different measures of pollution. For the sample ESG Bloomberg, given the main greenhouse gases emissions shall die. In the sample there are both EEA greenhouse gases that poor thin and other substances in significant ecological impact.
- The two studies employ different sizes of the cost of debt. Our previuos study uses Bloomberg ESG market measures the cost of debt (CDS spreads, default probabilities to Merton). These measures are not available for this study as many corporations covered here are not listed. We use the coverage ratio and the ratio between the annual change in cash flow and total debt as measures of the cost of debt.

In both studies, the data refer to 2011.

Discussion of Main results.

We find a positive relationship between the ecological footprint of industrial plant and the probability of bankruptcy.

Chart 2. Ecological Footprint and Implied Credit Spreads. Whole EEA Sample



Source: AD Financial

Chart 2 above shows plot the ecological footprint, measured as the economic equivalent in terms of expected loss in human lives (The ecological footprint). On the y axis, and the credit spread implied in the coverage ratios on the x axis. The chart shows that, even without controlling for the sector or the country, there is a positive relationship between the strength of the ecological footprint of each corporation, and its cost of debt.

This confirms our results for a positive link between the ecological footprint and the cost of debt of a sample of large international companies, with the universe of the most polluting plants operation on the soil of the European Union.

Having data correlated with the location of the plant is critical for the introduction of innovative financing debt instruments. In fact, local investors might be interested in lending money conditional on the improvement of ecological performance. Our work shows that this is not detrimental to financial performance of these bonds; in fact, on average, the better the ecological performance, the lower is the risk of default of the bond.

In order to better describe our results, we cut the sample across geographies and sectors.

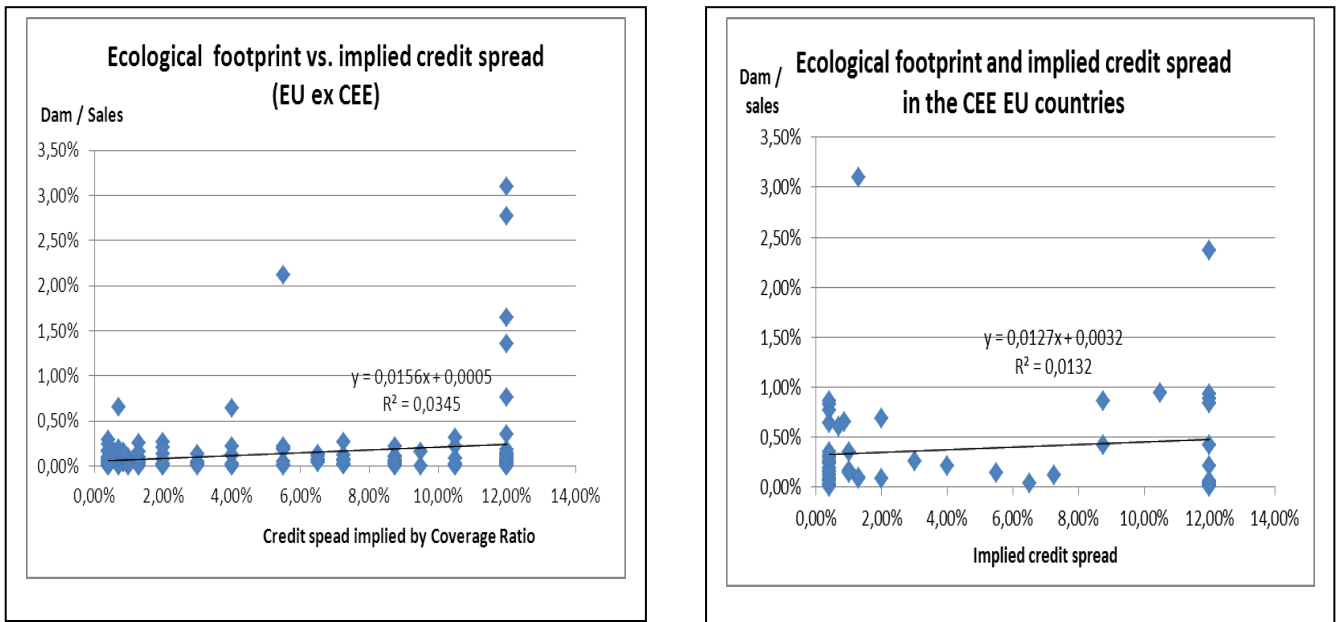
Western EU versus CEE

The first way to split the data is between EU15 and the new EU countries from CEE. It is well known that pollution was a material issue under communism, and we cannot exclude that environmental standards are

still lower in the CEE countries. In fact, the impact equations show are not much different across the two regions, as one can see by comparing the Chart on the left, reporting Western Europe data, and that on the right, with CEE data.

Chart 3. Ecological Footprint and Implied Credit Spreads.

EU ex CEE countries (Left) and CEE Countries (Right)



Results for the main sectors

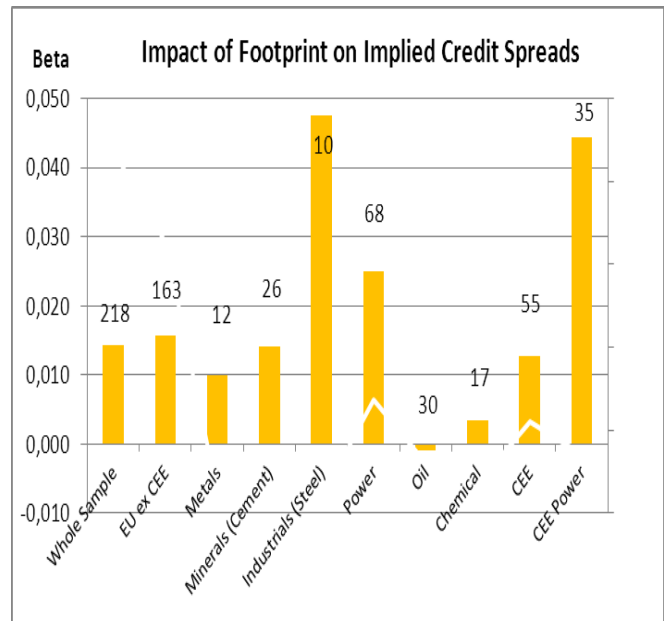
Table 1 below reports our results on the ecological impact for the main sectors. For all sectors, we get a significant impact of ecological footprint on the cost of debt. The impact of the ecological footprint is larger in the Power Sector. The Oil & Gas sector is the only one where we find no discernible impact. Some sectors, such as Metals, Chemical and Steel have a very small number of observations, Chart 3 reports the same information of Table 1, but we visualized the Impact Coefficient (Beta) and the Number of observations (on the top of the bar).

And one would say that they are the ones that would benefit from the issuance of green bonds, partly because of their close connection with the territory.

Table 1. Ecological Footprint Regressions by Sector

Ecological Footprint Regressions			
	<i>Beta</i>	<i>R-squared</i>	<i>No. Obs</i>
Whole Sample	0,014	2,80%	218
EU ex CEE	0,016	3,45%	163
Metals	0,010	5,24%	12
Minerals (Cement)	0,014	4,52%	26
Industrials (Steel)	0,048	2,80%	10
Power	0,025	4,91%	68
Oil	-0,001	0,54%	30
Chemical	0,003	3,58%	17
CEE	0,013	1,32%	55
CEE Power	0,044	2,13%	35

Chart 3.



We performed a benchmarking analysis of the major steel producers in Europe by matching the EEA air pollution costs scaled by sales and compared them with two measures of financial performance, the interest cover and the ROA.

Table 2 below show our results. The EEA performance of ILVA, if scaled by revenues, is average, and better than most of the performance of the ArcelorMittal subsidiaries, even if ILVA lags ThussenKrupp, as already noted. The financial performance of ILVA, despite being bad in absolute terms, is average in the sector, and on average better than most of the ArcelorMittal subsidiaries.

Table 2. Ecological Benchmarking of the Steel Sector

		Total aggregated damage cost (million €)		Total aggregated damage cost / revenues			
Parent Company / Facility name	Country	Low 'VOLY'	High 'VSL'	Low 'VOLY'	High 'VSL'	Interest cover 2011	Op. Margin / Assets th EUR 2011
Alcan Aluminium Uk Ltd	United Kingdom	279	603	0,58	1,26	-3,70	-0,708
Alcoa	Italy	42	100	0,10	0,23	n.s.	-0,346
ArcelorMittal GmbH	Germany	141	273	0,05	0,11	-4,50	-0,054
Arcelormittal	Germany	82	143	0,06	0,11	-6,25	-0,085
Arcelormittal	Czech Republic	249	396	2,12	3,37	n.a.	0,027
Arcelormittal	Spain	207	300	0,08	0,11	-66,41	-0,088
Arcelormittal	France	600	976	2,92	4,74	-0,07	0,041
Arcelormittal Galati SA	Romania	184	282	0,16	0,25	-25,21	-0,126
Arcelormittal	Poland	302	454	0,09	0,13	13,24	0,048
Arcelormittal	Belgium	290	539	4,09	7,59	24,90	0,076
Rusal (Russia)	Germany	43	105	0,00	0,01	10,78	0,110
Corus	United Kingdom	579	940	n.a.	n.a.	n.a.	n.a.
Corus	Netherlands	300	457	n.a.	n.a.	n.a.	-0,030
Dillinger AG	Germany	43	83	1,11	2,16	109,13	0,292
Hüttenwerke Krupp Mannesmann GmbH	Germany	209	388	0,07	0,12	0,86	0,001
ILVA S.P.A.	Italy	283	463	0,04	0,07	-1,61	-0,022
ISD Dunaferr	Hungary	57	92	0,05	0,09	-1,20	-0,069
KGHM Polska Miedz S.A.	Poland	80	150	0,01	0,02	n.a.	0,435
Lucchini S.p.A.	Italy	40	56	0,13	0,18	5,97	0,070
Ruukki	Finland	131	159	0,05	0,06	0,24	-0,005
Rio Tinto France	France	40	85	0,45	0,94	-0,02	0,118
Rogesa GmbH	Germany	193	324	0,12	0,20	1,00	0,000
Salzgitter Mannesmann Precision Etirage	France	70	186	0,36	0,95	n.a.	#VALORE!
ThyssenKrupp Steel Europe AG	Germany	547	1009	0,04	0,08	n.a.	#VALORE!
Třinecké Železárny, A.S.	Czech Republic	125	188	0,08	0,12	23,29	0,063
U.S.Steel s.r.o.	Slovakia	383	583	0,16	0,24	n.a.	-0,014
voestalpine Stahl GmbH	Austria	398	553	0,41	0,57	4,61	0,075

Conclusions.

Our analysis of the EEA data on the most polluting industrial plants in Europe reinforces the results of our previous study on the link between the ecological footprint of a firm and the cost of debt. Cutting the emissions of polluting materials lowers the cost of debt, and so there is an incentive for any individual firm to do that.

Local people are very concerned in pollution from nearby plants. They could be natural subscribers of innovative debt instruments such as green bonds, which relate the bond coupons to the amount of pollution reductions by the issuers.