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Accounting for beyond scope 3 GHG emissions

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***Extended abstract*: The research focused on further widening the boundaries of carbon impacts accounting, going beyond Scope 3 emissions. While Scope 3 is meant to measure Supply chain impacts, companies may have indirect impacts on competitors on other market agents that penetrate beyond their supply chain. In a network economy competitors, supply chains and final consumers are connected in a quite complex way, with GHG spillover impacts occurring outside the supply chain, too. Our research focused on providing a classification and giving an explanation for beyond scope 3 impacts. Those impacts can be classified as crowding out impacts, market expansion impacts or innovation impacts.**

keywords: carbon accounting, Greenhouse Gas Protocol, Scope 3 accounting, company reporting

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I. INTRODUCTION

Considerable progress has been made in Europe towards cutting greenhouse gas emissions during the last decade, but this achievement may still not be sufficient to keep climate change within 2 degree.s (Csutora, Mózner 2014, Schaltegger-Csutora, 2012). [1,2] The contradiction between apparently improving environmental performance of firms and the increasing level of carbon emissions shed lights on the importance of carbon emissions occurring beyond the fence line of firms.

Voluntary company initiatives, such as the Carbon Disclosure Project responded to this call, and provided a platform for company carbon reports, including Scope 1, 2 and 3 emissions. It provides in-depth definition of Scope 3 emissions and calls for controlling them.

According to the GHG Protocol, carbon emissions are usually grouped into different 'scopes'. The three scopes suggested by the GHG Protocol are the following:

Scope 1: Direct GHG emissions, including sources that are owned or controlled by the company (e.g., emissions from production, boilers, vehicles etc.)

Scope 2: Indirect GHG emissions from the generation of purchased energy consumed by the company (the protocol considers solely electricity, but other purchased energy – heat or steam – should also be considered here).

Scope 3: Other indirect GHG emissions based on activities such as external transportation or the use of sold products. Scope 3 is an optional accounting category that allows for the inclusion of all other indirect emissions. The Scope 3 standard of the GHG Protocol (WBCSD – WRI 2011) [3] provides detailed guidance for organizations on how to include their carbon impacts embedded along the value chain.

Scope 3 embraces employee mobility, business fleet, product use related emissions, product waste disposal, construction, etc. „Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company." (Greenhouse Gas Protocol, p.25.)

Beyond upstream emissions, Lenzen and Murray (2010) stress the importance of including downstream impacts in organizational carbon footprint accounts as well. To comprehensively account for these carbon emissions is a much bigger challenge compared to Scopes 1 and 2, as will be highlighted in Section 3.

Although Scope 3 emissions embrace significant portion of organizational emissions (Stein – Khare 2009; [4]Downie – Stubbs 2012) [5], these indirect elements are usually underestimated by companies. While most companies, especially when subject to some mandatory scheme, do account Scope 1 and Scope 2, carrying out a full breadth Scope 3 accounting is quite rare in practice. One of the rare cases is that of Toyota, that embraced all categories of Scope 3 into its accounting. It found that about 85 % of its Scope comes from the use of produced cars, while almost all the rest of emissions come from purchased goods and services. Other items, such as commuting or business travel are negligible compared to the downstream impacts of its products or upstream impacts of purchased goods.

Lee (2012) [6] gives a short description of the three Scopes and how they could be addressed. Some of Scope3 impacts can be estimated from data available within the company, while more indirect impacts are captured using hybrid accounting methods.

II. FROM SUPPLY CHAIN IMPACTS TO NETWORK ECONOMY IMPACTS

Even though Scope 3 emissions cover a wide range of upstream and downstream activities, critics arise about the three scopes. Matthews et al. (2008) [7] consider Scope 3 as too vaguely defined and instead suggest Scope 3 (indirect emissions for production) and Scope 4 (indirect emissions for the total life cycle including delivery, use, and end-of-life).

Our analysis goes even further, arguing that in a network economy significant share of corporate carbon impacts arise outside the supply chain.

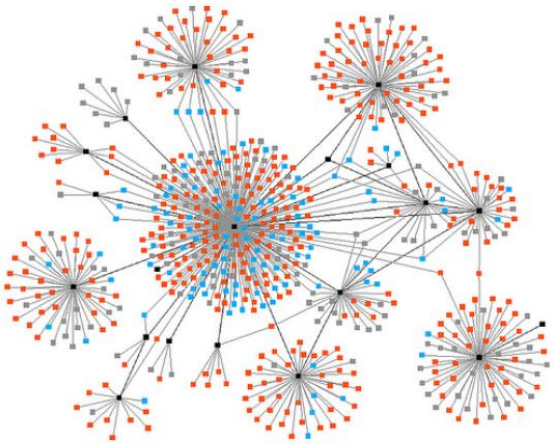

FIGURE 1. COMPLEXITY OF A NETWORK ECONOMY

Even though Scope 3 accounting itself seems to be over ambitious from the perspective of most companies, it is far from capturing all spillover impacts of company activities. Scope 3 was developed for evaluating Supply chain impacts in a well defined single supply chain, while our recent economy is a 'network economy' rather than an economy of multiple supply chains. In a network economy the relationship between economic agents is quite complex. Even competitors may cooperate in innovation, coopetition dominates over competition. The activity of focal companies effect not just suppliers and consumers, but competitors and producers of complimentary or substitute products, too.

Some network impacts are overlooked by Scope 3 accounting because it focuses single and separate supply chains. In the following we use examples from the transportation sector to illustrate these impacts.

	Intrasectoral	Intersectoral
Innovation	Eco-efficiency Innovation Innovative product or solution	knowledge transfer to other sectors
Crowding out	Greener products crowd out substitute conventional products	Cleaner industries crowd out dirty industries.
Market expansion	Low fare flights increase demand for international flights, incresing GHG emission.	Low fare flights increase demand for hotel industry

TABLE 1: NETWORK GHG IMPACTS NOT CAPTURED BY SCOPE 3

III. SCOPE 4: NETWORK GHG IMPACTS

Beyond supply chain impacts include intrasectoral and intersectoral impacts.

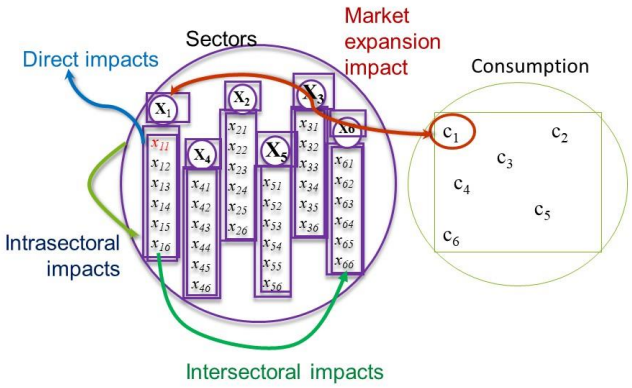

FIGURE 2. GHG IMPACTS IN A NETWORK ECONOMY

1) *Innovation impact*

Innovation can be eco-efficiency enhancing production innovation, or product innovation. Eco-efficiency innovation results in reduced GHG per output ratio. Improving energy efficiency during the production process is a typical example of this kind.

Product innovation results in reduced lifecycle GHG impact of products. e.g. more efficient engines of cars or alternative fuels are examples for product innovation.

Both types of innovation can provoke lively interest, especially on the part of competitors. Good innovation is difficult to be kept in secret by the patent holder, imitators make hard work to copy the innovation.

Metrics for changes in eco-efficiency are already available. Xie – Hayase (2007) [8] have developed the Environmental Intensity Change Index (EICI) – the ratio of the environmental impact in the evaluation period to that of the base period. One of their most interesting findings confirms that the EICI and the resulting evaluations are comparable across sub-sectors. This indicates that the EICI has the advantage of eliminating

the influence of process type. Thus, the Environmental Intensity Change Index can be used as a performance-based indicator for differentiating among environmental strategies.

The overall eco-efficiency impact of the company is the sum of its own impact and some part of the eco-efficiency improvement of companies that are demonstrably imitators of the innovation of the original company

The same applies for product innovation. Tesla, for example, follows an open innovation policy, with the slogan 'all our patent are belong to you.' Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use their technology. we felt compelled to create patents out of concern that the big car companies would copy our technology and then use their massive manufacturing, sales and marketing power to overwhelm Tesla.'

The company has understood that joint efforts of all electric car manufacturers are needed to create demand for electric cars and crowd out the infrastucture built to serve petrol based cars.

Knowledge transfer and technology transfer to new environment may multiplicate the impact of eco-innovation, transferring them to new economic sectors.

2) *Crowding out impact*

The absolute emissions of the more sustainable (or less un-sustainable) company will increase with its sales and market share growth. Still it contributes to sustainable development with a structural change of the market through the crowding-out effect it may create. The crowding out effect relates to the phenomenon of increasing the market share of a more sustainable product to the detriment of a less sustainable product.

For example The electirc car of Tesla is taking market share away from some other premium brands, such as BMW. The increase of GHG emission from Tesla car manufacturing is overcompensated by the GHG reduction gained by decreased use of BMW. Thus the aggregate GHG impact of increasing Tesla sales is a net decrease rather than a net increase.

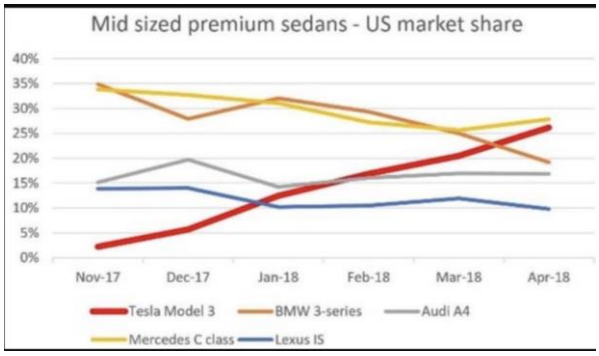

FIGURE 3. TESLA CROWDS OUT BMW

Some further examples for crowding out effects include:

- Lifestyle changes. DVD crowds out movie theatres.
- Art collection as hobby crowds out Mercedes cars.
- Handcraft clothing crowds out mass production, etc.

Longitudinal analysis of high detailed extended input-output tables (SIOT) is a possible way to capture those impacts.

3) *Market expansion impact*

Many companies show an increasing level of eco-efficiency and are able to point to a high level of sustainability policy, while their contribution to global unsustainability is likely to increase.

Increasing sales typically offset eco-efficiency improvements. Frondel et al. (2006) found that 76.8% of the sample facilities invest in cleaner production technologies. This is a high percentage. Can we assume that such innovation improves the sustainability position of companies? Eco-efficiency suggests that it is possible to increase productivity while simultaneously improving environmental performance (Bebbington 2001; Lehman 2002; Burnett – Hansen 2008). [9,10,11]

Environmental gains from eco-efficiency can, however, be easily counterbalanced when eco-efficiency is coupled with a significant increase in sales. EU energy efficiency studies indicate that the economic potential for energy efficiency improvement typically ranges from 1.4% to 2.7% per year, whereas the technical potential may be up to 2.2%–3.5% per year (IPCC Workgroup III 2001). An average growth in sales beyond 3.5% would probably not be consistent with sustainability in the long run.

Csutora (2011)[12] found in an OECD sample of companies that 77% of the sample companies employed cleaner production related process changes rather than end-of-pipe ones. Despite this, some 57% of facilities have probably increased the emission of pollutants rather than decreased them. 10% of organisations operate in the questionable zone.

Market expansion is still sustainable if:

- The growth of the sales doesn not exceed the level of efficiency improvement.
- Eco-efficient companies may grow at higher rate if less efficient ones shrink (crowding effect)
- Innovative products may crowd out companies with obsolete and unsustainable products (green energy vs. Fossil fuels, art collection as hobby may crowd out Hawai holidays)
- High priced craft products may crowd out mass products

IV. CONCLUSIONS

Although difficult to be measured, Scope 4 emissions should be at least modelled at theoretical level. A model is formulsated simulations were carried out to show inter and cross sectoral carbon impacts of company activites. Understanding these impacts contribute to providing a full picture of carbon impacts. We expect to get better insight on how market development, technological development, outsourcing and carbon management efforts co-influence the emission actually measured and the trends we experience in the world.

Morover, some companies, especially innovative growing enterprises in the green economy may be interested in estimating their positive impact on the global market and on global GHG emission.

Our research suggests that growth of green companies is not just possible and compatible with macro level degrowth, but even required if conditions of sustainability are thoroughly defined and met.

A steady state economy is not an economy without growth and shrink at micro level… birth of sustainable and death of unsustainable pave the way towards macro level sustainabilit if ever can be approached.

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