

Environmental benefits of E-commerce versus brick-and-mortar retailing: reality or illusion?

1. Introduction

Gone are the days when E-Commerce companies struggled to make profits. Since the late 2000's, E-Commerce has experienced exponential growth, reaching 8.7% of retail sales worldwide (15% by 2020). While online heavyweights are quick to vaunt the environmental benefits of E-Commerce versus traditional retail, it is our duty, as a responsible asset manager, to better understand this digital phenomenon and to demonstrate our ESG expertise.

2. Evidence of the environmental benefits of E-Commerce

Through academic sources, many authors highlight the environmental benefits of E-Commerce, or online shopping: the most obvious environmental drivers are energy (Weber et al. 2008ⁱ, Edwards et al. 2010ⁱⁱ) and resource savings (Matthews, Hendrickson and Soh (2001ⁱⁱⁱ)). At the end of the twentieth century, Cohen^{iv} (1999) predicted ten Internet trends that might likely become green practices, including E-commerce. Compared to traditional shopping, online shopping eliminates car trips and their associated emissions, and reduces inventories, waste and retail space (energy consumed mostly from lighting and cooling).

E-commerce, as a dematerialization of traditional distribution^v, may induce significant energy savings. Indeed, Weber et al. (2008) found that approximately two-thirds of total emissions from the traditional shopping experience came from customer trips to and from the retail store; the energy consumed by these trips was therefore far greater than the energy used in all the transport associated with the logistics system. From this study, Edwards et al (2010) focused on the "last mile", i.e., the last link in the supply chain – home delivery. He concluded that home delivery by parcel carrier was 24 times more efficient than when customers used their own car. However, there are caveats to those conclusions; they are discussed below.

Figure 1: Traditional logistics system versus E-Commerce.

Traditional logistics systems



E-commerce logistics systems



Source: Matthews, Hendrickson and Soh

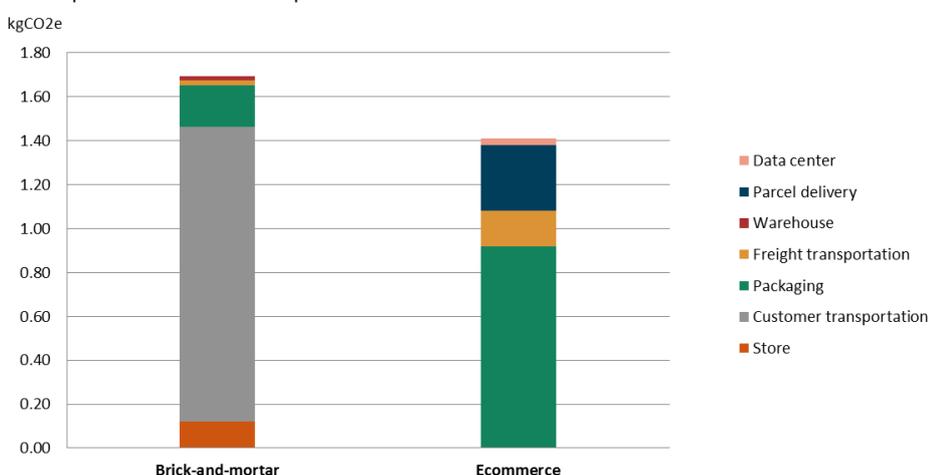
E-commerce, by rationalizing transport flows, may provide a tangible solution to the energy transition challenge and therefore contribute to UN Sustainable Development Goal 13: climate change solution. Indeed, according to the IEA (International Energy Agency), transport is one of the largest-emitting sectors, with approximately 30% of OECD CO₂ emissions^{vi}. As E-Commerce optimizes the logistics chain, by suppressing one of the five traditional links in the logistics chain – transportation from the customer's home to the retailer's – we can grant, in our macro model, a bonus factor of up to 20% of the Climate Change key sustainable challenge to online pure players.

Environmental benefits of E-commerce versus brick-and-mortar retailing: reality or illusion?

Case study – Online travel agencies: Even though online travel agencies do not directly offer tangible products or services like an aircraft company or a hotel, they do enable and support the mass-tourism trend, which has significant environmental impacts. Consequently, the companies scores are very negative on Climate Change in our macro analysis but being online pure players increases their score in comparison with traditional travel agencies.

The carbon footprint is a highly effective way of comparing the environmental impacts derived from the online and offline business models. However, several parameters should be considered in order to avoid any misinterpretations. While online companies are still reluctant to disclose GHG data, ESG providers do not integrate downstream carbon footprint elements such as consumer transportation into their Scope 3^{vii} estimate – *Scope 3 emissions are all indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions*. In light of this, by adding the GHG emissions caused by customer transportation, the MIT report on the environmental analysis of US Online Shopping^{viii} is, for us, the most advanced and reliable source of comparison of the carbon footprint of online versus offline retailers.

A comparison of carbon footprints between Brick-and-mortar and Ecommerce



Source: Candriam, MIT Center for Transportation & Logistics

The biggest difference between brick-and-mortar and E-Commerce is customer transportation, the “last mile”. Indeed, delivery by parcel carriers who are supposed to rely on an optimized delivery process is less carbon-intensive than when items are fetched by a customer in their own vehicle. As expected, the carbon footprint of running a retailer website (relatively low emissions from data centres) generates significantly lower emissions than the energy related to a physical store (retail space and inventories).

Not surprisingly, sources of GHG emissions are completely different between online and offline retailers. While customer transportation is the main source of emissions for offline retailers (close to 80%), packaging is the main component for online retailers (close to 65% of their carbon footprint). Indeed, while primary packaging is the same for both, the secondary (i.e., shipment) packaging is different. As individual and non-reusable shipping boxes and inner packaging are used by E-commerce companies, these then significantly increase these companies’ carbon footprint, while brick-and-mortar retailers use pallets and protective shrink-wrap.

As a rationalization of transport flows, E-Commerce constitutes a real opportunity to tackle environmental challenges such as climate change. This being the case, we have decided to promote E-Commerce in our Best-In-Class analysis through our Macro analysis model. However, depending on other factors (micro analysis), i.e., the way a company manages its stakeholders, the reality might not be as straightforward.

Environmental benefits of E-commerce versus brick-and-mortar retailing: reality or illusion?

3. Stakeholder management still matters

Irrespective of sector and business model, stakeholder interactions are a source of business risk and opportunity. E-Commerce is no exception to the rule. Even if this type of business is more likely to be less carbon-intensive than brick-and-mortar shopping, several factors could erode the environmental benefits of E-commerce:

- The customer location (urban vs. suburban) and the customer’s choice of transportation (individual vehicle versus public transport or “gentle” mobility): if the customer chooses public transport, the environmental benefits of E-Commerce become less obvious;
- Packaging: the use of individual packaging significantly downgrades the environmental benefits of using online retailers;
- Types of delivery: the increase in requests for high-speed delivery is not without environmental impacts since this implies the use of air-freight. Carrillo et al. (2014) pointed out that both modes were comparable if air shipping were used as the delivery method. Edwards et al. (2010) noticed that a failed delivery might lead to additional transport;
- Frequency of purchases, and item-bundling: online shoppers are more likely to buy items from several websites. Since items purchased online use individual and mostly not-recyclable packaging, item-bundling could be an interesting alternative;
- Returns policy: As the return of unwanted goods may create the need for additional transport, it negatively offsets environmental benefits, especially if customers have to return the product to a physical store or if they need postal services. E-Commerce is exposed to a higher percentage of product returns than traditional shopping: between 25-30% of goods bought online are likely to be returned (de Koster, 2002) compared with just 6-10% of goods purchased via the traditional retail channel (Nairn, 2003 ; Fernie & McKinon, 2009);
- Greater IT infrastructure: the IT sector is estimated as already consuming 7% of the global electricity demand, of which half is consumed by networks and data centres, increasing the interest in renewable energy procurement.

While the frequency of purchases or the customer location are exogenous for a company, online retailers are able to deal with other factors, such as the environmental performance of their IT infrastructure and their packaging or returns policies. Our micro analysis covers all the above-mentioned endogenous factors. For instance, we assess the returns policy process through the “commercial behaviour” criterion, and delivery type and IT infrastructure through the “Energy and Climate Change” criterion.

Illustration of our micro approach:

Issues	Stakeholder	Weight	Candriam's ESG theme (micro)	Potential KPIs
Energy consumed by IT infrastructure	Environment	7%	Energy & climate change	Electricity mix (% from renewable energy) Absolute and normalised CO2 emissions Savings from energy efficiency measures
Packaging			Raw materials & waste	Recycled content of products Weight reduction commitment
Type of deliveries			Energy & climate change	Breakdown of transport means
Return policy	Customers	30%	Quality & safety assurance	Customer satisfaction / retention Number of complaints Product return rates Breakdown of return options



Environmental benefits of E-commerce versus brick-and-mortar retailing: reality or illusion?

Finally, while online retailers disclose information regarding “Classic SRI” environmental topics, the returns policy, more especially the ease of returning items, is a sensitive and highly competitive topic since it may drive customer satisfaction and future sales. Therefore engaging with companies is an informal but important option for identifying their strategy.

4. Conclusion

At Candriam, we perceive this phenomenon of dematerialization as an innovation which meets some of the UN Sustainable Development Goals. To a broader extent, and under several parameters, E-Commerce could represent the tip of the green IT iceberg and demonstrate the relevance of new technologies to energy transition.

Obviously, it is not as black-and-white as it used to be for retailers: our analysis has to take into account several micro themes. However, the returns policy, for instance, is such a sensitive topic for retailers that the voluntary non-disclosure of communication is pushing investors to engage with them.

Both pure online players and pure physical retailing business models tend to disappear to the benefits of multi-channel distribution models. These are defined defined by Agatz, Fleischmann and Van Nunen (2008) as a “brick-and-clicks strategy; i.e. a combination of physical stores and online services. Indeed, the consumer-buying process is evolving and forcing retailers to adapt if they want to maximize customer satisfaction and, in fine, future revenues. Best Buy’s successful turnaround, from a pure brick-and-mortar to a multi-channel retailer, demonstrates the relevance of multi-channel retailers in the search to continually improve the shopping experience. At Candriam, through our SRI funds Best-in-Class assessment, we take a balanced approach, integrating the different ESG dimensions to which companies are exposed and that lead to us favour multi-channel retailers.

Is this not Amazon’s strategy behind the \$16 billion potential acquisition of Whole Foods? – to have a physical footprint and to blur further the lines between online and traditional retailers?

DISCLAIMER

This document is provided for information purposes only, it does not constitute an offer to buy or sell financial instruments, nor does it represent an investment recommendation or confirm any kind of transaction, except where expressly agreed. Although Candriam selects carefully the data and sources within this document, errors or omissions cannot be excluded a priori. Candriam cannot be held liable for any direct or indirect losses as a result of the use of this document. The intellectual property rights of Candriam must be respected at all times, contents of this document may not be reproduced without prior written approval.

The opinions, analysis and views expressed in this document are propriety to Candriam. This document is provided for information purposes only, it does not constitute an offer to buy or sell financial instruments, nor does it represent an investment recommendation or confirm any kind of transaction. Although Candriam selects carefully the data and sources within this document, errors or omissions cannot be excluded a priori. Candriam cannot be held liable for any direct or indirect losses as a result of the use of this document. The intellectual property rights of Candriam must be respected at all times, contents of this document may not be reproduced without prior written approval.

ⁱ Weber, C., Hendrickson, C., Jaramillo, P., Matthews, S., Nagengast, A., & Nealer, R. (2008). Life cycle comparison of traditional retail and e-commerce logistics for electronic products: a case study of buy.com. Working Paper, Carnegie Mellon, Green Design Institute.

ⁱⁱ Edwards Julia, B., McKinnon Alan, C., Cullinane Sharon, L. Comparative analysis of the carbon footprints of conventional and online retailing: a “last mile” perspective, 2009

ⁱⁱⁱ Matthews Scott, H., Hendrickson Chris, T. Soh Denise, L. Environmental and economic effects of E-Commerce: a case study of book publishing and retail logistics, 2001

^{iv} Cohen, N. (1999). Greening the internet: Ten ways E-commerce could affect the environment. Environmental Quality Management.

^v Oddo Securities, ESG Sector Report, Distribution, July 2010.

^{vi} IEA, Recent trends in the OECD: energy and CO2 emissions, 2016

^{vii} Definition of the Greenhouse Gas Protocol

^{viii} Weideli, D. Environmental analysis of US online shopping, MIT Center for Transportation & Logistics