Carbon footprinting is a tool for firms to determine the total greenhouse gas (GHG) emissions associated with their supply chain or with a unit of final product or service. Carbon footprinting efforts typically aim to identify where best to invest in emission reduction efforts, and/or to determine the proportion of total emissions that an individual firm is accountable for and should perhaps pay for through an offset mechanism. A supply chain in which all firms exert their socially optimal emission reduction effort levels is "carbon optimal", while a supply chain which offsets all emissions is "carbon neutral". In this paper we introduce a simple but effective model of joint production of GHG emissions in general supply chains breaking the total footprint by processes, each of which can be influenced by any combination of firms. With that structure, we examine conditions under which the supply chain can be carbon neutral and/or carbon optimal. We find that, in order to induce the carbon optimal effort levels, the emissions need to be over-allocated, so that the focus in the life-cycle assessment (LCA) and carbon footprinting literature on avoiding double-counting is, in this regard, misguided.

This is joint work with Charles Corbett, Tarkan Tan and Rob Zuidwijk.