Who Pays for Labor and Environmental Standards? The influence of product substitutability on the bargaining power between retailers and suppliers

Maria Carnovale *

Duke University, Sanford School of Public Policy

October 26, 2018

Abstract

While there is evidence that production networks serving highly regulated markets can transmit labor and environmental standards (LES) to under-regulated regions, the cost distribution of complying with LES is sorely understudied. This paper provides a theoretical model of multi-product retailers selling partially substitutable goods and outsourcing production to upstream suppliers. It investigates the effects of labor and environmental regulation and consumer-driven standards: under what conditions do they result in an uneven distribution of effort, and hence cost of compliance, between producers and retailers? Results show that when products are highly substitutable a multi-product retailer can shift the cost of compliance with LES on to its suppliers. Product substitutability drives the result as a change in product characteristics affects demand of its substitutes: a source of bargaining power for a multi-product retailer. The form of the regulation also affects cost distribution: suppliers are relatively better off when public regulation rather than private regulation is imposed on downstream retailers, with implications for the political economy of standard setting. Policy makers and consumers should consider product substitutability in their interventions to prevent well-meaning LES from exacerbating producers vulnerability.

Draft for IPES 2018 Conference

*maria.carnovale@duke.edu

1 Introduction

The current wave of globalization has included many developing countries into Global Value Chains (GVCs) and the global economy. However, it has also increased the vulnerability of many of their firms. GVCs, in fact, tend to shift resources towards lead firms, usually in developed countries, at the expenses of manufacturing firms, often located in the South of the World (Milberg and Winkler, 2013; Kaplinsky, 2000; Baldwin and Lopez-Gonzalez, 2015; Mudambi, 2008; Gereffi, 1999a; Carnovale et al., 2018). Regulations and production standards can exacerbate this vulnerability, contributing to the diverging economic performance of high-income and developing countries (Bolwig et al., 2013; Dolan and Humphrey, 2000; Kaplan and Kaplinsky, 1999; Ponte and Gibbon, 2005; Neilson, 2008; Cafaggi and Renda, 2012).

This paper contributes to studying the institutional constraints to economic development created by global markets. It examines the role of labor and environmental standards (LES) in reallocating rents between an upstream producer and a downstream multi-product retailer. Their relative bargaining power - influenced by product substitutability - tilts such reallocation in favor of a multi-product retailer. Multi-product retailers are now uncontested leaders in many consumers markets (think of Amazon or Wal-Mart). While their pricing strategy (Rochet and Tirole, 2003; Weinstein and Ambrus, 2008; Chen and Rey, 2012) and ability to regulate their production network (Boudreau and Hagiu, 2009) are widely studies, limited attention has been given to the development implications of their market power and how it interacts with LES.

Early theories of globalization postulated that the competitive advantage granted by the absence of LES would sink regulation in producing countries - "race-to-the-bottom" hypothesis (Cherniwchan et al., 2016; Rodrik, 1998; Eskeland and Harrison, 2003). However, there is little evidence this dynamic is at play. On the contrary, the globalization of production networks boosted LES in many countries, even when not supported by formal regulation.

The importance of labor and environmental characteristics in high-income consumption markets drives the international transmission of LES (Vogel, 1995; Greenhill et al., 2009; Garcia-Johnson, 2000; Perkins and Neumayer, 2012; Prakash and Potoski, 2007, 2006; Poulsen et al., 2016). Compliance is influenced by countries institutional characteristics as well as lead firms' governance (Distelhorst et al., 2015, 2016; Locke et al., 2009; Locke and Romis, 2010; Poulsen et al., 2016) stressing the role of offshoring firms in diffusing sustainable production standards globally (Lambin et al., 2018). Nevertheless, empirical evidence shows that the transmission of LES along GVCs can exacerbate the vulnerability of small-scale producers in developing countries (Dolan and Humphrey, 2000; Kaplan and Kaplinsky, 1999; Ponte and Gibbon, 2005; Cafaggi and Renda, 2012).

This paper provides a mathematical framework connecting available empirical studies. It presents a theoretical model of multi-product retailers selling partially substitutable goods and outsourcing production to upstream suppliers. The model captures the intuition that product substitutability interacts with enforced LES to influence firms' bargaining power and the distribution of compliance cost. Three forms of LES implementation are considered: public regulation imposed on upstream producers by their domestic regulator; public regulation imposed on downstream retailers over imports not complying with LES; and consumer-driven standards.

The model highlights three levels of competition that shape firms' profits: horizontal, vertical and across-product competition. Horizontal competition is between multiple suppliers of a single product variety. Vertical competition is determined by the division of rents between retailers and suppliers. Across-product competition is between product varieties competing over the limited budget of the final consumers. When they interact with LES, these three levels of competition affect the division between suppliers and multi-product retailers of LES

compliance effort.

Results show that when products are highly substitutable a multi-product retailer is able to shift compliance costs on to its suppliers. When retailers pursue an adequate level of product substitutability, product substitutability strengthens across-product competition thus increasing the bargaining power of the retailer. Results apply to both compliance costs, but also the cost of green-washing and fair-washing. It suggests that when products are highly substitutable, strictly enforcing regulation can further depress profits for suppliers to the advantage of retailers.

A comparison between private and public regulation shows that consumer-driven standards prompt a higher level of relative effort for the suppliers compared to the case where public regulation is imposed on the retailer.

This model provides a framework for industrial policies in producing countries. For instance, governments might want to provide financial support for LES compliance to local producers of substitutable goods destined to export markets. Those governments might let market dynamics drive development when the produced goods have low level of substitutability.

There are also implications for the political economy of environmental and labor regulation. Producing countries have an incentive to delay labor and environmental regulation when downstream stages of the GVC are subject to LES. On the other side, consuming countries unconcerned with inequality might also hold off on imposing LES on domestic firms. They would pressure producing countries to impose their own labor and environmental regulation. Consumer activism can deter consuming countries from imposing public regulation on domestic firms. In this setting, consumers that want to influence firms' sourcing strategies should opt for pressuring their own regulator to impose public standards on downstream multinationals as it places the least financial burden on upstream suppliers.

These policy implications are important given the diffusion of GVCs and the increased bargaining power of downstream firms. International trade is dominated by trade in intermediates and most of it takes place within the networks of multinational firms (Antras, 2003; Miroudot et al., 2009; OECD, 2013). At the same time, major consolidations processes in the retail industry increase the bargaining power at the downstream end of GVCs, elevating retail giants as price setting intermediaries. For instance, between 1992 and 2009, the top five grocery store retailers rose from controlling 30% of the US market to 60% and similar trends are at play in Europe (Hong and Li, 2017). These trends raise questions on the ability of suppliers to bargain over profitable market conditions. Policy design can mitigate distributional issues.

There is great enthusiasm over firms' accountability mechanisms to fulfil the promise of diffusing LES. Not much attention has been directed to the cost distribution of their implementation. This analysis shows that the industry structure matters in that cost distribution. Products' substitutability, the nature of the downstream outsourcing retailer and the form take by regulation affects the distribution of compliance effort and cost. Data limitation limits empirical studies on the effects of industry and trade structure, hence the importance of theoretical work. Policy makers and consumers should be cognisant of these dynamics as they can lead well-meaning regulation to increase the vulnerability of producers in the developing world.

The paper is structured as follows: section 2 outlines the previous literature. This paper contributes to the international political economy literature on the transmission of LES via multinational enterprises; the industrial organization literature on platform retailers; and the GVC literature on the effect of LES on value captured.

Section 3 provides an overview of the baseline model where suppliers produce a good that is sold to multi-product retailers and resold to the consumers. Consumers love variety and

divide their fixed income over all goods according to their relative price and their degree of substitutability. Final prices are driven by the level of competition at the supplier and the retailer level, as well as the substitutability among goods. The tax regime - a tax on the retailer (section 3.3) or a tax on the supplier (section 3.4) over the externality produced - has different impacts on suppliers' and retailers' relative profits, driving differential in compliance effort, as presented in Section 5.

Section 4 outlines a model without regulators in which the consumers prefer to purchase sustainable products. Firms can either invest in the visibility of the characteristics embedded in their goods, for instance through certification, or in upgrading the production process itself (Appendix E). In both cases, the impact of an increase in perceived characteristics is different for suppliers' and retailers' relative profits and this difference will drive their upgrading efforts. Results are presented and compared in Section 5.

Appendix D acknowledges that, when products are less than perfectly substitutable or at least one of the stages in the value chain is less than perfectly competitive, a double marginalization problem arises in the baseline model. An alternative pricing strategy that overcomes the double marginalization problem is presented and its relevance in the industries is considered. However, the final results on relative upgrading effort by suppliers and retailers still hold under this alternative pricing strategy. Section 6 outlines the limitations of this study and expands on its policy implications.

2 Previous Literature

The debate on the relationship between LES and international trade used to be dominated by the Pollution Heaven Hypothesis. If the cost of clean production is substantial, countries are going to specialize in the production of clean or dirty goods depending on their comparative advantage (Cherniwchan et al., 2016). The leniency of regulation can itself become a source of comparative advantage creating a "race to the bottom" in LES among countries (Rodrik, 1998). However, there is little evidence in support.

International trade, in fact, is now dominated by trade in intermediates and most of it takes place within the networks of serving high-income markets. According to Baldwin and Venables (2015), only 34% of total trade is in final goods. One third of the total volume of trade happens within firms' boundaries and one third of the total volume of trade sees multinational companies on both ends of the transactions (Antras, 2003). Miroudot et al. (2009) report that intermediate products make up the majority of trade with 56% of goods and 73% of services being exchanged among firms rather than reaching directly the final consumer. OECD (2013) estimated that 47% of final assembly, 46% of warehousing, 43% of customer service and 39% of product development were outsourced to countries other than that where the headquarter is located.

Most production processes are conducted within GVCs and final sale in developed countries is often facilitated by multi-product retailers that connect producers and consumers. Ruggie (2017) reports that in 2014 the Apple iPhone 6 was assembled using products sourced from 785 suppliers in 31 countries. Many of those suppliers where themselves multinational firms, who outsourced their production to foreign firms. Similar trends are outlined for companies such as Disney, Wal-Mart and major apparel brands (Vogel, 2007). Not only production is sliced up in geographically dispersed tasks, but it also constantly moves in search of lower costs locations (Feenstra, 1998) making production processes opaque and costly to monitor.

Many high-value consuming markets require LES to be embedded in the product. Through this mechanism a "race to the top" in labor and environmental regulation is possible: under-regulated countries have an incentive to converge to the standards of highly regulated ones,

as long as those highly-regulated jurisdictions are important markets for their exports (Vogel, 1995). Thus, while globalization can pressure LES downward, demand pressures it upward. Consequently, enhancing trade ties with developed nations can improve labor rights in low- and middle-income nations (Greenhill et al., 2009).

LES enforcement is facilitated by multinational firms. As large companies get under public scrutiny, many multinationals have developed codes of conduct and supply chain standards. As multinationals extend 'best-practices' to their trading partners, those practices are often adopted in the whole economy (Garcia-Johnson, 2000). These positive spill-overs have been documented for environmental and labor standards. For instance, Perkins and Neumayer (2012) find that countries exporting automobiles and related components to locations with more stringent auto-emission standards are associated with more stringent domestic regulation and that foreign direct investments into developing countries are more common when more stringent regulation is enforced in the receiving country. Greenhill et al. (2009) show that labor laws and practices are influenced by those of the export destinations. These studies confirm for public standards the same effects documented for private standards. For instance, Prakash and Potoski (2007, 2006) show positive effects on adoption of the voluntary environmental production standards ISO 14001 and Garcia-Johnson (2000) finds that comercial ties between the US and Brazil or Mexico diffused environmental standards in the chemical industry.

Not much of this literature focuses on the issue of distributional conflicts between outsourcing and producing firms. However, there is a vast industrial organization literature on how governance dynamics between upstream and downstream firms affect their rent distribution (Rey and Tirole, 1986; Rey and Vergé, 2010) and cost pass-through (Nakamura, 2008; Nakamura and Zerom, 2010; Gopinath and Itskhoki, 2010; Gopinath et al., 2010, 2011; Goldberg and Hellerstein, 2008; Burstein and Jaimovich, 2009). Horizontal and vertical competition have independent effects on cost pass-though. Firms with larger market shares have lower cost pass-through (Atkeson and Burstein, 2008; Auer and Schoenle, 2016; Amiti et al., 2014) as they are able to transfer costs shocks more effectively on their suppliers. Similarly, vertically disintegrated production decreases rates of cost pass-through consistently with an increase in double marginalization (Neiman, 2010, 2011; Hellerstein and Villas-Boas, 2010). Tariff pass-through depends on the presence of intermediaries competing a la Cournot in the presence of homogeneous goods (Iapadre and Pace, 2016).

Products' substitutability also affects the pass-through of a tax, as the price of one good affects the quantity sold of another one. The pioneering model of platforms was introduced by Rochet and Tirole (2003) describing retailers of diversified products who belong to a two-way market. Think of Amazon.com or App Stores whose business model consists of providing consumers with a large menu of options and producers with a diversified market to serve, setting themselves as the crucial intermediary in between (Boudreau and Hagiu, 2009; Sriram et al., 2015). This line of research investigates the pricing strategies of platforms, especially prices to access the service. In most industries it identifies a loss-leader and a profit-center: the platform burdens one side of the market with most costs (Rochet and Tirole, 2003; Weinstein and Ambrus, 2008; Chen and Rey, 2012). Platforms are also found to diminish the impact of taxes on consumer prices, placing the burden of the tax on upstream producers (Kind et al., 2010). Thanks to their strong market power platforms act as regulators within their own ecosystem, imposing various types of standards (Boudreau and Hagiu, 2009) and amplifying the effect of the regulatory spillovers previously described.

Ever since the seminal contribution of Gereffi (1994, 1999b), the Global Value Chain literature saw in the offshoring economy and the governance structure of GVCs a channel to increasing income disparities between the North and the South of the World. By recognizing that lead firms are most often located in developed countries, while upstream producers are located in the developing world, the GVC literature draws a connection between industry

dynamics and GVC production with economic development (Mudambi, 2008, 2007; Milberg and Winkler, 2013; Kaplinsky, 2000).

Within this literature, regulation and consumer-driven standards are often characterized as barriers to entry in high-value markets that affect value chain structure and governance. For instance, Bolwig et al. (2013) show that product or production standards do not benefit low-income countries' as they create technical barriers to trade, economies of scale and scope and do not translate into sufficiently higher price premiums. Additionally, they create issues of inclusion into the export oriented economy. Dolan and Humphrey (2000) show that the high phytosanitary and environmental standards, the required predictability of product characteristics as well as the quality necessary to appeal to the European consumer, create barriers to entry for producing farms in Kenya and Zimbabwe. Kaplan and Kaplinsky (1999) document that EU legislation protecting domestic farmers inflated the competitive advantage of Southern European producers of canned fruit at the expenses of their South African competition.

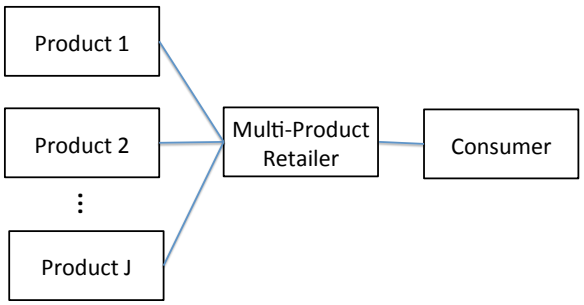
Gobal private regulation can also shift the bargaining power among firms resulting in a reallocation of the industry profits, independently of exit or entry. Consumer driven standards in the fishing industry concentrate market power at the retailer level, due to the increased salience of quality attributes, thus shifting bargaining power. Bargaining power shift industry profits towards downstream firms (Ponte and Gibbon, 2005). Similar results hold for Indonesian small-holder coffee producers (Neilson, 2008). Cafaggi and Renda (2012) show that the agricultural certification program Global G.A.P. imposes most of its costs on producers in developing countries. The implication is that private standards tend to reallocate profits towards downstream lead firms, often located in the developed world.

This paper provides a mathematical formalization of the aforementioned empirical literature. It investigates how public and private regulation protecting labor or the environment affect bargaining power, hence profits, of firms involved in GVCs.

3 Public Regulation

3.1 Intuition

Figure 1: Competition among value chains for three products provided to consumers



A set of consumers enjoys a variety of products they can purchase at a given retailer. Their limited budget forces them to make trade offs among goods according to their prices and the elasticity of their demand. Retailers are undifferentiated: they all offer the same products for the same prices. They outsource production to independent suppliers. Each good is produced by at least one supplier, but not necessarily only one.

The final profits of suppliers are subject to three competitive pressure: horizontal competition, driven by the multiple suppliers of a single product variety; "across-product" competition, induced by product varieties competing over the limited budget of the final consumers; and vertical competition, determined by the division of rents from the final sale of the product among retailers and suppliers. The final profits of retailers, instead, are only subject to horizontal and vertical competition as the "across-products" competition is nullified by the sale of all product varieties. This is because, when the price of one product increases, demand for every other product goes up.

Profits are determined by the quantity sold of each product and the mark-ups suppliers and retailers impose when optimally setting their wholesale and final prices. Prices are going to be determined by the level of competition at the retailer stage, the level of competition at the supplier stage and the degree of substitutability among products. Mark-ups are lower the more substitutable products are, as in a monopolistic competition setting, because the final demand for substitutable products is elastic. Mark-ups decrease with the number of horizontal competitors, as expected.

Given this setting, imagine that one of the goods is taxed because it violates LES. Taxation is explored at both the manufacturing and retailing stage. Specifically, the consuming country regulator can impose a tax on domestic retailers importing goods that do not meet the required LES. An example of this type of regulation is the Lacey Act that limits US imports of goods harmful to biodiversity in producing countries. This is the "Tax on the Retailer" case of Section 3.3. In the "Tax on the Supplier" case of Section 3.4, the producing country introduces a Pigouvian tax on domestic producing firms over a negative externality.

Compliance with LES avoids the tax. Suppliers can invest in a new production technology and retailers can contribute to that investment. This section will investigate the contribution compliance cost on the part of the suppliers and the retailers and their determinants. Results show that, when products are highly substitutable suppliers are subject to relatively more competitive pressure (the "across-goods" component) decreasing their bargaining power. Multi-product retailers can then shift the cost of compliance with LES on to suppliers. However, this only happens with a diversified product offering by the retailer: a single product retailer would not be able to shift those costs.

In fact, regulation always decreases supplier's profits, while it has two effects on the retailer's profits. On the one hand, retailers' profits on the taxed product drop like those of suppliers. On the other, as the relative price of one good increases consumers switch to its closest substitutes sold by the same retailer, a shift that is larger for highly substitutable products. This second effect mitigates the first one.

The second effect on the profits of a multi-product retailer numbs their incentive to invest in LES compliance. Thus, the multi-product nature of the retailer shifts compliance efforts when products are highly substitutable. It drives up the effort of upstream suppliers, even though they exhibit lower levels of absolute profits. Section 5 further elaborate on these results.

The same logic applies to the case where suppliers and retailers can design a contract to overcome the double marginalization problem: final prices are higher and aggregate prices are lower than they would be with a vertically integrated firms. When the number of suppliers is greater or equal than the number of retailers, retailers can offer part of the profits from the sale of the good at the vertically integrated price in exchange for the truthful revelation of

marginal cost of production and a fixed entry cost to consumers and suppliers. In this setting, as in the previous one, upgrading efforts would still be overwhelmingly born by suppliers for highly substitutable products, as long as the retailer sells multiple goods. Appendix D describes the model without double marginalization problem, the characteristics of a contract that allows for truthful revelation and results. Similar results apply when the tax is imposed on suppliers, as described in Section 3.4.

3.2 Baseline Model

Imagine a Global Value Chain with two stages, as the one described in Figure 1. Manufacturers are upstream and produce J goods indexed with $j \in [1, J]$. These goods are partially substitutable. The variable $\rho \in (0, 1)$ determines their degree of substitutability: the higher ρ the more substitutable goods are.

A variable number of identical suppliers, $i = [1, N_j]$ $N_j \in [1, \infty)$, produces each good j. The total quantity of j on the market, q_j, is the sum of $q_{i,j}$: the quantity produced by supplier i of good j. Suppliers sell their products to retailers. There is a variable number of identical retailers $R \in [1, \infty)$, indexed with $r \in [1, R]$, competing to buy the product from the suppliers and sell them to the final consumer. There is no specialisation in retailing services: all retailers sell all varieties produced.

3.2.1 The Consumer Problem

The representative consumer has income Y that is distributed over the entire set of products. It maximizes a utility function over quantities of the form $U = \sum_{k=1}^{J} q_k^{\rho}$, given the budget constraint $Y = \sum_{k=1}^{J} p_k q_k$. They enjoy consuming every good, but their fixed income forces them to trade them off considering their degree of substitutability and their prices.

Consumer optimization problem (1) yields a demand for each good, represented in equation (2) that is increasing in income and the price of every other good (represented by the price index G in equation (3)). It is also decreasing in its own price in a way that depends on the degree of substitutability between goods. Demand is more elastic when goods are substitutable [1].

$$\begin{aligned} \underset{q_j}{\text{maximize}} \quad & U = \sum_{k=1}^{J} q_k^{\rho} \\ \text{subject to} \quad & Y = \sum_{k=1}^{J} p_k q_k \end{aligned} \tag{1}$$

$$q_j = \frac{Y}{G} p_j^{\frac{1}{\rho - 1}} \tag{2}$$

$$G = \sum_{j=1}^{J} p_j^{\frac{\rho}{\rho - 1}} \tag{3}$$

[1] Usually these types demand systems substitute ρ, goods' substitutability, with $\sigma = \frac{\rho}{\rho - 1}$ the elasticity of demand. The resulting demand would then be expressed as $q_j = \frac{Y}{G} p_j^{1-\sigma}$ with $G = \sum_{j=1}^{J} p_j^{\sigma}$. However, in order to preserve the intuition of the effect of goods substitutability on the outcomes of interest, I am going to keep all functions expressed in terms of ρ.

3.2.2 The Retailer Problem

Retailers are aware of market demand for each product. They collect revenues over all products, but need to pay to the suppliers a wholesale price g_j for each good j as well as a fixed cost of operating F[2]. Their final profits are represented by equation (4).

$$\pi_r = \sum_{j=1}^{J} p_j q_{r,j} - g_j q_{r,j} - F \tag{4}$$

The total quantity of good j sold to consumers q_j is the sum of sales made by all retailer: $q_j = \sum_{r=1}^{R} q_{r,j}$. The quantity sold by each retailer is equal to the difference between total quantity on the market and the quantity sold by every other retailer.

$$q_{r,j} = q_j - \sum_{s \in [1,R]/r} q_{s,j} \Leftrightarrow q_{r,j} = \frac{Y}{G} p_j^{\frac{1}{\rho-1}} - \sum_{s \in [1,R]/r} q_{s,j} \tag{5}$$

Retailers are identical and compete à la Cournot. Retailer's maximisation problem (6) yields optimal pricing as in equation (7). The price depends on g_j, the wholesale price. Retailers apply a markup $\beta_r \in [1, \infty)$. The more substitutable the goods, the lower the markup. In the limit, retailers sell at cost. The lower the competition on the retail market (the lower R), the higher the markup.

$$\begin{aligned} \underset{p_1,\ldots,p_J}{\text{maximize}} \quad & \pi_r = \sum_{j=1}^{J} p_i q_{r,i} - F \\ \text{subject to} \quad & q_{r,j} = \frac{Y}{G} p_j^{\frac{1}{\rho-1}} - \sum_{s \in [1,R]/r} q_{s,j} \end{aligned} \tag{6}$$

$$p_j^*(g_j) = \frac{\frac{1}{\rho-1}}{\frac{\rho}{\rho-1} - \frac{R-1}{R}} g_j = \beta_r g_j \tag{7}$$

This price structure replicates the main results from monopolistic and Cournot competition:

1. When goods tend towards perfect substitutability, there is no mark-up for the retailer who sells at cost, independently of the level of competition: $\lim_{\rho \to 1} p_j = g_j$
2. When the retailer market is a monopoly, the markup depends on the degree of substitutability. The markup for complementary goods will be higher than for substitutes: $\lim_{R \to 1} p_j = \frac{1}{\rho} g_j$. These result replicate the traditional result of monopolistic competition.
3. When retailers operate under perfect competition, there is no markup and the each retailer sells at cost $\lim_{R \to \infty} p_j = g_j$

3.2.3 The Supplier Problem

Each supplier $i \in [1, N_j]$ of good j is informed about market demand and optimal pricing strategy by the retailers. They produce variety j at cost c_j and sell it to the retailers at wholesale price g_j for total profits $\pi_{i,j} = (g_j - c_j) q_{i,j}$. Total quantity sold by supplier i of good j is equal to the difference between the quantity demanded by the retailers and the quantity provided by every other supplier of the same variety. The N_j identical suppliers compete

[2]The underlying assumption is that F is too high for each supplier to sell directly to the consumers

to satisfy that demand maximising their profits (optimization problem (8)) and pick optimal price given by equation (9). As for equation (7), the optimal price depends on the unit cost of production c_j and a markup β_j that diminished as good tend towards perfect substitutability or when the j-supplier market is perfectly competitive.

$$\begin{aligned} \underset{g_j}{\text{maximize}} \quad & \pi_{i,j} = (g_j - c_j)q_{i,j} \\ \text{subject to} \quad & q_{i,j} = \frac{Y}{G}(\beta_r g_j)^{\frac{1}{\rho-1}} - \sum_{s\in[1,J]/i} q_{s,j} \end{aligned} \tag{8}$$

$$g_j^*(c_j) = \frac{\frac{1}{\rho-1}}{\frac{\rho}{\rho-1} - \frac{N_j-1}{N_j}} c_j = \beta_j c_j \tag{9}$$

Optimal final price to consumers is equal to equation (10). Optimal final demand is similarly given by equation (11). The profits of retailers and suppliers in equilibrium follow from these equations.

$$p_j^*(c_j) = \beta_r g_j = \beta_r \beta_j c_j \tag{10}$$

$$q_j^*(c_j) = \frac{Y}{G}(\beta_r \beta_j c_j)^{\frac{1}{\rho-1}} \tag{11}$$

A double marginalization problem arises whenever goods are less than perfectly substitutable and when the retailer or the supplier markets are not perfectly competitive. Under these circumstances, both retailers and suppliers are going to charge a mark-up, making the final price higher than that of vertically integrated firms. This depresses demand and total industry profits compared to a scenario of vertical integration. The double marginalization problem is addressed in Appendix D: an alternative model is presented where suppliers and retailers share the optimal profits under vertical integration.

3.3 Tax on the Retailer

The production of good j is taxed for violating LES. Assume production and retail take place in different countries and goods move across locations without transportation costs [3]. It is most natural that taxation on a negative externality takes place in the producing country. However, if production takes place in an under-regulated economy, the consuming country might want to complement regulation by imposing a tax, $t_j \in [0, 1]$, on imports that do not comply with LES[4].

This section considers the case where the the tax is imposed in the consuming country on domestic retailers. The case where the tax is imposed by producing countries on domestic suppliers is discussed in Section 3.4. Results for both are discussed in Section 5.

When the tax is imposed on retailers in the consuming country, retailers are maximising a profit function that include the tax $\pi_r = \sum_{k\in[1,J]/j} p_k q_{r,k} - g_k q_{r,k} + p_j(1-t_j)q_{r,j} - g_j q_{r,j} - F$.

[3]Transportation costs can easily be added to the model, but they do not alter the variable of interest: the relative upgrading effort of retailer and suppliers.

[4]The underlying assumption is that the regulator in consuming and producing countries are equally capable of detecting the externality, eliminating the opportunity for retailers to offshore production to hide their environmental impact. This assumption is naive, but it simplifies our analysis. However, to include monitoring capabilities, a simple expected value of the tax can be substituted to the tax rate, where the tax t_j is weighted by the probability of detection. It would simply decrease the extent of the tax.

The solution to that maximisation process given the consumer demand in equation (5), is shown in equation (12), where TR stands for 'Tax on Retailer.'

$$p_j^{TR}(t_j) = \beta_r \frac{g_j}{1-t_j} \tag{12}$$

Knowing the retailers optimal pricing strategy and its impact on final demand, supplier i of good j needs to maximise profits of the form $\pi_{i,j} = (g_j - c_j)q_{i,j}(p_j^{TR}(t_j))$ that yields optimal wholesale prices of the form of equation (9)[5]. Substituting equation (9) into equation (12) yields optimal consumer price.

The equilibrium profits of the retailer and the supplier take the form of equation (13) and (14) respectively, where $q_j^{TR}(t_j) = q_j(p_j^{TR}(t_j))$

$$\pi_r^{TR} = \frac{1}{R}\Big(\sum_{k\in[1,J]/j}(p_k - g_k)q_k + (p_j^{TR}(1-t_j) - g_j)q_j^{TR}(t_j)\Big) = \frac{1}{R}\Big(\sum_{k\in[1,J]/j}(p_k - g_k)q_k + (\beta_r - 1)\beta_j c_j q_j^{TR}(t_j)\Big) \tag{13}$$

$$\pi_{i,j}^{TR} = \frac{1}{N_j}(g_j - c_j)q_j^{TR}(t_j) = \frac{1}{N_j}(\beta_j - 1)c_j q_j^{TR}(t_j) \tag{14}$$

The derivative with respect to t_j of the two equilibrium profits delivers the impact of the tax on suppliers' and retailers' profits. The effect of the tax on the profits of the retailer is composed of two parts: the first part is the negative effect on the sales of good j, given by its after-tax price increase and the increase in its wholesale price. The second part is a positive effect given by the increase in sales of all other goods. Since the price of good j relative to every other good available is higher than before the tax, part of tits final demand will shift to all other goods. Product substitutability intensifies this shift. This second positive component mitigates the negative effect of the first part. Suppliers' profits, instead, drop like the first part of the retailers' profit without the positive effect on other goods.

These results require the assumption that the price index G is fixed for the supplier, but not for the retailer. The underlying assumption is that even when the supplier of good j is a monopolist, it still remains a small actor in the market because there is a large number of goods sold. The effect of an increase in price j on good j, then, has only a negative effect. At the same time G is assumed not to be fixed for the retailers. They are able to benefit from shift in consumption from taxed to untaxed goods and even if this shift has a minimal effect on the quantity consumed of every single good. Appendix A elaborates on these statements and provides formal proof.

$$\frac{\partial \pi_{i,j}^{TR}}{\partial t_j} = (\beta_j - 1)c_j \frac{1}{N_j}\frac{\partial q_j^{TR}(t_j)}{\partial t_j} = (\beta_j - 1)c_j \frac{1}{N_j} q_j^{TR}(t_j)\frac{1}{1-t_j}\frac{1}{\rho - 1} \tag{15}$$

$$\frac{\partial \pi_r^{TR}}{\partial t_j} = \underbrace{(\beta_r - 1)\beta_j c_j \frac{Y}{G}\Big(\frac{\beta_r \beta_j c_j}{1-t_j}\Big)^{\frac{1}{\rho-1}}\frac{1}{\rho-1}\frac{1}{1-t_j}}_{\text{negative effect}} - \underbrace{\frac{\rho}{\rho-1}\frac{1}{1-t_j}\Big(\frac{\beta_r\beta_j c_j}{1-t_j}\Big)^{\frac{\rho}{\rho-1}}\frac{1}{G}\sum_{k=1}^{J}(p_k - g_k)q_k(t_j)}_{\text{positive effect}} \tag{16}$$

[5]Final price in equilibrium when the tax is on the retailer $(p_j(t_j)^{TR})$ is equal to the final price when the tax is on the supplier p_j^{TS} as in Section 3.4, which means that consumer demand is the same under the two regimes for a given level of t_j

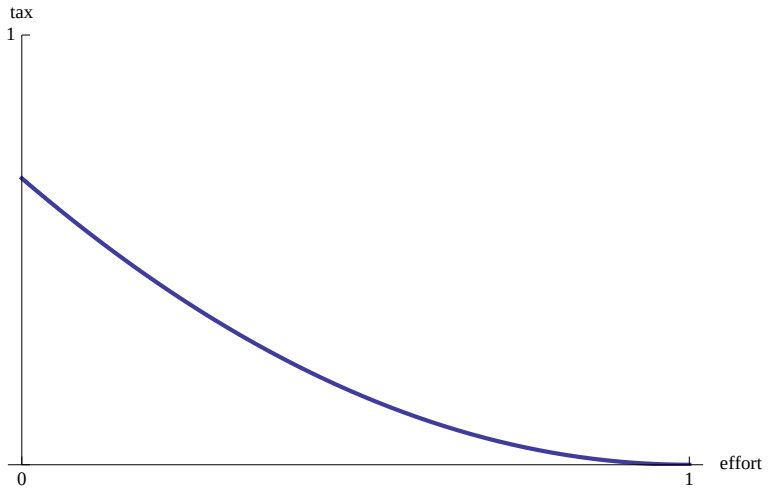
3.3.1 Adding Compliance Effort

Firms can take a costly action to comply with regulation and decrease the magnitude of the tax. For instance, they can upgrade production process or purchase certification[6]. The tax is a function of the levels of effort of supplier ($e_{i,j} \in [0,1]$) and retailer ($e_{r,j} \in [0,1]$) is expressed by equation (17) and is shown in Figure 2.

$$t_j(e_{i,j}, e_{r,j}) = t[(1 - e_{i,j})^a + (1 - e_{r,j})^b] \tag{17}$$

Function (17) assumes that efforts are bounded between 0 and 1 and $a, b \geq 1$. Efforts are not complementary, the tax would decrease even if one of the actors decides to free ride on the effort of the other. Both suppliers and retailers benefit from a production upgrade that drives down the impact of the tax, but both would prefer the other to incur in its costs. If we are considering the effect of the retailer's effort, the greater the level of effort (the closer to one), the lower the bite of the tax. If the effort of the supplier increases, then the curve shifts down: the magnitude of the tax is smaller. When the level of supplier's effort decreases, the curve shifts up for any effort of the retailer: the magnitude of the tax is larger[7].

Figure 2: Tax Function $t_j(e_{i,j}, e_{r,j})$



This figure is obtained for values: $a = b = 2$, $t = \frac{2}{3}$ and other effort equal to one.

Retailer and suppliers incur in different fixed costs for their compliance effort, $R(e_{r,j})$ and $S(e_{i,j})$ respectively. Costs are increasing in own effort[8].

[6]Similarly, they can take an action to hide the externality and decrease probability of detection.

[7]Results are robust for multiple choices of tax forms as long as efforts are substitutable. When efforts are complementary, i.e. both retailers and suppliers need to exert some effort in order to limit the impact of the tax, results on relative efforts are reversed, suggesting a stronger role for retailers' bargaining power. However, while complementary efforts seem applicable in the case of consumer-driven standards, for instance when producers engage in sustainable production processes, but their effort is only compensated by consumers if retailers advertize those characteristics, it does not seem as applicable in the case of public regulation.

[8]Including an increase in the variable cost would not drastically change the final results on the distribution of effort between retailers and suppliers. An increase in the variable costs of operation is transmitted to the consumer prices. The resulting increase in effort would decrease the effect of the tax on price, but at the same time increase the variable cost of production. This introduces a trade off for firms that would drive down their overall level of effort, but not change its distribution. Additionally, fixed costs of upgrading the production process have implications for development and inequality. For instance, the high cost of adoption and the high risk resulting from volatile consumer-driven standards hamper the diffusion of environmental certification.

Suppliers and retailers face the problem of picking their optimal effort, given the effort of the other one. In the presence of the tax, the profits for retailer r and supplier i of good j are $\pi_r(e_{i,j}, e_{r,j})^{TR} = \pi_r^{TR} - R(e_{r,j})$ and $\pi_{i,j}(e_{i,j}, e_{r,j})^{TR} = \pi_{i,j}^{TR} - S(e_{i,j})$, where π_r^{TR} and $\pi_{i,j}^{TR}$ are as in equation (13) and (14) respectively.

Optimal compliance effort is obtained by maximizing these profit functions with respect of own effort. The result of equation (18) follows from taking the ratio of the efforts and represents the relative level of effort of retailers and suppliers. Appendix A shows the derivation of these results. Equation (18) is composed of two parts. The first component (A) determines the level of effort as driven by the impact in profits on the taxed product line, while the second (B) is driven by the change in profits on every good other than the taxed one. Therefore, if the retailer only sells product j, the second part of the equation would be equal to zero. These two effects are weighted by the relative marginal cost of the compliance effort and the relative level of competition.

$$\frac{(1-e_{i,j})^{b-1}}{(1-e_{r,j})^{a-1}}\Big|_{TR} = \frac{a}{b}\frac{\partial_{e_{i,j}} S(e_{i,j})}{\partial_{e_{r,j}} R(e_{r,j})}\frac{N_j}{R}\Big(\underbrace{\frac{(\beta_r-1)\beta_j}{\beta_j-1}}_{A} - \underbrace{\frac{\rho}{(\beta_j-1)c_j}(\frac{\beta_r\beta_j c_j}{1-t_j})^{\rho}(1-\frac{1}{\beta_r})}_{B}\Big) \tag{18}$$

3.4 Tax on the Supplier

When the tax is imposed by the producing country on domestic producers of j, retailers' problem remains as in equation (6). Optimal retail pricing strategy, then, will be the same as in equation (7). The problem of supplier i of good j, instead, changes as her profits become $\pi_{i,j} = (g_j(1-t_j)-c_j)q_{i,j}$ given the demand function (8). Profit maximisation given the optimal pricing strategy of the retailer yields optimal wholesale prices (19). Optimal consumer price p_j^{TS} is obtained by substituting equation (19) into (7) where TS stands for 'Tax on Supplier.'

$$g_j^{TS} = \beta_j \frac{c_j}{1-t_j} \tag{19}$$

Equilibrium profits of the retailer and the supplier take the form of equation (20) and (21) respectively, where $q_{r,j}^{TS} = q_{r,j}(p_j^{TS})$

$$\pi_r^{TS} = \frac{1}{R}(\sum_{k\in[1,J]/j}(p_k-g_k)q_k+(p_j^{TS}-g_j^{TS})q_j^{TS}) = \frac{1}{R}(\sum_{k\in[1,J]/j}(p_k-g_k)q_{r,k}+(\beta_r-1)\beta_j\frac{c_j}{1-t_j}q_{r,j}^{TS}) \tag{20}$$

$$\pi_{i,j}^{TS} = \frac{1}{N_j}((1-t_j)g_j^{TS}-c_j)q_j^{TS} = \frac{1}{N_j}(\beta_j-1)c_j q_j^{TS} \tag{21}$$

The tax has a negative effect on good j profits for both the supplier and the retailer. A positive effect on the sale of every other product mitigates it for the retailer, but not for the supplier. For a single-product retailer of j, the second part of equation (23) would be null.

$$\frac{\partial \pi_{i,j}^{TS}}{\partial t_j} = (\beta_j-1)c_j\frac{1}{N_i}\frac{\partial q_j^{TS}}{\partial t_j} = (\beta_j-1)c_j\frac{1}{N_i}q_j^{TS}\frac{1}{1-t_j}\frac{1}{\rho-1} \tag{22}$$

$$\frac{\partial \pi_r^{TS}}{\partial t_j} = \underbrace{\frac{1}{R}((\beta_r-1)\beta_j\frac{c_j}{(1-t_j)^2}q_j^{TS}\frac{\rho}{\rho-1}}_{\text{negative effect}}\underbrace{-\frac{\rho}{\rho-1}\frac{1}{1-t_j}(\frac{\beta_r\beta_j c_j}{1-t_j})^{\frac{\rho}{\rho-1}}\frac{1}{G}\sum_{k=1}^{J}(p_k-g_k)q_k(t_j)}_{\text{positive effect}} \tag{23}$$

3.4.1 Adding Compliance Effort

When adding a functional for as in equation (17) for $t_j(e_{i,j}, e_{r,j})$ that depends on efforts, the function of relative effort (24) can be obtained as specified by Section 3.3.1 and Appendix A. The second part (B) of equation (24) is identical to (B) in equation (18), while the first part (A) is different.

$$\frac{(1-e_{i,j})^{b-1}}{(1-e_{r,j})^{a-1}}\Big|_{TS} = \frac{a}{b}\frac{\partial_{e_{i,j}} S(e_{i,j})}{\partial_{e_{r,j}} R(e_{r,j})}\frac{N_j}{R}\Big(\underbrace{\frac{(\beta_r-1)\beta_j\rho}{\beta_j-1}}_{A} - \underbrace{\frac{\rho}{(\beta_j-1)c_j}(\frac{\beta_r\beta_j c_j}{1-t_j})^{\rho}(1-\frac{1}{\beta_r})}_{B}\Big) \tag{24}$$

4 Private Regulation

Consumer standard are increasingly influencing firms practices. Brand power has increased in significance and scope. However, brand value is vulnerable to the negative press of poor labor or environmental practices.

In the 1990s activists exposed poor working conditions and child labor in the manufacturing facilities where Nike had outsourced production. After denying responsibility on the grounds that they did not have direct control over their independent suppliers, Nike kept suffering negative publicity. "The Nike product has become synonymous with slave wages, forced overtime, and arbitrary abuse," Phil Knight, Nike's CEO, said in May 1998 "I truly believe the American consumer doesn't want to buy products made under abusive conditions." Nike managed to save its reputation by becoming an industry leader in fair labor standards, increasing disclosure and imposing voluntary safe-labor and clean-air policies along its supply chain. Its prominent role in the industry compelled competitors to do the same (Niesen, 2013).

In 2010 Wal-Mart announced a plan towards a greener supply chain. They voluntarily cut 20 million metric tons of emissions in 5 years by targeting staple goods and by pressuring suppliers to rethink their own sourcing, transportation and packaging practices. Wal-Mart said supplier participation in the program was not mandatory, but that the giant retailer was interested in doing business only with suppliers that shared its environmental goals.

Certification naturally follows, with various independent organizations auditing the business practices of companies' and their suppliers. Certification, while potentially benefitting both suppliers and retailers, involve high sunk costs that could be unevenly divided.

4.1 Intuition

Consumers like a variety of products they can purchase from a given retailer. However, on top of enjoying those products, they care about LES, such as knowing goods were produced with environmentally sustainable or fair-labor practices. They divide their limited income over the available products according to their relative price, the degree of product substitutability, and their valuation of LES attributes. This valuation is going to depend on the observability of LES characteristics. If consumers do not know about the LES embedded in the goods they are not going to adjust their demand accordingly.

Retailers are undifferentiated, they all sell the same products at the same price. They outsource production to independent suppliers. Each supplier produces only one good, but there there are multiple suppliers per product. Firms' final profits are driven by horizontal competition; "across-product" competition, this time also influenced the perceived product quality; and vertical competition.

The mark-ups that suppliers and retailers impose when optimally setting wholesale and retail prices drive profits, together with the quantity sold. Mark-ups are lower the more substitutable products are, as in a monopolistic competition setting, because the final demand for substitutable products is more elastic. Mark-ups decrease with the number of horizontal competitors, as in the Cournot oligopolistic competition. The level of perceived LES compliance does not influence mark-ups[9]. Perceived LES compliance increases demand.

An increase in perceived LES compliance embedded in the products (either an increase in the actual attribute or an increase in its visibility), then, increases both retailers' and suppliers' profits through its positive effect on quantities. However, it affects them differently. Suppliers' profits are positively affected by the increased in LES perceived compliance. The profits of the retailer are subject to two opposing forces. The first one is a positive effect on profits of the LES complying product. The second is the negative effect on every other product sold, whose quantity decreases as their relative LES perceived compliance decreases. This second effect mitigates the first one and is stronger for substitutable.

Results are similar to the public regulation case. When products are highly substitutable, suppliers' bargaining power decreases because they are subject to relatively more competitive pressure (the "across-goods" component). Multi-product retailers can then successfully shift the LES compliance cost on to their suppliers. A single product retailer would not be able to shift those costs.

4.2 Model with Consumer Standards

Imagine a Global Value Chain of the same type as described in Section 3 and Figure 1. There are $N_j \in [1, \infty)$ identical suppliers ($i \in [1, N_j]$) for each product $j \in [1, J]$ who sell their output to $R \in [1, \infty)$ identical downstream retailers ($r \in [1, R]$). Retailers sell all J products without specializing or differentiating their offering in terms of price or quantity.

The J products differ in terms of LES compliance: to each product j is attached a level of LES compliance $z_j \geq 1$. Consumers value the LES quality embedded in a good, but can discriminate between low and high quality only if they observe it, a level of transparency indicated by the variable $\gamma \in [0, 1]$. The representative consumer's utility function becomes:

$$U = \sum_{k=1}^{J} z_k^{\gamma} q_k^{\rho} \tag{25}$$

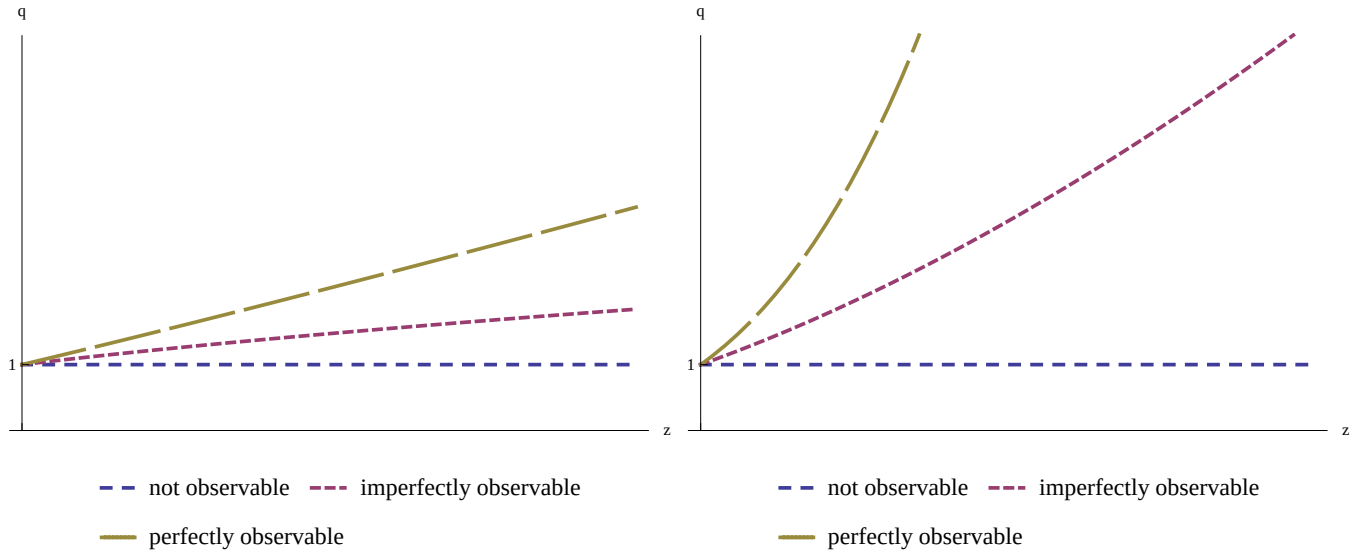
Consumers need to maximize utility function (25) subject to budget constraint $Y = \sum_{k=1}^{J} p_k q_k$. The quantity consumed of each product j follows from this maximization problem and is higher the higher its LES quality, but only if observable, as shown in equation (26) and Figure 3. However, the effect of observable quality on demand is higher the more substitutable products are. The relationship between demand, own price and income remains the same as equation (2). The impact of the price of every other good on demand is also going to be weighted by the observable product quality of every good suggesting that consumers not only compare prices, but also LES characteristics when purchasing their products.

$$q_j = \frac{Y}{G} p_j^{\frac{1}{\rho - 1}} z_j^{\frac{\gamma}{1-\rho}} \tag{26}$$

[9]Various studies show that consumers state a preference for eco-labelled products, such as seafood (Wessells et al., 1999; Johnston et al., 2001; Jaffry et al., 2004; Johnston and Roheim, 2006) and wood products(Ozanne and Vlosky, 2003; Forsyth et al., 1999; Aguilar and Vlosky, 2007; Forsyth et al., 1999) and coffee (Basu and Hicks, 2008). Nevertheless, there is little evidence that certifications and eco-labels can guarantee sufficiently high price premiums(Carlson and Palmer, 2016; Blomquist et al., 2015; Sedjo and Swallow, 2002; Asche et al., 2015)

$$G = \sum_{j=1}^{J} p_j^{\frac{\rho}{\rho-1}} z_j^{\frac{\gamma}{1-\rho}} \tag{27}$$

Figure 3: Demand function (26)



(a) Complementary products: $\rho = 0.1$ *(b)* Substitutable products: $\rho = 0.7$

Retailers and suppliers observe this demand function and maximize their profits in the same fashion as optimization problems (6) and (8), yielding the same optimal retail prices and wholesale prices as equation (7) and (9). Final consumer prices are the same as equation (10), i.e. in the model LES perceived quality does not have an effect on price as much as on quantity, consistently with what the empirical studies on environmental certification show.

Equilibrium profits for retailers and suppliers are:

$$\pi_{i,j}^* = (\beta_j - 1)c_j\left(\frac{Y}{G}(\beta_r\beta_j c_j)^{\frac{1}{\rho-1}} z_j^{\frac{\gamma}{1-\rho}}\right) \tag{28}$$

$$\pi_r^* = \sum_{k=1}^{J}(\beta_r - 1)\beta_k c_K\left(\frac{Y}{G}(\beta_r\beta_k c_k)^{\frac{1}{\rho-1}} z_k^{\frac{\gamma}{1-\rho}}\right) \tag{29}$$

4.3 Compliance Effort with Consumer-Driven Standards

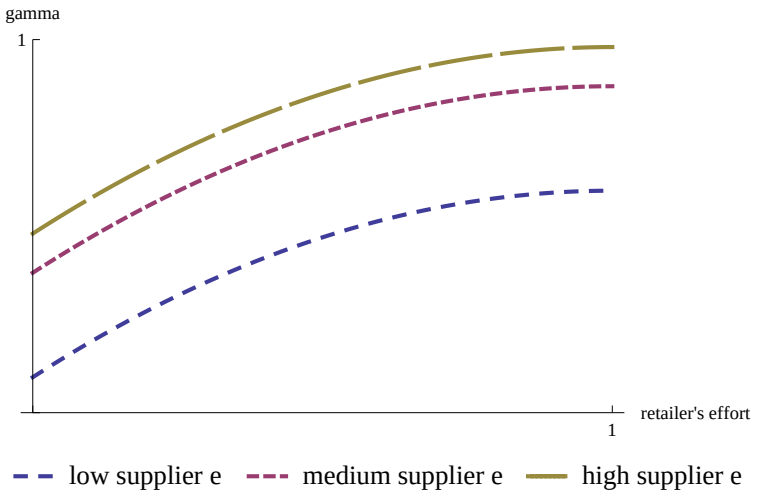
Effort in this case can take two forms. For a given level of LES quality (z_j), firms can invest on its visibility (γ) for instance though a certification or labelling program. Alternatively, for a given level of observability firms can upgrade LES quality, for instance by investing in a cleaner production technology. This section focuses on first one while Appendix E will outline the second case showing that it yields the same results in terms of relative compliance effort on the part of the retailers and suppliers.

Firms pick their optimal compliance effort given the impact of such investment on their profit and the cost of the effort itself, which as in the previous section is going to be determined by the functions $R(e_{r,j})$ and $S(e_{i,j})$ for retailers and suppliers respectively. The observability term is also going to be a function of efforts, as in equation (30) and Figure 4, where $a\,b \geq 1$

and effort of supplier and retailer are bounded between zero and one: $e_{i,j} \in [0,1]$, $e_{r,j} \in [0,1]$. As the effort of one increases, gamma increases, but at a decreasing rate. Both suppliers and retailers benefit from certifying the products, as it increases demand, but would rather prefer for the other to incur in its cost.

$$\Gamma(e_{i,j}, e_{r,j}) = 1 - \gamma((1 - e_{r,j})^a + (1 - e_{i,j})^b) \tag{30}$$

Figure 4: LES Quality Observability Function $\gamma(e_{i,j}, e_{r,j})$



This figure is obtained for values: $a = b = 2$ *and* $\gamma = 1/2$.

Firms maximize their profits with respect to own effort.

$$\underset{e_{i,j}}{\text{maximize}} \quad \pi_{i,j}(e_{i,j}) - S(e_{i,j}) \tag{31}$$

$$\underset{e_{r,j}}{\text{maximize}} \quad \pi_r(e_{r,j}) - R(e_{r,j}) \tag{32}$$

Appendix B describes the derivation of relative compliance effort function of equation (33).

$$\frac{(1 - e_{i,j})^{b-1}}{(1 - e_{r,j})^{a-1}}\Big|_{CS} = \frac{a}{b} \frac{\partial_{e_{i,j}} S(e_{i,j})}{\partial_{e_{r,j}} R(e_{r,j})} \frac{N_j}{R} \Big(\frac{(\beta_r - 1)\beta_j}{\beta_j - 1} - \frac{(\beta_r \beta_j c_j)^\rho}{(\beta_j - 1)c_j} (1 - \frac{1}{\beta_r}) \Big) \tag{33}$$

5 Results

The main result of this model is that as product substitutability increases (thus, as the elasticity of demand increases), the bargaining power of multi-product retailer increases. In fact, they can leverage the across-product competition created by product substitutability to shift most of the cost of LES compliance on their suppliers.

As horizontal competition increases, relative compliance effort of less competitive segment of the GVC increases. When the marginal costs of compliance to one firm increases, the other takes on more compliance effort, as intuitively expected. The same results apply to both public and private regulation as well as to the case where suppliers and retailers enter into a contract to avoid the double marginalization problem (as discussed in Appendix D). Minor differences in results among the different cases will be overviewed later in this section. What follows is a formal description of the these results and their derivation.

Proposition 5.1. *The gross profits of the retailers on each product are greater than the profits of its suppliers as long as there are at least as many suppliers as retailers:* $\pi_{r,j} > \pi_{i,j} \iff N_j \geq R$.

Intuitively, given a level of ρ, which is an attribute of the good sold and as such equal for suppliers and retailers, when there are more suppliers than retailers for a given good, the mark-up for that good is higher for the latter. Additionally, this results shows than even when there are the same amount of suppliers and retailers, the gross profits for retailers are higher, suggesting that even in a setting where all actor are perfectly informed and are subject to the same degree of horizontal and "across-product" competition, vertical competition favors downstream firms. Proof of this proposition is going to be provided in Appendix C.

Proposition 5.2. *For each product j, the impact of a tax on good j imposed on the retailer is always greater on the retailer than on the supplier as long as* $N_j \geq R$. *However, this effect is mitigated by the effect on the profits on every product other than j. This second effect is stronger the more substitutable products are.*

A tax impacts retailers' and suppliers' profits through its effect on demand, not mark-ups. Assuming that there are as many suppliers as retailers for good j ($N_j = R$), the effect on the quantities sold of good j is the same for both suppliers and retailers. However, retailers make more profits out of the sale of each unit of j than suppliers do, so their gross profits on product line j decrease faster. The process is accentuated if the horizontal competition is stronger at the supplier level ($N_j > R$), as the effect of the tax on quantities shrinks for the suppliers relative to the retailers. Nevertheless, when retailers sell more than one product, they are able to benefit from consumers substituting the taxed good j with other products, whose relative price has decreased as a consequence of the increase in the price of j. This effect is greater the more substitutable goods are, as their demand is more responsive to price, and it mitigates the negative effect on product j profits. Formal proof is given in Appendix C.

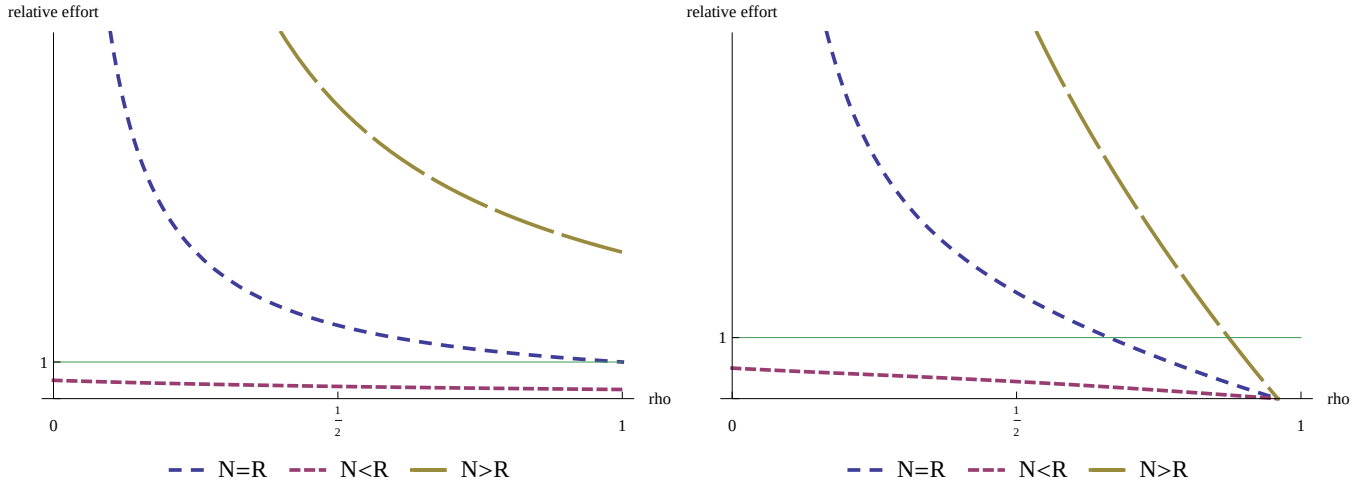
Proposition 5.3. *Compliance effort of the retailer is lower than compliance effort of the supplier for highly substitutable goods, and higher for goods with low substitutability, as long as the retailer sells multiple products and as long as* $N_j \geq R$, $\partial_{e_{i,j}} S(e_{i,j}) \geq \partial_{e_{r,j}} R(e_{r,j})$, $a \geq b$. *Compliance effort of a single-product retailer of j is greater than compliance effort of the supplier for all values of* ρ, *even though their difference decreases as goods are more substitutable.*

Proposition 5.3 follows directly from Proposition 5.2. Since the impact of the tax on good j is higher on the multi-product retailer than the supplier of good j for low levels of substitutability, the retailer will have a stronger incentive to invest in an activity that will decrease the bite of the tax on its profits, benefitting at the same time its suppliers. Nevertheless, as product substitutability increases ($\rho \to 1$), consumers' demand shift towards other products whose relative price has decreased. It follows that the impact of the tax on the multi-product retailer is lower and consequently, relative compliance effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$ drops too. Compliance effort of the suppliers matches and surpasses that of the retailers. These trends are visible in Figure 5b and will be further outlined in Appendix C.

This effect is due to the ability of the retailer to leverage the competition "across-products" to its advantage. Across-product competition is stronger for substitutable goods because consumers can easily switch between products. When the retailer sells only one product it lacks the ability to leverage the across-product competition to its advantage. Its relative compliance effort, then, is higher than that of suppliers independently of product substitutability.

Proposition 5.4. *Compliance effort of retailers increases (decreases) relative to the suppliers' as* $\frac{\partial_{e_{i,j}} S(e_{i,j})}{\partial_{e_{r,j}} R(e_{r,j})}$ *increases (decreases);* $\frac{a}{b}$ *increases (decreases);* $\frac{N_j}{R}$ *increases (decreases).*

Figure 5: Relative compliance effort when the retailers are taxed on good j as in equation (18)



(a) Single product retailer

(b) Multi-product retailer

These figures are obtained by using $t_j = 0.1$ and $c_j = 4$, $\partial_{e_{i,j}} S(e_{i,j}) = \partial_{e_{r,j}} R(e_{r,j})$ and $a = b$. The choice of t_j and c_j does not have any effect on Figure 5a, while the effect on Figure 5b is not on the overall trend and limit values, but on the values ρ the functions assumes value 1. Specifically, the higher c_j and t_j, the lower the values of ρ at which the function intersects the line 1. It plots the relative level of effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$, on the y-axes, as a function of ρ, on the x-axes. Note that the scale of the y-axes in Figure (5a) and (5b) are different to improve redeability. The difference in scale is highlighted by the position of the green line ($y = 1$)

As the cost of the marginal unit of effort to the retailer goes down or the marginal effectiveness of its effort goes up, compliance effort of the retailer is more cost effective. Taking everything else equal the retailer will bestow relatively more compliance effort. The same valid if the advantage were to be to supplier. When the level of horizontal competition increases at the supplier level, their profits decrease and with it the incentive to invest in LES compliance. For the same reason, when the horizontal competition at the retailer level increases, the relative effort of the suppliers goes up.

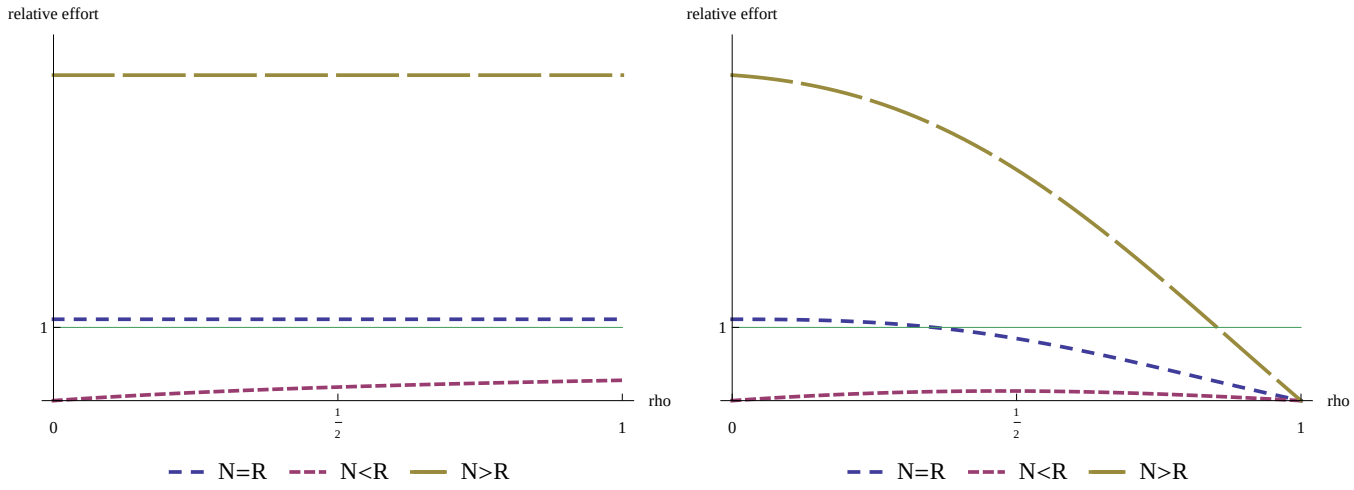
Similar trends are at play when public regulation is imposed on the supplier, as shown in Figure 6. The difference is that, for a single-product retailer, the relative effort of the retailer with respect to the supplier never goes to one as the products become more and more substitutable. Additionally, the effort of the multi-product retailer does not approach one as products approach perfect complementarity. Intuitively, suppliers are unable to shift compliance cost on to the retailer as effectively as retailers can. Proposition 5.4 remains valid in this case.

All the previously outlined are remain valid when the double marginalization problem is overcome through the contract outlined in Appendix D. Intuitively, the contract does not substantially alter the relative impact of the tax on suppliers' and retailers' profits: what determines their relative compliance effort. Figure 7 shows the results in this scenario.

Similar trends are also at play in the case of consumer driven standards, as shown in Figure 8. The intuition is the same: as horizontal competition increases, the relatively less competitive segment of the GVC increases its share of compliance effort. When the marginal cost to compliance effort of one firm increases, the other takes on more compliance effort.

These results rely on the functional forms of $t(e_{i,j}, e_{r,j})$ and $\gamma(e_{i,j}, e_{r,j})$. Specifically, these functional forms are valid when the efforts of retailer and supplier are not complementary: if

Figure 6: Relative compliance effort when the suppliers are taxed on good j as in equation (24)



(a) Single product retailer

(b) Multi-product retailer

These figures are obtained by using $t_j = 0.1$ and $c_j = 4$, $\partial_{e_{i,j}} S(e_{i,j}) = \partial_{e_{r,j}} R(e_{r,j})$ and $a = b$. The choice of t_j and c_j does not have any effect on Figure (6a), while the effect on Figure (6b) is not on the overall trend and limit values, but on the values ρ the functions assumes value 1. Specifically, the higher c_j and t_j, the lower the values of ρ at which the function intersects the line $y = 1$. It plots the relative level of effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$, on the y-axes, as a function of ρ, on the x-axes.

one firm does not need contribute any compliance effort it still would be able to benefit from the effort of the other firm.

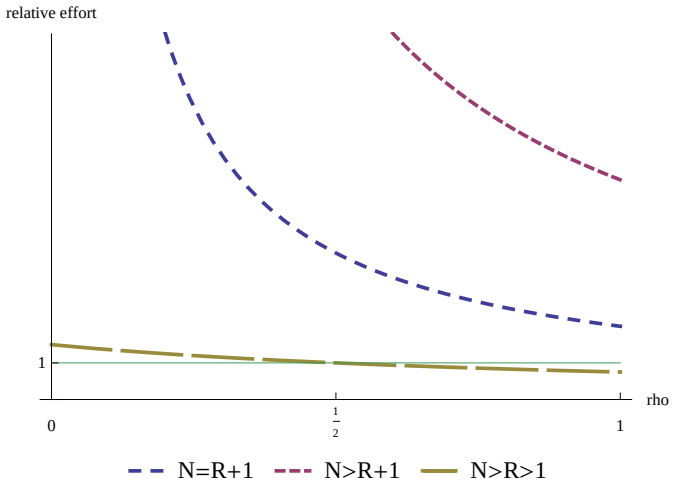
Proposition 5.5. *Relative compliance effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$ is greater when the tax is imposed on the retailer than with consumer driven standards, which in turn is greater than relative compliance effort when the tax is imposed on the supplier for a given ρ and for equal levels of horizontal competition: $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}\Big|_{TR} \geq \frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}\Big|_{CS} \geq \frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}\Big|_{TS} \forall \rho \in (0,1) \forall N_j = R.$*

Proposition 5.5 shows that the relative compliance effort of the retailer compared to the supplier is the lowest when producing countries regulate domestic suppliers. As intuitively expected, suppliers cannot shift the impact of a tax on retailers as effectively. Proposition 5.5 also shows that the relative retailer effort is higher with public regulation in the consuming country compared to consumer-driven standards. This follows from the fact that the bite of a tax is independent of product substitutability. Differently, the ability of consumers to boycott products on the base of LES compliance depends on the availability of close substitutes. That makes LES compliance effort of retailers stemming from consumer-driven standards more elastic to product substitutability compared to the tax on retailers case.

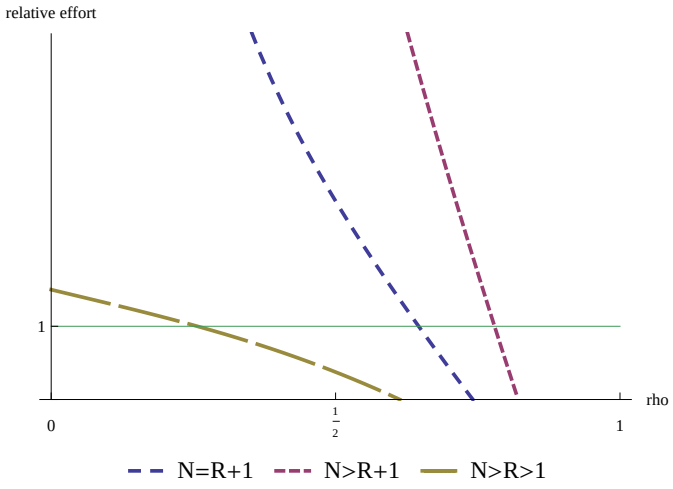
6 Conclusions

The potential of GVCs as vectors to expand labor and environmental protection across national borders via the intricate and elusive production networks of multinationals is very attractive. As long as important export markets are highly regulated or consumers are actively expressing their preferences for sustainable or fair-labor production processes, GVCs have been shown to effectively transmit those standards, silencing the concerns over globalizations' downward pressure on LES.

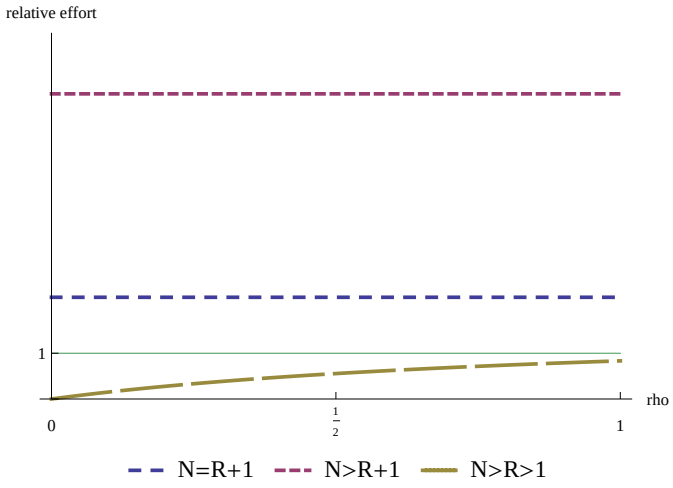
Figure 7: Relative compliance effort with a tax on good j when a contract avoids the double marginalization problem as in equation (50) and (51)



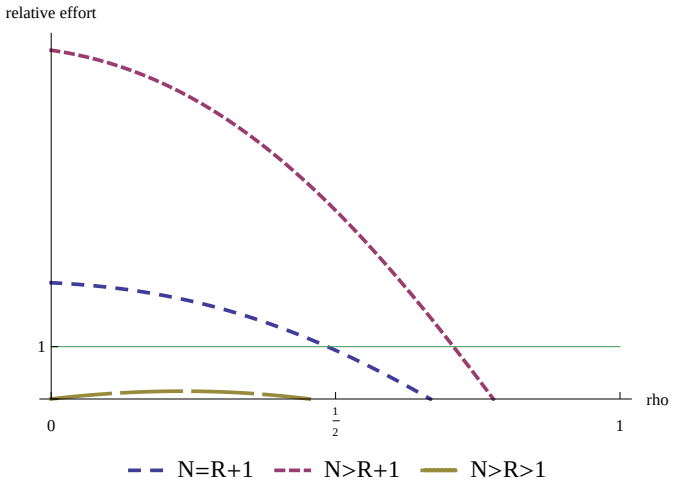
(a) Single product retailer and tax on retailer



(b) Multi-product retailer and tax on retailer



(c) Single product retailer and tax on supplier



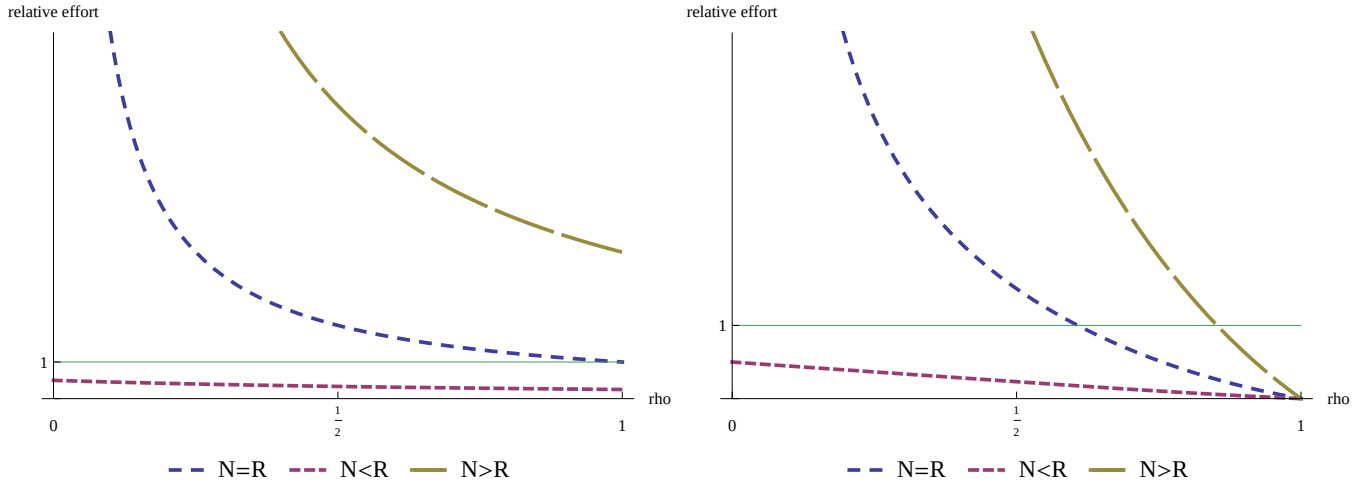
(d) Multi-product retailer and tax on supplier

These figures are obtained by using $t_j = 0.1$ and $c_j = 4$, $\partial_{e_{i,j}} S(e_{i,j}) = \partial_{e_{r,j}} R(e_{r,j})$ and $a = b$. The choice of t_j and c_j does not have any effect on Figure 6a, while the effect on Figure 6b is not on the overall trend and limit values, but on the values ρ the functions assumes value 1. Specifically, the higher c_j and t_j, the lower the values of ρ at which the function intersects the line $y = 1$. It plots the relative level of effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$, on the y-axes, as a function of ρ, on the x-axes.

Critics of this position point out that the expansion of GVCs was accompanied by an increase in global inequality. Traditionally, these critics argue that the globalization of production networks naturally redirects resources towards the GVC firms with the most bargaining power (usually the lead firms located in high-income countries), at the expenses of producing firms (usually located in developing countries). As long as downstream firms are large enough buyers for the final products, regulation and consumer standards exacerbate this unequal profit distribution by tilting the bargaining power within GVCs even more in favor of retailers.

This paper combines the international political economy literature on global transmission

Figure 8: Relative compliance effort on observability with consumer standards as in equation (33)



(a) Single product retailer

(b) Multi-product retailer

These figures are obtained by using values $c_j = 4$, $\partial_{e_{i,j}} S(e_{i,j}) = \partial_{e_{r,j}} R(e_{r,j})$ and $a = b$. The choice of c_j does not have any effect on Figure (8a), while the effect on Figure (8b) is not on the overall trend and limit values, but on the values ρ the functions assumes value 1. Specifically, the higher c_j, the lower the values of ρ at which the function intersects the line 1. It plots the relative level of effort $\frac{(1-e_{i,j})^b}{(1-e_{r,j})^a}$, on the y-axes, as a function of ρ, on the x-axes. Note that the scale of the y-axes in Figure (8a) and (8b) are different to improve redeability. The difference in scale is highlighted by the position of the green line ($y = 1$)

of production standards via multinationals; the GVC literature on the determinants of value chain governance and its effects on value captured; and the industrial organization literature on platform retailers. This combination allows to mathematically formalize the governance patterns within multi-product GVCs and investigate the distribution of effort to comply with public or private regulation.

The model depicts identical retailers selling multiple products to consumers that value variety and outsourcing production to upstream independent suppliers. This setting outlines three levels of competition: horizontal competition, "across-product" competition, and vertical competition. Their interaction determines the profitability of every firm in the GVC and the bargaining power that shape their relative effort to comply with LES.

The analysis can be extended in multiple ways. First, this is a static model with a fixed GVC structure. Regulation and industry standards can change GVC structure and its governance, for instance creating barriers to entry for suppliers. Integrating these elements into the model can provide more realism. Despite its simplicity, the model shows that even when suppliers are monopolists and retailers are not, the multi-product nature of the retailer drives up suppliers' share of LES compliance effort. Changes in the GVC structure, then, would not drastically change the basic results and their implications.

Second, the model assumes that all retailers are identical and does not take into account branding strategies and retailer differentiation attached to LES. In that case, consumers might decide to boycott retailers breaching LES on one product. Differentiation among retailers requires consumers with heterogeneous preferences over LES. This model, then, provides an approximation of the effects of similar retailers competing on a market with given preferences over such attributes. For instance, the competition between Traders' Joes and Wholefoods vs the competition between Wal-Mart and Dollar General.

Finally, we assume that compliance effort only imposes fixed costs to the firms and do not increase their variable costs of operation. Including an increase in the variable cost would not drastically change the final results on the distribution of effort between retailers and suppliers. An increase in the variable costs of operation, in fact, will be transmitted to consumer prices. In the case of the tax, for instance, an increase in effort would decrease the effect of the tax on price, but at the same time increase the variable cost of production. This introduces a trade off for firms that would drive down their overall level of effort, but not change its distribution.

Additionally, fixed costs of compliance have implications for development and inequality. The high cost of adoption and the high risk resulting from volatile consumer-driven standards hamper the diffusion of LES. When consumers frequently upgrade their definition of "quality," the continuous upgrade in production techniques required to satisfy that definition will thwart the ability to recoup the initial investment. This will drive an increasing wedge in profitability between the firm that make the investment and that enjoying the benefit of such investment.

The model shows that while public and private regulation can be an effective mechanism to diffuse LES via GVCs, they can exacerbate the natural tendency of GVCs to concentrate rents. When a multi-product retailer sells highly substitutable goods, the high level of price competition among products drives most LES compliance effort and cost on suppliers. For this to be true, however, retailers need to pursue an adequate level of product differentiation.

The model allows to compare public and private regulation. It shows that consumer-driven standards yield a higher level of relative compliance effort for the suppliers, compared to public regulation on the retailer. Suppliers end up bearing most LES compliance cost when the producing countries regulate producers directly.

These results create a framework for government intervention. For instance, when an industry is dominated by multi-product multinationals selling highly substitutable products local governments in producing country might subsidize an upgrade in production techniques, as they would unevenly burden suppliers. Conversely, in industries where products are not substitutable, the outsourcing multinational firm has a greater incentive to directly invest in local production, for instance with foreign direct investments. The framework provided outlines cases where local governments in developing countries might want to let the interaction within global markets drive development and redirect resources towards other industries where, for instance, public-private partnerships might be more beneficial.

There are also implications for the political economy of environmental and labor regulation. Producing countries are better off by delaying labor and environmental regulation when downstream stages of the value chain are subject to LES. In that case, in fact, downstream firms would contribute to LES compliance. Producing countries, instead, might want to introduce a public regulation later on, when those production standards have been ratcheted up thanks to foreign investments and the regulation is not binding for a large share of firms.

On the other side, a regulator in the consuming country that is not concerned with inequality among countries might also delay public regulation on domestic firms, and pressure producing countries to impose their own LES. For instance, the ILO's Declaration on Fundamental Principles and Rights at Work (1998) and various environmental treaties place the responsibility to protect workers and natural resources on producing countries [10]. Similarly, in the presence of consumer activism, the same consuming country regulator might also delay public regulation. In fact, when LES are enforced by private regulation compliance costs for domestic retailers are lower compared to the case when they are taxed. If consumers are also concerned with inequality among countries, they should prefer pressuring their governments to regulate domestic firms over boycotts. In fact, it places the least compliance cost on suppliers.

There is great enthusiasm for consumer-driven standards, certifications and other forms of

[10]International Environmental Agreements Database Project, University of Oregon, https://iea.uoregon.edu/

accountability for outsourcing firms to fulfil the promise of diffusing labor and environmental standards throughout their production networks. Not much attention has been directed to the distribution of LES compliance costs. The model presented shows that the industry structure matters in compliance cost distribution: the interaction between product degree of substitutability, the nature of the downstream outsourcing retailer and nature of the regulation affects the distribution of compliance effort and hence cost. Policy makers and even regulators in a broader sense, like consumers, should be cognisant of these dynamics as they can lead well-meaning labor and environmental standards to increase the vulnerability of producers in the developing world and contribute to global inequality.

References

Aguilar, F. X. and Vlosky, R. P. (2007). Consumer willingness to pay price premiums for environmentally certified wood products in the us. *Forest Policy and Economics*, 9(8):1100–1112.

Amiti, M., Itskhoki, O., and Konings, J. (2014). Importers, exporters, and exchange rate disconnect. *American Economic Review*, 104(7):1942–78.

Antras, P. (2003). Firms, contracts, and trade structure. *The Quarterly Journal of Economics*, pages 1–29.

Antràs, P. and Chor, D. (2013). Organizing the global value chain. *Econometrica*, 81(6):2127–2204.

Asche, F., Larsen, T. A., Smith, M. D., Sogn-Grundvåg, G., and Young, J. A. (2015). Pricing of eco-labels with retailer heterogeneity. *Food Policy*, 53:82–93.

Atkeson, A. and Burstein, A. (2008). Pricing-to-market, trade costs, and international relative prices. *American Economic Review*, 98(5):1998–2031.

Auer, R. A. and Schoenle, R. S. (2016). Market structure and exchange rate pass-through. *Journal of International Economics*, 98:60–77.

Baldwin, R. and Lopez-Gonzalez, J. (2015). Supply-chain trade: a portrait of global patterns and several testable hypotheses. *The World Economy*, 38(11):1682–1721.

Baldwin, R. and Venables, A. J. (2015). Trade policy and industrialisation when backward and forward linkages matter. *Research in Economics*, 69(2):123–131.

Basu, A. K. and Hicks, R. L. (2008). Label performance and the willingness to pay for fair trade coffee: a cross-national perspective. *International Journal of Consumer Studies*, 32(5):470–478.

Blomquist, J., Bartolino, V., and Waldo, S. (2015). Price premiums for providing eco-labelled seafood: Evidence from msc-certified cod in sweden. *Journal of agricultural economics*, 66(3):690–704.

Bolwig, S., Riisgaard, L., Gibbon, P., and Ponte, S. (2013). Challenges of agro-food standards conformity: lessons from east africa and policy implications. *The European Journal of Development Research*, 25(3):408–427.

Boudreau, K. J. and Hagiu, A. (2009). Platform rules: Multi-sided platforms as regulators. *Platforms, markets and innovation*, 1:163–191.

Burstein, A. and Jaimovich, N. (2009). Understanding movements in aggregate and product-level real exchange rates. *unpublished paper, UCLA and Stanford University*.

Cafaggi, F. and Renda, A. (2012). Public and private regulation: mapping the labyrinth. *DQ*, page 16.

Carlson, A. and Palmer, C. (2016). A qualitative meta-synthesis of the benefits of eco-labeling in developing countries. *Ecological Economics*, 127:129–145.

Carnovale, M., Mayer, F., and Pfaff, A. (2018). Who gets the surplus in value chains: development policies implications of value chain governance.

Chen, Z. and Rey, P. (2012). Loss leading as an exploitative practice. *American Economic Review*, 102(7).

Cherniwchan, J., Copeland, B., and Scott Taylor, M. (2016). Trade and the environment: New methods, measurements, and results. *NBER working paper series*.

Distelhorst, G., Hainmueller, J., and Locke, R. M. (2016). Does lean improve labor standards? management and social performance in the nike supply chain. *Management Science*, 63(3):707–728.

Distelhorst, G., Locke, R. M., Pal, T., and Samel, H. (2015). Production goes global, compliance stays local: Private regulation in the global electronics industry. *Regulation & Governance*, 9(3):224–242.

Dolan, C. and Humphrey, J. (2000). Governance and trade in fresh vegetables: the impact of uk supermarkets on the african horticulture industry. *Journal of development studies*, 37(2):147–176.

Eskeland, G. S. and Harrison, A. E. (2003). Moving to greener pastures? multinationals and the pollution haven hypothesis. *Journal of development economics*, 70(1):1–23.

Feenstra, R. C. (1998). Integration of trade and disintegration of production in the global economy. *The journal of economic perspectives*, pages 31–50.

Forsyth, K., Haley, D., and Kozak, R. (1999). Will consumers pay more for certified wood products? *Journal of Forestry*, 97(2):18–22.

Garcia-Johnson, R. (2000). *Exporting environmentalism: US multinational chemical corporations in Brazil and Mexico*. MIT Press.

Gereffi, G. (1994). The organization of buyer-driven global commodity chains: how us retailers shape overseas production networks. *Contributions in Economics and Economic History*, pages 95–95.

Gereffi, G. (1999a). A commodity chains framework for analyzing global industries. *Institute of Development Studies*.

Gereffi, G. (1999b). International trade and industrial upgrading in the apparel commodity chain. *Journal of international economics*, 48(1):37–70.

Gereffi, G., Humphrey, J., and Sturgeon, T. (2005). The governance of global value chains. *Review of international political economy*, 12(1):78–104.

Goldberg, P. K. and Hellerstein, R. (2008). A structural approach to explaining incomplete exchange-rate pass-through and pricing-to-market. *American Economic Review*, 98(2):423–29.

Gopinath, G., Gourinchas, P.-O., Hsieh, C.-T., and Li, N. (2011). International prices, costs, and markup differences. *American Economic Review*, 101(6):2450–86.

Gopinath, G. and Itskhoki, O. (2010). Frequency of price adjustment and pass-through. *The Quarterly Journal of Economics*, 125(2):675–727.

Gopinath, G., Itskhoki, O., and Rigobon, R. (2010). Currency choice and exchange rate pass-through. *American Economic Review*, 100(1):304–36.

Greenhill, B., Mosley, L., and Prakash, A. (2009). Trade-based diffusion of labor rights: A panel study, 1986–2002. *American Political Science Review*, 103(4):669–690.

Hellerstein, R. and Villas-Boas, S. B. (2010). Outsourcing and pass-through. *Journal of International Economics*, 81(2):170–183.

Hong, G. H. and Li, N. (2017). Market structure and cost pass-through in retail. *Review of Economics and Statistics*, 99(1):151–166.

Iapadre, P. L. and Pace, G. (2016). Trade intermediaries and the tariff pass-through. *Journal of Industry, Competition and Trade*, 16(4):441–454.

Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D., and Wattage, P. (2004). Consumer choices for quality and sustainability labelled seafood products in the uk. *Food Policy*, 29(3):215–228.

Johnston, R. J. and Roheim, C. A. (2006). A battle of taste and environmental convictions for ecolabeled seafood: A contingent ranking experiment. *Journal of Agricultural and Resource Economics*, pages 283–300.

Johnston, R. J., Wessells, C. R., Donath, H., and Asche, F. (2001). Measuring consumer preferences for ecolabeled seafood: an international comparison. *Journal of Agricultural and resource Economics*, pages 20–39.

Kaplan, D. and Kaplinsky, R. (1999). Trade and industrial policy on an uneven playing field: the case of the deciduous fruit canning industry in south africa. *World Development*, 27(10):1787–1801.

Kaplinsky, R. (2000). Globalisation and unequalisation: What can be learned from value chain analysis? *Journal of development studies*, 37(2):117–146.

Kind, H. J., Koethenbuerger, M., and Schjelderup, G. (2010). Tax responses in platform industries. *Oxford Economic Papers*, 62(4):764–783.

Lambin, E. F., Gibbs, H. K., Heilmayr, R., Carlson, K. M., Fleck, L. C., Garrett, R. D., de Waroux, Y. l. P., McDermott, C. L., McLaughlin, D., Newton, P., et al. (2018). The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change*.

Locke, R., Amengual, M., and Mangla, A. (2009). Virtue out of necessity? compliance, commitment, and the improvement of labor conditions in global supply chains. *Politics & Society*, 37(3):319–351.

Locke, R. M. and Romis, M. (2010). The promise and perils of private voluntary regulation: Labor standards and work organization in two mexican garment factories. *Review of International Political Economy*, 17(1):45–74.

Milberg, W. and Winkler, D. (2013). *Outsourcing economics: Global value chains in capitalist development*. Cambridge University Press.

Miroudot, S., Lanz, R., and Ragoussis, A. (2009). Trade in intermediate goods and services.

Mudambi, R. (2007). Offshoring: economic geography and the multinational firm. *Journal of International Business Studies*, 38(1):206.

Mudambi, R. (2008). Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography*, 8(5):699–725.

Nakamura, E. (2008). Pass-through in retail and wholesale. *American Economic Review*, 98(2):430–37.

Nakamura, E. and Zerom, D. (2010). Accounting for incomplete pass-through. *The Review of Economic Studies*, 77(3):1192–1230.

Neilson, J. (2008). Global private regulation and value-chain restructuring in indonesian smallholder coffee systems. *World Development*, 36(9):1607–1622.

Neiman, B. (2010). Stickiness, synchronization, and passthrough in intrafirm trade prices. *Journal of Monetary Economics*, 57(3):295–308.

Neiman, B. (2011). A state-dependent model of intermediate goods pricing. *Journal of International Economics*, 85(1):1–13.

Niesen, M. (2013). How nike solved its sweatshop problem. *Business Insider*.

OECD (2013). Interconnected economies: Benefiting from global value chains. Technical report, Meeting of the OECD Council at Ministerial Level, Paris 29-39 May 2013.

Ozanne, L. K. and Vlosky, R. P. (2003). Certification from the us consumer perspective: A comparison from 1995 and 2000. *Forest products journal*, 53(3):13.

Perkins, R. and Neumayer, E. (2012). Does the 'california effect'operate across borders? trading-and investing-up in automobile emission standards. *Journal of European public policy*, 19(2):217–237.

Ponte, S. and Gibbon, P. (2005). Quality standards, conventions and the governance of global value chains. *Economy and society*, 34(1):1–31.

Poulsen, R. T., Ponte, S., and Lister, J. (2016). Buyer-driven greening? cargo-owners and environmental upgrading in maritime shipping. *Geoforum*, 68:57–68.

Prakash, A. and Potoski, M. (2006). Racing to the bottom? trade, environmental governance, and iso 14001. *American journal of political science*, 50(2):350–364.

Prakash, A. and Potoski, M. (2007). Investing up: Fdi and the cross-country diffusion of iso 14001 management systems. *International Studies Quarterly*, 51(3):723–744.

Rey, P. and Tirole, J. (1986). The logic of vertical restraints. *The American Economic Review*, pages 921–939.

Rey, P. and Vergé, T. (2010). Resale price maintenance and interlocking relationships. *The Journal of Industrial Economics*, 58(4):928–961.

Rochet, J.-C. and Tirole, J. (2003). Platform competition in two-sided markets. *Journal of the european economic association*, 1(4):990–1029.

Rodrik, D. (1998). Has globalization gone too far? *Challenge*, 41(2):81–94.

Ruggie, J. G. (2017). Multinationals as global institution: Power, authority and relative autonomy. *Regulation & Governance*.

Sedjo, R. A. and Swallow, S. K. (2002). Voluntary eco-labeling and the price premium. *Land economics*, 78(2):272–284.

Sriram, S., Manchanda, P., Bravo, M. E., Chu, J., Ma, L., Song, M., Shriver, S., and Subramanian, U. (2015). Platforms: a multiplicity of research opportunities. *Marketing Letters*, 26(2):141–152.

Vogel, D. (1995). Trading up: Consumer and environmental protection in a global economy.

Vogel, D. (2007). *The market for virtue: The potential and limits of corporate social responsibility*. Brookings Institution Press.

Weinstein, J. and Ambrus, A. (2008). Price dispersion and loss leaders. *Theoretical Economics*, 3(4):525–537.

Wessells, C. R., Johnston, R. J., and Donath, H. (1999). Assessing consumer preferences for ecolabeled seafood: the influence of species, certifier, and household attributes. *American Journal of Agricultural Economics*, 81(5):1084–1089.