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ANALYSIS

Tariff escalation and invasive species damages

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ABSTRACT

We investigate the interface between trade and damages from invasive species (IS), focusing on escalation in tariffs between raw-input and processed-good markets, and its implication for IS-based damages. The current tariff escalation in processed agro-forestry products motivates our analysis. Tariff escalation exacerbates the likelihood of IS introduction by biasing trade flows towards increased trade of primary commodity flows and against processed-product trade. We show that a reduction of tariff escalation, by lowering the tariff on processed goods increases allocative efficiency and reduces IS-based damages, a win-win situation. We also identify policy menus for trade reforms involving tariffs on both raw input and processed goods leading to win-win situations.

1. Introduction

International trade can be an important driver of environmental change, although often indirectly through specialization and expansion or contraction of dirty activities (Beghin et al., 2002). In a few cases trade is the direct vector of the environmental issue as emphasized in recent literature. The latter literature has been focusing on accidental introductions of exotic or invasive species (IS) like pests, weeds, and viruses, by way of international transport of commodities, which is an important aspect of this complex nexus (Costello et al., 2007; Mumford, 2002; Perrings et al., 2000). The trade and environment interface is inherent to the economics of IS since trade is a major vector of propagation of these species. The current economic literature is mostly focused on the "right" criteria to use or the optimal environmental policy response to IS risk[1] (e.g., Binder, 2002; Knowler and Barbier, 2005; Sumner, 2003). A related debate evolves around quarantine and tariffs as a legitimate policy response to phyto-sanitary risk (Anderson et al., 2001; Cook and Fraser, 2002; Kim and Lewandrowski, 2003; Margolis et al., 2005).

Agricultural and forestry imports have always been an important conduit for biological invasions. The agricultural tariff structure with its strong influence on trade flows, is a determinant of IS risk and associated damages. Identifying the linkages between tariff structure, trade, and IS is an important issue to understand the risk of IS introduction. The trade and IS literature

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[1] Risk is defined as the product of a hazard (harmful event) and its likelihood of occurrence.

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is still limited. Using a Heckscher–Ohlin–Samuelson approach, Costello and McAusland (2003) show that lowering agricultural tariffs could potentially lower the damage from exotic species, even though the volume of trade rises. An increase in imports results in a reduced domestic agricultural output. Thus the output available for IS damage is reduced and so is the amount of contaminated land hence mitigating the propagation of IS. Subsequently, McAusland and Costello (2004) compare tariff (duties) and non-tariff regulations (quarantine measures, port inspections) aimed at monitoring IS risks linked to commodity imports. Tariffs are found to be optimal (i.e. the optimal trade tax is positive and increasing with the likelihood of invasion), while inspections are not. Paarlberg and Lee (1998) have also investigated the role of trade policy as a tool for monitoring risks, linking infection risk from imports to a tariff, so that the exporter of an infected product faces a higher tariff than would otherwise be the case. Margolis et al. (2005) investigate the interface between IS introduction via trade and trade barriers, by adding IS-based damages in a political-economy model of tariff formation. The tariff set by a government caring both for general welfare and lobbyists' donations is above the socially optimal level internalizing damages from IS. Unless the damage function from IS is common knowledge, it is impossible to distinguish the protectionist component of the tariff beyond its optimum level.

Our paper departs from this limited literature and fills an important knowledge gap in policy analysis related to trade and IS. We investigate the trade–IS interface, focusing on escalation in tariffs between raw-input and processed-good markets, and its implication for IS-based externalities. The current tariff escalation in processed agro-forestry products motivates our analysis. The paper addresses an overlooked but important aspect of the trade–IS debate. Tariff escalation occurs when tariffs increase with stages of transformation/processing of products into value-added products (e.g., from primary agricultural commodities to food-processing goods). Tariff escalation is a well-established and lasting fact in processing sectors using agro-forestry raw inputs (see Aksoy, 2004; Gallezot, 2003; Lindland, 1997; Rae and Josling, 2003 for recent evidence). Tariff escalation in processed agro-forestry products increases the likelihood of IS introduction by biasing trade flows towards primary commodity flows and against processed-product trade. Even though precise data on the differential risk from agricultural to processed-good imports are limited, the likelihood of pest introduction appears much higher for raw commodities than for highly transformed products. Many nature-based processed final goods are virtually IS free, whereas their raw input is a significant IS vector. For example, rice processing practices such as polishing, have a lethal effect on insects like rice weevils (Lucas and Riudavets, 2000). This suggests that the potentially high risk from weevils invasions related to rice imports could be negligible for milled rice as compared to paddy rice imports. Similarly invasive foreign insects in raw wood products such as the Asian longhorned beetle can be eliminated in final goods since finish milling and kiln drying will kill most wood organisms when done properly. A caveat to this discussion is that the mode of transportation and the handling of imported products can also be a vector of IS introduction independently of the intrinsic characteristics of the traded goods. The occurrence of IS via transportation varies by trade partner, transportation mode, and handling methods (Costello et al., 2007). New methods are addressing IS linked to transportation modes (e.g. deoxygenating of ballast water, and pallet fumigation).

We analytically explore the conjecture that OECD countries could reduce or rebalance their trade of primary products (agricultural commodities, wood) by unilaterally reducing tariffs on processed food and value-added wood products. The composition of their imports would change and the share of processed goods in imports would rise. Two welfare gains ensue. The first one is an allocative gain in markets. The second one refers to the reduction of IS introductions and associated damages. We formalize this intuitive conjecture and establish conditions under which it arises. We translate these conditions into practical policy recommendations. Our specific objectives are to identify policy settings and reforms under which win–win situations arise (reduced trade distortions, reduced IS introduction and damages).

2. Evidence on tariff escalation and IS

2.1. *Tariff escalation*

The economic literature has long established the existence of tariff escalation in the protection structure of commodity and processed-product markets. Protection escalates with the level of processing, in almost all countries and across many products. This escalation hinders the exporter's diversification into value-added and processed products.

There is a well-established older literature on tariff escalation from the late 1970s with the work of Yeats, Finger, and associates (Golub and Finger, 1979; Laird and Yeats, 1987; Yeats, 1984). Tariff escalation is still an enduring feature of agricultural and food-processing trade according to more recent literature, (Aksoy, 2004; Gibson et al., 2001; Lindland, 1997; Rae and Josling, 2003). It continues to be so despite the emergence of preferential agreements in the EU and the US (Gallezot, 2003). Rae and Josling (2003) find that export of processed food from developing economies has been impeded by tariff escalation in the industrialized countries but also within themselves. These findings are based on an older dataset (GTAP 4). Aksoy (2004), and Gibson et al. (2001) find similar patterns with much more recent data.

Telling examples of tariff escalation abound for a wide range of products. Current EU tariffs on milled rice imports into the EU are 80% compared to only 46% for brown rice (Wailes, 2004). Within the EU raw cocoa has a tariff of 0%. At its first processing stage (cocoa butter) it is charged 9%, and at its second stage (cocoa paste) it attracts 21%. The figures for coffee are 4% for the raw product and 11% for its second processing stage, and for soybeans 0% and 6% respectively (Aksoy, 2004). Japan and the US apply comparable tariff structures. Studies show that the proportion of processed products to the least-developed countries' total agricultural produce exports dropped from 27% to 16.9% from 1964 to 1994, while that of the developing countries as a whole during the same period increased from 41.7% to 54.1%. This, however, covers mostly only first-stage processing. If a further processing stage is taken into account, the proportions are much