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Pesticide residues and trade, the apple of discord?

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ABSTRACT

In this paper we study the impact of the regulations on Maximum Residue Levels (MRLs) of pesticides on the trade of apples and pears and related processed products with the aim of understanding how their similarity (or dissimilarity) affect trade. Most studies investigate the impact of sanitary regulations introducing directly in the analysis the MRL put in force in the importing country. They introduce in the analysis the level of the regulation in the importing country without taking into account the rule in force in the exporting country. Rather than focusing on a particular pesticide we take into account the entire list of substances set out by the various regulations. We then build a similarity index and introduce it into a gravity equation to assess the impact of the differences in MRL of pesticides on trade. Results suggest that the differences between regulations matter and may, in some case, hinder trade.

Introduction

Previous research has addressed how food safety standards affect international trade (Henson et al., 2000; Otsuki et al., 2001a,b; Moenius, 2006; Wilson and Otsuki, 2003, 2004; Winchester et al., 2012). Generally, economists try to assess trade losses borne by exporters when importing countries impose stricter regulations. Standards affect trade competitiveness insofar as they imply a cost of compliance on producers which increases the price of a product. Furthermore it is a commonly accepted result in the literature that standards are trade-impeding; at least for agrofood trade from developing countries. However there are some studies that highlight a positive impact on trade. Moenius (2006) has sought to show a positive impact of exporter standards on agrofood trade as they "can establish trust and reduce search costs for consumers". Disdier et al. (2008) report the "dual effects of SPS and TBTs in agriculture which can have no impact on trade or even facilitate it as they carry information and confidence on the imported products". Following Li and Beghin (in press), "the literature shows a wide range of estimated effects from significantly impeding trade to significantly promoting it". Henson and Jaffee (2008) argue that exporters facing strict food safety standards incur a cost of compliance which may be "offset by an array of benefits from the enhancement of food management capacity".

Departing from this argument, we assess the impact of the regulations on Maximum Residue Levels (MRLs) of pesticides on the trade of apples and pears and related processed products. "The MRL is an index which represents the maximum concentration of a pesticide residue (expressed as mg/kg) legally permitted in food commodities and animal feeds. MRL on food imports are set by each country and are imposed as regulatory standards at the border" (Wilson and Otsuki, 2004). We consider that apples and pears are a good case-study as these fruits are affected by numerous phytosanitary treatments and are also among the most traded fruits in the world along with oranges. The objective is to compare the "closeness" of standards. We seek to understand how the similarity (or dissimilarity) in regulations affects trade. Indeed, most studies examine the regulations put in force in the importing country. We assume that what matters is the difference in the tolerance levels of the importing and exporting country. A country which already imposes strict domestic tolerance levels on pesticide residues may have fewer difficulties in complying with the requisites of a stringent importer, given that its producers have already coped with the cost of compliance of maintaining low residue levels. This is done using a similarity index. A similarity index has already been used in the literature to compare regulations on Genetically Modified Organisms (GMOs) (Vigani et al., 2010) or varieties of grapes and wines (Anderson, 2009, 2010) and more recently on food safety standards (Winchester et al., 2012). We use a similar

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measure: the distance associated to Pearson's correlation coefficient to capture the proximity between regulations; then we introduce this index as an exogeneous variable into a gravity model to assess the bilateral impact of MRL of pesticides for forty trading partners (Argentina, Australia, Brazil, Canada, Chile, China, the 27 member states of the European Union (EU), Japan, Korea, Mexico, New Zealand, South Africa, Russia, and the USA). These countries represent more than 80% of traded fresh and processed[2] apples and pears.

The paper is organized as follows. Section 2 presents an overview of the MRL regulations in force in the chosen countries and details the construction of the similarity index. Section 3 deals with data and the econometric model. Section 4 presents the results. Section 5 concludes.

Maximum Residue Levels of pesticides: an unharmonized frame

Pesticide is a generic term which includes all substances used to avoid or control pests. The Food and Agriculture Organization defines it as: "any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport."

Furthermore pesticides are often hazardous substances that cause harmful or deleterious effects on human or animal and plant health through exposure or dietary intake as they tend to stay in the products in which they have been sprayed even when they are peeled or washed. In order to safeguard consumer health and to promote good agricultural practices, maximum levels of residue of pesticides have been set worldwide. Public authorities regulate these levels based on scientific prediction of an acceptable daily intake (ADI) of residues. When science is not able to derive an ADI some countries decide to set their MRL at a very low default level on the basis of the precautionary principle.

International harmonization of MRL does not exist at a global level. Even though the Codex Alimentarius provides MRL, they are not statutory. National authorities hold the sovereignty in fixing these limits. Therefore these legal limits can widely vary across countries. Regarding pesticide residues, there are as many regulations as countries. The number of pesticides registered and the MRL set, greatly vary from one country to another. Some countries have adopted very severe rules with MRL well below the Codex settings and zero-tolerance provisions for disallowed or prohibited substances or for which a MRL cannot be established due to the lack of toxicological data. This is the case of the Russian Federation which was the target of complaints for the stringency of its standards, whereas other countries have decided to adopt international standards set up by the Codex. This is for example the case in Argentina, Brazil, Chile, Korea, New Zealand or South Africa. Another important difference is the list of substances registered in regulations. These provisions are summarized in Table 1. Some countries (e.g. the USA or the EU) have a very detailed list while others provide a limited number of pesticides but zero tolerance provisions or a very low tolerance level for those which are not explicitely listed (as in Australia, Canada or Mexico).

Other countries have an even more complicated system. For example, Korea imposes 236 limits for apples and 210 for pears. If a limit is not set for a product, the Codex standard shall be applied, otherwise the limit for the most similar product is applied. If none of these solutions is applicable, Korea imposes a default value of 0.01 mg/kg.

New Zealand has 112 limits for apples and 107 for pears; codex MRL are recognized for imported food, Australian MRL recognized for food imported from Australia. If no MRL exists, a default MRL of 0.1 mg/kg is used.

In Russia limits are set for 124 pesticides for apples and 122 for pears. In 2008 Russia signed two bilateral memorandums with the EU and Chile. They stipulate that "if there is no Maximum Residue Level for pesticide residues, nitrates and nitrites specified for a certain type of product in the Russian legislation, the MRL for the most similar product included in the same commodity group (as defined in the Codex Alimentarius) is applied, and that if there is no MRL for the commodity group, the MRL of the Codex Alimentarius is used. If there is no MRL of the Codex Alimentarius, the MRL of the country of origin is applied".

The issue of international discrepancies between food safety regulations and their possible impact on trade has already been studied. Wilson and Otsuki (2003) have estimated that adopting the Codex standard on Aflatoxin B1 would raise world cereal and nut exports up to US$ 38.8 millions. Wilson and Otsuki (2004) assessed the impact on trade of harmonizing the MRL of chlorpyrifos on banana trade between 21 exporting countries and 11 OECD importing countries. They found that increasing the stringency of the MRL of this pesticide would have a negative impact on trade.

We investigate the influence of MRL of pesticides on the fresh and processed apples and pears trade flows between 40 trading partners. Countries in the sample have been chosen on the basis of four non exclusive criteria: (i) their share in the international trade of apples and pears; (ii) their consumption level concerning these fruits; (iii) their presumed stringency in regulations; and (iv) the availability of data on the MRL of pesticides they have set. We measure the "regulatory distance" of MRL of pesticides between the countries of the sample and assess how it affects the trade of these two fruits. We assume that concerning MRL, the main point is the similarity between regulations more than the absolute level of stringency and we presume that producers operating in a country which already impose stringent standards would have fewer difficulties in complying with stringent importing standards.

We use a direct measure of standards to compute an index evaluating the (dis)similarity in regulations, assuming that similar regulations may enhance trade while different regulations might impede trade. An index is then built based on the MRL of pesticides set by each country on apples and pears. The main difference from previous studies (Otsuki et al., 2001a,b; Wilson et al., 2003; Wilson and Otsuki, 2004 or Xiong and Beghin, 2011) is that we compute our index based on all pesticides found in those regulations rather than just one or two main substances. In the literature, the similarity index has been used by Anderson (2009, 2010) and Vigani et al. (2010). Vigani et al. (2010) have adapted the Jaffe (1986) methodology to investigate how the similarity or dissimilarity in GMO regulation affects bilateral trade. Their index is computed as the angular separation or uncentered correlation of the vectors of the variables under scrutiny (Jaffe, 1986, p. 986). More recently Winchester et al. (2012) propose a heterogeneity index adapted from the Gower (1971) index of similarity to analyze the trade impact of differences on food safety standards. Both studies show that countries with strong differences in regulations trade less, suggesting that an international harmonization is needed. We use a similar

[2] Dried apples, apple juice and preserved pears.