

Do Sanitary, Phytosanitary, and Quality-related Standards Affect International Trade? Evidence from Chilean Fruit Exports

OSCAR MELO

Pontificia Universidad Católica de Chile, Santiago, Chile

ALEJANDRA ENGLER

University of Talca, Chile

LAURA NAHUEHUAL

Universidad Austral de Chile, Valdivia, Chile

GABRIELA COFRE

University of Talca, Chile

and

JOSÉ BARRENA*

Universidad Austral de Chile, Valdivia, Chile

Summary. — Increasing awareness of food safety issues has led to intensive use of sanitary, phytosanitary and quality-related regulations and standards, imposing a burden on exporting countries worldwide. This study assesses the impact of such regulations and standards estimating a gravity model for Chilean fresh fruit exports that incorporates a stringency-perception index that comprises different dimensions of trade requirements. Our results suggest that an increase in stringency has a negative and substantial effect on exported volumes, and the reduction is higher if stringency increases in developed countries. Results also showed that different dimensions have different effects on trade.

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1. INTRODUCTION

Over the last 20 years, consumer awareness of food safety and health has increased worldwide. At the same time, media coverage of food threats has become more common and comprehensive. This has prompted the development of government food-safety-policy agendas and the establishment of new regulatory bodies that dictate and monitor regulations and standards with which food producers and exporters must comply (Kim, 2009). Consumer pressure to implement stronger liability laws has led to the emergence of private sector food safety and quality-related standards to reduce legal risk for retailers (Amekawa, 2009). Examples of these standards are GlobalGap, Tesco Natures' Choice, and Filières Qualité, among others. Consequently, in recent years official regulations and private sector standards have evolved in parallel, leading to more stringent requisites for producers and exporters covering a wide range of sanitary, phytosanitary and quality-related (SPSQ) regulations and standards, effectively reshaping the governance structure of global agri-food export chains (Henson & Humphrey, 2010; Henson, Masakure, & Cranfield, 2011; Ouma, 2010).

The literature recognizes that the impact of regulations and standards on international trade is varied and complex. Among the positive impacts, various authors conclude that safety regulations provide a common language within the

export chain and a means of differentiation that increases consumer confidence, thus acting as a catalyst for trade (Henson & Humphrey, 2010; Henson & Jaffee, 2008; Henson *et al.*, 2011; Jaffee & Henson, 2004; Nimenya, Ndimira, & de Frahan, 2012; Sheldon, 2012). However, there is also evidence of negative impacts on trade, which are particularly felt by middle- and low-income exporting countries (Chen, Yang, & Findlay, 2008; Disdier, Fontagne, & Mimouni, 2008; Gebrehiwet, Ngqangweni, & Kirstenn, 2007; Jongwanich, 2009; Otsuki, Wilson, & Sewadeh, 2001a, 2001b; Swinnen & Vandermoortele, 2011; Yue, Kuang, Sun, Wu, & Xu, 2010). In turn, regulations and standards, and their stringency, do not evolve uniformly across countries and regions, imposing additional complexities on agri-food export chains (Woods, Thornsbury, Raper, & Weldon, 2006). Therefore, focusing on only one aspect of SPSQ standards can result in misleading estimates of their impact on trade.

Studies by Drogué and DeMaria (2012), Yue *et al.* (2010), Jongwanich (2009), Disdier *et al.* (2008), and Otsuki *et al.* (2001a, 2001b), among others, focused exclusively on the maximum residue limits (MRLs), toxin limits or the number of detentions or notifications, showing that stricter and more

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heterogeneous sanitary and phytosanitary (SPS) standards may have a negative impact on trade, and as Drogué and DeMaria (2012) highlight, the negative impact on trade between countries disappears when they have similar MRL. Nevertheless, there are several relevant dimensions to SPSQ restrictions, and heterogeneity exists (Engler, Nahuelhual, Cofré, & Barrera, 2012; Rau, Shute, & Schuleter, 2010). Engler *et al.* (2012), in a comparative study of such standards for Chilean fresh fruit exports, showed that Latin American countries have more stringent phytosanitary regulations (e.g., quarantine treatments and restricted pests), while Asian countries are more stringent in quality measures, and European countries in MRL requirements. All three standards can restrict trade, although they target different aspects. Studies using notification or detention information to construct indices (Disdier *et al.*, 2008) address the multidimensional character of standards and requirements. However, this type of measure only counts the number of regulations or SPS events while failing to account for the difficulty of compliance (Korinek, Melatos, & Rau, 2008) and therefore remains a partial measure of stringency. To the best of our knowledge, few attempts have been made to separately estimate the impacts of multidimensional SPSQ measures across a range of relevant export markets. The most recent such attempt is Winchester *et al.* (2012), who follow previous research by Burnquist *et al.* (2012) and Rau *et al.* (2010). The authors include different dimensions of official regulations and conformity assessment procedures in the analytical framework and estimations, demonstrating that heterogeneity in official requirements weakly reduce trade. However, the difficulty of compliance remains to be addressed. Moreover, another complexity in estimating the impact using official regulations is the interaction between official regulations and private standards applied by retailers on trade (Henson & Humphrey, 2010). Private sanitary standards target the same aspects as official regulations, and therefore they also have an impact on trade.

Our aim is to shed light on the discussion of the role that SPSQ measures may have as catalysts for or barriers to trade (Jaffee & Henson, 2004; Nimenya *et al.*, 2012; Sheldon, 2012). A novel contribution of the study is the use of a stringency index that comprises different dimensions of trade restrictions (public and private), not only providing a measure of the regulation itself but also the complexity of complying with it.

We use the stringency index in a theoretically motivated gravity model to estimate its impact on trade. Indices have been widely used as explanatory variables in gravity models to estimate the impact of SPS standards and other nontariff barriers (Fontagne, Mimouini, & Pasteels, 2005; Gebrehiwet *et al.*, 2007; Jayasuriya, MacLaren, & Mehta, 2006; Kox & Lejour, 2005; Moenius, 2004; Otsuki *et al.*, 2001a, 2001b; Winchester *et al.*, 2012). However, our approach is innovative, as we quantify the impact of multidimensional regulations and standards in a trade gravity model using exporters' perceptions of their stringency. The use of perceptions allows us to: (i) measure not only the level of the restriction but also the complexity of achieving the required level in the case of quantifiable regulations (i.e., MRL or the number of quarantined pests), (ii) measure the regulations' stringency in the case of nonquantifiable regulations and standards (i.e., GAP or labeling requirements), and (iii) to aggregate multiple regulations and standards that are not readily comparable in terms of their measurement into a single index.

Chile represents an interesting case for exploring the impact of SPSQ standards in the fresh fruit trade because it is a small open economy relying heavily on exports. Although minerals still represent over 50% of total exports, the agricultural sector

generates 10% of that total, fresh fruit being the most important product (ODEPA, 2012). Over the last decade, fruit exports have increased by more than 50% in value, comprising over 75 species and more than 100 destination markets (ODEPA, 2011). One of the main threats to Chilean fruit exporter and producer competitiveness is the need to satisfy the requirements of many clients located in different countries and regions with their own regulations and standards and varying stringency levels that can even be in conflict with each other (e.g., pest and quarantine regulations and MRL). More stringent regulations and standards imply a higher burden on the supply chain, which could lead to the exclusion of some players. We focus on SPSQ dimensions relevant to the fruit export sector: the phytosanitary dimension, which refers to pest quarantine treatment and monitoring; the sanitary dimension, which involves MRL regulations; labeling, marking, and packaging requirements; Good Agricultural Practices (GAPs); and quality standards.

An improved understanding of the impacts of different nontariff barriers on trade (public or private) could enhance the discussion on how SPS standards affect developing countries and guide the design of public policies to address the effect of the most stringent regulations on trade and development. Moreover, it could yield new insights into the impact of regulations as catalysts for or barriers to trade in SPS forums at the World Trade Organization or the Codex Alimentarius Commission.

2. THE CHILEAN FRUIT EXPORT SECTOR

The Chilean agricultural sector is based on exports. The three major export products are fresh table grapes, wine, and fresh apples (ODEPA, 2011). The value of fresh fruit exports increased by 67.3% during 2005–10 (ODEPA, 2011), positioning Chile as the world's leading exporter of table grapes, apples, plums, and blueberries (Asociación Chilena de Fruta Fresca, 2011) and among the top exporters of most Mediterranean climate fruit species. A large share of this increase has been in traditional fruits, such as table grapes and apples, but also in new export products such as avocados, berries, and tangerines. Although the volumes of the new products were initially small, they have grown rapidly (Agosin & Bravo-Ortega, 2009).

Figure 1 depicts the evolution of the participation of different regions in the Chilean export value of fresh fruit. North America remains the largest destination market (the USA alone represents 85% of this market), although its relative importance declined over the last decade, primarily due to the rapid increase in the value of exports to Asia (254%) and South America (203%). However, Europe's share in total Chilean exports has remained relatively stable at approximately 24%.

The increase in Chilean fruit production and exports is due to a number of factors. First, Chile presents exceptional conditions for the production of Mediterranean fruit products. Chile has a mild Mediterranean climate that makes it ideal for the production of temperate climate fruits and can offer off-season production relative to the Northern Hemisphere. Chile has a diverse variety of climatic conditions that allows for an extended harvest period (Agosin & Bravo-Ortega, 2009) and a geographical isolation that results in excellent phytosanitary conditions that are largely free of pests.

The natural conditions offered by Chilean geography and climate have been well exploited by the private sector. The export sector has added new varieties to its export portfolio and

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