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Thirty years of European research on international trade in food and agricultural products

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Abstract – This survey focuses on the economic studies of international trade in agricultural and food products that has been an expanding area of specialisation in the agricultural economics profession in Europe since 1984. The contributions of agricultural economists have been particularly significant in Europe by assessing (i) the compatibility of agricultural policies with the multilateral trade rules and (ii) the macroeconomic impacts of agricultural trade agreements on Northern agricultures and on market access of developed and developing countries. Recent developments have shifted the focus of the international trade from countries and food industries towards food firms and products. The future research agenda will be driven by the needs of policy makers to find solutions to new and pressing issues and in particular growing societal concerns over the environmental, public health, diet composition, animal welfare and climate impacts of food production, and re-emerging food security concerns for developing countries.

Keywords: international trade, agricultural and food products, agricultural policy

JEL Classification : F13, Q17, Q18, F53

1. Introduction

The economic analysis of international trade in agricultural and food products has been an expanding area of specialisation in the agricultural economics profession in Europe since 1984. The start of the period 1984-2014 that we examine coincided with the dawn of the launch of the Uruguay Round of negotiations (1986-1994), intended to grant a central role to the agricultural sector for the first time. During previous rounds of General Agreement on Tariffs and Trade (GATT) negotiations, the contracting parties agreed on the specific nature of the agricultural sector and discounted it from trade liberalisation negotiations. The period then covers the application of the Agreement on Agriculture of the Uruguay Round (1995-2000) followed by the current round of multilateral negotiations, the Doha Development Agenda, initiated in 2001.

Obviously, our survey is a subjective assessment of the development of research areas related to trade in agricultural and food products. We cannot address all contributions by agricultural economists to the study of agricultural trade. Rather, we focus on two research areas where the contributions of agricultural economists have been particularly significant in Europe: (i) the macroeconomic impacts of agricultural trade agreements and (ii) the study of international trade from the viewpoint of food firms. We apologise to researchers whose works we have been unable to cover here because of space constraints.

The rest of the paper is organised as follows. In Section 2, we present the evolution of the topics addressed by agricultural economists in the field of agricultural policy with regard to international trade and/or international agricultural trade negotiations. Section 3 is dedicated to recent developments which have shifted the focus of the international trade from countries and agrifood industries towards food firms and products. In the last section, we discuss potential perspectives for future research.

2. Agricultural economists' analysis of international trade over the last thirty years: an analysis of journals' bibliographic reviews

This section focuses on the economic analyses of agricultural policies implemented in developed countries (OECD), the European Common Agricultural Policy (CAP) in particular, but also the The United States' Farm Bill and Canada's agricultural policy. The study is based on the bibliographic review of the tables of contents of international agricultural economics journals¹ on EconLit as well as three French journals: two agricultural economics journals, *Économie Rurale* and the *Review of Agricultural and Environment Studies* (RAEStud) (formerly *Cahiers d'Économie et Sociologie Rurales – CESR*), and the journal *Économie Internationale*² (formerly *Économie Prospective Internationale*). The national bias of the bibliographic review allows us to highlight, in the case of France, each journal's specificities in addressing the topic.

¹ Essentially: *American Journal of Agricultural Economics* (AJAE), *Canadian Journal of Agricultural Economics* (CJAE), *European Review of Agricultural Economics* (ERA), *EuroChoices*, and *Choices*, as well as the *Journal of Agricultural Economics* (JAE), *Australian Journal of Agricultural and Resource Economics*, *Agricultural Economics*, *Food Policy*, and the *Journal of Common Market Studies*.

² The journal *Économie Internationale* is a French generalist international economics journal published by the Centre d'Études et de Prospectives internationales (CEPII: French research center in international economics).

**In France:
the treatment of the topic varies according to the journal's orientation**

An initial overview of the articles addressing agricultural policy relating to trade and international negotiations published between 1984 and 2014 in French journals shows that the treatment of this topic varies significantly between journals, in keeping with their respective aims and scopes³.

The *RAEStud/CESR* is a journal published by the Institut National de la Recherche Agronomique (INRA: French National Institute for Agricultural Research) since 1984. In the 1980s, the topic of agricultural policies and markets and the global economy was almost non-existent and most of the studies presented in the journal concerned peasant identity or developed socioeconomic analyses of farmers' choices for their farms. The first article with "agricultural policy" in its title appeared in 1987, discussing production economics. It essentially involved an analysis of the CAP's impact on farmers' practices and the effects on the environment (Mahé and Rainelli, 1987). The situation was very different for the French journal *Économie Rurale*, published by the Société Française d'Économie Rurale (SFER: French Society of Rural Economics), a society including both academics and professionals from the agricultural sector. From the early 1980s, articles concerning the global economy or addressing international trade generally focused on the topic of the CAP and discussed the effects of its reforms, especially in France, in a difficult context of managing surpluses and the increased budgetary costs of the CAP for member states⁴.

In the French journal *Économie Internationale*, agriculture is discussed relatively infrequently—the agricultural sector is not addressed more than any other sector of the economy, and the journal gives a lot of coverage to macroeconomic policies (currency, banks, etc.). Articles dealing with agriculture are thus directly linked to current events and the evolution of the CAP on the one hand, and international agricultural trade negotiations on the other.

However, from the 1990s onwards, we see an increasing convergence of the subjects addressed in French and international agricultural economics journals. With each reform, the various authors discuss its expediency and relevance, comparing its format with the desired conciliation of national or regional agricultural interests with the rules of international trade and the rest of the world's trade partners. As the progressive decoupling of the CAP and the Farm Bill gave rise to the substitution of direct payments for the earlier price support, increasingly specific analyses were developed of the internal redistributive effects of the reform (not developed in this

³ This is undoubtedly true for all international journals, but the analysis was limited to the three French journals studied.

⁴ See, for example, special editions on the CAP, issues 163 and 164 (1984), in which approximately twenty articles (not listed here) are devoted to the CAP crisis in global agricultural trade.

section). It is, however, striking to note that analyses of the functioning of agricultural markets and determinants of price variations did not appear in *Économie Internationale* until the very end of the 2000s, after the “food crisis” of 2008 (Capelle-Blancard and Coulibaly, 2011), while the other French and international agricultural journals had already seized upon these issues in the 1990s.

The following section presents the evolution of the topics addressed in all journals, using a chronological approach.

The 1980s: the compatibility of agricultural policies and the GATT

In 1984, Green and Viau took stock of agri-food trade to measure the influence of the European Economic Community (EEC) and the USA respectively, demonstrating that the massive share of the EEC’s agricultural exports could be explained by a protectionist agricultural policy, contestable in the eyes of Europe’s trading partners (Green and Viau, 1984). This European analysis heralded the context of the Uruguay Round’s trade negotiations that focused—for the first time—on its agricultural component: the CAP was very widely criticised by the United States and the Cairns Group that, together, denounced the distorting effect of lower world agricultural prices caused by guaranteed prices, and the relatively unfair competition of European exports financed by the European CAP. In the late 1980s, the journal *CESR* launched a series of case studies to make an international comparison of the economic health of the different European countries’ agricultural sectors, linked to their respective positioning with regard to the CAP: Ireland and Denmark (Matthews, 1987; Walter-Jørgensen, 1987), and the United Kingdom (Burrell, 1988). Agricultural economics studies into the instruments of the CAP then strove to understand the effects of the milk quotas established in the EEC in 1984 (De Crisenoy, 1988; Desbrosses and Hairy, 1988; Perraud and Vertier, 1988), very quickly raising the question of the opportuneness of a market for trading quota (Gouin, 1988) and making international comparisons between European and Canadian experiences (Gouin and Morisset, 1988; Hairy and Perraud, 1988; Hollander, 1989), or intersectorial comparisons to learn from the European steel policy (Laurencin, 1988). However, it was not until events put agriculture at the centre of multilateral trade negotiations at the GATT, that some authors put the issue of the CAP and Europe’s position in the global trade in agri-foods (Phan, 1989) clearly into perspective.

However, from the mid-1980s, the debate on the direction that developed countries’ agricultural policies should take in a context of lower agricultural prices, flourished and increased in European, American and Canadian agricultural economics journals. Thus, in the context of the opening of the Uruguay Round (1986-1994) and the downward trend of agricultural prices, Barbero (1984), Larsen (1984), Harvey and Thomson (1985), Fennell (1985),

Marsh (1987) and de Veer (1987) analysed the CAP's instrumentation in view of its objectives. Similar questions about the future of the agricultural policy were raised in the United States (Bullock, 1984; Dobson, 1984; Heien, 1984; Josling, 1984; Schuh, 1984; Kramer, 1986; Thompson, 1986), Canada (Anderson and Gellner, 1985; Fulton, 1987) and Japan (Honma and Hayami, 1988). In particular, there were a great many studies on the effects of the principle of agricultural price stabilisation, at the centre of developed countries' modern agricultural policies. With regard to the grain industry, whose global markets had declined steeply, Shalit (1984) discussed the cost of the European agricultural policy, while Oleson (1985) and then Meilke and De Gorter (1988) analysed the effects of price support policies on third markets for grain. Similarly, Alston (1986) analysed the impact of the CAP on the international poultry market.

The launch of an agricultural component to the Uruguay Round negotiations plainly generated a growth of agricultural economics research in the field of international economics (De Gorter, 1987; MacLaren, 1991) and fuelled debate on the benefit of maintaining protectionist policies *versus* the liberalisation of international trade in the agricultural sector (De Benedictis *et al.*, 1991). With regard to methodology, De Janvry and Sadoulet (1987) examined the consideration of price stabilisation policies in general equilibrium models. It was at this time that certain technical questions were raised, which are still discussed today, for modelling agricultural markets like the treatment of exchange rates (Chambers and Just, 1986; Orden, 1986; Pagoulatos, 1986) or the choice of hypotheses concerning producers' anticipating prices (Frankel, 1986; Runge and Myers, 1985). This last topic was then the basis for a great number of studies on the consideration of risk in models (Chauveau and Gordon, 1988). Futures markets as an alternative to State intervention to manage market risk was evoked in 1988 by Gemmil (1988), a topic that was widely developed over the following decades.

In a different vein, the agricultural component of the Uruguay Round also led to the emergence of the use of political economics to analyse the issues at stake in agricultural policy reforms and their interaction with ongoing or earlier international trade negotiations (Rausser and Irwin, 1988; Paarlberg, 1989; Swinbank, 1989). This type of analysis continued extensively in the 1990s (Veeman, 1990; MacLaren, 1992; Blandford, 1996; Swinnen and van der Zee, 1993; Brooks, 1996; Olper, 1998; Coleman and Tangermann, 1999).

Bilateral trade agreements also concerned agricultural trade. Swinbank and Ritson (1988) examined the relationship between the European customs union and the Mediterranean basin countries. The issues in the free trade agreement on the horizon between the United States and Canada were studied by Allen and Rossmiller (1987), and Menzie and Prentice (1987) mentioned the importance of taking into consideration the impact of "informal" barriers on agricultural trade between these two countries, anticipating the theme of non-tariff barriers that was to be highly significant in the 2000s.

**The 1990s and 2000s:
modelling and assessing the effects of the reforms for Northern
agricultures...**

With the exception of Boudard (1990) who established a new point about the global forces of agricultural trade, all the other articles published in the journal *CESR* addressing agriculture between 1989 and the early 1990s specifically, contributed either by suggesting avenues of reforming the CAP adapted to the issues that were both internal to Europe and international in the framework of the GATT negotiations, or, using multi-product models, by assessing an agreement's impact on European agriculture (Demarty, 1988; Besnainou, 1989; Guyomard *et al.*, 1991a; Bourget and Becker, 1991; Guyomard and Mahé, 1993). The technical analysis of the instrumentation of the CAP and its effects on markets was thus developed during the 1990s in both French and international journals. Several authors attempted to identify performance determinants of key agricultural sectors and the impact of the agricultural trade policy on their restructuring. As the subject of an intense trade war, particularly between the European Union (EU) and the United States, grain was a central topic in economists' analyses as well as central to the GATT trade negotiations (Blom, 1991; Bureau and Danechvar-Kakhki, 1990; Dronne *et al.*, 1991; Guyomard *et al.*, 1991b; Le Mouël, 1991; Le Roux, 1991; Saint-Amour, 1991). These studies provided the opportunity to develop methods for modelling partial-equilibrium markets as well as the use of time series in econometrics (Dronne and Tavera, 1992b).

Between 1989 and 1993, the Uruguay Round was headed towards a *rapprochement* of European and American positions with regard to the necessary discipline of internal support. Mahé and Tavera (1988) examined the potential *rapprochement* of American and European agricultural policies; Tangermann (1988) evoked international coordination to adapt agricultural policies. Tyers and Anderson (1988) attempted to quantify the global effects of trade liberalisation resulting from the ongoing negotiations.

In the end, the Blair House compromise in 1991 led to a commitment from all the GATT contracting parties to reduce their coupled support by 20%. For the EEC, this commitment translated into the 1992 CAP reform that provided for a 20% reduction of guaranteed prices for products at the heart of the CAP, especially grain. The loss of earnings for farmers was compensated by introducing direct aids. It would seem that this initial challenging of the historic instrumentation of the CAP led agricultural economists to examine the modelling of agricultural price transmission across the EU in a CAP guaranteed price regime (Burton and Ballance, 1992; Surry, 1992) *versus* international market-related price regimes for vegetable oil markets (Dronne and Tavera, 1992a) or pork markets (Bellégo, 1992). The prospect of the Agenda 2000 reform, which emphasised the decoupling of internal support and raised once again the question of the future of milk quotas, made the instrumentation of the CAP the renewed focus of several

studies. Boots and Peerlings (1999) undertook a microeconomic modelling of the establishment of the dual pricing system for milk applied in the Netherlands in a context of a drop in price and quota market, presented as an alternative to the drop in prices expected from the reform. Similarly, Moro and Sckokai (1999) modelled the impact of increased decoupling in the arable sector. In addition to the European situation, Viatte (1990) scanned the programme of planned agricultural reforms for all OECD countries, and several contributions gave an analysis of reforms to undertake on a national level in order to respect the commitments that were on the horizon (de Gorter and Meilke, 1989; Fearne, 1989; Leuck and Kelch, 1989; Hill, 1990; Wornack *et al.*, 1990; Chambers, 1992; McCorriston, 1993). Analyses of the compatibility of the reformed and progressively decoupled agricultural policies of developed countries with trade liberalisation, and the impact on national agricultural sectors, were once again developed a few years later with the effective implementation of the reform programmes during the period 1995-2000 applying the agricultural agreement of the 1994 Uruguay Round (Tangermann, 1996).

In the early and mid-1990s, a new subject emerged in French agricultural economics journals: an assessment of economic integration in the agricultural sector and the lessons to be learned from it for the future expansions of the EU on the horizon. It was at this time that Central and Eastern European countries were entering into the negotiation process with a view of them joining the EU. The EU was used by agricultural economists as a new laboratory to analyse the effects of economic integration, with the agricultural and food industry moving to a single market before any other sector of the economy (Chevassus-Lozza and Gallezot, 1993a; Mahé *et al.*, 1995). Using the available data enabled, on the one hand, the effects of renewed expansion in this sector to be anticipated (Chevassus-Lozza and Unguru, 2002), and on the other, gave rise to a better understanding of the mechanisms of economic integration in general.

Apart from the highlights of the landmark multilateral trade negotiations, the topics of agricultural policies and international trade were far less present. Only Chevassus-Lozza and Gallezot (1993b), and Amable and Chevassus-Lozza (1995) broadened their retrospective of the French agri-food industry's competitiveness in the global market, notably bringing to light the role of companies' strategies and innovation in their international performance. Karp and Perloff (1994) suggested another link between international and industrial economics by presenting dynamic oligopoly models for the international rice and coffee markets. However, between 1993 and 1996, most of the studies concerning agricultural policies addressed agri-environmental questions and natural resource management. It was not until the very beginning of the 2000s that certain authors examined the link between the multifunctionality of agriculture and the development of environmental policies and trade liberalisation (Blandford and Fulponi, 1999; Burrell, 2003; Glebe and Latacz-Lohmann, 2007), and discussed the way in which the multifunctionality of agriculture could become a negotiating tool

for agricultural policies at the World Trade Organisation (WTO) (Anderson, 2000; Latacz-Lohmann and Hodge, 2001; Blandford *et al.*, 2003; Le Cotty and Aumand, 2003; Massot-Marti, 2003; Moreddu, 2003).

Analyses of the compatibility of developed countries' reformed agricultural policies with trade liberalisation, and the impact on national agricultural sectors reappeared with the dawn of a new round of international trade negotiations under the auspices of the WTO, expected in 1999 (the Millennium Round) but eventually effectively launched in 2001 as the Doha Development Agenda (Kennedy and Atici, 1998; Miner, 1998; Pantzios and Taylor, 1998; Satyanarayana, 1998; Veeman, 1998; Josling and Tangermann, 1999; Swinbank, 1999; Bourgeon and Chambers, 2000; Guyomard *et al.*, 2000; Mahé and Laroche Dupraz, 2000; Anderson and Pohl-Nielsen, 2001; Blandford, 2001; Tangermann, 2001 and 2002; Bouamra-Mechemache *et al.*, 2002; Ingco, 2002; Rude and Meilke, 2002; van Meijl and van Tongeren, 2002; Fortenbery, 2004; Mercier and Smith, 2006; Wailes and Rosson, 2008; Buckwell, 2007; Martin and Anderson, 2007). The stalemate of WTO negotiations in the 2000s and the evolution of agricultural market trends led some economists to ponder the issues at stake (Josling, 2005) and the grounds for regulating policies (Swinbank, 2010; Chavas, 2011; Brooks, 2014).

The creation of the WTO also gave rise to intense activity for its Dispute Settlement Body that, outside the round of international trade negotiations, deals with trade conflicts between WTO member countries, which also leads it to establish certain *jurisprudence* with regard to international trade regulations. Swinbank (2005) identified the points concerning the European CAP while Hudson *et al.* (2005) examined the American agricultural policy's compatibility with the WTO's cotton panel.

...But also in terms of market access

From the 1980s onwards, several trailblazer authors examined the impact of the CAP and agricultural trade liberalisation on developing countries (Matthews, 1985; Colman, 1989; Sarris, 1991). In 1992, Sadoulet and de Janvry modelled the effects of trade liberalisation resulting from the agricultural agreement of the Uruguay Round under negotiation. Chilowa (1998) analysed the effects of agricultural trade liberalisation on food security in Malawi. Van Rooyen and Sigwele (1998), McCalla (1999) and Baydildina (2000) examined the role of developing countries' agricultural policies on their own national or regional food security, while in the 2000s Matthews (2002) and Tangermann (2005) continued to contemplate the impact of OECD countries' agricultural policies on developing countries' interests. Mirzaei (2009) examined the repercussions of agricultural trade liberalisation on less developed countries. The concept of poor countries' preference erosion from agricultural trade liberalisation was highlighted several times (Chahed and Droque, 2003).

Furthermore, in addition to the 'classic' studies analysing the effects of trade liberalisation (reducing customs duties, eliminating export subsidies, reducing coupled forms of internal support) and their appropriateness for agriculture, agricultural economists brought to light the effects of other trade barriers on trade.

In 1997, Mahé highlighted the fact that trade barriers could not merely be assumed to be customs duties and instruments for quantitative limits, and that there was a need to ascertain the role of quality standards on agricultural exporters' access to European markets (Mahé, 1997). Gallagher (1998) sought to characterise the effects of non-tariff barriers on the distribution of trade margins. In the early 2000s, the development of international standards in agriculture and the agri-food industry became a new topic of research (Disdier *et al.*, 2008). Codron *et al.* (2000) and Valceschini and Maze (2000) addressed the question in a general way, while Thompson (2000) sought to highlight the ethical questions that this raised. The difficulties in internationally harmonising standards were especially well illustrated by the wine sector for which the territorial logic defended by the International Vine and Wine Office went against the logic of industrial standardisation defended by many members of the WTO (Hanin *et al.*, 2000; Garcia-Parpet, 2001; Steiner, 2001; Charlier, 2007; Marie-Vivien and Thévenod-Mottet, 2007), and for which trade is subject to very strong non-tariff barriers (Arnaud and Giraud-Heraud, 2002). European and American conceptions of the quality of internationally-traded products also clashed because of fairly irreconcilable visions of food safety and the precautionary principle. Fontagné and Mimouni (2001) and Cadot and Suwa-Eisenmann (2003) presented the context and terms of the transatlantic difference of opinion regarding international trade of genetically modified organisms. The respective prerogatives of countries and the WTO with regard to standardising the quality of food products and their compatibility were discussed by Victor and Weiner (2003) and Macé (2002). In concrete terms, Dong and Jensen (2007) attempted to establish the extent to which the sanitary and phytosanitary (SPS) agreement constitutes a barrier to Chinese agricultural exports, and Lively (2013) analysed how technical obstacles to trade hinder American meat exports.⁵

In addition to regulations concerning the quality of agricultural products primarily intended for consumption (sanitary and phytosanitary standards, food safety and environmental standards), which all constitute interesting examples of non-tariff trade barriers, agriculture also constitutes an expedient laboratory due to a very specific inventiveness with regard to the instrumentation of the trade policy in this sector. Some new instruments of trade policy require specific treatment in agricultural trade liberalisation

⁵ Sanitary and phytosanitary agreements are applied to protect human, animal or plant life or health from risks arising from plant pests (insects, bacteria, virus), additives, residues (of pesticides or veterinary drugs), contaminants (heavy metals), toxins or disease causing organisms in foods, beverages or feedstuffs, and diseases carried by animals.

simulation models. This is the case for tariff quotas that combine a double customs duty with a quantitative restriction (Abbott and Paarlberg, 1998; Matthews and Laroche Dupraz, 2001). Another example would be state trading enterprises that adopt an oligopolistic strategic behaviour are in a position to distort global markets (Borzeix and Marette, 2002).

This collection of studies advances the way in which economists approach the use of trade databases, model tariff and non-tariff barriers (Beghin and Bureau, 2001), measure the level of protection enjoyed by the agricultural sector (Bouët *et al.*, 2001), or model markets by using the recent development of gravity methods (Serrano and Pinilla, 2012). All these questions enrich the debate about the impact and limitations of methods to calculate agricultural protection and its effects in terms of opening up trade for the agricultural sector (Messerlin, 2002; Bouët, 2002; Doyon *et al.*, 2002; Gallezot, 2002; Gohin and Levert, 2006; Gohin and Moschini, 2006).

The late 2000s – Renewed concerns about risk and price volatility

It was also during the 2000s that the topic of risk treatment in international agricultural markets appeared and, consequently, the limitations of the representation models of agricultural markets drawn up and used by agricultural economists. Gohin *et al.* (1999) presented the advantages of using Computable General Equilibrium Models (CGEMs) compared with partial equilibrium models. Between 2002 and 2010, we can observe the rapid increase in the use of CGEMs. These models were not only used to assess the economic impact of trade agreements on the agricultural sector or even certain sub-sectors - *e.g.* Gohin and Gautier (2005), who focused on the European beef sector - but were also used in a more general way, by considering the agricultural sector as one sector among many. Boussard and Christensen (1999) drew attention to the fact that the assumptions of most CGEMs do not take market risk into consideration, which can lead them to overestimate potential gains from trade liberalisation (Boussard, 2000; Facchini, 2006). Along the same lines, Piketty and Boussard (2002) showed, with regard to the global sugar market, how taking risk into account in producers' behaviour significantly modifies the results of simulations of this sector's liberalisation.

In broad terms, the role of public intervention in the agricultural sector was the subject of intense debate, between arguments in favour of intervening in markets and arguments in favour of the increased decoupling of subsidies and risk management by private stakeholders. Kim and Chavas (2002) presented a dynamic model of the effects of price support on price volatility. Jacquet and Tyner (2004) compared the role of the State in agricultural markets in the EU and the United States with regard to taking risk management into account to design agricultural policies in a context of progressively decoupling support. Kroll (2007) questioned the grounds for decoupled agricultural policies. An overview of the unresolved questions

about the opportuneness of public intervention in agricultural markets was given by Femenia and Gohin (2010). Schmitz and Schmitz (2012) stressed the complexity of the links between agricultural policy and trade.

Consequently, the effects of reformatting developed countries' agricultural policies in the 2000s once again constituted a topic of research. Koundouri *et al.* (2009) analysed the impact of CAP on farmer's production decisions and risk aversion; Ridier (2004) discussed the expected effects of decoupling subsidies for French beef farmers according to whether risk is taken into account or not in agents' behaviour. In the United States Westcott (2005) assessed the effects of countercyclical payments on price risk for farmers, and concluded on a limited but real effect on production decisions. Also in the United States the arbitration between harvest insurance *versus* income support for farmers was discussed by Collins and Bulut (2011). In 1996 Cordier already had suggested that in a context of increased decoupling of support for agriculture, derivatives markets for agricultural products could take their place in the EU (Cordier, 1996). Along the same lines, Phélippe-Guinvarch and Cordier (2010) pointed out how the development of futures markets could improve risk management in the pork industry. The effective development of futures markets in the 2000s, especially in the grain sector, gave rise to new research fields aiming to understand the functioning and the effects of these new tools (Dawson *et al.*, 2006).

The reversal of global agricultural price trends, rising from the early 2000s and reaching a peak in 2007-2008, led economists to identify the explanatory factors and the appropriate policy responses (Tangermann, 2008; Von Braun, 2008; Timmer, 2010). The "food crisis" gave heightened attention to food security in developing countries (Amid, 2007; Pyakuryal *et al.*, 2010; Laroche D. and Postolle, 2013). The changing context of agricultural markets, combined with price volatility – which is not new, but against which agricultural policies no longer guard when they have been reformed for increased decoupling - re-opened the field for analysis and assessment of price volatility and its determining factors (Klein, 2000; Jin and Kim, 2012).

3. New perspectives on international trade in food products: countries do not trade, firms do

Recent developments in trade theory emphasise that it is individual firms that do the exporting and the importing, not countries. Trade theory of the 1980s and 1990s aimed at explaining intra-industry trade among similar countries (one of the most important trends in world trade in the end of the twentieth century) and its implications for welfare and income distribution. The studies analysing this international trade pattern are based on models initiated by Nobel prize-winner Paul Krugman where scale economies and tastes for different varieties are the key parameters. However, this literature considered that all firms export to all destinations. This ran counter to the

fact that only a fraction of firms in developed and developing economies are involved in international trade (Bernard *et al.*, 2011). For example, in France, the exporting firms in the food industry represent less than 25% of firms and serve eight foreign countries on average (Gaigné and Le Mener, 2014). Melitz (2003) provided a most convincing explanation for the so-called “zero” problem by positing that the productive capacities of firms are heterogeneous and that only firms that are productive enough can overcome an additional sunk cost to export or to import. Only highly productive firms self-select into export markets, and exporters survive longer and pay higher wages relative to non-exporters in developed and developing economies (Tybout, 2003). While standard trade models rely on differences in productivity (or endowments) among countries and industries, export/import fixed costs and heterogeneity in productivity across firms within an industry and a country are the key variables explaining the observed trade patterns.

This new approach of international trade based on sunk costs, product differentiation, and firm heterogeneity has induced a new research agenda which is particularly relevant for the food industry for different reasons.

First, the features of this type of framework fit well with the food industry. On the one hand, the food industry is composed of a large number of firms which are heterogeneous in terms of productivity (Gopinath *et al.*, 2004; Blanchard *et al.*, 2012). On the other hand, these food firms operate under imperfect competition and supply differentiated products (McCorriston, 2002). In contrast, the applicability of the new trade models to primary agriculture is not clear since most farms operate as price takers and do not export directly (farmers do not know whether their products are exported when they choose their level of production).

Second, the main predictions of this literature have been confirmed for the food industry. For example, it has been shown that (i) more productive food firms are larger, more likely to export, and serve more and distant markets (Gaigné and Larue, 2015; Chevassus-Lozza and Latouche, 2012; Vancauteren, 2013a), confirming a self-selection mechanism where only the most productive firms can recover the sunk costs for serving foreign markets and become exporters; and (ii) more efficient firms sell higher-quality goods at higher prices and serve more distant markets (Curzi and Olper, 2012), confirming the relationship between productivity, product quality, and export performance.

Third, the seminal paper by Melitz (2003) can be extended in different ways to study the challenges facing food firms and to deliver predictions from theory which can be tested with firm-level data. In what follows, we provide an overview of recent developments in this direction.

Quality matters in export performance

There has been much interest recently in the introduction of vertical quality differentiation to explain certain regularities found in international trade data

(Hallak and Sivadasan, 2013). For example, Kugler and Verhoogen (2012) allow for vertical differentiation in product quality to explain why larger plants tend to specialise in higher quality products and pay higher input prices. In one variant of their extended Melitz's (2003) model, they consider plant productivity and input quality to be complements in generating output quality, while in a second variant the technology for product quality is given by a Leontief production function, making the level of input quality proportional to a sunk investment in quality. They found evidence that larger, more productive Colombian plants operating in industries in which there is more scope for vertical quality differentiation (proxied by research and development (R&D) and advertising intensity), tend to specialise in higher quality products and pay more for their inputs. Crozet *et al.* (2012) argue that firms that export to a larger number of destinations tend to price their goods more dearly. Their empirical analysis is based on the Champagne industry because it is one for which a direct measure of product quality exists. More generally, a small firm can still export provided that the level of product quality is high enough. This is the so-called Alchian effect that makes trade costs relatively less important for high-quality (higher priced) products than for lower quality ones. Exporting firms sell higher quality products than non-exporters of the same size, a result reminiscent of Falvey's (1979) policy-induced quality upgrading effects. Curzi and Olper (2012) confirm this finding by using an alternative approach to study the relationship between product quality and food export performance across destinations from a panel of Italian food firms. Product quality is proxied by investment intensity, R&D expenditure, product and process innovations, as well as quality standard certifications (the ISO 9000 certification). They found that more efficient firms have higher export performance as they sell higher quality goods at higher prices.

The effect of tariffs and distance on quality has been also the object of several studies recently. Amiti and Khandelwal (2013) argue that tariff reductions induce quality upgrading for firms that are near the "world technology frontier" because quality upgrading can be seen as a means to escape more intense competition.⁶ Having a public standard defining the vertical level of quality entails that some firms are forced to use a higher level of quality than they would like and that the reverse is true for other more productive firms. Since more productive firms cannot deflect competition by increasing quality beyond the standard, they use their productivity advantage to gain market share. Empirical evidence from Olper *et al.* (2014) confirms the strong relationship between market penetration and productivity growth.

⁶ From the importing firms' perspective, a higher specific tariff tends to reduce the relative price of high quality products *vis-à-vis* lower quality products subject to the same unit tax. Distance has similar effects in inducing reductions in the volume of trade and in skewing the composition of trade toward higher quality products. Curzi and Olper (2012) report supportive evidence from Italian firms.

These above results have an interesting policy implication: industrial policy is also important to raise the export performance of firms. For example, national governments should encourage investment in R&D in small- and medium-sized firms to improve their productivity and the quality of their product.

The role of non-tariff measures: public vs. private standards

Chevassus-Lozza and Latouche (2012) showed, from the French exporters' point of view, that the European market remains fragmented despite the absence of tariff barriers. Based on a firm-based trade model, they show empirically that trade barriers continued to exist between EU countries, even though the authors control for the characteristics of firms as well as the foreign market size, linguistic barriers and distance to foreign countries. Their results suggest that non-tariff barriers shape significantly the trade pattern in food products in Europe even if efforts have been made to eliminate technical barriers to trade (TBTs) in the European food industry.⁷ It is not surprising that public and private standards are at the heart of many trade disputes at the WTO in "ag" and "non-ag" sectors and there has been much concern about the misuse or mischaracterisation of public standards as non-tariff barriers (Marette and Beghin, 2010). The 49 cases of TBTs disputes reported on the WTO website are roughly equally split between agricultural, food and beverage products and "non-ag" products. However the majority of the 41 disputes invoking SPS measures involve agricultural products.

Mankind realised a long time ago that food-borne illnesses can be mitigated through effective regulations. Records indicate that Egypt had laws aimed at reducing meat contamination in 2500 BC (Ihegwuagu Nnemeka and Emeje Martins, 2012 p. 422). Today, countries have developed their own set of standards with some guidance from the *Codex Alimentarius* and the WTO's Sanitary and Phytosanitary Agreement. Technological progress has been rapid in food manufacturing and private standards have filled a void in some instances or complemented public standards (Reardon and Farina, 2002).

Public and private quality standards have become increasingly common and controversial in the aftermath of epizootics, like the Bovine Spongiform Encephalopathy (BSE), and well-publicised cases of bacterial contamination, like the 2006 spinach contamination in the United States. Fulponi (2006) reports that major OECD food retailers have responded to such crises by imposing minimum quality standards on an increasingly wide set of food products, even though all interviewed retailers agreed that governments should be responsible for setting minimum standards because of their

⁷ As shown by Vancauteran (2013b), the product standard harmonization in Europe has generated pro-competitive effects, especially on small firms.

scientific capacity. Retailers commonly impose standards on upstream suppliers. The ISO quality management system and the Hazard Analysis Critical Control Point (HACCP) food safety system have been widely adopted by food manufacturers. Many manufacturers have also imposed on their suppliers their own standards to manage quality and food safety along supply chains.

The incidence of public quality standards on welfare and food industry restructuring has received a growing interest in agricultural economics. Gaigné and Larue (2015) provide a general approach to study the impact of public standards on the entry/exit of firms, trade and welfare by developing a general equilibrium model where firms are heterogeneous and choose strategically the quality of their product in a context of international trade. Their work differs from the current literature by focusing on public and private quality standards as public policy instruments and strategic profit-enhancing tools for firms and their effects on industry structure, namely entry/exit, product quality, productivity and pricing issues. For instance, a stricter national public standard (inducing higher fixed and variable production costs for all domestic and foreign producers) harms relatively more domestic firms than foreign ones as the difference in costs between domestic and foreign firms shrinks. Increasing quality standards benefit highly productive foreign firms which gain from the quality-induced exit of less productive domestic and foreign firms. In addition, they show that a higher public standard have an ambiguous effect on trade in accordance with empirical literature. Even though a stricter public standard reduces the mass of exporters, the level of trade is unchanged because of a reallocation of export sales from low productivity firms to more productive firms.

The empirical literature shows that, even if the standards are applied in a non-discriminatory way (between domestic and foreign firms), *ex ante* non-discriminatory measures may affect trade. On the one hand, the demand for foreign products may increase due to a better quality of products or due to a reduction in informational asymmetries between domestic consumers and foreign producers. On the other hand, standards can be “post-discriminatory” agreements and eliminate trade because of an additional cost of production (compliance costs). Such measures may remove product varieties that consumers demand but which do not satisfy the standard. For example, Ferro, Otsuki and Wilson (2015) find that stricter pesticide residue limits tend to increase fixed export costs, thus reducing the probability of agricultural exports. Yet, once exporters adjust their production to comply with the standards of a destination country, those standards do not impact the intensity of exports to that market. Their results suggest also that exporters from the developing countries are more constrained by those standards than their rivals located in developed countries.

In addition, Olper, Curzi and Pacca (2014) report on empirical studies pointing out that public and voluntary private standards have different effects on trade. The former tend to have an adverse effect on trade flows

while the latter tend to boost trade through a regulatory harmonisation effect. For example, Latouche and Chevassus-Lozza (2014) analyse the export performance of food firms certified with two European private standards: the International Food Standard and/or the British Retail Consortium standard (BRC). Certified firms complying with such requirements are able to supply some European retailers with products sold under their retailers' own private label. The authors' analysis reveals that certified firms are among the biggest and most productive firms in the sample. In addition, after controlling for the size and the productivity of firms, the authors show that French firms that adopt the BRC standard and enter the corresponding network enjoy a lower access cost than the other firms to serve foreign markets in the EU.

On the role of backward and forward relationships on food firms' export performance

The analysis of the export performance of the food processing industry cannot ignore its ties to the farm sector and the distribution industry. Recent developments have studied the impact of agricultural prices on the export performance of the food industry processing the primary agricultural products. Agricultural prices fell between the early 1900s and 2006 in Europe (and in the countries specialised in agricultural production) for two main reasons⁸: (i) the rise in productivity at the farm level and (ii), agricultural trade liberalisation (Femenia and Gohin, 2009)⁹. Because agrifood firms intensively use agricultural goods as inputs, one might expect that this decline in relative agricultural prices would allow all food processing firms to increase their export sales and encourage the entry of new firms in world market. However, the story is more complex. Indeed, the fall in the prices of primary agricultural commodities has been heterogeneously transferred to food firms. Because food firms supply differentiated products under imperfect competition, they can manipulate the prices of their products. In addition, the ratio of the purchase cost of intermediate consumption to the total production costs differs among firms belonging to the same industry and grows as the labour productivity of the firm increases (Gaigné and Le Mener, 2014). As a consequence, high productivity firms are more sensitive to a change in the agricultural prices. Hence, the most productive firms gain market shares when the price of common inputs falls. Due to the fixed costs of production, firms need a certain

⁸ In France Butault (2008) revealed a substantial fall in farm commodity prices, which decreased by 47% between 1978 and 2005.

⁹ First, in European and North American countries, some agrifood sectors have been substantially affected by trade reforms. Indeed, in the last two decades, the tariff barriers at European borders for agricultural products, which are primarily processed by agrifood firms, have decreased considerably. For example, between 1995 and 2002, tariff barriers for agricultural products at European borders decreased by 30%, and French imports of agricultural commodities increased by 25% (Bagoulla et al., 2010).

level of sales to make profits, and the shift of market shares away from the least productive (and least profitable) firms forces some of these low productivity firms to exit the market.

From French data Chevassus-Lozza, Gaigné and Le Mener (2013) confirm that larger and more productive food firms can better take advantage of lower agricultural prices due to agricultural trade liberalisation, leading to a reallocation of export sales from small firms to large firms. They also show that the number of food firms active on export markets may fall in response to agricultural trade liberalisation. Hence, agricultural trade liberalisation leads to winners and losers within the food industry.

The food manufacturing sector is also characterised by the use of specialised wholesalers/retailers with various degrees of partial vertical integration to reach the end consumers (Reardon and Timmer, 2007). Wholesalers in the French food industry account for roughly 30% of purchases of agri-food products and 35% of sales of agri-food sectors. In addition, among the 14,000 French food firms identified in France in 2012, about 1,500 food firms have equity shares in a wholesaler or in a retailer (see Gaigné and Larue, 2015). Recent studies have highlighted the important role played by intermediaries in international trade (Chepeta *et al.*, 2015). Gaigné and Larue, 2015 study theoretically and empirically the impact of acquiring equity shares in intermediaries on export performance of food firms. According to the industrial organisation literature, forward integration takes place to align or to reduce transaction costs and double marginalisation, to enhance market power through foreclosure, or to transfer intangible inputs within firms.¹⁰ Owning distribution networks may help a new company to reduce fixed distribution costs associated with exports or to acquire information on foreign markets. The findings in Gaigné and Larue (2015) support the hypothesis of an “intermediary premium” on firms’ export performance. The combination of lower marginal costs and lower markups enables food firms having their own distribution network to cover market entry costs for a larger set of destinations, increasing in turn both their probability to export and their export revenues. In addition, by acquiring equity shares in an intermediary, large food firms boost their export sales at the expense of small firms.

At the end of the food chain, supermarkets have come to dominate the retail distribution of food, especially in major European countries. Chepeta *et al.* (2015) showed that food exports to a given foreign market are impacted by the presence of the domestic retailer in that foreign market. From data on bilateral exports of food products sold in the world’s 100 largest retail companies from 2001–2010 in a large panel of countries, the authors show that a 10% increase in multinational retailers’ sales in a foreign country leads to a 2.1%–2.5% increase in food exports to this destination from the home country.

¹⁰ Foreclosure is the exclusion that results when a downstream (or upstream) firm is denied access to an upstream supplier (or a downstream buyer).

Some final remarks

Understanding the determinants of firms' export and import behaviours is important because those behaviours have implications for international trade patterns, the welfare effects of globalisation and food industry development. The application in the field of food industry of this new research agenda analysing international trade through the behaviour of heterogeneous firms has received little attention and seems more developed in Europe than in the US.¹¹ The papers reviewed in this section certainly represent an important step in the right direction. But further work on export performance is needed in order to establish the design of industrial and trade policies. More research on the import decision and its implications for the domestic food industry is also required.

4. Conclusion and perspectives for future research

The future research agenda for agricultural policy and international agricultural trade and negotiations will be driven by the needs of policy makers to find solutions to new and pressing issues, as well as by advances in data availability and methodologies. In this final section, we first look at likely future directions for research into the impact of agricultural policy on trade, and then at the emerging research agenda in international agricultural trade and negotiations.

The literature review highlighted that much of the previous work of agricultural economists focused on the trade and welfare implications of agricultural policy measures. Agricultural economists have a wealth of experience in analysing the impact of price-based interventions in agricultural markets such as border tariffs, intervention prices, coupled payments and the like. WTO rules now limit the use of market-based interventions in both developed and developing countries, but high bound tariffs and high ceilings for domestic support in many countries mean that they have not disappeared. The spread of standardised and comparable measures of policy support, based on the OECD's Producer and Consumer Support Estimates, but now extending to a growing number of countries in Asia, Africa and Latin America, as well as notifications under the WTO Agreement on Agriculture, generate a number of rich databases which are increasingly used to provide input on policy measures in quantitative economic models as well as reinvigorating research into the political economy of agricultural policies.

However, with agricultural policy reform, market interventions have become less important. Food and agricultural policies increasingly take

¹¹ For example, the works based on Melitz (2003) are not mentioned in the recent survey published in the AJAE special issue entitled "Understanding international trade in agricultural products: one hundred years of contributions by agricultural economists".

the form of regulatory mechanisms, voluntary contractual arrangements or conditional income transfers. Including the increased variety of policy instruments now used by governments in policy models has become more complex. For example, the 2013 CAP reform introduced a new green payment for farmers who follow practices beneficial for the climate and the environment, with one of the required practices being the creation of ecological focus areas on arable farms over a certain size. This measure caused heated political debate between those in favour who focused on the potential environmental benefits of this measure, and those opposed who argued that it would damage Europe's ability to contribute to global food security. Quantifying the precise trade-off is an important empirical research question for agricultural economists. The impact of the significant support that EU farmers receive in the form of direct payments linked to cross-compliance is also contested. While nominally these are decoupled payments, research has shown that they can influence farmers' behaviour through a number of channels, but the quantitative significance of these payments on production and trade particularly for European farmers still remains unclear (Balkhausen *et al.*, 2008).

National societal concerns and agricultural trade

The agricultural policy agenda in Europe and elsewhere is influenced by growing societal concerns over the environmental, public health, diet composition, animal welfare and climate impacts of food production. Stricter regulations in these areas such as, for example, the potential ban in the EU on certain classes of agricultural pesticides if classed as endocrine disrupters, more generous housing standards for poultry and animals, and the continued ban in many EU member states on the use of genetically-modified crops for cultivation, all have the potential to influence producers' costs of production and thus the competitiveness of EU agriculture on global markets. Future research will be important to support efficient policy design to minimise the costs associated with meeting these social objectives. Emerging issues like food waste and the environmental footprint of agricultural production will also warrant further investigation to better assess the international impact of policies to address these concerns.

The issue with the greatest potential to influence the research agenda for agricultural policy economists is undoubtedly climate change. Agriculture will be required both to contribute to the mitigation of greenhouse gas emissions and to adapt to the impact of a warmer and, potentially, more volatile climate. As agriculture, and particularly ruminant production, becomes more constrained by carbon emission limits, attention will focus more on issues of 'carbon leakage' given the possibility that reduced production in Europe will be replaced by greater production in third countries with potentially higher emissions. Whether 'carbon tariffs' designed to level the playing field with producers in countries with laxer climate targets would

be a means to achieve a more socially-optimal outcome or be simply another non-tariff barrier to trade will be widely debated. Agriculture can also help to offset carbon emissions through carbon sequestration, but farmers would expect to be rewarded for altering their agricultural practices to store carbon in this way. The treatment of carbon tariffs and subsidies under WTO rules will require careful analysis in the future.

A further direction in which agricultural and trade policy modelling will evolve will be to take account of the increasing integration of agricultural and energy markets particularly as a result of biofuel policies. Research into the contribution of biofuels and other renewable energies to carbon emission reductions has highlighted the potential for trade-offs between energy and food production. At one level, this simply requires the extension of existing agricultural models to include biofuel demands for agricultural feedstocks, but it is important to take full account of reverse flows of by-products for animal feed as a result of biofuel processing. One of the important policy issues to be addressed by such models is the importance and quantitative significance of indirect land use change. This is a sensitive parameter because it directly feeds into the debate on the greenhouse gas emission savings as a result of biofuel use. Further research to narrow the range of uncertainty around this parameter will make an important contribution to public policy.

European producers are expected to face greater market and production volatility in the coming period, because of the easier spread of animal and plant diseases in a more globalised world, more extreme weather conditions, greater integration with energy markets, increasing exposure to exchange rate risks and greater openness to global market volatility. There has been less work on price volatility and risk management instruments in Europe than in North America in the past, but in future there will be a greater focus also in Europe on the drivers affecting food price volatility. Interest in the impact of exchange rate changes on agricultural trade flows waned in Europe following the introduction of the Eurozone, but this area of research could see a resurgence of interest as the contours of a multi-polar world, including China as well as the United States and Europe, emerge more clearly.

Future directions in evaluating trade agreements

Evaluating the production, trade and welfare impacts of changes in trade policies will also be a core contribution of agricultural economists in the future, with a focus on the design of multilateral trade rules, the impact of regional and preferential trade agreements, and the changing structure of agricultural trade due to the growth in global value chains. Also here, new data sources and new methodologies promise exciting new insights.

As shown in previous sections of this paper, much analytical effort during the 1990s and 2000s was put into developing estimates of the likely economic gains from further multilateral agricultural trade liberalisation. As time went

on, the estimates of the global gains tended to diminish, in part because of better tariff data (using applied rather than bound tariff rates and taking account of existing preferential access arrangements), but also because of ongoing liberalisation often on a unilateral basis (Bouët, 2006). Nonetheless, all studies continued to predict positive overall gains, and most studies showed that these gains would be widely shared but with the potential downside that negative terms of trade effects could be dominant for some regions. Yet multilateral trade negotiations aimed at achieving further agricultural trade liberalisation under the Doha Round have failed to make progress. While opposition to trade liberalisation from producer groups which benefit from protection is certainly a major obstacle to an agreement, many developing countries worry that further trade liberalisation would put their food security at risk.

The relationship between trade and food security is one of the most ploughed furrows in agricultural economics, yet no consensus has been reached, in part because trade and trade liberalisation inevitably result in both winners and losers (*e.g.* consumers gain at the expense of producers with divergent implications for food security) and in part because it can take time before the full response of producers and consumers is observed. We need to know more about the channels by which agricultural trade affects food security through its impact on the elements of food availability, access, utilisation and stability, as well as sustainability. The ways in which agricultural trade affects agricultural productivity also need further elucidation. For many developing countries, opening to trade implies a greater risk of importing global market price volatility. Understanding better price transmission across borders and investigating ways in which developing country producers can be protected from imported volatility without at the same time further destabilising the world market will have a high pay-off for policy-makers.

Ensuring that WTO rules are compatible with developing countries' efforts to promote their food security should also have a high priority. Previous research has emphasised the extent of the policy space available to developing countries under existing rules (Matthews, 2014a). The potential contribution to food security that new instruments, such as a Special Safeguard Mechanism or Special Product status, may have has also been investigated. The spike in world food prices in 2008 focused attention on the role played by export restrictions introduced by major exporters and prompted a debate, not yet concluded, on how best to discipline the use of such restrictions. More recently, controversies over the Bali work programme agreed at the WTO's Ninth Ministerial Council Meeting in Indonesia (2013) have drawn attention to the rules governing public stock-holding at administered prices and, more generally, to the way in which domestic support commitments are measured under the WTO Agreement on Agriculture (Matthews, 2014b). There is a need to better align economic concepts of farm support with the legal definitions in the Agriculture Agreement, and agricultural economists can play an important role in helping to develop better rules. The benefits and

costs of foreign direct investment particularly in agricultural land also need to be more clearly assessed.

Public and private standards

With the multilateral trade negotiations seemingly at a standstill, many countries are turning to regional and bilateral free trade agreements as a way of opening market access. One of the growth areas in agricultural trade policy analysis during the 2000s was the evaluation of the effectiveness of reciprocal and non-reciprocal preferential agreements using gravity models, building on theoretical and empirical breakthroughs in their estimation. While gravity models allow an *ex-post* evaluation, *ex-ante* evaluation requires the use of CGEMs. The challenge for these models is that the major benefits from the new generation of preferential trade agreements, such as the proposed EU-US Transatlantic Trade and Investment Partnership (TTIP), are seen to arise from regulatory convergence and the removal of non-tariff measures (NTMs) rather than from conventional tariff liberalisation. NTMs have been handled in trade models by converting them to *ad valorem* tariff equivalents (AVEs), using either econometric or CGEM-based approaches. For example, in the TTIP negotiations, average agricultural tariffs are 4% and 14% for the US and EU respectively, but the AVE of NTMs has been estimated as high as 70% and 50%, respectively (ECORYS, 2009). However, there is much scepticism about the magnitude of the NTM AVEs and much more work is required to make them more robust (Korinek *et al.*, 2008).

The EU food supply chain is becoming more and more complex as traded agricultural commodities increasingly move through global supply chains where lead firms, often major supermarkets but also food processors, exercise vertical coordination. A key role in the governance of these supply chains is played by standards, not only product standards but also standards about the way products are grown, harvested, processed and transported. The EU food market is characterised by a proliferation of such initiatives in the two last decades. The trade effects of increased vertical coordination are disputed. Two views are found in the literature (Shepherd and Wilson, 2013). Even where not intended as explicitly protectionist measures, standards nonetheless have the potential to keep foreign producers out of domestic markets by imposing fixed and variable adaptation costs—the so called “standards as barriers” view. On the other hand, standards can also act as a catalyst for production upgrading, as resources shift to producers able to make the required technical adaptations (the “standards as catalyst” view) and integration into a global supply chain reduces the cost of exporting. Much more empirical work is required to assess the conditions under which these alternative views may be valid.

Data and methodology advances

The future research agenda for agricultural economists with regard to agricultural policy and international trade will be driven not only by changes in the policy questions to be addressed but also by the availability of new methodologies and new data. Much of the recent work in applied trade policy analysis has been driven by theoretical and methodological advances, such as the development of the firm-level theory of trade (discussed in Section 3), new indices to measure trade restrictiveness, the reconstituted gravity model and the much easier access to CGEMs (Piermartini and Teh, 2009). Future work should continue to improve the ability to estimate the impact of NTMs, as well as to capture the dynamic effects of trade liberalisation. Many observers have pointed out how dependent modellers are on recycling assumptions about key parameter values in model calibration (Cahill, 2010), so work on validating these parameter values should be encouraged.

The potential impact of new data sets cannot be overemphasised. For example, the availability of bilateral trade data at detailed tariff line level together with the relevant tariffs, allows a much more discriminating analysis of the impact of preferences than older empirical studies which simulated preference schemes with a dummy variable. Inventories of non-tariff measures are also becoming more complete. New OECD data (the OECD Trade by Enterprise Characteristics database), which breaks down international trade in goods by different categories of enterprises, provides a more solid basis for policy analyses that explore which types of firms are responsible for international trade in goods. Detailed firm-level trade data on actual shipments, by exporting and importing firms, with specific product details and their port of origin and entry are also now publicly available. Ultimately, researchers may be able to disaggregate trade flows not only by tariff line but using real product codes, the so-called Global Trade Item numbers (GTINs) that are used routinely by companies trading along the supply chain. As Cernat (2014) explains: “Such GTIN-based trade statistics do not just simply record “milk exports” but would contain many product attributes and differentiate for instance organic, low-fat goat milk with added vitamin D in a 6-pack of 0.33 l plastic bottles by firm A from a 1-liter regular soymilk carton by company B”. Cernat believes that making more systematic use of publicly available firm-level trade data could help to improve the accuracy of trade policy analysis. The confluence of policy issues with a high political salience, improved methodologies and new data sets underlines the vibrant future research agenda for agricultural policy and international trade negotiations.

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