Chapter 2
Toward "Trade Policy Analysis 2.0": From National Comparative Advantage to Firm-Level Trade Data

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Abstract This chapter makes the case for the need to "upgrade" current analytical tools used for trade policy analysis and complement them with more detailed firm-level data. Such an upgrade should be based on the latest intellectual advancements in trade theories and the latest firm-level trade statistics that are now becoming widely available. An upgraded "Trade Policy Analysis 2.0" could contribute to several trade policy priorities and to a better understanding of the benefits from international trade for firm competitiveness, job creation, and consumer welfare.

Keywords Trade policy • International trade organizations • Trade and labor market interactions • Trade forecasting and simulation

2.1 Trade Realities and Theories: The Role of Globalization and Technological Progress

International trade is present in everyone's life. Be it the fruits we have at breakfast or the electrical devices we use, our daily routine depends on complex trade flows and production processes scattered across multiple countries that hardly get noticed by the final consumer. To cater to a globalized economy, thousands of companies around the world sign business deals every day, either as exporters or importers. Trade flows have evolved over time and are becoming increasingly intricate, with countless parts and components crossing multiple borders at different stages of production along global supply chains, before reaching the final consumer.

International trade was revolutionized by the introduction of the standardized container, which led to a considerable reduction in shipping costs (Levinson 2006). An entire logistics industry is in place to make sure over 30 million containers are

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shipped seamlessly annually so that our daily routines unfold smoothly. The revolutionary technological changes did not stop with the invention of the container. Today, a limited but growing number of these containers are equipped with sophisticated global tracking technologies (GPS, radio frequency identification, satellite communications, etc.) that can locate products and shipments in real time, optimizing supply chains and inventories for the ultimate benefit of consumers. 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 publicly available. The data does not stop at the docks: producers can track in real-time their stocks on each supermarket's shelf and plan the next shipment to make sure consumers do not face shortages, while avoiding waste and costly warehousing. Firms engaged in global supply chains and those specialized in logistics have developed detailed classifications that allow the identification of producers, the location of their production facilities and the most detailed product characteristics about brands, quantity (weight, number of units, pack sizes), quality (concentration levels of various key ingredients) as well as pricing, delivery, and invoicing information.

These "globalization examples" are meant to offer a quick snapshot of the realities of world trade, as it happens. But is this multifaceted reality fully accounted for in trade theories and well reflected in the statistical and analytical support available to trade policy makers?

Over time, trade theories have made major strides in capturing such diverse realities. For a long period, trade theory was elaborated not so much on the trading firm (exporter/importer) but on much more aggregate concepts and had to assume a number of simplifying assumptions. The traditional trade theory was based on concepts like national comparative advantage or factor endowments. For decades, trade analyses were run based on the Ricardian and Heckscher-Ohlin models. In those models it was not really the firms but nations that engaged in trade. The "new trade theory" developed by Krugman (1979) won him the Nobel Prize and introduced new useful concepts that brought theory closer to the realities of international trade: consumers love product variety and firms produce differentiated products under increasing returns to scale. For policy and empirical purposes, "new trade theory" models and analyses added useful insights but they did not really distinguish between firms within sectors in terms of their characteristics and ability to export. It was only with the emergence of "new new trade theory," articulated by Melitz (2003) and subsequently developed by other trade economists (e.g., Bernard et al. 2007), that the firms became central in explaining trade flows, just as in the generic examples offered above.

In a less dramatic way than the containerization of international trade, the "new new trade theory" represented a "revolution" for trade theories and their ability to capture the detailed firm-level trade reality, by putting an emphasis on the central role of firm heterogeneity and by using newly available firm-level trade datasets. Several interesting findings came to the fore based on these new theoretical and empirical analyses. For instance, it became much clearer that not all firms can become exporters—only those that have a certain productivity threshold can engage successfully in trade. Also noteworthy, trade liberalization leads to Schumpeterian

"creative destruction" and increases average sectoral productivity but exporting also involves considerable sunk costs and therefore only a small proportion of total existing firms succeed to engage in trade.

The new firm-level trade datasets that are already publicly available allow researchers to identify and analyze each and every shipment of the 30 million containers of trade around the world by carrier, port of departure and destination, country, description of products and commodities at the most detailed level (e.g., at the 8- or 10-digit national tariff line level), equipment type, size, weight, value, currency used, shipper and consignee's street, city, zip code, plus any other detail contained in the entire bill of lading. One can also match this information with the most important firm characteristics (e.g., from publicly available balance sheets) that have an impact on export performance. So thanks to the new firm-level trade data "revolution," available trade models come nowadays much closer to business realities.

But what difference did all these major improvements—either in trade realities or theories—make for trade policy analysis?

The answer depends perhaps on a case by case basis. However, by and large, it is fair to say that such technological and analytical developments offer an untapped analytical potential that could lead to better informed trade policy making. It is time trade policy analysis moves closer to where the action is and benefits more from firm-level trade data and related developments. For some, such benefits may not be obvious and therefore a few examples may help to illustrate this point. While it is true that trade policy is by nature conducted at an aggregate level, whereby various trade rules cannot be adapted to the specific needs and economic circumstances found at firm-level, it is also true that trade negotiations cannot remove all possible trade barriers, notably in many key areas like non-tariff measures covered by European Union (EU) deep and comprehensive free trade negotiations. Prioritization of those non-tariff measures maximizing the benefits of EU trade policy in line with the objectives set out by EU leaders would therefore benefit from having access to the wealth of information that firm-level trade data has generated. Tariffs are well known and their reduction is subject to little uncertainty in FTA negotiations, but insufficient information regarding the most difficult trade barriers, notably non-tariff barriers (NTBs), is still a prevalent characteristic of trade policymaking.

The traditional analytical tools we have at our disposal (such as the standard computable general equilibrium [GE] models widely used for trade policy analysis) have great strengths, notably at estimating the macroeconomic effects of trade policy, but they remain imperfect. Current tools tend to work well at the aggregate level and whenever more detailed analyses are necessary they tend to be difficult and expensive.[1] For instance, firm-level surveys that may provide an indication of the incidence of non-tariff barriers across different types of firms (small vs. large,

[1] Partial equilibrium modeling and econometric analyses can be carried out at the tariff line level but they still work on aggregate data and contain a lot of heterogeneity, either in terms of specific products or firm characteristics.

existing vs. potential exporters) are difficult to run on a representative sample. Econometric estimates of the costs of non-tariff barriers may offer an alternative to firm-level surveys, but such estimates are not always robust or accurate enough for policymaking purposes.[2] Current tools are imperfect not only with regard to ex-ante policy impact assessments but also when it comes to monitoring and ex-post evaluation of trade agreements.

2.2 The New Political Challenges: The Blurring Line Between Trade and Other Domestic Economic Policies

Firm-level theoretical and empirical analyses have demonstrated that export performance is critically determined by firm characteristics such as ability to innovate, productivity, firm size, corporate governance, skills and labor market, the overall domestic business environment, etc. But few, if any, trade policy analyses have been conducted at firm-level. Moreover, there is growing consensus that trade policy needs to be well embedded within this broader set of economic policies, as recently reiterated by EU political leaders. Therefore, firm-level trade data that are becoming more common provide a unique opportunity for trade policy analyses to contribute to the operationalization of new political imperatives and for trade policy to act as a strong engine for growth and job creation in Europe.

Such political priorities can be better matched by new evidence-based policy recommendations and initiatives that can benefit from the most comprehensive databases with trade flows at the firm level. Firm-level trade statistics may be the new frontier of enhanced, data-driven trade policy making, similar to recent analytical developments underpinning other public policies and many corporate decisions. Big data is making major inroads in economics (Einav and Levin 2014) and produced already a shift in the way policy decisions are made, with major improvements in the efficiency of such policies, working smarter, and doing more with fewer resources (e.g. from detecting flu outbreaks more quickly to improving public health risk assessments, or crime prevention). Nowadays farmers use satellite data to decide which crops to plant, firms launch new products based on social media trends, and firms can organize a global supply chain on cloud computing.[3]

[2] The Transatlantic Trade and Investment Partnership negotiations—arguably the most important EU bilateral trade policy initiative—offer a good example. As part of its regular stakeholder consultation process, the European Commission has launched an online survey to gather additional firm-level information on non-tariff barriers facing EU exports to the US. But despite the high visibility of these negotiations, it only triggered a small response rate from among the 700,000 extra-EU exporters and many other potential exporters.

[3] Various press articles also reported recently that corporate analysts are using real-time satellite imagery of supermarket parking lots to predict future sales and corporate earnings, detailed imagery of cropland around the planet to predict grain prices, or truck traffic data to and from key production facilities to predict future export flows.

Even in the developing world, specialists analyzing newly available firm-level data started to formulate better-informed policy advice (see for instance Bhagwati and Panagariya 2012) and concrete policy responses to food shortages, drought, epidemics, and educational gaps in poor countries.[4] The European Commission has already identified firm-level statistics and "big data" as a major EU policy priority. Eurostat has worked since 2008 (Decision No 1297/2008/EC) on the Programme for the Modernisation of European Enterprise and Trade Statistics on "connecting the dots" at the firm level between national and EU sources.[5] The United Nations has also launched a program on big data for official statistics.

Firm-level trade data have the potential to improve trade policy analysis just as these new datasets led to major improvements in other public policies. Firm-level trade data can bring benefits at all levels of analytical support to trade policymaking. Ex-ante analyses may benefit from more specific data offering additional insights to current analytical tools. For narrowly defined policy questions that have small or no major macroeconomic or "general equilibrium" effects, firm-level analyses could better inform policy makers in the middle of difficult negotiations (e.g., knowing whether a particular non-tariff barrier is more important than another, deciding which NTB cost reduction mechanism leads to a balanced outcome that maximizes firm-level benefits without compromising on other societal objectives, etc.) Monitoring the implementation of various trade policy instruments can also be greatly facilitated by comprehensive firm-level trade statistics. The recent example of the EU–Republic of Korea FTA demonstrated that the more ambitious a deep and comprehensive FTA is, the more resource intensive its implementation becomes, notably on those thorny issues of regulatory cost reductions where information is imperfect and difficult to obtain.

Firm-level trade data allows a more refined assessment of the future impact of trade policy initiatives on the extensive margin of newly exporting firms. Trade policy analyses need to pay more attention to firms that are prevented from expanding abroad by existing barriers and could become successful exporters once trade barriers will have been reduced by trade negotiators. Since a large proportion of EU exporters sell their products to only a handful of markets outside the EU (Cernat et al. 2014), such firms are quite vulnerable to unforeseen trade policy changes in their trading partners. Entry and exit into a particular export market can be quite costly, and export volatility at the firm level can be a major deterrent of national export performance. Hence "the importance of being earnest" in maintaining a constant presence in export markets may actually involve large sunk costs. Trade policy can reduce such entry sunk costs, but it would be important

[4] For interesting anecdotal evidence on the use of mobile phone data in designing public policy responses in developing countries, see Talbot (2013).

[5] The European Commission has also launched under the FP7 program a "Policy Making 2.0" research project aimed at providing concrete recommendations on the potential use of existing and future ICT and "big data" technologies for policy makers to improve their work.

to know better which specific measures are most costly. This is typically done through firm-level surveys. However, surveys can only be used most effectively when combined with a comprehensive firm-level trade database.

Firm-level trade statistics can also improve ex-post assessments. A typical question raised about the benefits of FTAs is how many jobs were actually created as a result of increased bilateral trade. Current analytical tools have several limitations in establishing a causal relationship between the existence of FTAs and labor market changes (new job creation, job reallocation within and across sectors, etc.) Some policy instruments, such as the European Globalization Fund (EGF) are specifically designed to deal with adjustment costs and facilitate the reinsertion in the labor market of those negatively affected by globalization. In itself, the EGF enhances the coherence and synergies between trade and other EU policy instruments. Knowing the firm-level characteristics of those EU enterprises negatively affected by globalization and the key factors that facilitated the re-insertion of workers benefited from EGF measures can provide valuable lead indicators and best practices that can feed back into trade policymaking.

Last but not least, detailed firm-level trade data might also improve communication, leading to a more meaningful engagement with stakeholders and thus reduce public misperceptions about trade policy. In the current political context, public support for trade policy is often elusive, making the case for the ongoing mega-FTA negotiations with strategic partners politically more difficult than it should be. Arguing the case for trade at the firm level would address these misconceptions. For many stakeholders, current EU trade policy initiatives are not always seen as an important booster to economic recovery in Europe. Certain stakeholders are wary of adverse consequences and the public debate around trade policy is usually monopolized by certain narrow topics. A broad-based, firm-level approach to trade policy might offer a more fact-based dialogue.

Firm-level trade data would quickly generate a rich dataset since Europe has over 700,000 exporting firms, with the vast majority of them being small and medium-sized enterprises (Cernat et al. 2014). Trade policy analyses are hardly sufficiently disaggregated for individuals and communities to relate to the predicted impacts. For instance, in the case of products already fully liberalized under the EU–Republic of Korea FTA (KOREU), EU exports increased much more than the same product exports to countries with which Europe does not have an FTA. More of this type of detailed evidence is needed to show that EU FTAs are well negotiated and that trade policy can provide tangible benefits for EU economic recovery within a short period of time. And such an increase was not at the expense of lower quality product standards or other societal costs. But individuals find it hard to relate strongly with abstract trade gains that are not directly linked to their daily lives. Why should a particular country or societal group be in favor of trade liberalization if there is little information about what trade policy can bring to *them* as opposed to *Europe*?

If firm-level trade statistics were used more systematically, then trade policy could "come to your town." Such firm-level trade statistics would, for instance, be

able to indicate clearly how many firms in a particular community find it easier to export to or import from the Republic of Korea as a result of KOREU, or how much their exports to the Republic of Korea increased once the FTA was implemented. Firm-level trade statistics might bring familiar logos and company names into the picture and citizens would relate more closely with exporting firms where either they or people they know personally would probably be employees. Such types of firm-level trade statistics could also facilitate the identification of case studies of interested enterprises willing to advocate how they managed to become exporters, increase sales, or expand labor force.

2.3 Toward Trade Policy Analysis 2.0: Taking Advantage of Existing Firm-Level Trade Data

One of the main objectives of EU trade policy is to create new business opportunities for the over two million importing and exporting firms in Europe. If those firms, and the tens of millions of workers they employ, are the primary beneficiaries of EU trade policy, it would be a major improvement in the robustness of trade policy analysis if "the firm" was the underlying unit of analysis. Therefore, the first thing one should do is to take advantage of the firm-level trade data made available in the public domain by customs administrations around the world. These databases are already compiled and exploited by trade facilitation services companies that try to improve business contacts and promote transparency on new market opportunities for potential exporters.

Trade policy makers can also tap into these publicly available databases. The new databases with trade in goods and firm characteristics that Eurostat has been compiling for a while (and the intention to improve similar data for trade in services) offer new analytical potential. The data available from Eurostat Trade by Enterprise Characteristics (TEC) database suggests that 60 % of all exporting firms depend on exports to only one or two extra-EU markets (Cernat et al. 2014). Having detailed information on the actual exporting companies, the products exported, and their destinations contribute to shaping future trade policy priorities at different levels (both negotiations and implementation priorities).

Based on recent advances in macro-statistics and the creation of new databases (e.g., the World Input–Output Database and Trade in Value Added), GVCs have become a major theme in trade policy discussions, but without, so far, generating major trade policy changes. Partly the reason for this was the inability of current analytical tools to offer detailed insights, given the very aggregate nature of these macro-statistical databases. But there is good news coming from real global supply chains. Firms managing supply chains rely on various standard, universal product codes and global databases developed by the logistics industry that allows GVC participating firms (e.g., suppliers of components and final assembly firms) to know exactly the brand, variety, quality, dimensions, essential product characteristics,

and price range of billions of traded products. Such detailed databases could considerably transform the way trade policy analysis is conducted. In "Trade Policy Analysis 2.0" the unit of analysis shifts from countries and sectors to exporting and importing firms. Once the actual exporters and importers become the units of analysis, firm-level trade data will also provide a much more refined product disaggregation.

Currently, the most disaggregate cross-country international trade statistics use the Harmonised System (HS) classification at six digits. National customs have products defined even more narrowly at 8- or 10-digit tariff line levels, for instance, but these product codes differ across countries and it is usually hard to come up with accurate concordance tables and do proper comprehensive analysis beyond the HS6 product categories. Trade defense actions or WTO trade disputes, let alone sensitive tariff lines in bilateral or plurilateral negotiations, often boil down to very detailed products for which HS6 trade statistics are too aggregate. Within each HS6 code, product differentiation is considerable: the same HS6 code could cover for instance an entire shelf in supermarkets, despite huge variety in product quality or functionality.

In Trade Policy Analysis 2.0, the unit of analysis moves from HS6 product classification to real product codes, the so-called Global Trade Item Numbers (GTINs) that are used routinely by companies trading along the supply chain. Such GTIN-based trade statistics do not just simply record "milk exports," but would contain many product attributes and differentiate for, 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-l regular soymilk carton by company B. Similarly such GTIN trade statistics can differentiate between an entire car brake system or just the brake disks, pads, cylinders, etc. Unlike traditional trade statistics it will not only indicate country of origin but also the manufacturer, quality levels (basic vs. premium quality brand, original equipment manufacturer), and engine or transmission type (if relevant).

A growing number of academic articles have already been published using such barcode retail data, but despite important analytical potential, very few have actually addressed questions relevant for trade policy analysis. Knowing, for instance why hundreds or thousands of companies export a product successfully in one country and not in others (or why some EU exporters do not take advantage of preferential trade rules in FTAs) may prove extremely useful for creating new business opportunities and generating more jobs in Europe. Sometimes there can be good economic reasons for such export gaps and the non-existence of trade flows is no anomaly. Other times, however, trade is perfectly feasible, but transactions are hampered by trade barriers that can be tackled by trade negotiators. To detect such actionable trade gaps from aggregate trade statistics is quite difficult. Experience has shown that obtaining detailed and accurate information from a large, representative number of exporters that spontaneously manifest themselves whenever they are faced with trade barriers is equally difficult. Therefore, having a more systematic use of publicly available firm-level trade data would improve the accuracy of

trade policy analysis. In return, more "personalized" trade policy advice at firm level has the potential to improve business awareness and increase exports in existing and new markets, thus contributing directly to a more rapid economic recovery and job creation in Europe, making a stronger case for the importance of EU trade policy.

Firm-level data could also improve our understanding in other trade-related policy areas. The overwhelming role of international investment in generating the current levels of globalization is generally absent from the standard models used for policy assessment. The interplay between trade and investment negotiations therefore requires a similarly rigorous analytical approach. The important role of foreign affiliates sales (Lakatos and Fukui 2013) and the fact that two-way traders are generally more productive than those firms engaged only in exporting (Kasahara and Lapman 2013) are only two additional examples that call for the need to better understand which import barriers actually dampen EU export competitiveness. The major role of global supply chains in shaping trade patterns also triggered a debate about the need for a major upgrade in multilateral trade toward a new "WTO 2.0" set of rules dealing with the intricate interaction between investment, services, and intellectual property (Baldwin 2012). The growing importance of intermediate services exported "in a box" as part of processed goods (Cernat and Kutlina-Dimitrova 2014) also requires further reflection on how to bridge the various gaps between General Agreement on Trade in Services and General Agreement on Tariffs and Trade rules.

The conditions under which export-driven productivity increases can occur (and their expected magnitude) are important elements for policy makers. The status of direct exporters as opposed to indirect exporters (those that export through wholesalers and intermediaries) may have an impact on productivity gains and the existing firm-level trade statistics can distinguish between direct exporters and wholesalers, thus narrowing down the impact of trade policy to different types of companies engaged in international trade.

Furthermore, unlike the parameters underlying more aggregate trade analyses, not all companies in a sector will face similar opportunities. In each economic sector in fact, whether offensive or defensive vis-à-vis particular trade negotiations, there will be firms that stand to gain and others that may be negatively affected. The internal disagreement between such firms within various sectoral associations makes industry consensus in favor of trade policy more difficult. The same split assessment can occur not only in terms of support for trade liberalization, generally speaking, but also on more detailed and technical issues such as rules of origin or the estimation of direct and indirect spillover effects from trade liberalization, notably in the case of NTB reductions.

Firm-level trade statistics could lead to a much better calibration of current trade policy in line with global value chains, an issue of growing importance. Knowing for instance that a large share of exporting firms to a particular FTA partner require considerable inputs from a third country would then allow a much better understanding of the specificities of rules of origin that should be put in place to ensure a

satisfactory preference utilization rate. Current rules of origin and their conditions on what is an originating product for the purposes of an FTA may not seem constraining. But beyond macro-level figures, the reality can vary greatly across sectors and products, whenever production is fragmented globally. Applying such common metrics across all FTA negotiations will generate a good data-driven comparative framework. Firm-level trade statistics and greater feedback from a large sample of EU exporters would allow greater confidence that each FTA provision is well equipped to deliver the best opportunities for trading firms today and in the future. New micro-policy indicators (e.g., identifying regional exporting clusters, detailed GVC linkages at the firm level, the role of product standards, or procedural bottlenecks, etc.) can be derived to improve monitoring and implementation of various trade policy instruments. These micro-indicators based on detailed firm-level data could be cross-linked and corroborated to ensure greater coherence between current and future trade policy initiatives.

The "new new trade theory" models also make the important distinction between extensive and intensive margins in international trade. Currently, the impact of trade policy initiatives is implicitly based most of the time on the intensive margin. But in a multi-product, firm-level trade model, the effects can be more complex: new product varieties and new exporting firms (large and small) may be part of international trade. The leap toward "Trade Policy Analysis 2.0" does not mean that current analytical tools should be discarded, quite the contrary. The current CGE trade models and their standard Armington structure offer a solid analytical basis and contain the seeds for their own evolutionary course toward greater policy relevance. New theoretical discussions and the wealth of empirical firm-level data[6] used to enhance the gravity-model and extend the standard CGE model (e.g., using partial equilibrium–CGE combinations or other types of micro-simulation models embedded in a CGE approach) make the goal of building an integrated CGE model at the firm level well-suited for policy analysis and look more attainable than a couple of years ago.

The introduction of containers revolutionized shipping and reduced international trade costs. The introduction of firm characteristics into trade models revolutionized trade theory, and the increasing availability of firm-level data revolutionized empirical trade analyses. Finally, there is massive trade information "by container" being made available and the big data approach stands to revolutionize economics, as well as public policies and corporate strategies. In some domains, this big data driven approach is already becoming part of the mainstream. Will all these fundamental factors revolutionize the analytical support to trade policymaking toward a more systematic use of firm-level trade data? Based on the arguments presented above, most probably the question is not "whether," but "when."

[6] See for instance Mayer et al. (2011) and the research work program funded by the European Commission under the EFIGE project.

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