PAST AND PRESENT ISSUES IN TRADE STATISTICS
AN INSIDER'S VIEW

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Trade statistics are perhaps among the oldest official statistics alongside population censuses. Until very recently, trade statistics remained closely tied to their original eighteenth-century purpose of informing the Prince about taxes collected by customs officials; more recently in the mid-twentieth century, they came to serve also in establishing the National Accounts required by the State for managing the economy. Then the world economy became truly global. Trade statistics had to become trans-national and multi-dimensional if they were to be representative of the twenty-first century economic system. The methodology has matured in the 2010s; in the process, trade statistics have gone beyond their initial purpose of serving the State to become a tool for understanding the complex relationships linking various industries across different borders. The resulting information is increasingly used to assess not only the economic dimensions of trade but also its implications in terms of employment and the environment.

Keywords: administrative history, international trade statistics, globalization, economic history

This special issue discusses the "birth" of official statistics, and trade statistics are among the oldest official statistics available. This paper provides some perspective on how official public trade statisticians perceive the nature of their activities and their history. It also reflects on the current debates among official statisticians and how the changes in their practices and conceptions can inform our views on past statistics. The final section highlights the changes now taking place in the theory and practice of trade statistics.

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1. Past approaches to official statistics

Modern statistics, as a science, was born in the seventeenth century with the rise of experimental approaches, including the interest in repeatable experiments and control groups (Devlin, 2008; Hacking, 2006). Interpreting and deriving inferences about the numbers produced by experiments was made possible by the progress in understanding probabilities, in which the pioneers were Blaise Pascal, Pierre de Fermat, and Christian Huygens.

Those breakthroughs were consolidated in the eighteenth century into two schools of thought, one led by Jacques Bernoulli (*Loi des Grands Nombres*) based on the objective observation of frequencies derived from independent repeated events (giving the name of "frequentists" to this school of statistics) and the other derived from Thomas Bayes's work in which *a priori* inferences (subjective probabilities) are revised by observations. This divide between "frequentists" and "subjectivists" (or Bayesians) still exists today. Statistics as an aid to decision-making is often of the subjective type: decisions are based on partial belief rather than full knowledge built from the frequency of events. This type of statistics is especially relevant for private business where the entrepreneur innovates and therefore, past observations are of little help in building long-term scenarios in the presence of uncertainty.[1] Public sector statisticians, on the contrary, prefer to avoid subjectivity in their professional work, leaving that to the policy makers. Hence, they avoid the use of statistics and if they must use them, they prefer the frequentist approach.

Avoiding statistics may seem a counterintuitive aim for a public sector statistician producing official statistics. Let me explain. For a mathematician, a statistic is a number with an associated distribution of probability.[2] "Probability" leads to "contestability"; the number has to be contestable in the etymological sense: it should

1. Uncertainty arises when inferences based on observed events are no longer reliable predictors of future events. The traditional frequentist approach, based on extrapolating observed data, fails to provide a robust forecast when the future cannot be modeled as a repetition of the past.
2. More formally, data result from the observed occurrences of an unknown "Data Generating Process". These observations may appear randomly (as when a sample of households is taken out of a given population) and are affected by additional measurement errors. Data in statistics are always tentative unless they are from a complete and error-free enumeration (e.g. an exhaustive population census).

be tested and called into question. And calling an official statistic into question is not something that public sector statisticians very much care for.

The dislike for probability in our profession can be related to the epistemological differentiation of "*statistics as a science*" (actually, a branch of applied mathematics) and "*statistics as an instrument at the service of the Prince"* (and later the State) (Porter, 1980). This big divide marked our profession at least up until the second half of the nineteenth century. It was perhaps sharpest in Germany, according to Desrosières (2010). The German approach to statistics (circa 1660) was to map and organize the territory in order to measure the wealth of the Prince and his State – which included the individual wealth of the Prince's subjects. A further goal was to help the State in collecting taxes and levying soldiers. These statistics resulted in a holistic yet diversified recognition of the fragmented empire that emerged after the Thirty Years War. The two pillars of German statistics were "Classification" and "Systematic Data Collection", Desrosières (2010).[3]

"Systematic" meant that no place should be given to chance or probability. This could most easily be achieved by using exhaustive censuses and well-maintained administrative registers. In some ways, official statistics were nothing more (or nothing less) than an endeavor to translate into numbers a textual narrative that reflected both the whole (the Empire) and the parts (the micro-states that composed the Empire). Surveys looked like a collection of monographs. It would have been a heresy for a seventeenth-century German statistician to refer to the "average German county" or the "average German subject". Like God, the Prince was supposed to be able to comprehend the universe both in its totality and in the details of each one of its numerous components.

French practices were close to those of the German school, even though the kingdom of France was much more centralized than the German Empire. Ever since Richelieu and Colbert, intendants, holders of a public administrative office, were tasked with keeping track of what was going on in their province and informing the King. From Colbert onward, these reports were increasingly stand-

3. Desrosières (2010) ascribes the term "statistics" to Achenwall (1719–1772) of Gottingen University where the German school matured.

ardized, leading to the development of systematic accounting procedures that aimed at erasing local particularities. Those reports remained confidential, Gilles (1964).

At about the same time (circa 1660), a different approach to statistics was developing in England. This approach is often described as "political arithmetic". It was more closely linked with a precise objective (e.g. the establishment of mortality tables) rather than the completion of a holistic quest.[4] It was also more prescriptive than descriptive. Because of the more liberal organization of society, and also because English precursors were more often scientists than civil servants, English statisticians looked beyond the administrative registers to make inferences about unobserved data. Among the techniques inherited from the English school is the concept of "multiplier of population", to be used when no population census is possible or accepted, Rohrbasser (2005). The method extrapolates the total population on the basis of a few limited censuses in some counties plus administrative registers related to births. This was the ancestor of what statisticians today call the "sampling approach" to data collection, based on samples defined on the basis of their probabilistic properties.

The co-existence of the German and English approaches helps identifying a point of tension in official statistics: is exhaustiveness important? To put it another way, is an average truly representative? It is only at the end of the nineteenth century that Adolphe Bertillon brought some clarification to the various meanings of "average".[5] In modern official statistics, both exhaustive and probabilistic approaches coexist. My subjective opinion (I am a Bayesian by training) is that, on the one hand, public servants would rather deal with "administrative registers" that are cheaper to manage in the long run and closer to the public administration perspective. For example, the German approach to statistics

4. Needless to say, our presentation omits many details since some influential authors on political arithmetic, such as William Petty, favored a more holistic approach and exhaustive censuses. However, it is fair to say that the probabilistic approach to official statistics first arose in England in the context of political arithmetic.

5. Bertillon distinguished "objective average" (repeated measures of a physical object of fixed – yet unknown – dimensions), "subjective average" (what a modern statistician would refer to as the mean value of a sample when its probabilistic characteristics are known), and "arithmetic mean" of disparate objects, where the notion of average does not carry any objective value.

prevailed in the Soviet Union: most if not all of the data collected there were not "statistics" but streams of administrative data collected by local authorities and compiled by the line ministries. On the other hand, statisticians tend to prefer the design of sampling where they can use their scientific training (unless they become managers and set about reducing operating costs).

2. The importance of taxonomy for the history of trade statistics

A second legacy, more specific to the German school (translating the various specificities of a territory into descriptive numbers), is the quest for representative classifications and nomenclatures. It is perhaps not surprising that one of the main contributors to taxonomy was the seventeenth-century German mathematician and philosopher, Gottfried Leibniz. His aim was to define a universal coding structure able to express various concepts. Modern statisticians are still busy today developing and adapting classifications, and it is an important issue if trade statistics are to be internationally comparable. This has been a crucial area in the history of trade statistics.

Much of the action in the history of trade statistics is linked to the history of tariff nomenclatures, as the data collection aspect of these administrative registers has not changed much until recently (even if, as we shall see, things are now changing rapidly). From an international perspective, the first serious attempts to harmonize tariff classifications internationally date back to the mid-nineteenth century. Harmonization was both a scientific and an economic objective. Using common standards and classifications facilitates the crossing of borders.

The following timeline details the main steps in the evolving measurement and classification of world trade statistics (Asakura, 2003; Nakagawa 2011).

— In 1853 an International Statistical Congress, held in Brussels, debated the necessity of unifying customs schedules.

— In 1889 the International Trade and Industry Congress, held in Paris, adopted a resolution to employ uniform nomenclature.

— In 1906 the second International Congress of Chambers of Commerce and Commercial and Industrial Associations, held in Milan, issued a Recommendation calling for common classification in customs tariffs.

After World War I, the League of Nations made efforts to reduce customs duties and tariff barriers; in the process, the period marked the opening of the age of international cooperation with respect to customs and tariffs statistics. Most – if not all – of the procedures were aimed at standardizing the statistical dimension of the administrative registers collected by participating countries as well as facilitating trade between nations.

— In 1923: the International Convention for the Simplification of Customs and other Formalities was established.

— In 1927: the World Economic Conference of the League of Nations held in Geneva examined the simplification of customs tariffs and unification of tariff nomenclatures. The League of Nations established a Sub-Committee of Experts for the Unification of Customs Tariff Nomenclatures.

— In 1931: A draft customs nomenclature (Geneva Nomenclature) was established by the Sub-Committee of Experts for the Unification of Customs Tariff Nomenclatures.

— In 1937: the Geneva Nomenclature was revised. The expansion of its usage was stopped by the breakout of World War II.

The modern nomenclatures and classifications were developed in the post World War II period, both by the United Nations and the World Customs Organization.

— In 1948 a Customs Committee was set up by the European Customs Union Study Group under the auspices of the Committee of European Economic Cooperation and formulated a new tariff schedule based on the Geneva Nomenclature. It was called the Brussels Tariff Nomenclature (BTN). It also developed a definition of values for customs valuation.

— In 1952 the Convention establishing the Customs Co-operation Council (CCC) came into being. In 1955, the BTN was revised following a review of its method of classification and methodology.

— In 1959, the Convention on the Nomenclature for the Classification of Goods in Customs Tariffs (the Nomenclature Convention), including the revised BTN, was applied internationally.
— In 1974 BTN was renamed the Customs Cooperation Council Nomenclature ("CCCN").
— In 1983, the International Convention on the Harmonized Commodity Description and Coding System ("HS Convention") was adopted. It became effective in January 1988.

Today, custom statistics are compiled according to the 2012 version of the Harmonized System (HS). The Harmonized System is administered by the World Customs Organization and is updated approximately every five years.

3. New issues in trade statistics

While trade statistics were considered a "mature" branch of official statistics, things began to change with the transformation of the nature of trade. The first driver of change was the rise of services as an important source of export revenues; the second was the so-called "Third Industrial Revolution" with the international fragmentation of manufacturing activities along global value chains.

3.1. Trade in service statistics

The history of trade in services statistics is quite different from the history of trade in goods statistics, as governments do not collect taxes on services trade. Taxes being the best friends of official statisticians, the quality and coverage of these statistics on services are much poorer.

The compilation of trade in services is closely related to the Balance of Payments manual edited by the International Monetary Fund. The earliest coordinated attempt at unifying the statistical methodology is found in the first edition of the Balance of Payments Manual in January 1948. This effort was a continuation of the work by the League of Nations to develop guidelines for balance of payments statistics. Today, the Manual is in its sixth revision, in parallel with the updating of the System of National Accounts in 2008.

But balance of payment statistics are not detailed enough to provide a clear view of the economic importance of trade in services. They traditionally cover three broad categories: Transport (closely related to trade in goods), travel (of persons) and others (business statistics, etc.). With the signature of the Uruguay Round and the General Agreement on Trade in Services (GATS) that was applied from 1995 on, trade negotiators have required more detailed information on trade in commercial services. The job of developing international concepts, definitions, and classifications for trade in commercial services was attributed to a "Task Force" established by the UN Statistical Commission in 1994. In 2010 the Statistical Commission validated the latest revision of the Manual on Statistics of International Trade in Services.

3.2. "Trading tasks" in the twenty-first century: the end of traditional trade statistics?

Most of these efforts may appear obsolete when one realizes that the nature of international trade has changed dramatically since the mercantilist era. In the pre-globalized world, it was difficult to separate production and consumption across space because of poor transportation technology. Most trade took place on village market squares, putting the producer and the consumer in direct relationship. Only the most precious items were traded internationally. The Industrial Revolution and the invention of the steam engine broke the overwhelming unity of space between production and consumption. By reducing transportation costs in time and money, railways and steamers promoted the mass consumption of goods produced far away. But most of what was exported by a given country was actually produced in that same country, or at least made from imported primary goods. In fact, the Industrial Revolution took root in countries that had coalmines and, to a lesser extent, iron ore to make the manufactured goods. Countries exported goods they themselves produced, sometimes with the input of certain primary goods imported from less developed areas – often their own colonies.

In the nineteenth century, when Ricardo developed what were to become the foundations of international trade theory, the Portuguese entrepreneur importing a steam engine from England would know that everything from the steel of the wheels to the boiler

pressure gauge came from Great Britain. Similarly, an English club importing Port wine for its members could be sure that it came from Portugal. Today, if Port wine is still of Portuguese origin, the concept of country of origin for manufactured goods has gradually become obsolete. Through outsourcing and offshoring, the geographical fragmentation of the various operations, from the design of the product to the manufacture of the components, assembly, and marketing have spread across the world, creating international production chains. Nowadays, as the WTO proclaims, more and more products are "Made in the World" rather than "Made in the UK" or "Made in France", (Jara *et al.* 2012).

Trade in tasks is very much in tune with the idea of a smaller world, where traditional boundaries and distances are collapsing and human societies interact as closely across oceans as they did among villages in the Middle Ages. When goods are "Made in the World", traditional statistics that are based on customs records of international transactions in merchandise cannot reflect the actual origin of the value-added embodied in the final goods. Economically speaking it becomes meaningful to split these flows into intermediates – goods that are further used in the production process – and goods for final consumption.

The specific contribution made by each country participating in the chain has to be identified in order to avoid double counting and properly identify the origin of the value-added. To take a famous example of a globally manufactured good, if we want to assign to each country of origin the value-added imbedded in an iPad imported by the U.S. from China (traditional trade statistics), we must be able to measure how much comes from China, Japan, or Korea, and, of course, from the US itself. This new "international trade in tasks" calls for a new measurement of international trade focusing on the value-added content – or domestic content – of trade flows. Interestingly enough, national statisticians alone cannot compute these statistics as they need information from other trade partners. Trade in value-added is truly global.

In this process, the traditional distinction between goods and services has become increasingly blurred. When statisticians have to identify each country's contribution to global production chains, every good boils down to an assemblage of manufacturing and business services. Indeed, another way of describing the new

nature of trade along global value-added chains is to refer to trade in tasks, where each country/industry makes its contribution as a specific task, from research and development to manufacturing or after-sale services.

The approach favored by international statisticians up to now (but this is a very young field of work and things may change rapidly) makes use of existing trade and national accounts data (see Daudin *et al.* (2011) for an example based on non-official statistics). It is only recently that comparable global indicators based on official statistics have been made available (2012 for the WIOD project; 2013 for the OECD-WTO TiVA database). Those results capture the main effects of global manufacturing in the twenty-first century. They redistribute the relative weights of goods and services and of bilateral trade imbalances. Trade in value-added also helps in apprehending the direct and indirect impacts of tariff policy on the effective rate of protection received by industrial sectors and the additional costs borne by services.

The existing indicators on trade in value-added still suffer from serious shortcomings. While they provide very valuable information about the relationship between international trade and economic development, available databases developed on official data still need to be extended in order to cover all developing and least developed countries. The present trend is to go beyond input-output tables and to base *TiVA* estimates on Supply and Use Tables. This simplification opens the way for the inclusion of more countries and more frequent updating of the official datasets.

Furthermore, for trade analysts used to working at the very detailed levels of the Harmonized System (HS6 digit or more) when analyzing the impact of tariff and non-tariff measures, trade in value-added information is still excessively aggregated. This is especially important as the new theoretical models of international trade place great emphasis on the heterogeneity of firms (Escaith, 2014). Firms that are active on the international market are often larger and technologically more advanced than firms producing for domestic use only. In addition, exporting firms tend to make more intensive use of imported inputs, especially in developing countries. All those characteristics have important implications and may lead to substantial aggregation bias if ignored. To return to the seventeenth century debates that opposed the exhaustive

and probabilistic approaches to official statistics: there is no such thing as a "representative firm", at least if one stops at the traditional classification of the UN System of National Accounts. One could either try to disaggregate as much as possible – which might run into decreasing returns to scale – or introduce a probabilistic approach to trade statistics, based on prior inferences.[6]

The new frontier for trade statisticians lies therefore in (i) developing micro-databases to fully capture the heterogeneity of firms that are active in these global value chains, and (ii) incorporating heterogeneity into the input-output models, for example by differentiating firms by size or by their export-orientation (often leading to the same sub-sets). Thanks to the excellent reception of the new datasets and the support received from the G-20 in 2012, the research program on global value-chains is now firmly rooted in the working program of international statistics. A recent initiative by the UN Statistical Commission to develop international recommendations for developing new indicators on International Trade and Economic Globalization based on the global value chain concept is a significant step forward in this direction.

4. Conclusion

Trade statistics – the collecting of import and export data – is firmly and deeply rooted in the German tradition. The collection of these data was vital for the Prince, as duties paid on shipments served as a significant source of revenue for the State, and trade restrictions were a key ingredient in the Prince's internal and external strategy. Actually, for the mercantilists, trade was just another way of waging war, or, at least, financing the war effort. Even if the bellicose purpose of trade is not as prominent nowadays as it was for the mercantilists (following the hypothesis of "sweet commerce", some modern politicians even advocate trade on the basis that countries which trade among themselves do not make war),[7] the fiscal dimension is still here, especially in countries with limited tax-collection capacities. In many places,

6. For example, we know that exporting firms are usually large; moreover, most industrial surveys include some indicator of size (number of employees, turnover, etc.). An a priori disaggregation of industrial surveys between exporting and non-exporting firms could be based on firm size.

statistical statements on imports and exports are based on administrative registers maintained by customs administrations that belong to the ministry of finance. The first difficulty for the continuation of this tradition is the renewed interest in trade in services and trade in tasks. It is not clear whether the exhaustive approach can satisfy the curiosity of the researcher and the public on these issues.

In addition, the way official statisticians interpret their social role is changing. Since its inception and until very recently, official statistics was considered a function of the State in the service of the Prince. That can be seen in all the examples of trade statistics that are given in this special issue. In the second half of the twentieth century, and more specifically in the 1990s, official statistics came to be viewed as a public good for the benefit of all citizens. Today, there is an increasing need to serve different users and adapt production to their needs. Official statistics are not only required to be representative, but also transparent and "customized". Transparency has both political and technical dimensions; the technical dimension is easily dealt with through best practices and international quality frameworks accepted by all professionals, but impeccable quality does not always solve the political issue of trust and (mis)perceptions. The increasing demand for micro data reflecting the diversity of civil society, sends us back – after two centuries – to the old controversy of unrepresentative averages.

Eighteenth-century trade statistics were incomplete and of poor quality. The exhaustive, German tradition cannot be used to interpret them. Historians, like modern day statisticians, have to be more like the English pioneers and look at all the contextual data that can be used to extrapolate the partial statistical information available and to understand the bigger picture. They must also be sensitive to the issues of transparency so that their work can be useful to the whole research community and even to the wider public.

7. This idea is present from Montesquieu to Mill on the liberal side, and was also expressed by Kant in his late eighteenth-century essay *On Perpetual Peace* in which he argued that commerce is incompatible with war. On the development of this idea, see Hirshman (1977).

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