

ACCOUNTING GLOBAL VALUE CHAINS AND COMPETITIVENESS: A CHALLENGE FOR OFFICIAL STATISTICS

PETER VAKHAL¹

ABSTRACT

A changing globalisation landscape has introduced new trade forms, corporate governance, and ownership structures in international economics. Official statistics have not been able to cope with recent trends so far although some new measures, such as Trade in Value Added (TiVA) statistical method, have been introduced. Despite that, value chains still cannot be mapped (at least partly), and the existing official statistical indicators are most likely biased as are also the derived measures of international competitiveness. Particularly, global value chains challenge official statistics. Complex ownership relations and trade within the same business group are the main sources of difficulties. Owing to transfer pricing, especially in the case of intangible goods, the accurate valuation and allocation of value added and profits is ambiguous. As a result, price indices of foreign trade may be biased, thus influencing GDP and several items in the balance of payments (BoP) and every traditional indicator of competitiveness, such as Revealed Competitive Advantage (RCA), unit labour cost (ULC), and real effective exchange rate (REER). In the value chain, the role of subsidiaries may be upwardly biased, while the importance of brand owners may be downwardly biased. The aim of this paper is to analyse the effect of globalisation on official statistics and to identify the points where data are most likely inaccurate.²

¹ Corvinus University of Budapest, research associate at Kopint-Tarki Institute for Economic Research

² The research was financed by the National Research, Development and Innovation Fund (project number: K125125)

INTRODUCTION

In the past decades, international trade went through a structural transformation due to rapid technological developments in logistics, Information Technology (IT), and forms of trade. Owing to the emergence of e-commerce, several other types of commercial channels have opened up. International division of labour is now organised via global value chains (GVCs) and that completely changed the structure of global production. Given that, the volume of world trade has almost doubled in the past 20 years, and according to the World Trade Organisation (WTO), more than 50% of total trade is related to value chains. The embeddedness in GVCs is also a competitiveness issue of any country. Thus, it is crucial to have consistent and unbiased estimations of international trade and production networks.

The GVC “phenomena” are described mainly by case studies while official statistics are lagging and cannot cope with the recent trends. Moreover, as official international trade statistics measure the free on board (fob) prices of traded goods, rather than value added, they provide biased data. Consequently, gross domestic product (GDP), foreign direct investments (FDI), and other macroeconomic statistics will also be biased. No doubt that the vast majority of statistical indicators are affected by the globalisation of production. The emergence of transnational companies (TNCs) have created entirely new forms of production, trade, and ownership in the business sector. This paper goes through the challenges of GVCs and globalisation accounting that official statistics face. It will analyse the effect of global value chains on micro- and macro-statistical indicators and illustrate them through a hypothetical case. As a conclusion, some recommendations will be proposed. The goal of this study is to call attention to the shortcomings of official statistical indicators in light of GVCs.

THIS GLOBALISATION IS SOMETHING ELSE

Rodrik (2011) described the post-1990s period as the era of hyper-globalisation in which the production factors and other aspects influencing the business environment, which were believed to be local, began to become globalised. After the WTO’s Doha round, the volume of capital flow in the world was multiplied, and the trading of goods and services has been soaring. Free-trade agreements, customs unions and economic integrations helped the formation of value chains and contributed to economic growth. Legal harmonisation made the foundation of subsidiaries abroad much easier and was a milestone in business internationalisation. Some developing and emerging economies experienced FDI inflow reaching up to 10% of their GDP. In fact, according to UNCTAD, the FDI stock in some South-East Asian countries soared to 80% of their domestic product in 2016. The presence of large foreign affiliated subsidiaries in the home economy is one of the trademarks of globalisation. Official statistical methodology for measuring them was created before the sharp reduction of trade and investment barriers when subsidiaries were 100% owned by their parent companies. The emergence of global value chains, technological development, and of international investment protection agreements diminished the need for full control over the subsidiary’s production. Thus, a growing number of transnational firms chose shared ownership [Raff et al. (2009)]. Corporate governance has also changed, and subsidiaries are often owned by asset management companies, firms controlling regional investments, offshore companies, or sometimes by other subsidiaries resident in the home economy or in a third country. Ownership structures are more complex than they were two decades ago and finding the ultimate investor(s) is a tough task for official statistics.

Complex ownership structures are usually linked to tax optimisation, which is a peculiarity of global companies. Special attention is required in case of those multinational corporate management structures in which financial transactions are processed through a holding

company resident in a third country. These firms usually do not have any real production activity, but they are still an integral part of the business group. According to the International Monetary Fund's (IMF) definition, companies falling under the category of Special-Purpose Entities (SPE) must not have any real production, and their role in the business group is limited to tax optimisation. At the same time, in multinational production networks, units with real economic activity can also have such functions as those of SPEs if profits are transferred to other networks to balance their financial accounts. These financial operations raise the problem of internal transactions (within business groups) and transfer pricing.

As the strict ownership structure of the value chains is relaxing, a new anomaly has developed in GVCs. Some brand owners completely outsource the manufacturing sequence of production for contract work [Barnes et al. (2015)] and re-import the goods. Inputs and intangible goods (and sometimes capital goods too) are owned by the client; the manufacturer provides only the workforce. In that case, the brand owner is a factoryless goods producer (FGP), and contract work is accurately accounted for in foreign trade; the ownership does not change, and import should be increased by the amount of contract work fee only. At the same time, in modern GVC supply systems, inputs can also arrive from third countries (still possessed by the brand owner), and output may not be re-exported to the owner but to the final customer in any country. In that case, the economy of the brand owner has a transaction with a third country concerning goods that it owns but does not produce.

Merchandise trade is a special issue of international transactions performed within the value chain. Transfer of inputs along the supply chain is usually registered as foreign trade as a result of production. However, modern GVC governance usually involves supply centres to process the procurement and distribution of inputs of the chain members [Manders et al. (2016)]. These centres are often located in a third country and merchanting is conducted there. That is, intermediate or capital inputs are purchased by the supply centre. The goods never physically enter the country but are directly shipped from the importer to the producer. Sometimes, the supply centre also operates as a distribution centre that facilitates delivery [Yu et al. (2016)]. A vast amount of foreign trade volume is created by that, and it is registered in the system of national accounts (SNA) of the host economy although it is unclear as to whether it should be included

- in re-export as the ownership changes, but no substantial modification is made;
- in export (if minor modification, such as repackaging, is done);
- or not be included at all and consider the whole transaction as goods in transit [see IMF (2004)].

Re-export is an ambiguous phenomenon in foreign trade as it is included in gross exports although it is not produced in the exporting economy. Not all bilateral transactions within a value chain are related to goods or services. The trading of intangible goods, such as intellectual property products (IPPs), leases or licences, are common ways of income rearrangement between members of the same business group. Compared to transfer prices, the handling of intangible goods in international trade is more complicated. Although transactions of IPPs are not considered as traditional trade in the current account, they are registered as flows of capital in BoP. In other words, trade of intangible goods (assets) do not imply real economic activity directly. However, owing to identities in BoP, it may have its counterpart in the current account (besides the financial account).

Most problems of global value chain accounting arise from the vague definition of resident actors and ownership structure. Traditional official statistics consider subsidiaries as legal

entities of the domestic economy, not as foreign branches of a multinational company. Therefore, all flows between the parent company and the subsidiary are considered as trade or financial transaction even if all assets of the subsidiary are in the possession of the parent firm. In such circumstances, the position in the value chain of the subsidiary's host economy may be biased upwards. If the parent company (who owns 100% of the subsidiary) retains the profit in the domestic economy, value added will be higher although the contribution of the host country was only the labour cost.

One may say that all new phenomena can be adjusted by focusing on gross national income (GNI) instead of GDP. In primary incomes account, incomes allocated to the rest of the world is indeed taken into account. However, in the GNI framework, the contribution of the domestic economy to the primary incomes is usually unknown. That is because the generation of primary incomes according to ownership is barely reported and not considered as relating to foreign entities but to domestic units. It is noteworthy here that the distinction by ownership is not applied in the case of foreign trade. Thus, standard gross (or net) national income data do not describe globalisation better than GDP does.

To interpret globalisation by available official statistical data, in particular the presence of global value chains, is a complex and difficult task. Newly published indicators like Trade in Value-added (TiVA) approaches the issue in an innovative way. Although it also utilises hard official statistics, such as gross exports or gross income [Timmer et al. (2012)], it does not give a realistic picture of global production, the role of global income generation, and of distribution.

Moreover, new developments of globalisation and global value chains most likely bias the traditional statistical indicators. Modern forms of trade, e-commerce, versions of GVC governance (FGPs, SPEs, Shared Service Centres, etc.) modify theories of trade, corporate and national competitiveness and multilateral economic relations. Traditional indices of comparative advantages or competitiveness are gradually losing their validity. The demand for new measures is high, and official statistics need to adopt recent changes and restructure data collection without putting more burden on the economic sectors.

How are official statistics affected by globalisation?

This chapter gives a brief overview of how recent developments in globalisation and global value chains bias official statistical indicators.

Rapid developments in information technology and logistics, shipping costs and times have reduced significantly in the past two decades. Production is more global than ever before, including services. Net export has become the most important growth factor in the world as the economies of emerging countries have joined global value chains. This has introduced fundamental changes in production and trade; the goods and intermediate inputs of more and more countries involved in the production of them circulate them in the world before making them final goods. The engagement of multiple international producers challenges official statistics. Besides the traditional trade of final goods, new trade forms have developed. In some of them, there is no real physical movement of goods in the reporting country, and sometimes there is no real business deal behind the movement of goods and services. In the following, the most challenging new forms of trade are elaborated [UN (2011)]: **Merchanting** (or triangular trade) is an act in which the resident party has an intermediary role between two non-residents' trade. The resident purchases the good from a non-resident and then resells it to a non-resident without physically having the product in question. The profit of the mediator is

the difference between the two sale prices. The resident's country does not import anything, but the final customer buys from the resident and physically imports it from the one who is only contracted with the resident. A good example of this is online markets (like Amazon). Merchanting is technically a re-export process, and it is included in the export of the merchant's BoP although export is increased by the mediator's commission only. At the same time, if the re-export does not explicitly take place (like some modification is made or the items are held in inventory for a short time, etc.) the transaction increases export by the full price of the product.

Quasi trade, or quasi-transit trade is another (relatively) new trade form. In this case the import or export of the good is registered in an intermediary country, which is usually where the port is located. For example EU import from a third country should be registered in that member state where it enters the community regardless of its final destination. The goods entered are physically there, but the legal owner is not resident in the intermediary country. A typical example of this is the Rotterdam-effect that increases the foreign trade of the Netherlands to a very high level although much of the imported goods leave the country. This affects the level of international trade in goods but not the GDP (as it is balanced). At the same time export/GDP or gross exports are seriously biased. These two indicators are frequently used to describe the competitiveness of any nation.

Internet trading is a special case of new trade forms in services similar to merchanting. The resident customer buys a service from a non-resident via the Internet and the fulfilment does or does not occur in the same country where the financial fulfilment occurred (usually in a low-tax-rate country). The owner of the product is vague, and for this reason, the trading partners only exist at the country level.

Globalised production networks challenge statistical offices and not only because of the increased volume of trade but also owing to the changed ownership structures. The real owner of the product is often unclear and official statistics keep to the residence-based indicators. That is, the value created should be accounted for in the domestic economy regardless of who the owner of the producer is. Therefore, global value chains remain completely hidden for official statistics. Furthermore, traditional statistical indicators become biased. That bias will be elaborated in detail in the following paragraph.

Numerous statistical indicators exist concerning business relations between domestic and foreign companies. Operations of foreign companies are described by the Foreign Affiliates Trade in Services (FATS) indicators that provide accurate information regarding parent-subsidary relations. However, value chains cannot be evaluated through them. As already mentioned above, the traditional ownership structures have been changing in GVCs, and contract-based relations are becoming increasingly frequent in the supply chains [Nicita (2013)]. If there is no ownership relation between the domestic and foreign companies, FATS does not register anything. Transactions take place in contract-based relations (even if the importer is the sole customer of the exporter) and are aggregated into the trade statistics. Therefore, FATS provide information rather on transnational companies and also tells a little about global value chains.

Besides FATS, BoP deals with international business relations although it is also characterised by the same shortcomings as FATS. Rassier (2017) argues that the definition of resident company is not accurate because it considers all domestic companies as autonomous firms. Therefore, even in a parent-subsidary relationship, the parent company is present in the

domestic economy (registered by FATS). It does not carry out production; the subsidiary does. Every transaction between the parent company and the subsidiary is considered as investments or trade. Additionally, intangible assets from the parent company is also considered as trade [Lipsey (2006)]. It is unclear then who the owner of the value added and the profit is. Besides, it is also doubtful whether the values of the transactions between two affiliated companies truly reflect the market values. As traditional trade means the change of ownership of a product for a price negotiated on the market, it is questionable whether transfer pricing transactions between two companies with the same owner should be considered as traditional trade.

BoP is part of the SNA, thus every bias caused by changes in the international economic environment is also built in other macroeconomic variables. The accounting of international transactions in BoP is based on the implicit assumption that prices reflect market values and that all transactions are accounted in the country where they are actually created. In extreme cases, the magnitude of the bias can be huge as can be seen from what happened in Ireland in 2015 when partly because of transfer prices and income allocation, the GDP volume was 26.3% [OECD (2016)].

Transfer prices bias not only the values of income created in the domestic economy but also the price indices of foreign trade. This is the case, in particular, if a shift in prices does not reflect changes in production. If the value of transactions is overpriced, the import price index will also be overestimated. This, in turn, creates an upward bias with respect to the GDP in the importing economy and a downward bias in the exporting economy [Mead (2014), Dridi and Zieschang (2004), Nakamura et al. (2015)]. In the following details, a hypothetical case of a value chain is presented in order to present the bias in the system of national accounts.

Table 1: A hypothetical example of effects of a modern value on statistical indicators

Event	Participating countries	Statistics involved	Notes
The US parent company opens a regional centre in Germany.	USA, Germany	USA: FDI, IIP (international investment position), FATS DE: FDI, IIP, Investments, GDP, FATS	Direct investment, the owner is well defined; no bias.
The German centre opens factories in Central Europe.	Germany, Slovakia, Hungary	DE: FDI, IIP HU: FDI, IIP, Investments, GDP SK: FDI, IIP, Investments, GDP	The ultimate investor is the USA. If it is backtracked, no bias occurs. If not, bilateral BoP is biased.
The German centre leases assets for an overpriced fee to the factories.	Germany, Slovakia, Hungary	Trade in services, foreign trade price indices, IIPs, GDP in all countries	The assets are in the possession of the American brand owner; bilateral BoP is biased. Overpriced leasing biases price indices and GDP.
Factories trade intermediate goods at transfer prices between each other.	Hungary, Slovakia	Merchandise trade, foreign trade price indices, GDP in all countries	It is unclear whether transfer pricing transactions between companies with the same ultimate owner actually count as traditional trade. Foreign trade statistics, GDP are biased.
Final goods are shipped to distribution centre in Slovakia from which they are forwarded to Austrian consumers.	Hungary, Slovakia, Austria	Foreign trade, prices indices, GDP in all countries involved	The Hungarian factory is not related to the Austrian consumers; the Slovakian-Austrian trade is biased. Trade in value added indicators remove bias from bilateral trade but not from GDP and price indices.
The centre contracts a Swiss company to perform online sales in Austria.	Switzerland, Germany, Slovakia, Austria	SK-AT: merchandise trade CH-SK, CH-DE, CH-AT: trade in services	The Austrian consumer is in contract with the Swiss retailer; all financial transactions are between these two countries. The product is delivered from Slovakia, which also contains Hungarian inputs. The Swiss company conducts financial transactions with the Slovakian company and the German centre; thus all transactions are accounted for multiple times.
The US brand owner opens a customer centre in India to handle financial transactions and customer relations.	Austria, India, USA	AT-IN: trade in services US-IN: primary income transfers US: GNI IN: GNI	The Austrian consumer purchases American services through the Indian customer centre. If the US firm retains profit in India, GNI is biased because the Indian contribution to the generated incomes is lower than that which is reported.
The German centre opens an SPE in Luxembourg to account for regional financial flows and profit are earned during production.	Germany, Hungary, Slovakia, Luxembourg	Primary incomes, trade in services FDI, IIP, GDP, GNI in all countries involved	Although the activity of the SPE in Luxembourg can be filtered out in BoP, real financial flows cannot be tracked.
Part of the profit is transferred to the US from Luxembourg.	Luxembourg, the USA	FDI, IIP, trade in services, GNI in all countries involved	Although the activity of the SPE in Luxembourg can be filtered out in BoP, real financial flows cannot be tracked.
Hungary directly delivers final products to US consumers.	Hungary, USA	Merchandise trade, price indices, GDP, GNI in all countries involved	The origin of the product is Hungarian, which was produced in Hungary, owned by a German regional centre founded by the US brand owner.

The table calls attention to the fact that a value chain does not only involve those statistics that describe the bilateral relations but also several items of BoP are affected. Of these, current accounts and primary incomes are the most exposed. Besides, GDP and GNI can be also biased owing to import price indices, especially, if transfer prices are applied. Because of the vague definition of resident companies, the value of financial transactions accounted for with respect to the capital owner and also the brand owner is likely to be lower, while subsidiaries or contracted partners may have upward bias. These biases affect all indicators that are based on these macroeconomic statistics. In the following chapters the traditional indicators of international competitiveness are reviewed and the influence of globalisation and GVCs is discussed.

Traditional indicators of international competitiveness

Measuring competitiveness is often hindered by the lack of proper definition. Every subdiscipline in economics (like marketing, business economics, macroeconomics, etc.) has its own interpretation. Additionally, business sectors have also created their own explanations. As a result, there is no universally accepted definition of economic competitiveness. The main source of this problem is likely the fact that several subjects can be analysed within the framework of competitiveness. It can be approached in many ways: firm level, product level, industry level and (inter)national economy-wide level (that is, analysing the whole economy in a national or international environment). These levels require distinct measures too.

A traditional way to analyse economic competitiveness at the product and industry levels is usually the RCA initiated by Balassa (1965). The RCA indicator can be calculated and interpreted easily: The higher the share in the world export of the product, the higher its competitiveness. Therefore, the industry producing that particular product (owing to perfect competition on the market) is internationally more competitive. Constant Market Share (CMS) is another way to analyse industrial competitiveness although it is rarely used because of its limitations as it strongly relies on the selection of industries involved in the investigation.

ULC approaches competitiveness from the cost side and usually, two types of ULC indicators are published. The nominal unit labour cost (NULC) is the quotient of the nominal per capita labour cost and the per capita real GDP (real productivity). The smaller the amount of the labour cost compared to the created value added, the more competitive the economy is. Real ULC (RULC) is inflation adjusted NULC, which is equivalent to wage share. ULC indicators always refer to the whole economy although only a few industries participate in foreign trade. It is worthy of note here that, besides the exposure to export demand, trade is only one aspect of ULC. Labour costs are also affected by other factors, such as educational level, and labour market situations. A more devastating characteristic [or dangerous obsession named by Krugman (1994)] of ULC based competitiveness measures is that they may delude economic policy that keeping labour costs low is healthy for the economy on the long run.

Globalisation and global value chains have enhanced low-wage economic policies in developing or emerging countries. Heintz (2005) argued that advantages in value chains are not uniformly distributed among the members involved. Consumer prices of the final goods are set by the brand owners, on the basis of production costs and consumer demand. Consequently, in the long run *ceteris paribus*, it is the productivity of the suppliers that determines the prices. Yields, fuelled by intense competition on the supplier's side, are

distributed between the consumer and the brand owner, and the latter are not incentivised to share it with the manufacturers. Thus, keeping ULC as a headline indicator of competitiveness can easily lead developing and emerging countries into the middle-income trap.

Real (effective) Exchange Rate [R(E)ER] is another traditional measure of competitiveness, that compares the changes of price levels between competitors or group of competitors (effective RER—REER). The indicator assumes that the products on the world market are homogenous. Thus, goods are not differentiated according to economic categories. That is, the indicator assumes that countries export final goods only. It is also not linked directly to productivity (contrary to the ULC); thus, it is more robust, but it also has shortcomings. First, intermediate and final goods and services cannot be sold on the same market; the former can be hardly substituted unlike the latter, and the elasticities are different. Second, because of cross-sectional differences in productivity, the effect of changes in REER is not constant along the industries in the economy. That is because export demand of goods and services produced are not alike [Gregorio and Wolf (1994)]. These cons of REER outweigh pros when it comes to GVC analysis. Although REER can handle groups of countries, it is still a bilateral indicator (a country's RER is compared to the average of main trade by trading partners). Therefore, the effect of REER changes tells nothing about its outcome in the entire value chain. It is important also to mention, that owing to an increased volume of international transactions, exchange rates are under permanent pressure, and sometimes, because of tax optimisation, there is no real economic activity behind the financial flows.

How does the emergence of global value chains affect the derived statistical indicators of competitiveness?

The main problem with the traditional RCA and CMS indicators is that they rely on the “old” trade theories of Ricardo, and Heckscher-Ohlin-Samuelson. The underlying assumptions of these theories are as follows:

- Countries have the same production function.
- The role of the production factors is the same across countries.
- Returns to scale are constant.
- Consumer preference is indifferent on the world market.
- There are no biases in domestic and international competition.
- Consequently, there is perfect competition on the world market.
- Only final goods are produced and traded.

In our globalised world economy, these premises are not valid anymore. Helpman and Krugman (1985) have proven that there is imperfect competition on the world market, and companies operate with increasing returns to scale. Later, Melitz (2003) explained why firms do have a heterogeneous production function instead of homogenous one. Owing to the structural and fundamental changes in the main concept, trade theory was renewed so many times that nowadays the literature refers to it as the new-new-trade theory.

Mudambi (2008) demonstrated that in a vertically integrated chain, the lowest value is delivered by the production segment, while sections before and after the physical realisation add much more value to the final product. This structure became known as the smile-curve and it brings trade in value added to the fore. This along with the fact that, contrary to the traditional Balassa framework, services became tradable and softened the definition of global value chains. According to Koopman et al. (2011), global value chains are systems of value-added sources in a globally integrated network. Since the millennium, tracing value added has turned into one of the main research goals in international economics.

Global value chains and competitiveness are strongly interwoven with each other. As countries, industries and companies are integrated in the GVCs, the principal goal is to advance in the chain and become more competitive. At the same time, there is no indicator that could reliably (and preferably officially) tell us about the current position of the entity in the GVC.

Owing to the lack of official statistics, only estimations about GVCs are available. Measuring the role of countries and companies in the value chain is strongly hindered by the shortcomings of the traditional trade statistics, which registers trade flows in gross terms. Because of globalised international trade, it means that some flows are accounted for twice or even more times. For example, an intermediate product is sent abroad for manufacturing purposes, and later it comes back to its origin. Thus, physically almost the same product returns home, and it has already been accounted for once. This double counting increases the volume of foreign trade while the price and value of the products increased much less. Therefore, bilateral trade relations are biased, while the rest of the world account remains the same.

Xing and Detert (2010) in their well-known paper proved that in gross terms, the USA has 1.6 billion trade deficits with China in the value chain of iPhone. At the same time China is specialised in the manufacturing of the phones and imports parts as intermediate goods from all over the world. In the value-added approach, it means that only 4% of the total value added is produced in China. This also means that the true US trade deficit is only about US\$65 million, while US\$1.5 billion trade deficit is incurred with other countries (mainly Germany, Taiwan, and South Korea) as China imports their intermediate goods to assemble iPhones. The deficit with the rest of the world is, of course, the same US\$1.6 billion.

The demand for registering value added in international trade (that is, the net approach) can be attributed to the 2000s. In 2012, the OECD and WTO released the first trade in value-added database, which relies on international input-output tables. The method catches value-added flows within the group of investigated countries and derives several indicators that help to identify the position of a country's GVC. The existence of TiVA data has revolutionised the traditional measures of competitiveness.

Bems and Johnson (2012) adjusted the traditional real-effective exchange rate (REER) with value added. The researchers showed that supply side shocks in competitiveness can be modelled by value-added weights. In other words, the competitiveness of a country improves in case of exchange rate depreciation in another country at a lower level in the GVC.

Timmer et al. (2012) challenged the traditional RCA indicator and focused on income generated by GVCs. In their approach, competitiveness can be measured indirectly by an industry's share in global income production. As income is generated by value added (they took advantage of the global consumption \equiv global value added produced identity), there is a direct connection with GVCs. The main differences between RCA and GVC income are as follows:

- While RCA focuses on products, GVC income concentrates on the industry.
- This shows the strength of the companies operating on the world market.
- The approach is cross-sectional and offers deeper investigation possibilities.

Their analysis proved that global production has been continuously fragmentising (possibly because of the spreading of protectionism), and besides winners, GVCs have losers. In the past 15 to 20 years, East-Asian nations have gained a significant share of GVCs. Thus, the income generated in developed countries has decreased significantly.

Because of the bias mentioned above—that some exported value added finally returns to the domestic economy—the RCA based competitiveness measurements are not fully reliable. Koopman et al. (2014) have developed a new methodology that filters out double-counted export. If one adjusts the traditional RCA measure by trade in value-added data, the global ranking of countries (which is interpreted as competitiveness) will be rearranged. On the basis of the value-added adjusted revealed comparative advantage (VARCA) indicators, it has been shown that while China and India had significant comparative advantage in some product groups (mainly in manufacturing), this advantage shrinks if adjusted by value added. Moreover, India's advantage turns out to be a disadvantage. The main lesson of Koopman et al. (2014) is that the comparative advantage of East-Asian countries is much smaller than was previously estimated.

The last indicator that is presented here is the domestic value-added ratio (DVAR) derived by the OECD and published in the TiVA database. DVAR measures the domestic value added content of exported value, and therefore, it can be interpreted as an index of competitiveness. Advancing in GVCs entails increasing DVAR—the higher the competitiveness, the higher the domestic value and the lower the import content in the exports is. The main criticism of this approach is that the DVAR level strongly depends on the product structure and the country's (industry's) position in the production network and on the smile curve. According to Vakhal (2017), producers (industries or countries depending on the database) at the end of the smile curve can never achieve 100% DVAR, whereas it was usual for them to produce much more value added than the producers in the preceding parts of the value chain. Another criticism of this approach is that DVAR can be different on the same production level (e.g., automotive assemblies), depending on the current position of the producer in the production sequence.

The main criticism of the TiVA data (and, thus, the derived indicators) is that they are based on estimations and not on official statistics. Despite careful and profound estimations, TiVA data are over-aggregated and contains biases, and this error cannot be measured or controlled. This is strengthened by the fact that there are several international input-output (IO) database and if one conducts the same analysis on all of them, the results will not be the same. This problem is rooted in the fact that TiVA data are based on national IO tables, where the methodology is not universal let alone the fact that national matrices are also based on estimations, which also involve biases. Estimation errors are cumulated and can bias final results of TiVA calculations significantly. In the next sections, some evidence will be shown to present why official statistics could not cope with globalisation; why it fails to produce official trade in value-added data; and consequently, why competitiveness measures are inaccurate. It also contains recommendations to tackle challenges.

POSSIBLE EXTENSIONS OF STATISTICAL DATA COLLECTION FOR BETTER ACCOUNTING OF GLOBALISATION AND GLOBAL VALUE CHAINS

As already discussed above the main reason why official statistics produce biased measures is that data collection is still based on outdated assumptions of international trade and transactions. New aspects of international business relations should be also taken into account by statistical offices although reporting is already burdensome for companies. Statistical data collection sometimes aims at sensitive data and reporters are reluctant to provide the true

numbers. Digitalisation and new technologies in IT, such as blockchain, may help to track international transactions and follow the route of the products. At the same time, new methods solve the problems only partly because within business group valuations (transfer prices), transactions due to tax optimisations cannot be handled by them. The following sections present the two most important basic statistics regulated by Eurostat.

International trade

International trade statistics is based on some of the oldest statistics that are systematically collected by statistical offices. The first data collection took place after WWII although it not happened in an organised form. Because of the lack of common classification system, the consistency of an international trade system was severely unreliable. Morgenstern (1963) checked the consistency of the trade data assuming that because of mirror statistics, export and import data were equal. He found serious problems but could not provide any plausible solution. Much later, Frederico and Tena (1991) investigated the database, found the same problems and tried to find root causes. Three potential problems were identified:

- Inevitable problem: Shipping costs should be equal to the difference of export f.o.b. and import cost, insurance, and freight (c.i.f.) prices. This seldom happens and causes serious problems in the case of trade between non-neighbouring countries.
- Structural differences (partly avoidable): Despite the common accounting system (see later) the classification of the products is that delegated to the national authorities; thus, consistency is not always assured.
- Other problems (inevitable): Data recording problems and smuggling.

The World Customs Organisation (WCO) introduced the harmonised tariff system (HS) in 1988. It classifies the goods into approximately 9400 categories (8 digits) according to their nature. Besides HS, the most frequently used nomenclatures are the following:

- Combined Nomenclature (CN)
- Standard International Trade Classification (SITC)
- Classification of Products by Activity (CPA)
- Broad Economic Activities (BEC)

International Trade in Goods Statistics (ITGS) compliance in the European Union is regulated by Eurostat, but data collection remains under national competence. Eurostat's compliance guide (2015) defines the data categories to be collected albeit rather broadly; however, the national statistical offices have relatively high flexibilities in this respect:

- Reporter identification (mandatory)
- Reference period (mandatory)
- Direction of flow (export, import) (mandatory)
- Commodity by CN (mandatory)
- Partner (mandatory)
- Value (mandatory)
- Quantity (mandatory)
- Nature (mandatory)
- Country of origin (optional)
- Region of origin and destination (optional)
- Delivery terms (optional)
- Mode of transportation (optional)
- Statistical procedure (optional)

It is mandatory that goods sent for processing only to another member state be registered in the Customs Procedure Code (CPC) system. The purpose of that is to track the route of the product (previous procedure, last procedure, and next procedure). This statistic provides the re-export and re-import international trade data. For the sake of minimising the burden on reporters, statistical offices now contemplate being less demanding. As trade flows are registered monthly, this effort is understandable.

In case of extra-EU trade, the entities will report similar data categories. The only difference is that whereas the statistical office collects the data in the case of intra-EU trade, extra-EU trade data collection involves customs and tax authorities as well. All entities participating in extra-EU trade are obliged to have a so-called Economic Operator Registration and Identification (EORI) number, and it must be reported for taxation purposes. At the same time, EORI numbers are required to be reported only for the reporting entity.

One can see from the short summary of intra-extra trade reporting standards that in both cases the partner of the transaction remains mostly unknown as only the partner's country is reported. Thus, in case of standard data collection of foreign trade, most information referring to the international labour division, value chains or production networks remain hidden.

Industrial production

In contrast to foreign trade statistics data collection that covers full population, business statistics are collected on a sample basis in most member states of the European Union. The reason for that (besides the fact that the population of operating companies is much larger than that of those who export or import) is that the data collection from industrial firms has multiple purposes. According to Eurostat (2006) industrial data are the source of several statistics. Selected companies must report inter alia:

- output (production, turnover, domestic and non-domestic turnover, domestic and non-domestic new orders)
- prices (domestic and non-domestic output prices)
- employment (number of employed persons, hours worked, wages, and salaries)
- special variables (not discussed)

Every bullet point has its own reporting sheet. Of these, among others, the following statistics will be compiled: industrial production (input to SNA), producer price index (inflation, SNA), employment (SNA, input to LFS) etc. The fulfilment of all these reporting sheets would put too much burden on companies, and it is for this reason that a sampling procedure is implemented.

Industrial statistics is basically compiled from two sources:

- the production value-based statistics (collected monthly),
- the product-based statistics (at least annual data collection).

The two types of data collection are very similar. However, the product-based version is a bit shorter as it is only for compiling industrial production index (IPI), which is rather a flash estimate of the industrial activity in the economy. The product-based survey includes a question about the mode of production where the firm can report how much of the total production of a certain product is made by its own production and how much was produced by paid work (that is, the parts and accessories are not purchased by the producer but by the client). In case of paid work, the customer's location (domestic or non-domestic) remains hidden. On the other hand, companies that order paid work abroad must report it without

revealing identity of the partner country; that is, parts and accessories in the possession of the reporting company are transferred to an unknown foreign country where the supplier creates technical modification on them and then transfers the goods back.

The industrial data collection is clearly output-based as that is much easier for the companies. However, in the case of special products that require less input, input-based data collection would be possible as mentioned by Eurostat (2006). Nevertheless, IPI data collection is Europe-wide and output-based. At the same time, this means that no information is collected on a regular basis about:

- Inputs used for production
- Production process
- Physical transformation of the product
- Domestic and non-domestic partners (only for compilation of input-output matrices once every 10 years)

The lack of this information above makes it impossible to map value or supply chains. Value added per company can be calculated (as it is an input data for the GDP), but trade in value added is not. The reason behind this is that information regarding the inputs is not collected; neither is the identity of suppliers and customers. Even if industrial production data were paired with trade data, modelling GVCs would still be almost impossible. The only index that can be produced is the ULC as it is measured by the average cost of labour input per output or hours worked.

The following table summarises the effect of new trade forms on competitiveness indicators:

Table 2: The effect of globalisation on traditional indicators of competitiveness

Trade form	In official statistics	Affected indicators of competitiveness
Value chains (assuming no double counting)	The route of the goods is untraceable. Value added to the product is not measurable. Detaching value chain in gross value added with respect to the entity is not possible as industrial production statistics is output-based.	DVAR, VARCA, VAREER
Value chains (assuming double counting)	To the above: Double counting cannot be filtered.	To the above: GDP
Merchanting or triangular trade	Only bilateral trade relations are registered; one trade partner remains hidden. Bilateral trade balances are biased.	RCA, REER, GDP
Quasi (-transit) trade	Because of the physical movement of the good, the intermediary country will appear as a true trade partner while there is a risk that the original partner remains hidden.	see above
Internet trade	Only bilateral trade relations are registered; one trade partner remains hidden. Bilateral trade balances are biased.	see above

Because of the incomplete official statistics, all indicators of competitiveness are affected. Indices having the GDP or gross export as deflators are most likely biased because of double counting. The standard statistical data collection of industrial production and merchandise trade neglects the new trends of globalisation. Therefore, one cannot get the full picture of supply chains and networks. No information of the physical transformation of the products is available; thus, what happened to the inputs is unknown. One may infer this only from the classification of economic activity of the producer. Trade and industrial production statistics are not linked. This is the major shortcoming of official statistics. Without that data, supply chains cannot be analysed through official statistics. They can be analysed only through empirical case studies.

Possible extension of data collection to reduce bias in competitiveness indicators

As it was already noted, permanent reporting places considerable burden on companies. The bigger the firm, the larger the staff that deals with official reporting. At the same time, today's technology makes statistical and taxation reporting much easier than before. Tracing the route of goods (in gross terms) is a solved problem that makes GVCs partly visible. However, tracing VA is still an unsolved issue. Introducing some new data categories in the surveys would provide important information:

- Registration of the trade partner's code for statistical classification of economic activities in the European Community (NACE) in international trade surveys.
- Use of CPC and service codes in invoicing.
- Synchronisation of production and trade data by companies.
- Synchronisation of tax, customs and production data.
- Matching of VAT refund data with production data.
- Taking advantage of big data analytics (blockchains).

A more detailed database containing information about the complete route of the goods and services would be an opportunity to analyse value and supply chains based on official data. It is impossible to track the assembly of the final product by all parts and accessories although it would give an overall view of possible components of consumer goods. It would also give the information about the (imported) intermediate inputs utilised to produce several types of (final) goods. The supply network could be extended by the partner companies and the final result would be like a product-by-product input-output supply-use table. In possession of such tables, one could identify potential competitor countries and industries. One could even derive more reliable indicators of competitiveness and more accurate analysis of globalisation trends.

SUMMARY AND CONCLUSION

Globalisation has been rapidly changing because of the recent developments in information technology and logistics. There has been a fundamental shift in corporate governance and ownership structures of multinational companies. Official statistics could not cope with the latest trends, and data collection of international relations (trade, investments, financial flows etc.) is still based on traditional trade theory whose the underlying assumption is that the main channel of trade is strictly bilateral and only final goods are traded. Relying on these (probably false) hypotheses, the official statistical indicators may contain biases, especially if a country is deeply integrated in supply chains. The main source of the bias is the intra-trade within the same business group, notably if transfer pricing is applied. Though statistical offices adjust transfer prices (known as the arm's-length method), the revaluation of process is not straightforward. Especially, the valuation of intangible goods is challenging (leasing fees, licences etc.). Transfers that are not based on pure market negotiations bias foreign trade price indices, and via that GDP, GNI and several items in the BoP will also be biased.

The most complicated issue of globalisation is the trend that because of the complex structure of ownerships in value chains, the real owner of the value added and profit is ambiguous. Traditional statistics is domestic based. Thus, all values generated by resident companies in the home economy are considered to be domestic. At the same time, in global value chains, the subsidiaries are owned by the brand owner. Therefore, value added is created by utilising capital and assets that are in the ultimate owner's possession. As a result, the real contribution of the domestic economy to the value chain is unclear. Usually, the role of subsidiaries in the value chain is upward; the role of brand owner is downward biased.

As main macroeconomic variables may not be as accurate, all indicators that derive from these measures will also be biased. Competitiveness indicators, that are also used to evaluate the position of an economy in the value chain may be inaccurate as variables of GDP, and gross export are used as deflators. Some TiVA statistics by OECD—if indexed by gross export—also carry this bias.

Two reasons why value chains cannot be mapped are that the assumptions of statistical data collections are outdated and also that the data required are not collected. Further, trade statistics are not linked to industrial productions statistics; trading partners are unknown (only the country of the partner is recorded); and the modifications made on the input goods are also unidentified. For input-output modelling, more detailed data are collected although this is done every 10 years.

Statistical offices do utilise bigdata and apply the blockchain method to track the route of the goods, services, and value added. It must be acknowledged that any modification of data collection may put more burden on companies that already have an increased workload in reporting. Official statistics need to change so that they are to match to globalisation because inaccurate data may lead to biased assessment and unfavourable decisions.

BIBLIOGRAPHY

- Balassa, B. 1965. Trade liberalisation and “revealed” comparative advantage. *The Manchester School*, 33(2), 99-123.
- Barnes, T., Lal Das, K. S., Pratap, S. 2015. Labour contractors and global production networks: the case of India’s auto supply chain. *The Journal of Development Studies*, 51(4), 355-369.
- Bems, R., Johnson, R. 2012. *Value-Added Exchange Rates*. NBER Working Paper No. 18498 (Cambridge, MA: The National Bureau of Economic Research).
- De Gregorio, J., Wolf, H. C. 1994. *Terms of trade, productivity, and the real exchange rate* (No. w4807). National Bureau of Economic Research.
- Dridi, J., Zieschang, K. 2004. *Export and import price indices*. IMF Staff Papers, 51(1), 157-194.
- Eurostat. 2006. *Methodology of short-term business statistics*. Luxembourg.
- Eurostat. 2015. *Compilers guide on European statistics on international trade in goods*. Luxembourg.
- Federico, G., Tena, A. 1991. On the accuracy of foreign trade statistics (1909–1935): Morgenstern revisited. *Explorations in Economic History*, 28(3), 259-273.
- Heintz, J. 2005. Low-wage manufacturing and global commodity chains: a model in the unequal exchange tradition. *Cambridge Journal of Economics*, 30(4), 507-520.
- Helpman, E., Krugman, P. R. 1985. *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*. MIT press.
- IMF 2004. *Re-Exports and Goods in Transit*. Seventeenth Meeting of the IMF Committee on Balance of Payments Statistics, Pretoria, October 26–29, 2004. (BOPCOM-04/28).
- Koopman, R., Powers, W., Wang, Z., Wei, S. J. 2011. *Give credit where credit is due: Tracing value added in global production chains* (No. w16426). National Bureau of Economic Research.
- Koopman, R., Wang, Z., Wei, S. J. 2014. Tracing value-added and double counting in gross exports. *The American Economic Review*, 104(2), 459-494.
- Krugman, P. 1994. Competitiveness: a dangerous obsession. *Foreign Affairs.*, 73, 28.
- Lipsey, R. E. 2006. *Measuring international trade in services* (No. w12271). National Bureau of Economic Research.
- Manders, J. H., Caniëls, M. C., Paul, W. T. 2016. Exploring supply chain flexibility in a FMCG food supply chain. *Journal of Purchasing and Supply Management*, 22(3), 181-195.
- Mead, D. 2014. Analyzing alternatives to export price indexes. *Beyond the Numbers*, 3, 27.
- Melitz, M. J. 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6), 1695-1725.
- Morgenstern, O. 1963. *On the Accuracy of Economic Observations*. Princeton: Princeton University Press.
- Mudambi, R. 2008. Location, Control, and Innovation in Knowledge-Intensive Industries. *Journal of Economic Geography*, 8 (5): 699–725.

- Nakamura, A. O., Diewert, W. E., Greenlees, J. S., Nakamura, L. I., Reinsdorf, M. B. 2015. Sourcing substitution and related price index biases. In Houseman (Ed.) *Measuring Globalization: Better Trade Statistics for Better Policy I.*: 21-88.
- Nicita, A., Ognitsev, V., Shirotori, M. 2013. *Global supply chains: trade and economic policies for developing countries*. UNCTAD Policy Issues in International Trade and Commodities Study Series No. 55. UNCTAD, Geneva.
- OECD. 2016. Irish GDP up by 26.3% in 2015? <http://www.oecd.org/sdd/na/Irish-GDP-up-in-2015-OECD.pdf> Accessed: 13.03.2019.
- OECD-WTO. 2012. *Trade in Value-Added: Concepts, Methodologies and Challenges*. Joint OECD-WTO Note, March 15, 2012.
- Raff, H., Ryan, M., Stähler, F. 2009. Whole vs. shared ownership of foreign affiliates. *International Journal of Industrial Organization*, 27(5), 572-581.
- Rassier, D. G. 2017. Improving the SNA treatment of multinational enterprises. *Review of Income and Wealth*, 63, 287-320.
- Rodrik, D. 2011. *The globalization paradox: democracy and the future of the world economy*. New York: W. W. Norton & Co. USA.
- Timmer, M. P., Erumban, A., Los, B., Stehrer, R., De Vries, G. 2012. *New measures of European competitiveness: A global value chain perspective*. World Input-Output Database, Working Paper, 9, 2012.
- UN. 2011. *The impact of globalization on national accounts*. New York and Geneva.
- Vakhal, P. 2017. *Magyarország elhelyezkedése a globális érték- és termelési láncban* (The position of Hungary in the Global Value Chain). Kopint-Tárki Working Paper.
- Xing, Y., Detert, N. C. 2010. *How the iPhone widens the United States trade deficit with the People's Republic of China*. ADBI Working Paper No. 257.
- Yu, Y., Wang, X., Zhong, R. Y., Huang, G. Q. 2016. E-commerce logistics in supply chain management: Practice perspective. *Procedia Cirp*, 52, 179-185.