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Trade in intangibles and the global trade imbalance

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KEYWORDS

global trade imbalance, global value chains, trade in intangibles, trade in services, US-China trade imbalance

1 | INTRODUCTION

Trade imbalances have been a major issue that ignited the recent wave of anti-globalisation in some industrialised countries. Given the emergence of intangibles in recent decades (Durand & Milberg, 2019; Haskel & Westlake, 2017; Orhangazi, 2018; Rikap & Lundvall, 2019) and the increasing embeddedness of trade in knowledge and services in global value chains (GVCs) following the globalisation of production (Baldwin & Evenett, 2015; Helpman & Krugman, 1985; Venables, 1999), our understanding of capitalism and international trade faces significant challenge. An important question arises with regard to the channels and the measurement of the trade in intangibles, which include a range of intellectual properties such as patents, know-how, trademarks, copyrights, brands and trade secrets. How to modify the framework for the measurement of international trade so as to comprehensively and truly reflect the complex trade relationships between countries in the twenty-first century becomes an important question awaiting an answer.

While the trade literature has evolved from classical theory of trade in goods to theories of intra-industry trade, and recently to trade in tasks, trade in intangibles has not been fully integrated into the theory of international trade. In recent years, there have been valuable efforts made by the World Trade Organisation (WTO), Organisation of Economic Cooperation and Development (OECD) and United Nations Conference on Trade and Development (UNCTAD) in creating new data sets on "trade in value added" and in combining trade in goods and services to provide a more comprehensive picture of global trade. All this presents an important step forward in improving trade statistics. However, global trade in intangibles still has not been fully captured in these new data sets, partly due to the lack of a comprehensive framework that integrates international trade in goods, services and intangibles and the difficulties in data collection.

Despite the valuable work on the important role of intangibles in economic growth (e.g., Corrado et al., 2017; Haskel & Westlake, 2017; Reindorf & Slaughter, 2009) work is the only pioneering work on trade in intangibles. This edited volume supported by the National Bureau of Economic Research (NBER) includes insightful and pioneering work by Robbins (2009) on measuring payments for the supply and use of intellectual property, by Moris (2009) on new data and methodological issues related to Research and Development (R&D) exports and imports, and by Hanson and Xiang (2009) on international trade in motion picture services. Moris (2017) finds a complementarity relationship between supply-chain trade in R&D services and FDI flows. Another indirectly linked research is a recent study by Guvenen et al. (2018) on profit shifting in the United States. MNEs that find that productivity growth of U.S. firms, after adjusting for profit shifting, is especially large in R&D-intensive industries. However, overall, trade in intangibles have not been systematically analysed and integrated into the measurement of trade balance.

Studies on MNEs find that in order to balance their local and global operations optimally, MNEs are organising their value creation activities in a "global factory" structure of organisational form (Buckley & Ghauri, 2004). A differentiated network of activities is held together through the control of key assets and flows of knowledge, most of which are intangibles (Buckley, 2009; Hannibal & Knight, 2018). Ownership advantage, mainly determined by intangible assets, consists of important factors that affect firms' decision to go global (Wu et al., 2016) and control a network of activities along their GVCs (Eriksson et al., 2014; Yeniyurt et al., 2005).

At the same time, although the literature on GVC has placed intangibles at the centre of the research, it focuses on their role in the governance of the GVC, rather than as important factors that affect the power relationship in the GVC. It is argued that governance is usually exerted by companies that are not in the manufacturing stage; they control the knowledge exchange and trade it within different forms of governance (where FDI is the most hierarchical, compared with outsourcing at arm's length; Gereffi et al., 2005; Mudambi, 2008). More recently, Rikap and Lundvall (2019) argue that technological giants become intellectual monopolies based on their power in intangibles. They build, re-design and lead Global Corporate Innovation and Production Systems that equip them with technological and financial power derived from the platforms as well as the "significant freedom to redistribute the rents that they expropriate globally".

This paper aimed to integrate the literature on technology, international trade, international business and global value chains, and develops an analytical framework of global trade that integrates trade in intangibles and trade in goods and services. This would enable us to better understand international trade in the context of new realities of globalisation. Intangibles are a sort of created factor endowment of a country. Intangibles enter international trade not only as a factor endowment embedded in manufactured goods and services, but also directly through various trade modes which are specific for intangibles. Through in-depth discussions of the five modes through which trade in tangibles are carried out, this paper develops a modified framework to measure international trade statistics.

2 | THE EVOLUTION OF INTERNATIONAL TRADE

According to the "Theory of comparative advantage" (Ricardo, 1817), all countries have a comparative advantage in some products. Countries can benefit from international trade by specialising in products in which they enjoy a comparative advantage. Countries export products that use their abundant and cheap factors of production and import products that use the countries' scarce factors (Leamer, 1995) as suggested by Heckscher-Ohlin's "Theory of factor proportion". Moreover, countries that innovate first tend to enjoy a comparative advantage in technology terms (Vernon, 1966).

Yet, as a technology moves to a mature and saturation stage, it becomes more and more standardised and its diffusion to less advanced countries increases. According to the "Product life cycle" theory, the import or export of a product is determined by the relative overall cost of production.

Since the 1970s, marked by a drop in transportation costs, the production process has become more segmented and specialised, and the production network/value chain changed from local to global. This gave rise to intra-industry trade based on economies of scale, monopolist competition and network effects (Krugman, 1979, 1981, 1991; Lancaster, 1980; Melitz, 2003). Into the new millennium, outsourcing and trade in tasks have become a new trend due to technological progress and digitalisation. Research into trade in tasks has investigated the motivations and benefits of offshoring and outsourcing and the evolution of industrial organisations (Baldwin & Robert-Nicoud, 2014; Baldwin & Venables, 2013; Grossman & Rossi-Hansberg, 2008, 2012; Rodriguez-Clare, 2010). It suggests that MNEs create trade in headquarters' services such as R&D, technology, design and marketing services. However, almost all of these theories have been developed and applied in the context of international trade of *goods*, with services considered as intermediary inputs. Overall, despite the great advancement, intangibles have not been explicitly considered as a factor in international trade.

Increasingly the production in many industries is organised globally along the GVCs, which is "the sequence of productive (i.e. value added) activities leading to and supporting end use" (Sturgeon, 2001). In the chain of tasks that contribute to the value creation of a product, the normal activities start from basic and applied R&D which results in the creation of the ideas as well as the technology and design of new products. The commercialisation of the research outcome, be it patents or other intellectual properties, is followed by resources' extraction, production, marketing and distribution. Within a GVC, countries tend to specialise in value creation in specific segments of goods or services. As a result, international trade expands from the trade of goods (as analysed in the classical trade theory) to the *trade of goods, services and knowledge* (Baldwin & Evenett, 2015). According to Constantinescu et al. (2018) and the World Bank (2017), in 2014 about two thirds of total trade involved production that crossed national borders at least twice before reaching end users. In many manufacturing industries, the two ends of the value chain—conception, research and development at the starting end, and branding and marketing at the finishing end—command higher value added per unit to the product than does the middle part of the value chain—manufacturing (Alcacer & Oxley, 2014; OECD, 2013; Shih, 1992).

3 | TRADE IN INTANGIBLES AND A GVC-BASED INTEGRATED FRAMEWORK OF INTERNATIONAL TRADE

The value added of one product is not owned in one country but is spread in different countries along the global factory (Buckley & Ghauri, 2004). Because the global R&D resources are highly concentrated in a few industrialised countries (OECD, 2017; World Bank, 2017), new knowledge creation remains a prerogative of a few industrialised economies. According to the World Intellectual Property Organisation (WIPO) (2017), until 2017, the world's top 25 innovative countries were all developed economies except China, a new-comer from the developing world which only gained a place in the top 25 in 2017. At the same time, some countries have developed a strong and internationalised business services' sector such as the UK, and some have developed a series of brands that enjoy international fame, such as France, Germany, Japan and Italy. As a result, developed countries tend to export knowledge and knowledge-intensive components and import manufactured products, while developing countries tend to export manufactured products while importing knowledge-intensive products. In terms of value-added capturing, most of the products' value-added distributions

TABLE 1 Different modes of IP trade and forms of value capture

Types of trade in intangibles	Description	Forms of value capture
Licensing/franchising (patented technology and business model, or know-how or brand)	Licence the right to use the IP and transfer relevant knowledge	Royalty fee guaranteed, and flat rate or a fixed lump sum payment upfront.
Intellectual services (include training, consultancy)	Provide knowledge to individuals and organisations	Consultancy fee for training or consultancy or other forms of services provided, for example, after-sales services for installation, maintenance and repair
Foreign direct investment	Invest and hold equity shares (IP counts as part of investment or tools to control)	Dividends, hidden profits obtained through transfer pricing
Outsourcing	Sign vendor contract	Profit of final products net of outsourcing costs. Captures value of branding, marketing channel, or ideas/concept, or key components that the vendor owns. Controller
Globalisation of R&D (collaboration & overseas R&D investment)	Collaboration between different firms and parties Overseas funding or investment in R&D	Intangibles count as part or all of the contribution. Intangibles' owner shares proportional part of the value added of final product according to agreed contract Accepting foreign funding and produce and providing knowledge outputs (intangible assets) to foreign funder; or MNEs invest abroad in some R&D activities, importing talent to produce knowledge (intangible assets) to "use/sell" domestically or internationally

Source: Authors' own elaboration.

follow the smile curve. Nevertheless, the proportion of value captured by intangible capital exceeds that of physical capital in the GVC and has been increasing in recent years. In 2014, the income share accruing to intangibles was 32% for all products manufactured and sold worldwide, almost double the share for tangibles (WIPO, 2017).

In a paper on intangible capital and growth in advanced economies, Corrado et al. (2012) use a model that has two sectors, an upstream or knowledge-producing sector and a downstream or knowledge-using sector. The upstream sector takes freely available concepts or ideas—basic knowledge—and produces "finished" ideas or commercial knowledge (e.g., blueprints). Another way of thinking about the two sectors is that one is the "innovation" sector and the other is the "production" or "final output" sector. They argue that conventional economy-wide GDP growth is given by the growth rate when investments in innovation are not capitalised. But when such investments are capitalised, aggregate value added and its real growth reflect the current production of *both* sectors.

We develop a model of international trade that considers international trade in both goods and intangibles following the approach used in Corrado et al. (2012). We start from a simple 2-country and 2-sector model to illustrate the trade relationship. Country A exports knowledge and imports manufacturing products, and country B imports knowledge and exports products. In general, trade in intangibles takes place in two major categories. One includes licensing of intellectual property rights (IPRs), financial and insurance services, and delivery of intellectual services such as business services and data management. The other includes mechanisms where the control of intellectual capital results in income transfers between countries, which is often accompanied by the control of financial capital. These other mechanisms include FDI, outsourcing, innovation collaboration and overseas R&D investment as part of the globalisation of R&D. This is often organised by lead firms in global value chains or Global Corporate Innovation and Production Systems (Rikap & Lundvall, 2019) to gain benefits or even "extra profit" from the intangibles they control. Table 1 summarises these mechanisms of trade in intangibles.

3.1 | Licensing/franchising

An often-used method for the trade in intangibles is licensing. This method applies to a wide range of intangibles including patented technologies and business models, and un-patented know-how or branding. The owner of an intellectual property may charge licensing fees or royalties for the use of intellectual property rights (such as patents, trademarks, copyrights, industrial processes and designs including trade secrets and franchises) through licensing agreements, of produced originals or

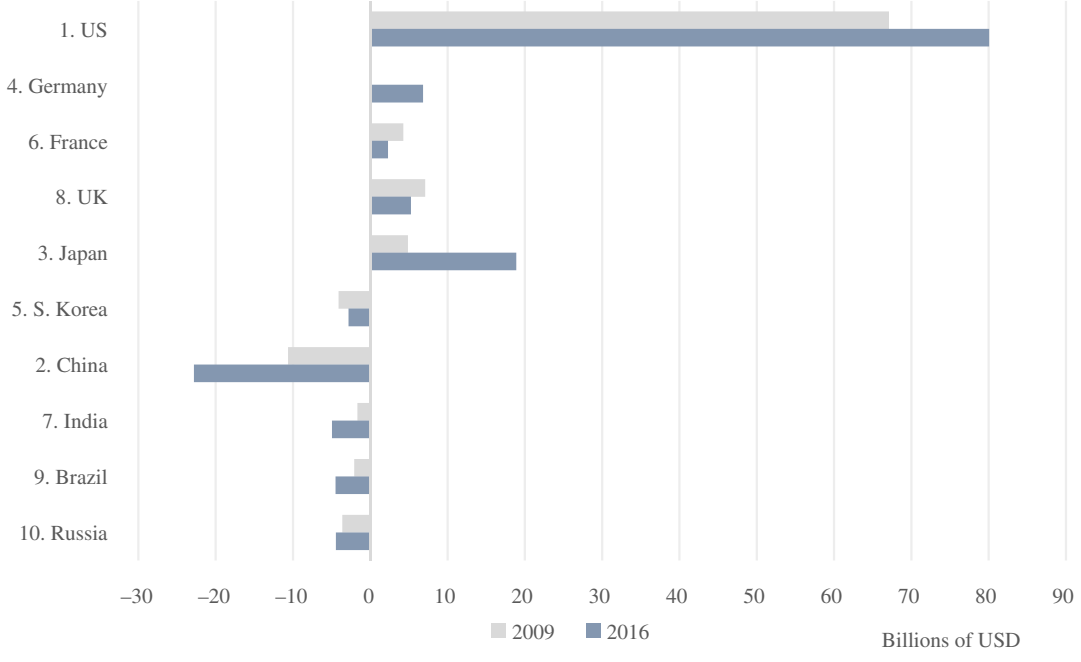

FIGURE 1 Net receipts for intellectual property use for top ten countries with the highest R&D expenditure between 2009 and 2016. *Note*: Numbering next to the name of the countries shows the rank of the country in R&D expenditure *Source*: www.imf.org accessed in November 2018

prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable or satellite broadcast; IMF, 2017). In addition to direct licensing, there are also cases of cross-licensing that companies in different countries allow to each other for the usage of specific patented technologies.

Looking at countries with the highest R&D expenditure, Figure 1 presents the net receipts for intellectual property use in 2009 and 2016. Numbering shows the rank of the country in R&D expenditure in 2016. The United States has the highest R&D expenditure, China ranked the second largest and Japan the third. Among these top R&D investors in the world, Figure 1 shows that the United States enjoyed a significant surplus in 2009 at round USD 67 billion. This surplus increased in 2016 to around USD 80 billion. Japan ranked second in terms of net receipts for IP surplus; the surplus was about USD 19 billion in 2016. In contrast, the BRIC economies, as well as South Korea, are all running deficits. In 2016, the deficit for China for the use of intellectual property was about USD 23 billion. Such deficits in IP use for the economies in transition are increasing over time.

3.2 | Intellectual services

Consulting services are a mode to transfer knowledge to individuals and organisations through the provision of training, consultancy services or after-sales services for installation, maintenance and repair, etc. Intellectual properties are shared with the recipients (though the owners do not lose them). The value of their IPs is realised through consultancy fees received by service providers. Compared with other methods of IP value capture, the value of IP captured through consulting services is lower, partly because the significance of IP in terms of uniqueness and un-replicability is less. For IP traded in other forms, it often requires the presence of the services provider which is affected by people's mobility, regulation of concerned countries and transportation costs.

The IMF defines services' receipts of a country as economic output of intangible commodities that may be produced, transferred and consumed at the same time. In 2016, the total international payment for services was as high as USD3777 billion. Among the various service industries, "IT, communication and other services" and "financial services" are the sectors that are more intangible asset-intensive than the service industries such as tourism and transportation. Figure 2 shows the net export of IT, commercial and other services in 2009 and 2016 for countries with the largest R&D expenditure, arranged by decreasing net exports in 2016. As Figure 2 indicates, the United States, India, UK, China and Germany are large exporters of "IT, communication and other services", while South Korea, Russia, Brazil and Japan are net importers. These patterns seem to be intensifying over time for most of these countries.

With regard to the net export of Insurance and Financial Services in 2009 and 2015 for countries with the largest R&D expenditures, Figure 3 shows that the UK, Germany and United States are large exporters of insurance and financial services, while China is a major importer, with the figures for other countries being very small in comparison. The role of the United States as a large exporter of these services has grown rapidly in the past few years.

3.3 | Foreign direct investment

In many cases, especially when an IP is owned by a firm, the firm may choose to combine the IP with a certain amount of physical investment (including either financial capital or machines and equipment and/or marketing know-how), and directly invest in a foreign country by setting up a company

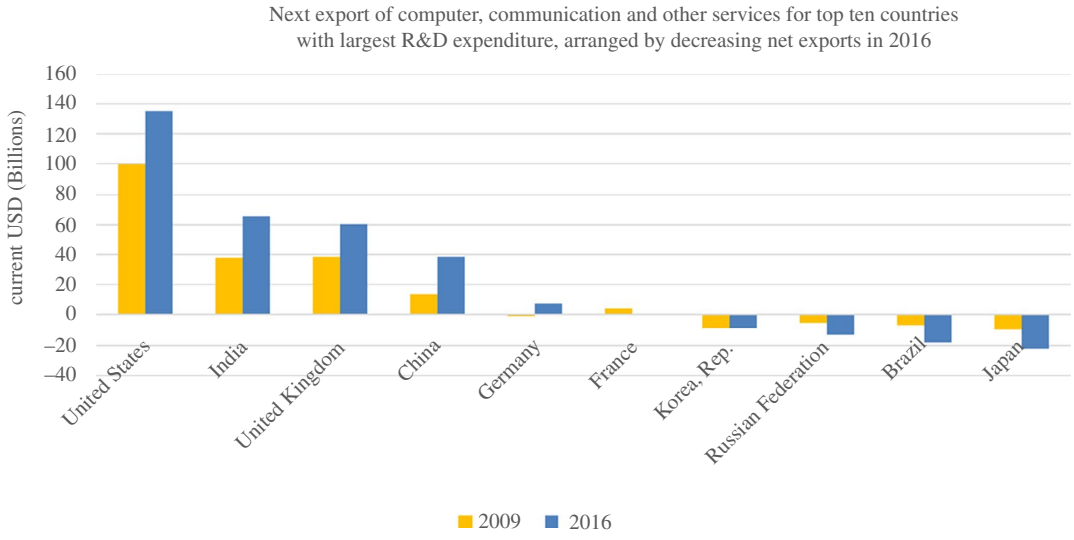

FIGURE 2 Net export of computer, communication and other services for top ten countries with the highest R&D expenditure in 2016 *Source*: https://wits.worldbank.org/ accessed in November 2018

or manufacturing/service unit in that country. The greater the commercial/financial capability the IP owner has, the more likely the owner is to use an FDI to capture the value of its IP, instead of licensing. Examples of such IP capturing are direct investments by Siemens, Volkswagen, Mercedes Benz, General Motors and General Electric in China and some other developing countries.

IP owners will gain a return on their IP and the investment as the company grows, and in some cases, from hidden profits obtained elsewhere through transfer pricing. For example, in the United States in 2016, the top technology Internet firms, such as Amazon, have an income of $12.2 billion from web services and $44 billion from overseas operations; income from international operations of eBay was $5.1 and $47.4 billion for Google.[1] In 2016, Microsoft Limited registered a turnover of $1,290 million, Intel Corporation Ltd., $5,544 million, and Cisco International Ltd. had a turnover of $11,777 million.[2]

Outward investments from the major industrialised countries such as United States, Japan and Germany are in intangible asset-intensive industries. Figure 4 presents inward and outward FDI positions in 2015 in intangible heavy industries for top countries in the Global Innovation Index 2018. Here, intangible heavy industries include manufacturing, information and communication services, scientific, technological and professional services, and insurance and financial services. Large outward FDI stocks exist for the United States, Germany and Japan. They seem to be net exporters of intangibles embedded in FDI.

The MNEs did make considerable profits from their overseas direct investment. In addition to the examples given earlier, in China, for example, the profit of foreign-invested enterprises (FIEs) by foreign investors other than HK, Macao and Taiwan (HKMT) was RMB995.7 billion (or US$158.55 billion) in 2015 and for HKMT the profit was RMB594.8 billion (or US$94.71 billion;

[1] *Source*: Company reports extracted from relevant company websites, accessed in May 2018.

[2] *Source*: FAME database accessed in May 2018.

TABLE 2 Profit of industrial firms with annual turnover over 20 million Renminbi in China (100M RMB)

Firms by ownership	2008	2009	2010	2011	2012	2013	2014	2015
Total	30,562	34,542	53,050	61,396	61,910	68,379	68,155	66,187
SOEs	2,532	1973	3,303	3,567	3,882	2,944	2,708	
Collective	617	638	806	864	895	580	541	509
Shareholding	3,306	4,033	6,203	7,648	7,650	8,043	7,413	6,448
HK&M&T	2,976	3,448	5,113	5,521	4,947	5,456	5,930	5,948
Foreign	5,266	6,659	9,906	9,973	9,019	10,347	10,647	9,957

Note: HK&M&T refers to Hong Kong, Macao and Taiwan investors invested firms. Exchange rate of RMB was USD1 = RMB6.28 in 2015 and 8.20 in 2005.

Source: China Macroeconomic Information Network.

Table 2). Although nearly half of the FIEs claimed to be losing money in 2015, according to the China National Tax Bureau, around a third of these losses were due to operational problems, while two thirds of these firms were reporting losing money due to abnormal reasons, such as transfer pricing.[3]

3.4 | Outsourcing

In recent years, outsourcing has become a widely used mode of international production (Lewin & Volberda, 2011). For instance, in the case of Apple, the outsourcing company owns intellectual properties in the form of patents, designs, and branding and marketing channels and controls the GVC. Such outsourcing manufacturing firms increasingly provide intellectual services rather than physical goods (Fort et al., 2018; Leamer, 2009). Other examples in addition to Apple include IBM, which increasingly offers data solutions rather than mainframes, and Pitney Bowes, which has abandoned the production of postage metres to offer logistics services. Such intangible assets-intensive services in fact capture a large proportion of trade flows. According to the 2017 World Intellectual Property Report (WIPO, 2017), in the iPhone value chain, the value captured by the lead firm, Apple, accounted for 42% of the iPhone sale price; this is followed by 22% for cost of materials, 15% for distribution and retail, 5% for IP licences and 5% for unidentified material. Among the rest, there was only 1% for labour in China. Similarly, Huawei and Samsung capture 42% and 34% of the value added in their mobile phone value chains, respectively (WIPO, 2017).

In the services industry, outsourcing is also widely used, especially in the professional or business sectors where services can be disembodied, and remote delivery becomes feasible with the facilitation of digital technologies. For example, in the business services sector, IPs such as brand and process design are owned by MNEs, while the accounting tasks are outsourced to contractors in India or South-East Asia.

To note, the value of IP captured via outsourcing does not only involve the outsourcer and outsource countries. As final products are sold globally, the total value captured includes the value embedded in the goods imported to the vendor's country but also those sold globally, whether via the

[3]*Source*: China Macroeconomic Information Network and website of the Ministry of Commerce, China, accessed in May 2018.

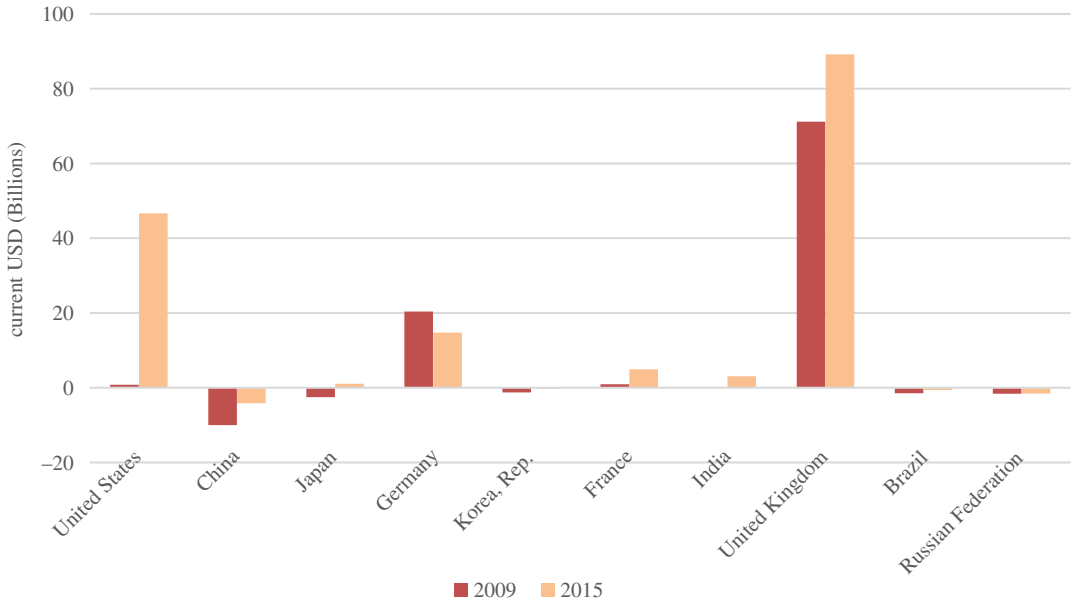

FIGURE 3 Net export of insurance and financial services for top ten countries with the highest R&D expenditure *Source*: https://wits.worldbank.org/ accessed in November 2018

vendor country or not. This is, nevertheless, a very difficult area for monitoring and supervision by the home country's government. MNEs also have reasons for not transferring their profits in the subsidiaries back to their home countries.

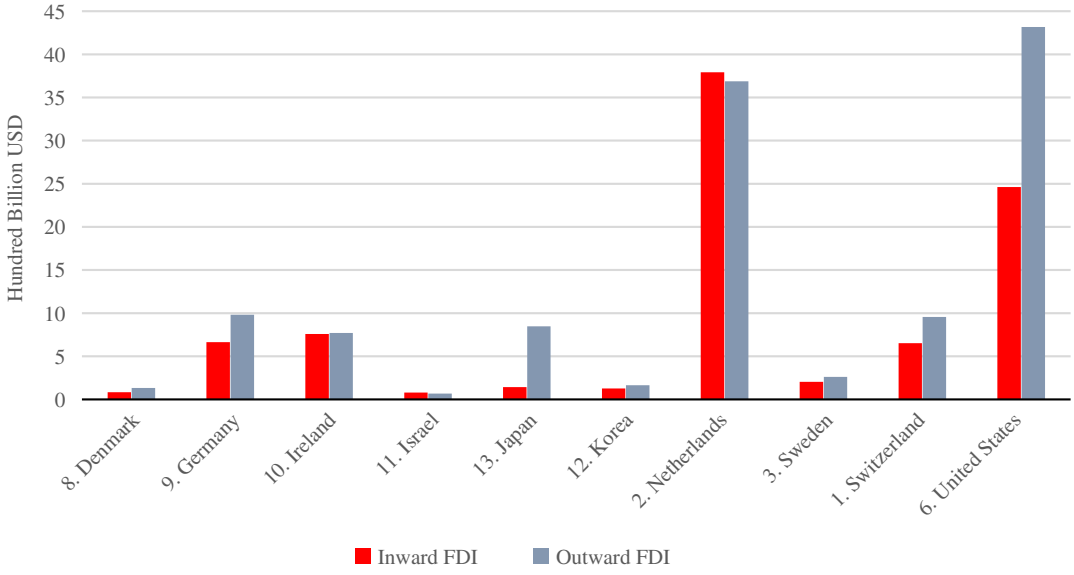

FIGURE 4 Inward and outward FDI positions in 2015 in intangible heavy industries for top ten countries in the Global Innovation Index *Source*: www.oecd.org accessed in November 2018

3.5 | Internationalisation of R&D

This category includes two mechanisms. One is cross-border innovation collaboration, and the other is overseas investment in R&D. In the case of cross-border innovation collaboration, owners of IPs form alliances with different firms and parties in the network, intangibles count as part of the assets. The form of value capture will be a certain percentage of the value added of the final product which is proportional to the IP's value in the total assets of the alliances. This mode differs from the FDI mode in that it does not require equity investment. For example, the vendor can issue a licence for use of an IP, but not convert it into equity share nor charge a guaranteed flat licence fee in the traditional way. Instead, the IP owner will gain financial income according to an agreed proportion of the actual sales of the product. Another widely used form of collaboration occurs when all parties agree to form a consortium to carry out R&D jointly. If successful, their collaboration continues through the phase of production and commercialisation. An example is represented by SEMATECH, the semiconductor technology consortium in the United States, which includes U.S. firms and some foreign firms at the later stages (Walsh et al., 2016). Another example is China's 3G development consortium, which includes Datang, Huawei, ZTE and Siemens and some small American firms (Mu & Lee, 2005).

A second mechanism through which cross-border trade in intangible assets takes place directly is through overseas investment in R&D by MNEs. On the one hand, with the globalisation of R&D, some firms receive foreign funding to produce knowledge outputs to the funder. This is a type of direct trade in intangible assets. For example, according to OECD (2017), Austria, Ireland, Iceland and the UK are among the countries that have the highest foreign funds to total business R&D investment ratio. On the other hand, some MNEs provide investment in R&D in foreign universities, research institutes or companies. These MNEs import talent or produce knowledge (intangibles) offshore to reinforce their international leadership in technology (Branstetter et al., 2018) and gain rents domestically or internationally.

Typical examples of MNEs' power accumulation in technological and overall intangibles are the global platform giants. The intellectual monopolies, for example, the big companies, Google, Amazon, Facebook, Apple, Microsoft and Alibaba and Tencent, build and control platforms that make it possible to extract value and appropriate rents through privileged access to data from producers and consumers all around the world. They gain intellectual power through heavy investment in R&D, globalisation in R&D, domestic and international trade in intangibles through merger and acquisition, and providing funding to foreign R&D partners and setting up overseas R&D centres. Because of the monopoly power in innovation and production, these intellectual monopolies are able to extract extra rents through "unequal exchange" (Ricci, 2019; Rikap & Lundvall, 2019).

4 | THE INTEGRATED FRAMEWORK OF MEASUREMENT

Therefore, if we allow for trade in both goods and intangibles and assume that the exports of intangibles take place via all the aforementioned channels, the trade relationship between countries is no longer a linear 2 × 2 model, but a network model including both the "spiders" and "snakes" (Baldwin & Venables, 2013). Figure 5 illustrates GVC-based international trade from a more complicated network perspective, when tangibles and intangibles are both included and nested in a multi-stage, multi-country network. It presents two global value chain cases (GVC1 and GVC2). Each GVC is split into several stages from materials' extraction or production, R&D, design, to spare parts and components' production, final assembly, to branding and marketing. These different stages of production of each value chain are located in different countries, which allows the lead firm of the GVC (often an MNE)

to achieve maximum profits. At different stages of the production, there are direct inputs of intangibles or indirect inputs through intangible-intensive services or intermediaries into the GVC production.

Nevertheless, if we want to understand the trade relationship between country A and country B, at least, exports of country A to B should include the following:

1. Exports of goods recorded under the "balance of trade" of the current account of the international balance of payments.
2. Royalty fees due to licensing of intangibles recorded under the current account.
3. Knowledge-intensive services recorded as part of factor income under the current account.
4. Exports of other services recorded under "services" of the current account.
5. Returns on intangibles capitalised and captured through foreign direct investment recorded as part of factor income under current account.
6. Value added created via outsourcing and collaboration attributed to intangibles recorded in companies' exports or overseas sales to all other countries.

Correspondingly, the imports into country A from country B should include (1) the imports of goods; (2) the payments for IPs; (3) intangible-intensive services; (4) the imports of other services; (5) payments on intangibles capitalised through FDI; and (6) payments for value added created via outsourcing and collaboration attributed to intangibles. Table 3 summarises the mechanisms in the form of a balance of payment.

The most challenging part is to trace and record income under mechanisms 4 and 5 (return on intangibles and value created via outsourcing). For various considerations, for example, tax avoidance, MNEs may transfer the value to a country where the tax rate is low or almost exempt. It is very difficult for the home country to trace or supervise these decisions and behaviours of the MNEs. The income captured through channel 5 may be discovered in theory, but this is very difficult and costly in practice. This is because we must trace each GVC product by product, calculating the value added at each stage of the

TABLE 3 Trade value flows including the trade in intangibles

Trade income	Trade payments
I. Exports of goods (measured by trade in value added)	I. Imports of goods (measured by trade in value added)
II. Exports of services, of which	II. Imports of services, of which
IP royalty receipts	IP royalty payments
Intellectual services receipts (include intangible-intensive services' provision and income from providing R&D work for foreign funders)	Intellectual services payments (applicable sectors the same as those for receipts)
Other services receipts	Other service payments
III. Dividends of MNE subsidiaries, proportion due to intangibles (factor income in BOP)	III. Transferred funds of dividends of MNEs from the country
IV. Value added created via outsourcing and collaboration which should be attributed to own intangibles. Due to segmentation of production and global sales of final product, it may not fully reflect in bilateral trade. Income may be under-recorded due to transfer pricing and profit shifting of MNEs	IV. Payment of imports of intermediaries/technologies for the production and final products created as a result of outsourcing or collaboration

Source: Author's own elaboration.

GVC given complex input and output combinations at each stage. Moreover, in many cases, strong IP owners use a mixture of methods for IP value capture—industry, market, partner and destination market.

5 | APPLYING THE INTEGRATED FRAMEWORK FOR TRADE BALANCE

5.1 | Data and methods

This section uses data to illustrate the calculation of the adjusted trade balance using the integrated framework and compares it to the traditional measurement of trade balance. It combines a detailed case study of the United States and a cross-country analysis for the most innovative countries in the world measured by innovativeness according to the WIPO's Global Innovation Index. The United States is selected for the detailed case study because (a) it is the largest trading nation in the world, and (b) it has comprehensive, reliable and open-accessed data on goods and services trade, inward and outward direct investment in total and by sector. The final data set includes sixteen countries, which are the United States, United Kingdom, Germany, Switzerland, Sweden, Netherlands, Denmark, France, Ireland, Israel, Japan, South Korea, Singapore, Canada, Australia and China. Adjusted measurements are calculated using a new framework for comprehensive measurement of trade balances for the year 2015 when the latest trade in value-added data are available for all the countries.

We first include trade in goods and services in the measurement as this data set includes the trade in intangibles that are embedded in these traded goods and services, to avoid double accounting. Second, we use trade in value-added data collected from OECD's dedicated data set. This reduced the double accounting problem in the measurement of trade in goods due to intra-industry trade. Third, we calculate the returns from intangibles trade via foreign direct investment, both outward and inward, in selected intangible-intensive industries, such as manufacturing, financial and insurance services, computer and data services and education services.

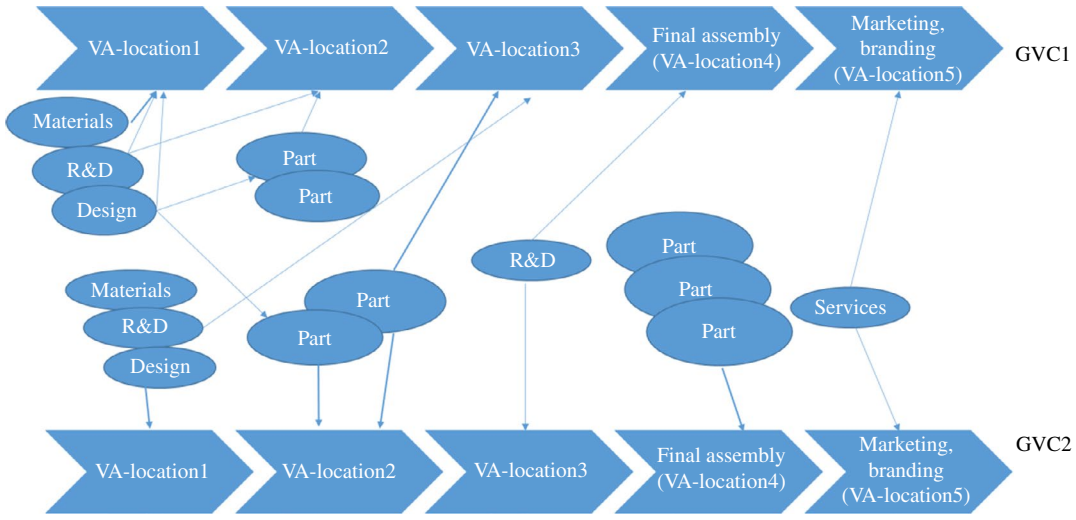

FIGURE 5 GVC-based network model of international trade. *Source*: Authors' own elaboration

For the estimation of adjusted trade balance, net income from intangibles bundled in FDI transactions is critical. However, there is no existing research that can give an indicative share. This is mainly because (a) it is difficult to estimate the proportion of technology investment in total FDI as the situation is different for different companies; (b) more importantly, this is confidential for all investment contracts. Companies do not publicise this information. Nevertheless, a recent study by Guvenen et al. (2018) finds that "Profit shifting has increased significantly since the mid-1990s, resulting in lower measures of U.S. aggregate productivity growth". "We construct an alternative measure of value added that adjusts for profit shifting. The adjustments raise aggregate productivity growth" (abstract). "Our adjustment to productivity growth is quite large in some important industries. When we group industries by R&D intensity, the adjustments to the value added of R&D-intensive industries are as large as 8 per cent of the group's value added in some years" (p. 6).

Based on Guvenen et al. (2018), we can reasonably assume that net income from exporting intangibles from direct investment abroad channel accounts for 8% of the total investment position abroad for industries that are heavy in intangibles, and 2% of the total investment position abroad for the non-intangible-intensive industries. The selected intangible-intensive industries are (a) manufacturing; (b) information and communication services; (c) professional, scientific and technical services; (d) insurance and financial services; and (e) education services. For a country's income from exporting intangibles through outward FDI and expenditure in importing intangibles through inward FDI, we use the same return ratios, 8% for intangibles intensive industries and 2% for other industries.

5.1.1 | Data

For traditional measurements of trade balance, the data on net trade in goods are collected from World Integrated Trade Solutions (WITS). Trade in value-added data for both goods (including agriculture, mining and manufacturing) and services are collected from OECD's published dedicated data set on "Trade in Value-added", thanks to the international joint efforts in the collection and publication of services trade data led by WTO, OECD and UNCTAD. As the returns from intangible-intensive services are already included in the trade data, charges for intellectual property, for example, royalty fees, are also included in the "International trade in services statistics" published by OECD.[4] Therefore, we do not add a separate entry on royalty fees to the sum of net trade in value added for *all* industries.

Industry-level inward and outward direct investment is available from the OECD website for OECD countries for some years. The data on inward and outward FDI stock from UNCTADStat published by the United Nations Conference on Trade and Development (UNCTAD) are also used to fill in gaps for OECD countries where total FDI positions were missing for some years.[5] For China, industry-level inward FDI and OFDI data are collected from the website of the National Statistics Bureau. For the case study of the US trade reported in section 6.2, the data of US inward and outward direct investment are collected from the Bureau of Economic Analysis of the United States Department of Commerce.

[4]See https://stats.oecd.org/Index.aspx?QueryId=74689.

[5]The data from the two sources match closely in most cases with the notable exception of the Netherlands where the OECD data show a higher FDI and DIA stock by a couple of hundred billion dollars. In this case, the OECD data are used as these higher numbers are concentrated in insurance and financial services—an intangible heavy industry. For the United States, UNCTAD reports higher FDI and DIA than OECD.

TABLE 4 Trade balance of the United States (US$ billion)

Indicators	2011	2015
1. Traditional "Net trade in goods"	**−741**	**−763**
2. Net trade in value added in goods and services	**−557**	**−507**
Of which,		
2a. Charges for the use of intellectual property, net	87	85
2b. Trade in Insurance and Financial Services, net	22	50
2c. Trade in information, communication, other bus services and education, net	145	164
3. Direct investment abroad: position	4,514	6,008
4. Direct investment abroad: position, selected industries[a]	3,395	4,317
5. 2% of the remaining DIA position	22	34
6. 8% of DIA position for selected industries[a]	272	345
7. Overall DIA position with weighted average	294	379
8. Inward foreign direct investment: position, overall	3,499	5,710
9. Inward foreign direct investment: position, selected industries[a]	1,730	2,462
10. 2% of the remaining inward FDI position	35	65
11. 8% of inward FDI position for selected industries[a]	138	197
12. Overall FDI position with weighted average	174	262
13. Total trade in intangibles (outsourcing and collaboration not included) = 2a + 2b + 2c + 7–12	**374**	**416**
14. Trade including intangibles (adjusted measure, outsourcing and collaboration not included) = 2 + 7–12	**−437**	**−390**

Source: Authors' own estimation based on data collected from https://wits.worldbank.org/; www.imf.org; www.oecd.org; and www.unctad.org accessed in November 2018 and trade in value-added data from https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm in July 2020.

[a]"Selected industries" in numbers 4, 6, 9 and 11 refers to intangible-intensive industries: manufacturing, insurance and financial services, information and communication services, business services excluding distributive trade, transportation, hotel and food services, and education services.

The aggregated trade balance measured in traditional methods and improved methods taking into account of trade in services and intangibles are shown in bold.

We also made an effort to estimate the total amount of trade in intangibles for an individual country in our example so that we understand its size. For this purpose, we used the net trade in value added in selected intangible-intensive services from the OECD's dedicated data set as described above.

Finally, the income from intangibles traded through outsourcing is difficult to trace and comprehensive data are rarely available. Only some listed MNEs have information of overseas income. Therefore, we did not include income from intangibles embedded in outsourcing in the modified measurement estimation. This implies that our estimated results will be lower than the true net gross income from trade in intangibles.[6]

[6]For Apple Co Ltd., for example, its net profits from non-America regions were US$32 billion in 2015 and US$27 billion in 2016, respectively, according to the company's annual report.

TABLE 5 Traditional versus adjusted measures of trade imbalances for selected most innovative countries, billion US$, year 2015

Country	Traditional measure (Goods)	Trade in value-added measure (Goods)	Trade in value-added measure (goods and services)	Adjusted measure (goods and services and intangibles)	Adjustment (positive: reduction in deficit) Value	Adjustment (%)	Correction by using trade in value added (%)	Further correction by incorporating trade in services (%)	Further correction by incorporating trade in intangibles through FDI (%)
US	−761.87	−580.63	−507.03	−389.76	**372.11**	49	24	10	15
UK	−179.78	−125.62	−52.84	−46.44	**133.34**	74	30	40	4
Turkey	−49.01	−34.13	−23.54	−29.24	**19.77**	40	30	22	−12
France	−32.06	−65.92	−28.49	7.94	**40.00**	125	−106	117	114
Australia	−19.01	−23.09	−24.13	−23.93	−4.92	−26	−21	−5	1
Canada	−18.62	6.7	−58.26	−45.96	−27.34	−147	136	−349	66
Japan	−7.33	−22.4	−15.77	51.09	**58.42**	797	−206	90	912
Israel	−3.39	0.46	9.94	9.24	**12.63**	373	114	280	−21
Sweden	14.35	7.57	22.29	27.59	**13.24**	92	−47	103	37
Denmark	14.38	5.43	18.08	22.66	**8.28**	58	−62	88	32
Switzerland	53.8	22.26	69.05	89.67	**35.87**	67	−59	87	38
Netherlands	72.65	5.76	43.43	25.18	−47.47	−65	−92	52	−25
Singapore	92.57	14.6	77.35	44.29	−48.28	−52	−84	68	−36
South Korea	120.28	96.76	92.52	97.87	−22.41	−19	−20	−4	4
Ireland	125.78	65.06	82.63	81.28	−44.50	−35	−48	14	−1
Germany	275.59	181.32	251.26	281.3	**5.71**	2	−34	25	11
China	576.19	299.33	305.77	320.31	−255.88	−44%	−48	1	3

Source: Authors' own estimation based on data collected from https://wits.worldbank.org/ (for traditional measure); www.imf.org; www.oecd.org (for trade in value-added data); and www.unctad.org (for FDI data) accessed in November 2018; and http://www.stats.gov.cn/english/ (for China's FDI and OFDI industry-level data).

Positive adjustments, i.e., reductions in deficit, are shown in bold.

5.2 | Application 1: Case study of the United States

Taking the overall trade balance of the United States as an example, we can see from Table 4, after adjusting for the income from trade in intangibles, that the trade deficit of the United States dropped sharply by nearly a half. In the year 2015, the net trade of the United States, taking into account net trade in goods and a part of intangibles, was US$390 billion, instead of US$763 billion using the traditional measure; it was US$437 billion in 2011 instead of US$741 billion. The portion of trade in intangibles included in the calculation comprises IP licensing, trade in insurance and financial services, computers, communications and data services, professional business services and education services, as well as net income from direct investment overseas and net expenditure from FDI positions in the United States. To note, this adjustment has not taken account of the net income of intangibles involved in all outsourcing activities by U.S. firms such as Apple, and income from international innovation collaboration.

5.3 | Application 2: Estimation of trade balance for world's top innovative countries

Table 5 shows the traditional versus adjusted measures of trade imbalances for the most innovative countries in the world. It also describes the value and ratio of traditional methods, adjustments in each step, comparing the traditional measure and adjustment components, in all sampled countries.

5.3.1 | Countries where the trade deficits are over reported or surplus underreported by traditional measures

In addition to the United State, notable figures are those of the United Kingdom and Japan whose trade deficits are significantly over reported using the traditional measures. For 2015, the usual measures report a deficit of 180 billion US dollars for the UK. Adjusting for intangibles brings the figure down more than threefold to 46 billion USD. For Japan, the adjustments mean a trade surplus of 51 billion US dollars instead of a deficit of 7 billion US dollars, when only trade in goods are accounted for. The results for Germany, Japan, Switzerland, Sweden, Israel, France and Denmark also demonstrate a greater surplus or change from deficit to surplus status using the modified integrated trade measure.

5.3.2 | Countries where deficits increase, or surpluses reduce after adjustment

The most striking case is of China where a large trade surplus of 576 billion US dollars reduces to 320 billion US dollars. The Netherlands, Ireland, Singapore and South Korea also see a substantial reduction in trade surplus. Ireland's surplus decreases from 126 to 81 billion USD with adjustment, particularly due to Ireland's large payments for intellectual property. The same happens with the Netherlands, where the trade surplus drops from 73 to 25 billion US dollars. Similarly, for Singapore the trade surplus reduces from around 93 billion dollars to 44 billion, and South Korea also experiences a decrease from 120 to 98 billion US dollars. These changes suggest that these countries import more intangibles than they export. Two resource-rich countries, Canada and Australia also see an

increase in trade deficit suggesting their comparative advantage in natural resources in comparison with the global innovation leaders.

Comparing the adjusted measure with the traditional trade measure across different countries, the United States has the largest adjustment in amount, enjoying a significant improvement in trade balance. This is mainly due to the correction using trade in value-added data, but also from significant income from trade in intangible-intensive services and trade in intangibles from FDI. It is followed by China which sees a significant reduction in its trade surplus, which is largely due to the removal of double accounting and using trade in value-added data. China is the largest importer of intellectual property with the highest payment of royalty fees that is several times higher than that of most other countries in the sample.

Overall, the adjustment for different countries is driven by different modes of intangible trade. For the United States and Japan, surplus in intangibles trade accrues mainly due to the FDI and intellectual property and IT services. For the UK, major surplus in intangibles trade occurs through the removal of double accounting and income from intangible-intensive services such as financial services. For France and Germany, the adjustment results from improvements in all three major steps including trade in value-added data, trade in services and intangible trade through FDI. Similar adjustments are found in other countries such as Sweden, Switzerland and Demark, whose revised surpluses accrue to FDI and trade in IT, financial and other business services, and calculations using trade in value added. To note, much of the increases in surpluses and decreases in deficits are underestimates, as outsourcing is not included.

Looking at the difference in results from different trade measurements across different countries, Figure 6 shows that overall, the global trade appears to be more balanced when we measure trade using

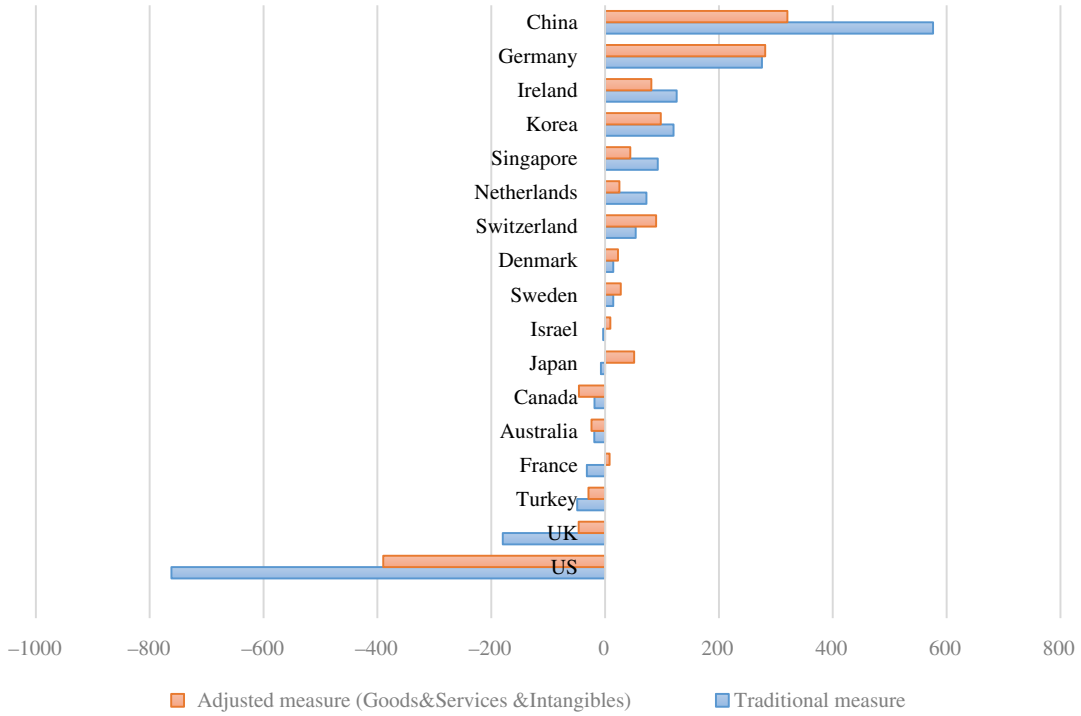

FIGURE 6 Trade balance of selected countries: Traditional versus adjusted measurement, 2015 *Source*: Authors' own calculation based on results reported in Table 5

the adjusted integrated measurement. However, while the scale of trade balance changed significantly for the United States, it remains the country with the highest trade deficit after adjustment. China remains the country with the largest trade surplus, followed by Germany which moved close to China's level after the adjustment.

6 | THE NEW GLOBALISATION CONUNDRUM

The emergence of the global factory, that is the globalisation of production driven by MNEs increasingly slicing the activities of firms more finely, deepens the international division of labour. This constrains the development options of many developing countries (Buckley, 2009). Its consequences represent political challenges, and reaction against these has led to a questioning of the effects of global capitalism and its moral basis (Buckley & Ghauri, 2004; Kaplinsky, 2000). It also concentrates the high value-added activities in rich countries with only a few developing countries being able to upgrade with small steps along the value chain.

Can countries achieve high value-added activity-based income growth, creation of massive numbers of jobs for blue-collar workers and environmental protection through trade at the same time in the twenty-first century? MNEs finely slice the production in locations where resources are easy to access and cheaper or where labour is cheap for activities that are labour-intensive. If they go back to the nineteenth-century model, for example, for a company such as Apple that does everything from R&D, design to production and marketing all in the United States, then the unit cost would increase considerably. The company will need to raise the unit price of an iPhone—which hurts the consumer—to keep their profits, or keep the same sales price while reducing the profits it captures. Admittedly, income growth will generate indirect employment effects. The strength of this indirect employment effect will depend on how many of these jobs will be local and how much will be outsourced, and whether and how effective the government can mobilise labour forces in the outsourcing manufacturing sector to the "new production and services" sectors through various policies. Therefore, globalisation enabled a large scale of trade in intangibles through various modes which result in high income. However, there is a trade-off between protecting jobs for low-skilled workers and pursuing high value added based on intangibles' monopoly at the same time for one single country. This is the new conundrum of globalisation.

7 | CONCLUSIONS

This paper attempts to integrate the literature on technology, international trade and global value chains, and develop an analytical framework of global trade that integrates trade in intangibles and trade in goods and services in the context of globalisation and increasing trade in intangibles. Through in-depth discussions of the five modes through which trade in tangibles are carried out, it proposes an integrated framework for the measurement of international trade.

Applying this framework to the world's most innovative countries, we find that major countries such as United States, UK, Switzerland, Japan, France, Germany and Sweden see large upward adjustments in trade imbalance, thus reporting large surpluses in trades of intangibles. To note, much of the increases in surpluses are still underestimates as outsourcing is not accounted for. Some countries such as China, Netherlands, Ireland, Singapore and Korea see a decrease in their trade surpluses, implying that they are importing intangibles.

Applying this framework to the trade balances of the United States finds that in the year 2015, the net trade deficit of the United States shrinks sharply by nearly a half. The net trade in goods, services and intangibles of the United States reduced to US$390 billion instead of US$763 billion as reported using the traditional measure. If we further adjust for the net income of intangibles involved in all outsourcing activities by U.S. firms, the size of the trade deficit of the United States will be even smaller.

This framework of trade measurement provides a useful lens for us to understand the broad picture of international trade in the twenty-first century. The balance of trade in goods no long presents a good indicator of the trade relationship between countries. The international joint efforts in publishing trade in value-added data and expanding it to include the trade in services are a valuable improvement, but still not enough. The various avenues of the trade in intangibles should also be considered in the big picture.

Findings from the research have significant policy implications. First, the global trade imbalance and policy responses to solve it should be discussed under a framework that fully incorporates different types of trade activities in the twenty-first century. The adjusted trade measure suggests a less distorted and more balanced picture of global trade in terms of trade income. Therefore, using the distorted trade figures based on traditional trade measures as an excuse to launch many trade wars will harm the existing global trade system, which needs reform but not dismantling. Moreover, as a policy tool, increase in the exports of intangibles, not just the increase in exports of high-technology products, is another policy tool for consideration for the governments.

Second, findings of this research shed light on the debate on the impact of globalisation and the policy measures to make a more inclusive globalisation. In recent years, globalisation has been blamed as an important cause of the increasing inequality in the developed countries. International trade in goods has been the target of attack and is leading to protectionist rhetoric. Our findings suggest that the global economic imbalance is not as severe as suggested by the statistics of trade in goods. In fact, the industrialised countries have a large surplus in trade in intangibles. This is in addition to the traditional gains from trade, such as efficiency gains through relocation of resources and welfare gains to consumers, increased variety of products, and lower markups and hence social gains for consumers (Feenstra, 2018). The problem is that the benefits of trade in intangibles are highly concentrated to a few owners of the intangibles and a small community of skilled researchers or technicians who created them. As Rodrik (2018) argues, while the economic pie expands with globalisation, some groups are left behind. Therefore, the social discontent that blames globalisation is, to a certain extent, a domestic problem. A re-distribution of the often hidden or shifted income from the entities who gained greatly from the trade in intangibles to the rest of the society is crucial to reduce the inequalities. Tax avoidance by MNEs depositing these benefits at different locations globally should be curbed. Of course, findings and policy implications from this research do not exclude the need for reforms to make globalisation more inclusive.

Third, there is the new globalisation conundrum, which suggests that there is a trade-off between protecting jobs for low-skilled workers and pursuing high value-added jobs based on intangibles for one single country. The finely sliced and orchestrated global production and consumption controlled by the MNEs lead to the high value added per head captured by the intangible assets in the industrialised countries and low value-added manufacturing activities based on cheap resources and labour in the developing countries. There are three policy options for consideration. One is re-shoring of manufacturing activities back to the industrialised countries. The feasibility of the re-shoring then depends on whether MNEs would like to give up some of their profits or not, and whether technical progress can make this economically feasible or not. This will, however, reduce consumer welfare in the trading countries. The second policy option, as discussed earlier, is a re-distribution of the income within the countries where a few entities enjoy huge gains from trade in intangibles and profit shifting. The third policy option, which

is closely linked to second option, is to fully localise the indirect employment effect of income growth and mobilise labour forces in the outsourced manufacturing sector. This can be done by encouraging "new production and services" sectors through various social, educational, gender and regional policies. This will require a mindset change about the role of government in the industrialised countries.

Fourth, findings of this research contribute to the discussion on how to measure the impact of globalisation. It suggests that the impact of globalisation should be measured not only by increasing interaction and integration of the flows of goods, investment and services, but also through the flow of intangibles which are more complicated to trace and measure. Closer coordination between trade and investment statistics reporting to better record MNEs' global activities is an important policy and action area to improve trade statistics.

Future research should develop in-depth and systematic research on intangibles' valuation and trade mechanisms through foreign direct investment and international collaboration to enrich our in-depth understanding of these complex processes. Moreover, methods and regulatory requirements for data collection on trade in intangibles should be developed to inform policymakers and international organisations. Third, is international trade, measured using the integrated method, a more powerful engine of economic growth? Future research should also investigate this and provide new empirical evidence. Finally, in what ways and to what extent will the technological revolutions transform the modes and scope of the trade in intangibles? This is also an emergent area for future research.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in IMF, World Bank, OECD, UNCTAD, BAE of the US and NBS of China at https://wits.worldbank.org/; www.imf.org; www.oecd.org; www.unctad.org; www.bea.gov; and www.stats.gov.cn. These data were derived from the following resources available in the public domain: https://wits.worldbank.org/; www.imf.org; www.oecd.org; and www.unctad.org.

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