# OECD WORK ON PRODUCTIVITY AND GLOBAL VALUE CHAINS - LESSONS LEARNED AND NEW DIRECTIONS

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## 1. Introduction

Productivity has been on the OECD agenda since its origins in the OEEC (Paige and Bombach, 1959), when the OEEC hosted the European Productivity Agency (King, 2006). The measurement and analysis of productivity growth have remained on the OECD's agenda since, reflecting the important role productivity plays for economic growth, wages and incomes and the achievement of a range of other public policy objectives. Globalisation, including its measurement, has also long been on the OECD's agenda, reflecting the importance of international trade and investment for almost all OECD economies. The notion of "global value chains", however, is a more recent feature of the OECD's work and only started to get widespread recognition in the first years of the 21st century (e.g. OECD, 2007).

To support its analysis of productivity and globalisation, OECD has invested heavily in the development of new tools to analyse growth, productivity and globalisation over the past decades. These include the Structural Analysis (STAN) family of databases, first developed in the early 1990s; the OECD Productivity database and Activities of Multinational Enterprises database, developed in the early 2000s; and, more recently, in order to provide measures of Trade in Value Added (TiVA) and other metrics related to GVCs, a set of Inter-Country Input-Output (ICIO) tables, building on the work started in the early 1990s.

OECD has played a major role in the development of methodologies to improve the measurement of productivity, globalisation and other key drivers of productivity, sometimes resulting in official methodological handbooks, *e.g.* on productivity, quality-adjusted ("hedonic") prices, the measurement of globalisation, and the measurement of intellectual property products. Over the years, the research in these areas has informed revisions to the System of National Accounts (SNA) – the key statistical framework for developing indicators of productivity and GVCs. OECD has also undertaken a range of analytical work to better understand the drivers of productivity and globalisation and their impacts, including reports on global value chains, knowledge-based capital and productivity, that has frequently led to high-level reports to ministers and senior policy makers.

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Over the years, OECD work on productivity and globalisation has closely mirrored the work of the Groningen Growth and Development Centre (GGDC) on these issues, reflecting considerable cooperation over the past 25 years. Like OECD, GGDC has invested heavily in the development of new datasets to support research and analysis, both in the areas of productivity and global value chains, and has undertaken a range of analytical work building on these databases.

This paper reviews some of the key areas of OECD work over the past 25 years, including the development of new analytical databases such as STAN, ICIO and TiVA; the development of better methodologies and measurement tools; the emergence of new analytical and policy insights; and the delivery of new policy recommendations. At the same time, the paper is not attempting to be comprehensive and mainly touches on some of the key areas of work.

The paper also highlights some differences between the work of the OECD and that of the GGDC, which partly reflects the respective nature of the two organisations. This includes the respective roles of the two organisations; but also the nature of cooperation with statistical offices, which affects the availability of data and methodological discussions; and with governments and international organisations like the UN, Eurostat and others more broadly, which affects the nature of analytical and policy work being conducted by the OECD and GGDC, respectively.

The paper mainly touches on work on productivity and global value chains, and makes no reference to OECD work on historical statistics, where there has also been considerable cooperation with the GGDC (OECD, 2014). A final section of the paper concludes and highlights some key differences in the work of the OECD relative to the GGDC, such as the OECD's growing work with official (often confidential) micro data, which is contributing to both the productivity work and the work on global value chains. This section will also point to some key insights that have benefited from the cooperation of GGDC and the OECD, and will briefly look ahead to the future.

## 2. OECD work on productivity measurement and analysis

### *2.1. National Accounts and Productivity Measurement – Methodological Contributions by the OECD*

Systematic measurement and analysis of economic growth and productivity started as early as the 1940s (Tinbergen 1942) and gained full momentum in the post-war period with Solow's (1956, 1957) models of economic growth and the empirical work by Kuznets (summarised in Kuznets 1971) and Denison (1962). Another milestone was Jorgenson and Griliches (1967) who challenged the measurement conventions adopted by Denison, Kuznets and Solow by using gross concepts of output, by introducing theoretically-backed measures of capital services (Jorgenson 1963) and by introducing constant quality indexes for capital and labour inputs. Less noted but similarly important was the careful link between productivity measurement and national accounts established by Jorgenson and Griliches (1967) and in the later decades, by Jorgenson and his co-workers (Jorgenson 1995). This is remarkable because in most countries, there was very little institutional and methodological interaction between academia and official national accountants.

The institutional divorce of national accounts from productivity measurement continued for several decades in most countries: while productivity analysts were using national accounts for their purposes, national accounts methodologies and data were only partially fit for that purpose and researchers either had to construct their own data or deviate from the measurement consensus that had gained place in academia. The most important gaps in the national accounts framework included (i) no recognition of capital services which meant that data on the remuneration of capital in production (gross operating surplus) was only available at current prices but without a breakdown in the price and volume of capital services; (ii) the use of index number formulas with a fixed base year, thus deviating from the strong case that theory had provided in favour of superlative index numbers (Diewert 1976) or at least annually-chained indices; (iii) an asset boundary that was largely confined to tangible or physical capital.

Several developments have since marked a convergence.

First, the *1993* revision of the *System of National Accounts* introduced, among other changes, guidance regarding the selection of the index number formulae in the national accounts. Peter Hill, then head of the OECD National Accounts Division was a major contributor to the 1993 SNA, and the lead author of the chapter on index numbers (Hill 1988, 1993) that paved the way for a broad-based acceptance and introduction of chain index number formulae in countries' national accounts although only a few countries (United States, Canada) went all the way towards introducing Fisher index numbers, fully in line with Diewert's economic theory of index numbers. But the biggest sources of index number bias in the form of fixed-base indices were nearly universally eliminated in OECD countries.

It is of note that the 1993 SNA also recognised software and several other intangibles as assets, thus opening the door for a broader recognition of knowledge-based assets that took place in the 2008 revision of the system of national accounts.

Second, the *OECD Productivity Manual* (OECD, 2001a), developed under the auspices of an OECD Working Party was the first international manual on the subject matter. While it did not break new ground in terms of the substance – and this is not normally the objective of an international manual that needs to reflect consensual and well-tested techniques – it was one of the first international manuals on economic measurement that made a particular effort to tap into the body of academic research that had been developed over several decades to provide guidance for productivity measurement as part of official statistics.

Third, the dot.com boom in the late 90s gave rise to a wide-spread discussion on accurate measurement of prices of information and communication technology products, and more generally, the measurement of inflation. Famously, the report of the Boskin Commission (Boskin, Dulberger, Gordon, Griliches and Jorgenson 1996) estimated that U.S annual inflation in the mid-1990s was overstated by 1.1 percentage points. Part of this bias was attributed to insufficient capturing of quality improvement of products and incomplete capturing of the price declines that often accompany the introduction of new products in the market. Although the report dealt with the U.S. CPI, most of its insights were equally valid for price statistics in other countries, in particular insufficient capture of quality change inherent in new ICT products. A point of particular debate among statisticians was the question whether and if so which hedonic methods should be used by statistical agencies to derive constant quality price indices for ICT products. In 1990, Triplett remarked "To put it succinctly, hardly any use has been made of hedonic

methods in U.S. government price indexes. The same statement holds for price indexes of other countries." (Triplett, 1990, p. 208).

The U.S. BEA had started to employ a hedonically-adjusted price index for computer equipment in 1985 that declined at a much steeper rate than the corresponding price indices in Europe giving rise to the suspicion that the gap in productivity growth between the U.S. and Europe was a statistical rather than an economic phenomenon. The OECD contributed actively to this debate first from a more academic perspective (Wyckoff 1995, Schreyer 2002) but it was quickly apparent that an authoritative source was needed for guiding statistical agencies in their efforts to deal with hedonic methods, in particular in conjunction with ICT products. Authored by one of the leading experts in the field, Jack Triplett, the OECD published a Handbook in 2006 on *Hedonic Indexes and Quality Adjustment in Price Indexes* that has lost little of its relevance more than a decade on (Triplett, 2006).

Fourth, a further landmark in the rapprochement of academic research and statistical agency practice was the publication of a '*Blueprint for Expanded and Integrated U.S. Accounts* (Jorgenson and Landefeld 2005). The *Blueprint* includes a production account presenting factor payments in both current and constant prices, thus complementing the already existing breakdown of compensation of employees into a price and volume component with a similar breakdown for capital into unit user cost and volumes of capital services. This means that all elements that are needed for multi-factor productivity measurement (real output, real inputs and current price weights) are provided in a consistent manner in the U.S. NIPA. This principle of recognising the volume of capital services inside the national accounts was one of the key features of the 2008 Revision to the System of National Accounts. Chapter 20 of the *SNA 2008* presents measures of capital services, described as follows:

"By associating these estimates with the standard breakdown of value added, the contribution of labor and capital to production can be portrayed in a form ready for use in the analysis of productivity in a way entirely consistent with the accounts of the System. (p. 415).

The OECD played a leading role in preparing this significant change to the SNA by contributing a series of issues papers to the *Canberra II Group on the Measurement of Non-financial Assets* and by acting as one of the five international organisations in the *Inter-secretariat Working Group on National Accounts* (ISWGNA) that led the SNA revision process in terms of substance. A consistent companion product to the 2008 SNA was the 2009 *OECD Manual on Measuring Capital* (OECD, 2009a). This provides detailed recommendations on the practice of constructing prices and volumes of capital measures and shows how to formulate an integrated and consistent system of measures of investment, capital services (for productivity measurement), depreciation (for various net measures), revaluations and wealth capital stocks (as entries in balance sheets) at industry and economy-wide levels.[2]

[2] OECD also plays a role in revisions of ISIC, which is ~~an~~ important element in internationally comparable estimates of industry productivity. Whatever the merits of definitions of ISIC at detailed (3- or 4-digit) level, for SNA, the hierarchy matters – only 2-digit level and aggregates are considered in determining the breakdown of prices and volumes. For example, fast growing innovative industries such as ICT and pharma were 4-digit sectors in ISIC Rev.2 and therefore not represented in SNA68. The ICT sectors were

Fifth, the year 2008 saw also the completion of the first EU-KLEMS project that developed production accounts and associated productivity measures at the industry level for the economies of the 25 European Union countries covering the period 1970-2005 (findings are summarised in Timmer, Inklaar, O'Mahony and van Ark 2010). Several of the OECD's basic data products such as the STAN database (see below), as well as early versions of the OECD's Input-Output tables database, had been upstream inputs to the KLEMS work (and predecessors such as GGDC 60-industry database). The EU-KLEMS project has since expanded into the World KLEMS initiative and much more could be said of these. But for the purpose at hand it suffices to point to the institutional role that EU-KLEMS played in addition to its research role, namely fostering the dialogue between researchers and national statistical offices to provide data that continues to be in great demand by policy-makers.

Sixth, the *Canberra II Group* was also instrumental in preparing the ground for another major innovation in the 2008 SNA, namely the extension of the asset boundary of intangibles to include the fruits of research and development as assets – these are now all summarised more descriptively as *intellectual property products*. The rising importance of producing and using knowledge assets and exerting property rights over knowledge in one form or another is broadly acknowledged but the characteristics of knowledge assets (often unique but easily reproducible, production in-house rather than via markets, no wear-and-tear but obsolescence, overlap and danger of double-counting with software assets) tend to exacerbate the measurement challenges associated with them. In an effort to provide a first response to these questions and as a practical guide for implementing the relevant parts of the 2008 SNA, the OECD, under the auspices of special Task Force, prepared its 2010 *Handbook on Deriving Capital Measures of Intellectual Property Products* (OECD, 2010a).

Nevertheless, measurement issues associated with Intellectual Property Products are far from resolved. In particular, the conjunction of Intellectual Property assets with globalised production has given rise to new challenges for national accountants and concerns about our ability to accurately allocate value-added to different countries when intellectual property products of significant size are easily transferred across borders within companies. For several years, the OECD has been active in the international efforts to inject more clarity and common treatment of these cases into countries' national accounts, for instance by co-authoring the Handbook on *The Impact of Globalisation on National Accounts* (UN-ECE 2011) and the *Guide to Measuring Global Production* (UN-ECE 2015) and more work is going ahead.

The OECD has conducted much statistical groundwork and continues to do so. For instance, one important activity is the work of the ***OECD Expert Group on Extended Supply-Use Tables***. The Group has been leading international efforts to develop SUTs that not only integrate and separately identify different types of enterprises, including e.g. exporters versus non-exporters, multi-national enterprises and SMEs as a core building block in the national accounts framework and architecture, but that also include additional information on employment and wages, and capital expenditure[3]. These extensions matter for a better understanding of the drivers of productivity and economic growth and also provide the granular

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raised to 2-digit level in ISIC Rev.3 (SNA93) but not until ISIC Rev.4 (SNA08), did the pharmaceutical industry become a 2-digit sector.

[3] See the Group's Terms of Reference (https://www.oecd.org/sti/ind/tiva/eSUTs_TOR.pdf) and Ahmad and Ribarsky (2014).

information that is needed for an improved understanding of globalisation[4] and its consequences. A report summarizing the recommendations of the *Expert Group* will be published in the course of 2017, and a dedicated chapter describing the accounting framework will also feature in a forthcoming Handbook by the *UN Expert Group on International Trade and Economic Globalisation* (2018). An important prerequisite to separating industrial activities into different types of enterprises lies in countries' capacity to link different datasets at the micro-economic level, especially between trade statistics (goods *and* services) and business statistics (including business registers, structural business statistics, FDI, and other enterprise surveys), which a view to identifying and characterising those firms that are engaged in international trade within each industry and those that are not. The OECD is currently developing a *Handbook on Linking Trade and Business Statistics* that will guide countries in this endeavour, and has co-developed, with Eurostat, a *Compilation Guide on Services Trade by Enterprise Characteristics* (2017, forthcoming).

Another methodological development is also worth noting in the context of measuring production and productivity, namely the recognition of non-produced assets such as natural resources. A singularly important non-produced asset in many OECD countries is land and yet, its measurement in balance sheets and as a source of capital services is at best incomplete. In 2015, therefore, Eurostat and the OECD published the first compilation guide on land estimation (Eurostat-OECD, 2015) to promote internationally comparable measures of values, volumes and prices of land in a national accounts framework. As other academic and OECD research had shown (Diewert and Fox 2016; Brandt, Schreyer and Zipperer 2016), the inclusion of non-produced assets into the scope of capital services can markedly modify the resulting productivity estimates.

To summarise, much has happened over the past decades by way of bringing closer the world of research and the world of official statistics in the area of national accounts, measurement of productivity and globalisation. The OECD has played its role by way of contributing methodology, data and a platform for exchange but for reasons of space the recount remains far from exhaustive and there are many significant contributions that others have brought to the table.

### *2.2. Productivity data at the OECD*

Initial OECD research on productivity was mainly carried out at the aggregate level, and relied on available national accounts data, as included in the OECD's National Accounts database and OECD's Labour Force Statistics, as well as internal OECD databases underlying the Economic Outlook. Data on capital stock or capital services were initially not included in these databases and there were questions as regards the consistency of available employment and hours worked data with the GDP data from the national accounts (see e.g. Ahmad, et al, 2003). The OECD's Productivity Database, launched in 2005, was intended to build a more integrated and comprehensive database that also included data on capital services (Schreyer, 2003; Pilat and Schreyer, 2005). This database continues to be updated regularly and provides

[4] See e.g. OECD *et al* (2017) and OECD-World Bank Group (2016).

an important input into the OECD *Compendium of Productivity Indicators* that is released on a regular basis (OECD, 2017a) as well as the OECD's *Going for Growth* series (OECD, 2017b).[5]

In the early 1990s, work started to explore the structural features of productivity growth in more detail, and better understand its industry dimensions. In the first instance, the STAN family of databases was conceived to analyse international technology spillovers (Papaconstantinou et al, 1996) and the relationships between productivity, technology and innovation (Sakurai, et al, 1996). Four databases were developed, linked by a common industry list, to carry out this work: *i)* the principal Structural Analysis (STAN) database (based on SNA by industry time series supplemented with industry survey results), first officially released in 1996 (OECD, 1996); *ii)* a set of "harmonised" national Input-Output Tables, covering 10 countries, first released in 1995 (OECD, 1995); *iii)* Analytical Business Expenditure on R&D by industry (or ANBERD database) used as a proxy to estimate industry "technology intensity" and; *iv)* estimates of bilateral trade in goods by industry (BTD). These databases have continued to evolve since as industry classifications have changed (from ISIC Rev.2 to ISIC Rev.3 and now ISIC Rev.4), as SNA recommendations have been revised (from SNA68 to SNA93 and now SNA08), and as the coverage and quality of official national statistics has much improved. The range of variables and countries included in the STAN database has expanded over time and a new dimension to BTD was added to distinguish trade in intermediate and final goods thus transforming into the Bilateral Trade Database by Industry and End-use category (BTDIxE).

The work on Input-Output tables has expanded and evolved considerably over time and, since 2010, has evolved into an integrated inter-country input-output (ICIO) database, that currently covers 63 economies and underpins the OECD's Trade in Value Added (TiVA) database that is used for the analysis of global value chains, and is discussed in more detail below.

A more recent expansion of the data sources supporting productivity analysis involves the growing use of micro data. In the OECD context, three main sources of micro data can be distinguished:

- Administrative data, such as patent data, that are available for OECD productivity analysis and some of which are also available to external users.[6]

- Private sources of micro data, notably the ORBIS database developed by Bureau Van Dijk, that provides a wide range of financial variables for business, and that has underpinned recent OECD work on the Future of Productivity (OECD, 2015a).

- Official micro data from statistical offices that are used in OECD analysis through the use of software routines that are applied by national statistical agencies to generate new and policy-relevant micro-aggregated indicators. This source of data is, for example, used in the OECD's Multiprod project (Berlingieri, et al., 2017).[7]

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5 See: http://www.oecd.org/std/productivity-stats/

6 For example: http://www.oecd.org/sti/intellectual-property-statistics-and-analysis.htm#ipdata

7 See: http://www.oecd.org/sti/ind/multiprod.htm

### *2.3.Analytical work on productivity and policy insights*

Productivity and policies to enhance productivity growth have been on the OECD's agenda since the origin of the OECD in the Organisation of European Economic Cooperation (OEEC), when work was undertaken to compare productivity and income levels across European countries (Paige and Bombach, 1959). The OEEC also established a European Productivity Agency, which in its first programme echoed Paul Krugman's stating: "Productivity is a means to an end. The final purpose of the campaign is the achievement of a higher European standard of living." (King, 2006).

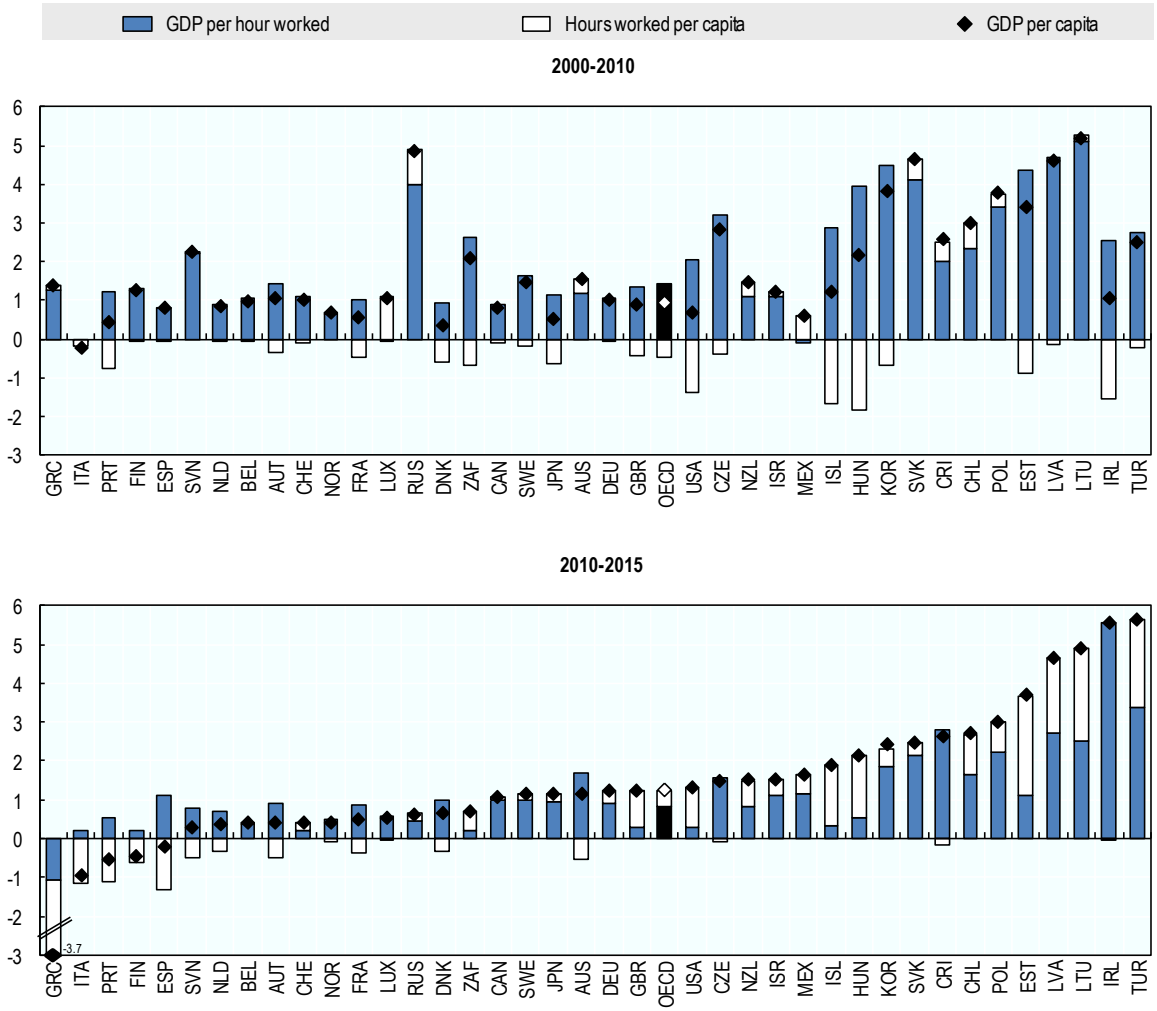
Since these early origins, productivity has remained an issue that regularly returns to the OECD's agenda as policy makers seek to understand the structural factors driving economic growth and the policies that could help strengthen growth performance. Analytical reports on aggregate productivity performance have been a regular feature of OECD's work over the past decades (Englander and Mittelstadt, 1988; Englander and Gurney, 1994; OECD, 2001b and 2003; OECD, 2015a).

In the mid-2000s also, the breakdown of GDP per capita in labour utilisation and productivity became a central element of one of the OECD flagship reports on economic growth, the annual report on *Going for Growth* (OECD, 2017b). This breakdown - initially proposed by the Conference Board - contributed to a sharper breakdown in the drivers of economic growth, and helped to focus recommendations on policies and factors that either affected labour utilisation or labour productivity. For example, Figure 1 provides a breakdown of the contributions to GDP per capita from increased labour utilisation and GDP per hour worked over two periods from 2000 onwards (OECD, 2017a). It shows that in many countries, especially those that have experienced higher than average OECD growth rates, post-crisis GDP per capita growth has largely been sustained by increased contributions from labour utilisation. This differs significantly from the pre-crisis period, where the contribution from labour utilisation had only a limited impact in most countries and indeed declined in many (Figure 1).

This breakdown can be further elaborated by breaking labour utilisation down in its key components, i.e. changes in average hours worked per capita, changes in the employment rate, and changes in the share of the total population that is of working age, i.e. 15-64 old. At the same time, growth accounting techniques can help break labour productivity growth down into the contributions of capital deepening (including the role of ICT versus non-ICT capital) and that of multi-factor productivity growth (OECD, 2017a).

**Figure 1. Growth in GDP per capita, labour productivity and labour utilisation**

Total economy, percentage change at annual rate




Source: OECD Productivity Statistics (database), http://dx.doi.org/10.1787/pdtvy-data-en, April 2017. http://dx.doi.org/10.1787/888933477037

To complement this breakdown, considerable work was also undertaken to develop cross-country indicators of policy, e.g. on product market regulation, labour markets, financial markets and restrictions on trade and FDI (e.g. Nicoletti, et al, 2000 and Koske, et al., 2015). Other policy variables, e.g. on management or bankruptcy legislation, are also used in the work and sometimes derived from academic and other external sources (e.g. Bloom, et al., 2007 for indicators on management). These indicators were subsequently used to benchmark national policies and integrated into econometric analysis, thus helping to substantiate the role of key policy factors affecting productivity performance, such as regulations (e.g. Nicoletti and Scarpetta, 2005; Bourles, et al. 2010).

Already at an early stage of its analytical work, OECD explored micro data as a source for new evidence, working with academics and researchers that had access to national sources of micro data. In the mid-1990s, some early work was undertaken exploring micro data to better understand productivity

performance (Doms, et al., 1995). These early efforts were reinforced in the early 2000s by two other and larger projects, one focusing on the dynamics of employment and productivity as part of a broader project on the sources of growth (Bartelsman, et al, 2005, 2009; OECD, 2003), the other focusing on the impacts of ICT on productivity (OECD, 2004; Pilat, 2005). The work by Bartelsman, Scarpetta and others marked the first time the OECD was engaged in a large-scale effort to tap into official micro-data through a distributed approach, opening the way for later projects on innovation (OECD, 2009b), employment dynamics (Criscuolo, et al., 2014) and productivity (Berlingieri, et al, 2017a).

During and immediately following the 2007-2008 economic crises, productivity took somewhat of a backseat in the OECD's analytical work as much of the focus moved to stabilisation policies. It started to return as an important policy issue from 2012 onwards, when a new - though still small-scale - OECD productivity conference was held, bringing together academics and policy makers. In 2014, a large-scale productivity conference was held as a joint event of the OECD and the NBER, demonstrating the growing interest in the topic.[8]

This renewed interest was also reflected in the OECD's analytical work and the growing interest of many countries in the policy issues related to productivity. The OECD's 2015 report on *The Future of Productivity* (OECD, 2015) marked an important milestone in this respect. It used a private source of micro data, Bureau van Dijk's Orbis database, to explore productivity patterns. The work pointed to a sharp divergence in labour productivity performance between leading firms, that have continued to experience strong productivity growth even following the economic crisis, and other firms, that have experienced stagnant productivity growth (Figure 2). Moreover, the study found that this divergence occurred in both manufacturing and services sectors (OECD, 2015).

Work since has shown that this divergence was not just due to growing capital intensity in leading firms compared to laggards, and that the divergence was also apparent in multi-factor productivity growth. It also showed that the divergence in multi-factor productivity was not just due to the ability of leading firms to extract rents - as expressed in higher mark-ups - but that the divergence was mainly due to stronger innovation in leading firms (Andrews, et al., 2016). Finally, the work found that some sectors, notably ICT services, had experienced a stronger divergence of productivity growth than others, suggesting that some industry-specific factors may also play a role.

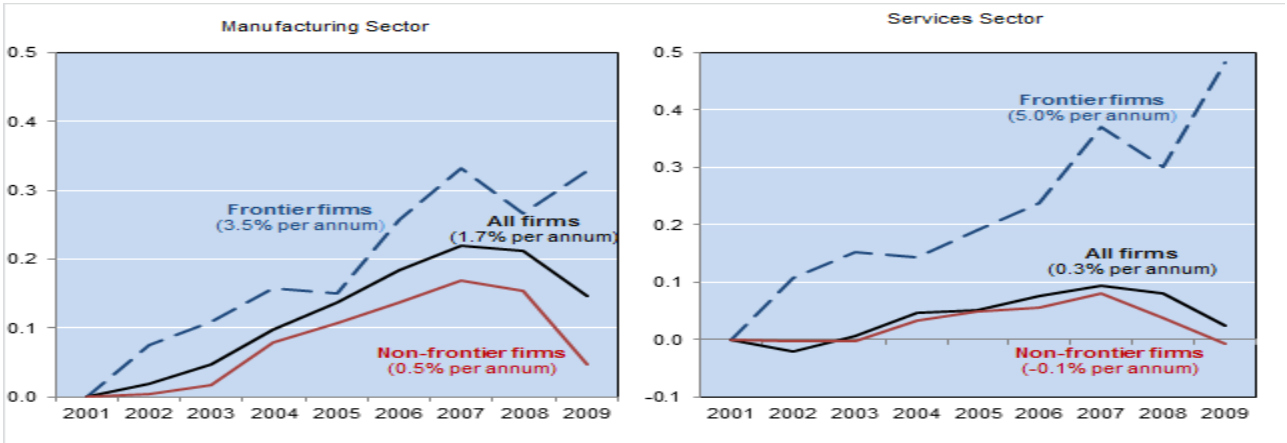
A second important recent milestone in the OECD work on productivity was the link that was established between the divergence in productivity growth and the growth in inequality that was being observed across many OECD countries. The 2016 report on the *Productivity-Inclusiveness Nexus* that was prepared for the 2016 OECD Ministerial meeting suggested that these two trends might have some common sources (OECD, 2016). For example, growing rent capture by frontier firms and the underutilisation of resources may have slowed the diffusion of innovation and limited productivity gains while entrenching inequalities of income, such as trapping workers in unproductive activities and low-quality, low-wage jobs. Since then, further work on this topic has emerged (e.g. Berlingieri, et al., 2017b), using national sources of micro data, that found evidence that the two great divergences in productivity and wages had several common sources.

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[8] See: http://www.oecd.org/economy/productivity-growth-and-innovation-in-the-long-run.htm

**Figure 2. Divergence between productivity in the globally most productive firms and other firms**

Labour productivity; index 2001=0




Notes: "Frontier firms" corresponds to the average labour productivity of the 100 globally most productive firms in each 2-digit sector. "Non-frontier firms" is the average of all other firms. "All firms" is the sector total. The average annual growth rate is shown in parentheses.

Source: Andrews, D., C. Criscuolo and P. Gal (2015). "Frontier firms, technology diffusion and public policy: micro evidence from OECD countries", OECD Economics Department Working Paper, No. 1240 and OECD (2015).

A third important milestone in the OECD's recent work was the establishment of a Global Forum on Productivity at the end of 2015, which brings together government officials and academics from around the world to discuss research and policy findings as regards productivity.[9] The OECD has established a work programme to support the Forum, which meets once a year in the context of a large-scale conference (Mexico in July 2015, Lisbon in July 2016; Budapest in June 2017), and also in the context of regional events and workshops (e.g. an event in Chile in December 2016 focused on productivity performance in the LAC region). A new series of OECD Productivity Working papers was also launched to support the Forum. In July 2016, government officials from over 40 countries attended the Forum, showing the broad interest the topic has gained as many countries are concerned about the sharp slowdown in productivity growth that has occurred across many OECD countries in recent years.

Underpinning much of the latest OECD work is a growing focus on micro data, both on the basis of private sources, such as the Orbis database (as used in the Future of Productivity report, OECD, 2015), as well as official sources, as used in the Nexus report and a number of recent studies (Berlingieri, et al., 2017a, 2017b). This has helped the analysis to go beyond aggregate (or sectoral) measures, and has also helped to demonstrate the importance of business dynamics and resource allocation for aggregate productivity performance.

The OECD's productivity analysis has therefore changed considerably in recent years. First, it has become focused on a wide set of policy questions faced by governments around the world, such as the slowdown in productivity growth, but also questions going beyond productivity as such, e.g. the relationship between inequality and productivity, or the link between productivity and environmental sustainability (Brandt, et al., 2017). Second, it has become more driven by demands from policy makers, e.g. as reflected the strong support for the newly established Global Forum on Productivity, and the

9 http://www.oecd.org/global-forum-productivity/

willingness of countries to actively contribute to the work, including through their support for work with national sources of (micro) data. Thirdly, it has become more strongly founded in micro data, which is providing new insights in the factors and policies affecting productivity growth.

## 3. OECD work on Global Value Chains

Globalisation and international economic integration are not new. However, the recent evolution of global supply and procurement networks has significantly changed foreign dependencies both for inputs (imports) and outputs (exports). These changes in global production systems combined with the removal of trade barriers, e.g. through tariff reductions, and a widespread decrease in transport and communication costs, have meant that conventional economic and policy analyses based on a single economy or region can be insufficient to provide adequate insights into policy discussions at national and subnational levels. In particular, environmental and trade policy analysts now supplement conventional approaches with information concerning spatial (international) spillover effects revealed by economic models within a multi-country/region framework.

The economic and social impacts due to these changes in foreign dependencies have evolved unevenly in terms of geographical locations and development patterns are now very different to those observed in the late 19th century to late 20th century. Whereas initial trade patterns reflecting comparative advantage led to the 1st unbundling, where production and consumption became separated, the 2nd unbundling in the second half of the 20th century led to the fragmentation of production and the emergence of global value chains (Baldwin, 2009).

The emergence of GVCs also enabled the gradual integration of emerging economies in the trade networks of developed economies, with Eastern and South-eastern Asia and Eastern Europe being the most important examples in this respect. However, while this process created new opportunities for emerging economies, most global consumption was still concentrated in developed regions. In other words, the geographical location of production and consumption was imbalanced.

This gap between the location of producers and consumers has, in some cases, generated international frictions, including in trade. The differences in the location of producers and consumers has also had an impact on other international social and economic policy agendas such as discussions on the global environment, the responsibilities of multi-national enterprises, and corporate tax avoidance.

Until recently, key theoretical and methodological tools and corresponding empirical evidence to explore these effects of the evolution of multinational/regional value chains had been missing mainly due to the limitation of statistical data that would allow the compilation of inter-country input output tables on a global scale.

The main focus of this section is therefore to explore OECD work aimed at identifying and developing high-quality international comparable economic databases that can support analysis of these global issues, by combining statistics on international trade, production and expenditure at a harmonized sectoral level, this providing a set of empirical tools for policy analysis regarding the evolution of globalisation.

### *3.1. Methodological work and data development*

As noted already above, the OECD has engaged in the collection and analysis of input-output tables for almost 25 years. A first database of harmonised national input-output tables, covering 10 countries, was released in 1996. It was initially mainly used for the analysis of R&D and technology diffusion (Sakurai, et al., 1996; Papaconstantinou, et al., 1996). In turn, this helped underpin the revision of the high-technology sector and product classification that now could account not only for R&D performed within a sector, but also for R&D embodied through that sector's inputs, in particular capital (Hatzichronoglou, 1997).

A second important application of the harmonised national input-output tables that emerged in the early 2000s was the analysis of carbon embodied in international trade (Ahmad and Wyckoff, 2003). At this stage, the OECD database on input-output tables had expanded from 10 to 24 countries, which together accounted for some 80% of global carbon emissions. The work explored the role of trade in goods by creating an indicator that estimated $CO_2$ emissions related to domestic demand, as a complement to the more common indicator associated with domestic production of emissions. Using conservative assumptions the paper showed that estimates of $CO_2$ emissions generated to satisfy domestic demand in the OECD in 1995 were 5% higher than emissions related to production. This analysis was extended in 2009 to cover more than 40 countries and two additional years, 2000 and 2005 (Nakano et al, 2009).

A third and increasingly important application that emerged from the OECD's work with input-output tables was the analysis of global value chains. Already in the late 1990s there was a recognition that input-output tables could provide useful indicators on globalisation (OECD, 1999), and the 2005 Handbook on Economic Globalisation Indicators (OECD, 2005a) devoted some space for a discussion on the use of input-output tables with a few indicators emerging in the 2005 OECD indicators report on globalisation (OECD, 2005b). As of 2007, the recognition of the use of input-output tables for the measurement of globalisation became more established (De Backer and Yamano, 2007) and the 2010 globalisation indicators report included a special section on global value chains, with many indicators drawing on input-output tables (OECD, 2010b).

Following the worldwide collapse in trade in the wake of the 2008 financial crisis, calls for better metrics for analysing GVCs intensified. In particular, in early 2009, the World Trade Organization (WTO) appealed to OECD to develop indicators of trade in value added (TiVA), in a joint endeavour, building on its recognised experience in developing Input-Output based analytical tools and drawing on the experience of experts such as those working at IDE-Jetro, USITC and those involved in the WIOD project (then in its infancy). OECD rose to the challenge of constructing the required Inter-Country Input-Output (ICIO) system. The first set of TiVA indicators was released in January 2013 in a joint release by the OECD and WTO, with coverage for 40 countries, 18 aggregate industries and data for 3 years: 2005, 2008 and 2009. Thereafter, the database expanded further so that it currently covers 63 economies (+ Rest of the World), including all 35 OECD countries, all EU28 countries, all G20 countries, most ASEAN and APEC economies and a selection of South American countries. Colombia, Costa Rica, Croatia, Morocco, Peru and Tunisia are the most recent additions. The current data covers 34 industries, including 16 manufacturing sectors and 14 service sectors, and provides data for 17 years from 1995 to 2011. For two countries, the database also accounts for the high level of firm heterogeneity within the manufacturing sector: for China, processing firms, other exporters and non-exporters are distinguished, while for Mexico

global manufacturing firms are distinguished from other firms. Also, the ICIO distinguishes separates direct purchases by non-residents and cross-border trade.

The OECD Inter-Country Input-Output (ICIO) database has therefore emerged in a gradual and organic way, expanding in country coverage, industry detail and years covered, and responding to new policy applications as they emerged, with new applications being identified as the data evolved and the data was used more widely for analysis. This is expected to continue and new applications are still emerging as the database becomes more widely known within the OECD and in different policy communities.

The database itself will also continue to evolve. There continues to be demand for more countries to be included in the database and for more recent years. A new version is currently being developed based on ISIC Rev.4 (NACE Rev.2) and the latest SNA 2008 / BPM6 inputs. Work is also underway on "Nowcasting", with the aim to provide more timely information, by developing methods for extrapolating TiVA indicators to provide figures for more recent years (for t-1 rather than t-3). Moreover, work continues to better account for firm heterogeneity, going beyond existing work for China and Mexico.

The development of the ICIO and TiVA indicators therefore is still work in progress and is one part of a global response to better measuring globalisation. A range of international initiatives have been established to develop more integrated and coherent views of trade, investment and production and develop appropriate statistical infrastructures. For example, as noted already above, the OECD Expert Group on Extended Supply and Use Tables is seeking to improve the accounting for firm heterogeneity, e.g. as regards export intensity (processors, exporters, non-exporters) and ownership (domestic v. foreign-owned).

Efforts are also underway to improve the quality and coverage of trade in services statistics; e.g. to reduce asymmetries in reported trade statistics. International trade statistics serve many analytical purposes. Yet, as collected from national sources, this data is often internationally inconsistent, in particular in its bilateral breakdown – what country A reports as exports to country B can be significantly different from what country B reports as imports from country A. This is a reflection of differences between countries with respect to the valuation of transactions, customs regimes, and methodologies (such as the treatment of re-exports and re-imports), that create asymmetries across countries; which are further exacerbated by differences in confidentiality policies, product classifications, and time of recording. When asymmetries in trade data are large, this can constitute a problem for analyses. For instance, the OECD's work on TiVA requires transitive data on international trade. The OECD is carrying out work, in conjunction with national statisticians and other international organisations, to reduce bilateral inconsistencies in trade in goods and services This is not the first attempt to construct balanced trade data but it is new by being accomplished through a structured modular approach in co-operation with countries that ensures transparency and relates to both merchandise and services trade data.[10]

[10] See e.g. Fortanier, Liberatore, Maurer and Thomson (2017).

*Benefits and Limitations of Inter-country Input-Output Systems*

National input-output (I-O) tables describe the sales and purchases relationships between producers and consumers within a country. They can be produced to reveal the relationships between sales and purchases, both final and intermediate, to industry outputs. Moreover, inter-country input-output systems (ICIO) expand the inter-industry relationships to cross-border transactions, by linking harmonised national I-Os with balanced bilateral trade in goods and services, while ensuring consistency with contemporaneous national accounts time series.

These ICIO systems can explicitly point to the direct and indirect relationships between multiple agents in the global economy. The international linkage analyses based on the ICIO model can include four dimensions of countries/regions and four dimensions of industries / product groups:

- At the country (region) level: Value-added source country, Exporting country, Importing country and Final expenditure country

- At the industry (product) level: Value-added source industry, exporting industry, Importing industry /final demand category and Final demand industry /product group

Currently, there is no other database or economic model that can handle the highly complex inter-connected system of the global economy. For example, the size of a global-scale ICIO database can easily surpass five million data points per year, even with relatively small dimensions such as 34 industries, 64 countries and 5 final expenditure components. For example, a database of (64 source countries x 34 source industries) x (64 demand countries x (34 intermediate industries + 6 final demand components)) + 5 value-added / output components x 64 countries x 34 industries leads to a tables with about 5.57 million data points *per year*. Linking over 5.5 million observations within alternative models, such as macro-econometric models is not possible.

While ICIO databases have proven to be useful for various globalisation analyses, there are some statistical and conceptual limitations. The ICIO database relies heavily on various underlying economic statistical sources to compile a database and it may take at least 3-4 years for certain underlying data sources (such as Supply and Use tables, or SUTs, and symmetric Input-Output tables) to become available in most countries. In addition to timeliness issues, the availability of statistics in developing economies can be relatively poor because of issues of coherence between National Accounts, Balance of Payments and Supply and Use tables. Compiling and processing the necessary data requires a significant allocation of resources both in terms of money and expertise.

The conceptual issues of I-O based analyses are broadly categorized within the framework of National Accounts and the interpretation of multipliers derived from global I-O tables. These can be summarized as follows:

- *Framework of National Accounts*: In principle, an I-O database covers the transactions within an annual production network. The economic and trading activities of multiple year production (e.g. large aircraft and ships), accumulation of capital formation, transactions of used capital goods and re-exports activities are not directly considered in the framework of conventional analyses. Also, the sectoral information of direct purchases by non-residents and industry activities by

characteristics of enterprises e.g. exporters/non-exports and foreign owned firms are relatively poor.

- *Interpretation of multipliers*: The aim of the framework of National Accounts (I-O) is to record the monetary transactions of inter-industry relationships for accounting purposes and the shares of intermediate inputs to output, i.e. input coefficients do not always represent the technological coefficients of physical processes. Also, the economic activities of all countries are not recorded in exactly the same manner. For example, due to confidentiality issues and/or to minimize data collection burdens, the unit of measurement for industry statistics (i.e. the economic activity dimension) may be closer to enterprises rather than establishment-based economic activity that is recommended by the Manual for the System of National Accounts (United Nations et al., 2009). Thus an 'industrial activity' may not be easily comparable across countries.

- *Trade flows in National IO and ICIO*: Not all trade flows included in National Accounts and merchandise trade statistics are represented in the ICIO framework. For example, re-exports reported in the import tables are removed in the ICIO framework, where the trade flows between countries are origin – final destination concept.

### *3.2.Analytical work and policy insights*

As noted already above, with its detailed information on international transactions between target countries, the ICIO system can serve as an important input into a wide range of evidence based economic and social policy analyses for individual countries. In particular, indicators can be developed to inform discussions in the areas of trade policy, industrial policy, environmental policy, regional development and risk management. These analyses can eventually affect the decisions of policy makers during international negotiations on trade, economic and environmental issues.

*International trade policies using Trade in Value-Added (TiVA) estimates*

Current manufacturing systems now involve supply chains of specialized operations in multiple locations. In other words, the conventional understanding of beneficial exports and injurious imports has recently changed. Indicators based on an ICIO system can provide both conventional and alternative viewpoints of our understanding of bilateral trade relationships. Due to the significant increase in international trade in intermediate supplies, exported goods and services include the value originally embodied in intermediate imports. As an alternative to a conventional trade measures in “gross” terms, an ICIO system can be used to develop measures of Trade in Value-Added (WTO and IDE JETRO, 2011; OECD, 2013).

OECD (2013) presented a comprehensive effort to bring together some of the initial policy implications of GVCs, both for trade policies and a range of international (e.g. investment) and national policies. For example:

- Trade-facilitating measures, such as fast and efficient port and custom procedures, are important as they enable the smooth operation of value chains.

- In most economies, around a third of intermediate imports end up in exports. In GVCs, tariffs and other import barriers are therefore effectively a tax on exports. The negative effects of trade protection are compounded when parts and components cross borders many times.

- GVCs also strengthen the economic case for advancing multilateral trade negotiations, as barriers between third countries upstream or downstream matter as much as barriers in direct trading partners and are best addressed together.

- Services are more important than visible in gross trade statistics. Services already account for over half of value creation in GVCs in many OECD countries and over 30% in China. GVCs require efficient services and the possibility to move people, capital and technology across borders. Regulatory reforms and liberalisation of trade and investment in services are essential to enhance competition and increase the productivity and quality of services.

- Data on trade in value added point to considerable difference between gross exports and value-added based trade indicators. This impacts the understanding of key trading partners for different economies and influences recent and ongoing trade negotiations within and between current and proposed free trade zones such as ASEAN, NAFTA, European Union, EU-USA and the Trans-Pacific Partnership.

Since this report, the OECD's analysis of GVCs for trade policy has continued and has contributed to several ongoing policy discussions, including at the G20 (e.g. OECD and World Bank, 2016).

*Energy and transportation infrastructure policies*

One of the key advantages of I-O analyses is its ability to estimate the derived demand for products such as utility and transportation services. In general, industries and consumers do not gain profits, benefits and utilities by just consuming the utility and transportation services except for a few cases such as holiday flights, leisure driving, etc. The demand for these activities often occurs as a result of demand by another sector. The ICIO system allows analysts to overcome the limitation of single country frameworks and the derived demands of another country can be explicitly introduced. In terms of planning perspectives, it is important to know the structure of demand propagation of their own utility and transportation services, because development of these infrastructures usually takes many years of preparation, and negotiations to build the facilities and the costs of construction and maintenance are enormous.

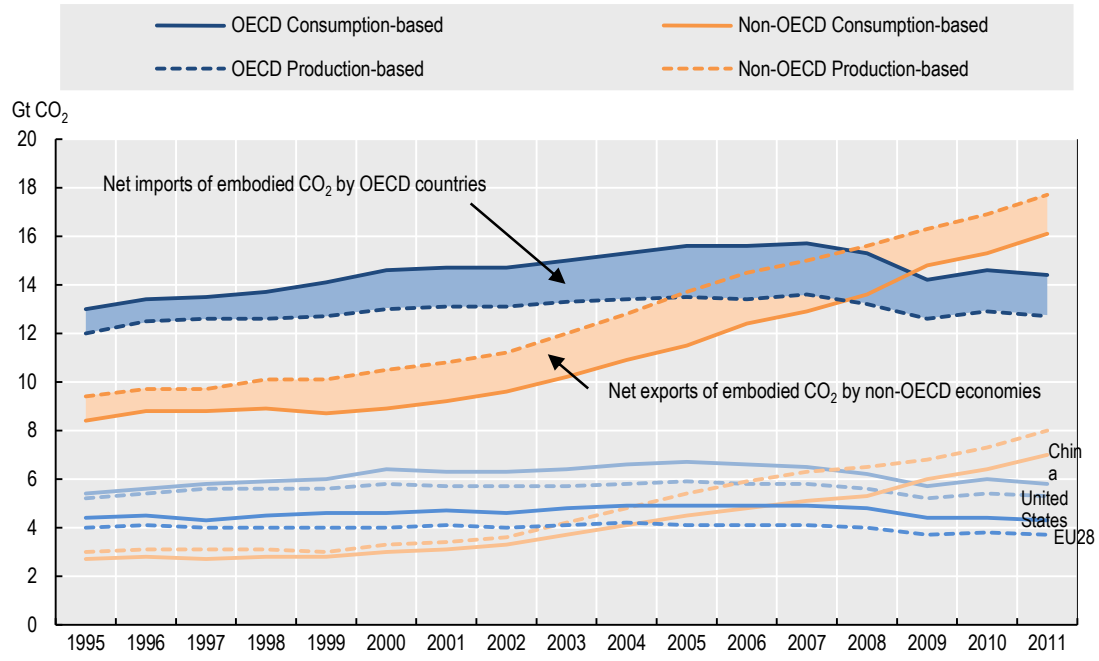
*Environmental policies*

ICIO models, often referred to as multi-regional I-O (MRIO) or interregional I-O (IRIO) models, initially gained most attention from global environmental analysts. Various types of globally linked I-O tables have been developed by different type of ecological footprint analyses. Changes in consumption and production locations have significantly altered the global patterns of consumption-based ecological impacts and production-based ecological impacts. The global input-output type model is well suited to the analysis of consumption-based greenhouse gases (GHGs) because most of these GHGs are related to energy, transport and extraction of energy related mining products that are usually indirectly consumed by households and importers.

The increasing fragmentation of global production requires the examination of CO2 emissions from a consumption, as opposed to an exclusively production, perspective. Rather than allocating emissions to the country where they are produced, the consumption approach allocates them to the country in which the goods and services that embody the emissions are eventually consumed. Figure 3 shows that in the OECD area, consumption-based emissions have been significantly higher than production-based ones, with large variations across countries. The top three countries and regions in total consumption-based as well as production-based emissions in 2011 were China, the United States and the European Union. The EU28 countries have decreased both production and consumption-based emissions since 1995, while there has been a significant (2.5 times) increase in China and a slight increase in consumption-based emissions in the United States. China is now the country with the single highest absolute emissions from a consumption and production perspective. In per capita terms, however, although Chinese per capita emissions have doubled since 1995, US consumption-based emissions remain almost four times higher.

**Figure 3. Trends in production- and consumption-based CO2 emissions, 1995-2011**

CO2 emissions from fuel combustion, Gigatonnes (Gt)




*Source*: OECD (2015b), *Science, Technology and Industry Scoreboard 2015,* http://dx.doi.org/10.1787/888933273201

*Risk management*

A number of recent natural disasters in East Asia raised some understandable concerns over global supply chains. The sensitivity of national economies to external shocks in other parts of the world is significantly increased by the participation in global production networks. The inter-country/inter-regional input-output system can contribute to a better understanding of the direct and indirect vulnerability of countries to economic shocks and inform them about possible pre-emptive actions that can be taken to minimize impacts.

*Jobs and skills*

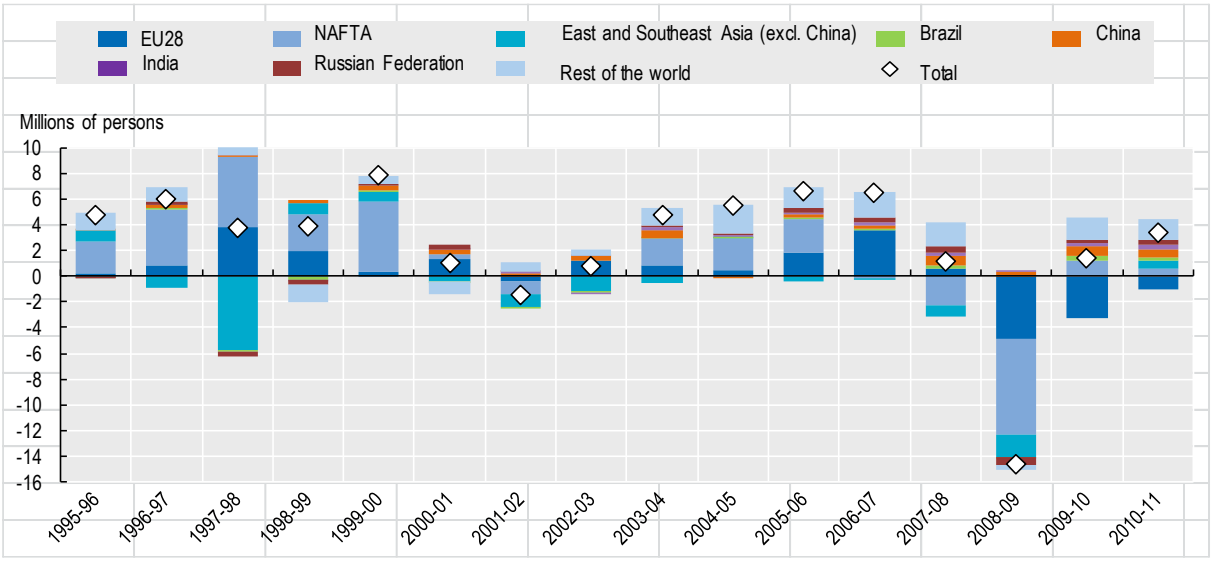
Employment embodied in domestic and foreign final demand expenditures can be estimated in a similar manner to that of TiVA indicator value added embodied in foreign final demand using the ICIO system. The labour inputs per unit production and labour productivity are widely different across countries and industries. The estimates of domestic employment embodied in foreign final demand attempt to capture the share of jobs used in production to satisfy foreign demand for final goods and services.

As the fragmentation of manufacturing processes within a same industry group become evident, the separation of tasks are observed in the allocation of employment characteristics by educational and occupational skills, gender and age groups. A global ICIO system allows an identification of the international division of labour in detail (Marcolin, et al., 2016).

For example, Figure 4 shows that an apparent overall increase of about 4 million business sector jobs in the OECD area, between 1997 and 1998, hides an increase of about 10 million jobs to meet demand in the European Union and the United States, which was offset by a loss of about 6 million jobs due to the financial crisis that hit Southeast Asia in 1997. In general, changes in OECD employment are affected by changes in OECD demand. This is illustrated by the significant loss of jobs during the most recent financial crisis, which was attributed to the decrease in demand across OECD countries. The immediate post-crisis period saw modest increases in OECD employment driven by demand from emerging economies, while sluggish demand in the European Union contributed to increased job losses.

**Figure 4. Origin of demand for business sector jobs in OECD, 1995-2011**

Millions of persons, annual changes by region of demand




Source: OECD (2015b), *Science, Technology and Industry Scoreboard 2015*, http://dx.doi.org/10.1787/888933272901

The integration of work on jobs and skills with GVC was recently further explored in the OECD Skills Outlook (OECD, 2017c). This report notes that on average in OECD countries, one-third of jobs in

the business sector depend on demand in foreign countries.[11] It also notes that countries can help ensure that their participation in global markets translates into better economic and social outcomes, through a range of policy actions, where investing in the skills of their populations is paramount. For example:

- When skills development accompanies participation in global value chains, countries can achieve stronger productivity growth. Countries with the largest increase in participation in global value chains over the period 1995-2011 have benefited from additional annual growth in industry labour productivity. This extra growth ranges from 0.8 percentage points in industries that offer the smallest potential for fragmentation of production to 2.2 percentage points in those with the highest potential, such as many high-technology manufacturing industries.

- To integrate and grow in global markets, all industries need workers who have not only strong cognitive skills (including literacy, numeracy and problem solving) but also managing and communicating skills, and a readiness to learn. To spread the productivity gains from participation in global value chains across the whole economy, all firms, including small firms, need workers with such skills.

*Other applications*

The OECD's ICIO database can be used for a wide range of other uses and new applications continue to emerge within the OECD as the database develops further and new users explore the data. Some recent examples include:

- The ICIO database is currently being used to explore the economic impacts of tourism, supporting the OECD's work on tourism.

- It is being used to examine sector-specific issues, such as developments in the steel industry.

- New aspects and firm dimensions are being added, e.g. the role of SMEs in global value chains, or the role play by multinational firms and their foreign affiliates.

In all, the ICIO database has shown to be a highly flexible tool that can be used for a wide range of economic analysis with potentially important policy implications.

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[11] Such estimates derived through an input-output accounting framework are sensitive to certain assumptions. Two main assumptions are that exporting firms have (i) the same labour productivity as firms producing goods and services for domestic markets and (ii) the same share of imports, in relation to output, as domestic firms. However, evidence suggests that exporting firms have (a) higher labour productivity and (b) a higher share of imports for a given output, suggesting that the results presented may be biased upwards. Note also, much foreign demand is intra-regional i.e. for most EU countries a majority of foreign demand comes other EU countries. See http://oe.cd/io-emp.

## 4. Lessons learned and looking ahead

Since the establishment of the GGDC, there have been regular exchanges between the OECD and the GGDC and its researchers reflecting the shared interests in productivity and global value chains. These have covered exchanges on methodologies, cooperation on database development, as well as cooperation and exchanges on analytical work.

Overall, this exchange has proven fruitful for both parties. In several areas of data construction, e.g. as regards STAN/EUKLEMS or TiVA/WIOD, the OECD and the GGDC were the only organisations seeking to build large-scale international datasets for the structural analysis of productivity and global value chains. The resulting cooperation and friendly competition between the two organisations was important to improve the quality of the databases, help address common challenges, and helped both organisations in making progress more rapidly than would have been possible if only one of the organisations had been active in the field. Even stronger cooperation would have been desirable in some areas, such as the construction of the EUKLEMS database, but regretfully the OECD was not able to participate directly in some of the GGDC's EU-funded efforts due to legal limitations.

Moreover, much of OECD's work on productivity and global value chains over the years would have been possible without inspiration from pioneers of theory and practice from many universities and research institutes. For example, for many OECD databases, feedback from users has been important in making progress and meeting user's needs.

More generally, the work by OECD and GGDC and the challenges experienced by both are linked to the gap in established statistical concepts and frameworks and users analytical needs. In addition, OECD and GGDC have often worked to overcome gaps in the long lead times between agreeing concepts for new statistical frameworks (such as the SNA) and the actual implementation and production of reliable stats by national authorities. For example, it wasn't until mid-2000s that important elements of SNA93 were implemented – chained volume indexes, hedonic prices, FISIM adjustments, capitalisation of software etc., implying a lag of 10-12 years. Moreover, countries moved at different speeds in implementing the new framework. While things are improving (by 2015 most OECD countries had implemented SNA08), many countries (including some OECD countries) still have difficulties in providing sufficient information for reliable productivity by industry estimates (notably as regards hours worked, capital services and prices). There are many reasons for this, not least lack of resources as new surveys are expensive to design, implement and carry out on a regular basis. Also, statistical offices are faced with demands for more complex statistics (e.g. on intangibles) and may lack skilled practitioners.

In fact, the reason that STAN and EUKLEMS exist in the first place is to overcome such gaps in national statistics. Ideally STAN and EUKLEMS shouldn't exist. As new concepts and definitions and recommendations are being developed to better account for globalisation (e.g. the eSUTs project discussed above) analysts may have to wait some years before a critical mass of countries can provide the necessary good quality statistics. Projects like STAN, EUKLEMS or their successors may therefore still be needed in the future.

The strong similarities in data development efforts between OECD and GGDC also contributed to common interests in the analytical work with the resulting databases, and have led to fruitful exchanges over the years, e.g. in areas such as ICT and productivity. However, the interests and missions of the two

organisations differ more in the area of analysis than in the area of data construction, given the mission of the OECD to deliver policy analysis and recommendations, and for the GGDC to provide academic research.

In recent years, the OECD's empirical work on productivity and global value chains has increased in importance within the OECD as policy is becoming more focused on long-term sources of growth and competitiveness and as the work on GVCs has fed extensively into thinking about trade policy and globalisation. Recent OECD Ministerial meetings have frequently featured studies on productivity and/or globalisation, and a growing number of policy areas within the OECD use the available data, such as the TiVA database, to explore key policy issues. Moreover, work on GVCs and productivity has fed into discussions at the G20 and G7, e.g. in the area of trade policy.

In the area of productivity, the OECD's work has also changed considerably in recent years. First, it has become more focused on key policy questions faced by governments around the world, including questions beyond productivity growth as such, e.g. the relationship between inequality and productivity, or the link between productivity and environmental sustainability. Second, it has become more demand-driven, reflecting the strong support for the newly established Global Forum on Productivity, and the willingness of countries to be actively engaged in the analysis of productivity. Moreover, institutional arrangements within a country that can help enhance productivity growth have become an important feature of the work, e.g. as witnessed by the establishment of national Productivity Commissions in many countries. Thirdly, the OECD's work has become more strongly founded in micro data, providing new insights in the factors and policies affecting productivity growth.

A fundamental difference between the OECD and the GGDC relates to the way work is undertaken. OECD work is discussed and ultimately approved by member countries meeting in Committees and working groups, and is developed in close consultation with national statistical offices and governments. This helps ensure consistency with and feedback into statistical work at the national and international level, including the development of statistical standards and methodologies. It also helps to ensure that the work is relevant and can be used by policy makers. However, this process may sometimes also limit the scope of the work and typically implies a longer process than can be achieved in academic work. This difference helps explain why some GGDC databases are updated more rapidly than OECD data. On the other hand, the extensive use of the OECD data in policy reports helps demonstrate the importance of this evidence base to policy and decision makers, which can help strengthen support for the necessary work at the national level. For example, many statistical offices are currently undertaking work to improve the underlying data for input-output tables, as discussed above.

Another important difference - particularly important for the TiVA database and its related analysis - is the increasingly global nature of the OECD's work, where there is much interest in better understanding the engagement of countries in South East Asia and Latin America in GVCs. The latest version of the TiVA and ICIO database therefore covers 63 countries and accounts for over 90% of world GDP and global trade. The OECD is also active, in co-operation with other international bodies, in efforts to mainstream data development for TiVA in various regions of the world, via a network of regional TiVA initiatives (such as APEC-TiVA, Eurostat’s Figaro project and NAFTA-TiVA).

This difference in approach also affects analysis. OECD's analytical work on productivity and global value chains is presented to specialised Committees and working parties that scrutinise the work and explore the policy implications in detail, before the work is released to a wider public or to high-level and ministerial meetings. This process helps to ensure buy-in from countries in the work, strengthening the likelihood of implementation, although the consensus-building process also influences the messages that are ultimately released to the public.

In all, the complementary nature of the OECD and the GGDC has worked well over the past 25 years. Going forward, cooperation between the OECD and the GGDC will continue to play an important role for the OECD, notably as regards data construction and methodological development. As regards analysis, the nature of the work between the two organisations has diverged somewhat in the area of productivity, with a growing focus in the OECD on the use of micro data, although aggregate and sectoral data will remain important too. In the GVC work, a closer relationship on the analysis between the two organisations continues to this date.

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