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The Power of Sectoral Geographical Centrality in Global Production

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Abstract

Power is a key component in understanding and analyzing global production and the governance structures of Global Value Chains. In this paper, we propose a novel analytical link between the power dynamics in GVCs and the network configuration of their respective production topology. Our proposed link is based on the notion of positional power according to which power is associated with the centrality of a sector with regards to the production process, the sector belongs to. Using global input-output data, we show that the network structure of global production is associated with the global distribution of profits among national economic sectors and, consequently, influences the power relations and thus the governance structures of supply networks. More specifically, we find a high correlation between the distribution of profits and a sector's position in global production, captured by its total strength centrality. Based on this, we provide a quantitative measure of positional power within global production and its governance structures.

Keywords: global value chains, positionality, power relations, network theory.

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1 Introduction

Since the early 1990s, the frameworks of *Global Commodity Chains* (GCCs), *Global Value Chains* (GVCs) and *Global Production Networks* (GPNs) have dominated the analysis of global production and circulation. Sometimes conflicting and divergent, and other times complementary and synthesizing, these approaches highlight the inner mechanisms that allow multinational corporations to coordinate, and eventually, dominate a geographically dispersed, and functionally specialized, global supply system. Following an interdisciplinary methodology, the aforementioned frameworks have managed to form their analytical locus within international political economy and to promote distinctive literature for the analysis of world capitalism (Coe and Yeung, 2015; Gereffi, 1994; Gereffi et al., 2005; Henderson et al., 2002).

In this analysis, the concept of power is central. Power translates into the ability of lead firms to shape governance structures to dominate their respective value-chains or production-networks, and consequently capture the highest possible amount of value-added. Each analytical approach focuses on different levels of production and places emphasis on different aspects (or dimensions) of power relations. For example, the GCC framework focuses on the technological differences of production processes to explain the birth and evolution of global commodity chains, driven by either large and powerful producers (Producer-Driven) or sizeable and dominant buyers (Buyer-Driven) (Gereffi, 1994). On the other hand, several contributions using or extending the GPN framework stress the bidimensionality of power, which is perceived as both a topological characteristic of the position (positionality) each actor holds in the production network, as well as a relational attribute of the exchange relations between network participants (Coe and Yeung, 2015; Henderson et al., 2002). Specifically, the more recent version of the GPN framework, known as GPN 2.0, goes one step further, arguing that power relations and asymmetries are latently embedded into specific configurations of global production networks.

Depending on the level of analysis, one can analyze the power characteristics of a firm, sector or supply chain. We acknowledge that the specific choice of a level of analysis comes with both advantages and drawbacks. While the focus on a firm-level is able to provide detailed insights regarding the dynamics of specific firms, it lacks the generality of the policy implications that come when choosing to focus on the whole supply chain and vice-versa. In this paper, we analyze power on the level of a national sector. This choice has two important advantages. First, it takes into account both the geographical dispersion and the overall production process. Second, it allows for quantitative analysis of power relations given the availability of relevant data from the World Input-Output Database (Timmer et al., 2015) and the OECD Inter-Country Input-Output Tables (ICIO) database (OECD, 2018a).

Focusing on the links between the functional and spatial structures of global production on the one hand, and power dynamics and profit distribution, on the other, we argue that the network characteristics regarding the centrality of production agents are closely related to the patterns of profit distribution between global economic sectors. Assuming that profit distribution is both conceptually and empirically linked to the economic, political and institutional power of economic agents, our approach allows drawing a set of conclusions on the power asymmetries between economic actors (Bowles et al., 1986, 1990; Gordon et al., 1987). More specifically, we analyze the topological (positional) dimension of power in production networks, captured by relevant measures of centrality used in economic and social networks (Jackson, 2008).

Applying different correlation tests, we show that the centrality of economic sectors is correlated to their profit shares. In order to have a complete analysis on the various influences on profitability, including the different versions of positional power captured by the various centrality measures, we would need to run regressions. These regressions should incorporate firm-level data like concentration ratios, firms' age and size, etc. (Pervan et al., 2019), which would require a geographical and sectoral reduction (based on the countries and sectors of analysis). Due to this tradeoff, we focus here on the correlation between centrality measures using the highest possible number of countries, and we discuss in conclusion the necessary steps towards an econometric analysis with more variables.

The structure of the paper is as follows. Section 2 discusses the concept of power, with a particular focus on the notion of positional power. In Section 3 we introduce the concept of network centrality and elaborate on how centrality is able to identify the key actors in a multilayered and complex global production system. Section 4 describes the data and methodology we follow in our empirical analysis. Section 5 presents the key findings of our correlation tests, whereas Section 6 concludes and proposes possible directions for future research.

2 Power in Global Production

Starting with the notion of governance structures, defined as the 'authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain' (Gereffi, 1994: 97), Gereffi provided the first conceptualisation of inter-firm power relations in a commodity chain. His dichotomy between producer-driven (PD) and buyer-driven (BD) value-chains broke new ground by constructing a framework to analyse global production processes. However, it was critiqued for treating the process as too static, forbidding the co-existence of BD and PD governance structure along the same value-chain (Dallas et al., 2019: 669) and leaving little room for analyzing the transformation of governance structures (Gibbon et al., 2008).

As a result, a new framework initiated by Gereffi, Humphrey and Sturgeon (2005) – global value chains – attempted to overcome the limitations of GCCs while simultaneously expanding its analytical scope. As far as power relations were concerned, Gereffi et al. (2005) proposed the well-known fivefold typology of governance structures (Market, Modular, Relative, Captive, Hierarchical) dependent upon three factors: the complexity of transactions, codifiability of information, and supply-base capabilities. In turn, these governance structures corresponded to a continuum of degrees of explicit coordination and power asymmetry, spanning from low values characterizing the market governance structure, to higher and higher values, as the structures move from the market towards hierarchical governance structures.

Despite the improvements proposed by Gereffi et al.'s. (2005) new governance typology, many maintained that it remained still too static and homogenized in nature, with geographical, social and institutional specificities unaccounted for (Coe et al., 2008; Dicken et al., 2001; Gibbon et al., 2008; Henderson et al., 2002). This critique led to the development of a new framework, the GPN, which conceptualized the world economy as a network connecting different economic and non-economic actors. In this way, the notion of power reflects both the topological-positional characteristics of network actors (structural dimension) and the qualitative characteristics of the linkages in a production network (relational dimension) (Dicken et al., 2001: 93). A succeeding version of the GPN framework, the GPN 2.0 put more emphasis on the analytical role played by network configurations, as the reflection of the actor-specific strategies, with respect to power dynamics, highlighting the importance of actor-specific strategies, shaped by the confrontation of network agents against certain competitive dynamics (Coe and Yeung, 2015: 65).

The aforementioned literature sparked a vibrant discussion around the issues of power under transnational capitalism. Each stage of that discussion identified important limitations in the respective analytical frameworks and thus paved the way for the subsequent theoretical and empirical development (Dallas et al., 2019; Galanis and Kumar, 2020; Mahutga, 2014a; Rutherford and Holmes, 2008; Tonts et al., 2012). Recently, Dallas et al. (2019) summarized the discussion of power relations in this extended literature of value-chains and production-networks, proposing their own power typology. This new typology incorporates the diverse multidimensionalities that have been found in the literature and proposes a 'systematic framework that draws from the varied implicit usages of power in GVC and GVC-adjacent literature' (Dallas et al., 2019: 667). The new typology consists of four types of power relations (bargaining, demonstrative, institutional, constitutive). It is based on the combination of direct or diffuse 'transmission mechanisms' and dyadic or collective actor-specific 'arenas of actors'. For instance, the bargaining type of power is consistent with dyadic and directly transmitted power relations established between actors in value-chain and production-networks, while the demonstrative type of power reflects situations of dyadic diffused relationships. Likewise, the institutional and constitutive types of power correspond to power relations that are transmitted in collectively direct and collectively diffuse ways, respectively.

In parallel with the above literature on power relations, there have been numerous attempts to empirically analyse global value chains, in terms of the depth of the phenomenon of spatial production fragmentation and the re-integration of the global economy through international trade. These attempts, heavily borrow analytical tools from Input-Output Analysis and network theory, in order to assess the extent of production fragmentation (Antràs et al., 2012; Antràs and Chor, 2017; Feenstra, 1998; Milberg and Winkler, 2013), to explore the structural characteristics of international trade patterns (Fagiolo et al., 2009; Hausmann and Hidalgo, 2011; Serrano and Boguñá, 2003), to analyse the shock propagation properties of global production structures (Acemoglu et al., 2012; Gabaix, 2011) and to measure the volumes of value-added in exports and imports of trading nations (Hummels et al., 2001; Johnson, 2018; Koopman et al., 2012; OECD, 2018b).

However, the literature on power relations in GVCs and the international trade and GVC-participation empirical literature has not yet produced any meaningful synthesis with the exception of Mahutga, who in a series of papers (2014a, 2014b, 2014c) focuses on the positional conceptualization of power. More specifically, building upon Power-Dependence Theory (Cook and Emerson, 1978; Emerson, 1962), he introduces the concept of *positionality* to express the power attributes of the lead-firms in an economic network. Assuming that the country-specific trade patterns of industrial sectors reflect the behaviour of the lead firms in BD and PD networks, he measures the positional power of countries participating in the most characteristic examples of buyer- and producer-driven networks (namely, the garment and transportation equipment industries, respectively). In this way, the positional power of a country in a BD trade network will depend on the import content of its exports, implying that the higher the share of its imports to the exports of its trading partners, the higher the number of business relationships with many 'dependent import partners' (Mahutga, 2014a: 167). The exact opposite is expected for countries in a PD trade network.

In this paper, we turn the focus to the positional power of national sectors and only apply correlation tests in order to take into account the maximum geographical dispersion of the IOTs. We argue that this is possible by empirically exploring the power dynamics and asymmetries of national sectors, as these are manifested through global IOTs. Taking into account the inter-sectoral idiosyncrasies of global sectors, we add one piece of missing information on the analysis of trade patterns between countries. Moreover, insofar as the discussion for power relations within the GVC and GVC-adjacent literatures evaluates the dynamics between buyers and suppliers positioned in different sectors of the economy, then utilizing input-output data is a prerequisite for a consequential analysis of global power asymmetries. Notwithstanding the fact that a sectoral analysis of power in the GVC framework comes with the cost of simplifying from the level of the firm as the analytical unit, we contend that we have something to gain analytically from the high dimensions of the databases that provide country- and sector-specific input-output data (*see* Section 4), which will ultimately reduce aggregation bias.

3 Production, Network Centrality and Power

Any (global) production process can be described as a series of value-added processes where the outputs of one process are the inputs of another. This complex procedure can be depicted through a production network, with each node representing national economic sectors and their links the value of their respective transactions. Within a network, the position of a node can be captured by different measures of centrality, and over time new measures are being developed (Jackson, 2008). Hence the centrality of an economic sector is a key component regarding the topological-positional dimension of power relations.

Using IOTs, we are able to calculate the centrality of each node-sector and quantify the topological characteristics of global production, simultaneously at the functional and geographical level. In turn, these topological characteristics reflect the influence or power that each node-sector possesses in the whole network. This is a well-established fact in the literatures of economic sociology and social network analysis (Freeman, 1978; Yeung and Coe, 2015: 65). In this way, the position of firms in the production process becomes the key ingredient of their power with respect to their competitors, partners and employees. The same applies to the sectoral level, as well.

Here we consider the centrality measures of *Degree*, *Strength* and *PageRank* . Degree is the most widely used centrality measure, defined as the number of links (connections) a node has with the rest of the nodes. For directed networks, we have to distinguish between incoming and outgoing economic transactions and thus introduce two types of degree centralities, the In-Degree, that counts all the transactions that point to sector i, and Out-Degree, which counts the outgoing transactions originated from sector i. Then Total-Degree is simply the sum of the two-directional measures of the number of links. So, in our context, degree centrality measures the number of business relationships that have been built between economic sectors. Strength centrality takes into account the volumes of inflows and outflows of inputs and outputs, between sectors in an economy. As in the case of degree centrality, we can distinguish between in-strength, measuring the volume of inflows to an economic sector, and out-strength, measuring the volume of outflows from a sector. The sum of two will give the total strength. In our context, degree and strength centralities capture the number and weight of the business relationships established among the various sectors of the world economy.

However, these two centrality types only take into account only the direct production links of an economic sector, its nearest neighbours, in other words, irrespective of those neighbours' position in the overall structure of the economic network. This means that they do not take into account the possible power of a node that may have few links but with "powerful" nodes that could provide the first node with positional power. Considering this shortcoming and the need to uncover the effects of the rest of the sectors within a network, global centrality measures have been proposed, such as *Eigenvector* and PageRank centralities (Jackson, 2008).

Eigenvector centrality is defined as the sum of the links connecting a sector with its neighbours. In eigenvector centrality, each link connecting the node under consideration with the neighbouring nodes has a different weight, based on the centrality of the latter. That is, the centrality of a node depends not only on the number of links it has established with other nodes, but also on the number of links those other nodes have established with their neighbours, as well. Thus, for example, a sector has higher eigenvector centrality if it is connected to more connected sectors.

A variant of the eigenvector centrality measure was introduced by the founders of Google search engine, Larry Page and Sergey Brin, who developed, along with Rajeev Motwani and Terry Winograd, a computer algorithm for rating and ranking webpages based on their importance (Page et al., 1999). PageRank centrality instead of calculating a centrality score proportional to the centrality of neighbouring nodes, it scales the effect of those nodes that have a large number of outgoing links. Consequently, a sector will be highly central in terms of the PageRank centrality measure, if it is connected to highly connected sectors that have gained their importance, although they have a large number of out-going links. In that way, PageRank centrality controls for those cases of economic sectors, which under the eigenvector centrality measure, would have accumulated high scores of centralities, merely since they have established business relationships with large input providers, for example, energy, transportation and financial intermediation, services.

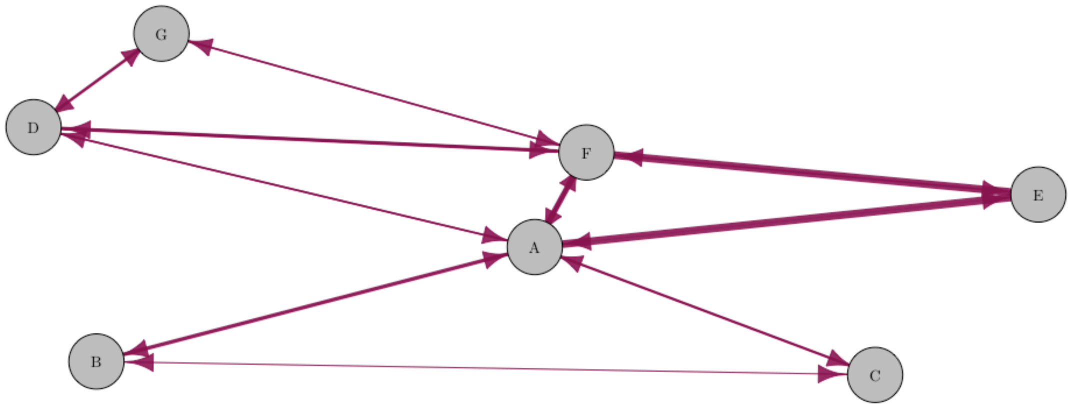
3.1 A Network Example

In **Figure 1**, we have plotted a hypothesized production network, with each node expressing an economic sector, and the links connecting them, the value of transactions between them. The sub-graph (b) shows the input-output intermediate goods/services table that functions as the 'recipe' of the production network. Each row shows how much each sector's output has been distributed to the economy and used as inputs. Likewise, each column shows how much inputs, each sector will purchase from the other sectors of the economy, to produce its respective output.

Based on the information of the input-output table, we can calculate, in sub-graph (c), the centralities of every sector in the economy. As we can see, each measure highlights the different properties of the structure of the production network. For instance, with degree centrality, we get the information that the most important (central) sectors are A and F, while sectors B, C, E, and G, share the same amount of positional power. A different picture is given when we consider the measure of strength centrality.

Here we observe that the value of transactions between the sectors of a production process, matters for their relative positional power. Whereas in the previous example of degree centrality we could not make any conclusion regarding the relative power of sectors B, C, E and G, now with strength centrality, we have a clear ranking of power asymmetries. PageRank centrality, on the other hand, takes into account how central the neighbors of a node are, and thus modifies the ranking output of strength centrality analogously.

(a)



Consuming Sectors

Producing Sectors	A	B	C	D	E	F	G
A	0	100	70	50	200	150	0
B	20	0	30	0	0	0	0
C	40	10	0	0	0	0	0
D	50	0	0	0	0	70	80
E	10	0	0	0	0	200	0
F	85	0	0	95	45	0	50
G	0	0	0	35	0	45	0

(b)

Centrality Measures

Economic Sectors	Degree	Strength	PageRank
A	10.00	775.00	0.20
B	4.00	160.00	0.06
C	4.00	150.00	0.08
D	6.00	380.00	0.16
E	4.00	455.00	0.12
F	8.00	740.00	0.27
G	4.00	210.00	0.12

(c)

Figure 1 Centrality Measures in a Hypothesized Production Network

Source: Own Calculation. *Notes:* Sub-graph (a) is the visualization of a production network. Each node represents one of the sectors of our hypothesized economy. The thickness of each link is indicative of the volume/value of the transaction. In sub-graph (b) we have plotted an input-output table of intermediate goods of the hypothesized economy. The rows show the producing sectors and the columns the consuming sectors. Each element of the input-output table expresses the value of transactions between sectors. In sub-graph (c) we have calculated the Degree, Strength and PageRank centralities for every node-sector of the economy.

The reason why we concentrate on these three types of centrality measures, is implicitly given by the previous discussion. Degree, strength and PageRank centralities, as the fundamental measures of positional influence, give us information for both the multitude of links, as well as the strength and depth of the connections of a network node. Consequently, computing these three centrality measures we are able to make significant conclusions about the topological power of a node[5]. Even though the different types of centrality measures capture different aspects of power, it does not mean that each of these will be similarly correlated with profits. In the next section, we find these correlations.

4 Data and Methodology

For our calculations, we use four databases from the WIOD and the collection of ICIO Tables, offered by OECD, for different industry classifications and time ranges. The WIOD comes into two versions, at basic prices in millions of US dollars. The 2013 version covers 35 economic sectors (ISIC Rev.3), for 40 countries and a proxy for the Rest-of-the-World (RoW), from 1995 to 2011. The 2016 version of the WIOD, on the other hand, covers 56 economic sectors (ISIC Rev.4) for 44 countries (including an estimate the RoW), from 2000 to 2014. The OECD database (OECD, 2018a) provides time-series global IOTs in two versions, as well. The first version covers 34 industries (ISIC Rev.3) for 64 OECD and non-OECD countries, including an estimate of the RoW from 1995 to 2011, while the second version covers 36 industries (ISIC Rev.4) for 65 countries (plus RoW), from 2005-2015. **Table 1** summarizes the basic information for the four network configurations. The number of country-sector nodes is less by one country because we had to exclude the RoW, due to the unavailability of data regarding value-added components (labour and capital income). The complete lists of countries and sectors covered by the databases can be found in Supplementary Materials.

Table 1 Summary Statistics of Economic Network Configurations

Database	Years Covered	Industrial Classification	Sectors	Countries	Nodes	Average Links
WIOD	1995-2011	ISIC-Rev.3	35	40	1,400	1,763,906
WIOD	2000-2014	ISIC-Rev.4	56	43	2,408	5,039,876
OECD	1995-2011	ISIC-Rev.3	34	63	2,142	2,287,321
OECD	2005-2015	ISIC-Rev.4	36	64	2,304	4,408,763

Source: Own Calculation

Based on these four global production network data, we are able to capture the positional power of each sector, by calculating the degree, strength and PageRank centralities and explore their behavior against sector-specific shares of profit distribution. Profit distribution shares are computed by dividing the *Gross Operating Surplus* (GOS) component of the *Value-Added* of each sector, in each country, over

[5] For more details regarding the mathematical formulations of the various centrality measures see Estrada and Knight (2015).

the total amount of GOS generated in the global economy. OECD database provides direct estimates of the GOS. The WIOD IOTs, however, have been constructed in terms of *Gross Value-Added* (GVA) and thus, to compute the GOS, we had to subtract from GVA the amount of employees' compensation for each sector, in each country and for the total global IOTs. For the analysis of the association between sector-specific positional power, measured by centrality, and GOS, we apply both a parametric (Pearson) and non-parametric (Spearman and Kendall) correlation tests, over the whole period.

We perform two types of correlation tests: First, the parametric Pearson correlation test is designed for samples that follow a normal distribution. For non-normal distribution, it is more appropriate to use non-parametric correlation statistics, especially if we are dealing with heavy-tailed distributions, as is the cases with centralities and sectoral profit-shares (de Winter et al., 2016). In particular, Spearman ϱ and Kendall τ, seem to have better statistical properties with non-normal distributions compared to Pearson's r, and are invariant to monotonic transformations, such as the log-transformation that we apply on our data (Li et al., 2012). The distributional characteristics of the three centrality measures can be found in the Appendix (**Figure 4**). They show a clear non-normal distribution and thus jsutify our decision to consider, the non-parametric choices of Spearman and Kendall, additional to the Pearson's correlation test. Second, we want to explore how the relationship between profit distribution and positional power behaves in cases of non-linearities, a task that is best performed with the rank-based Spearman and Kendall correlation coefficients estimates.

5 Empirical Results

Figure 2Error! Reference source not found. captures the behavior of the three correlation coefficients, for every year covered by the IOTs. Each row of the figure corresponds to a production network configuration based on the four databases. Equally, each column of the figure corresponds to one of the three correlation measurements that we have used in our analysis, the Pearson, the Spearman and the Kendall. Lastly, each line corresponds to one of the three centrality measures, namely total-degree, total-strength and PageRank. In the Appendix (**Table 2**) we gather all the results for the three correlation tests applied over the relationship between positional power, measured by three alternative measures of node centrality, and sectoral profit-shares, in log-log scales[6].

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[6] For the application of the log-log transformation, we had to exclude those values of centralities and shares of profitability, that were equal to zero since the natural logarithm of zero is undetermined. Excluding the zero values from the data eventually reduced the size of each dataset, by 10% for the WIOD (ISIC3), 8% for WIOD (ISIC4), 17% for OECD (ISIC3) and 8% for OECD (ISIC4). However, the impact on the co-movement conclusions is minor, because country-sectors with zero centralities

All the parametric and non-parametric correlation coefficients are statistically significant, for at least 0.1% level of statistical significance. The only exception is the relationship between total-degree and profitability for the economic network based on WIOD (ISIC3) for six years between 2005 and 2011.

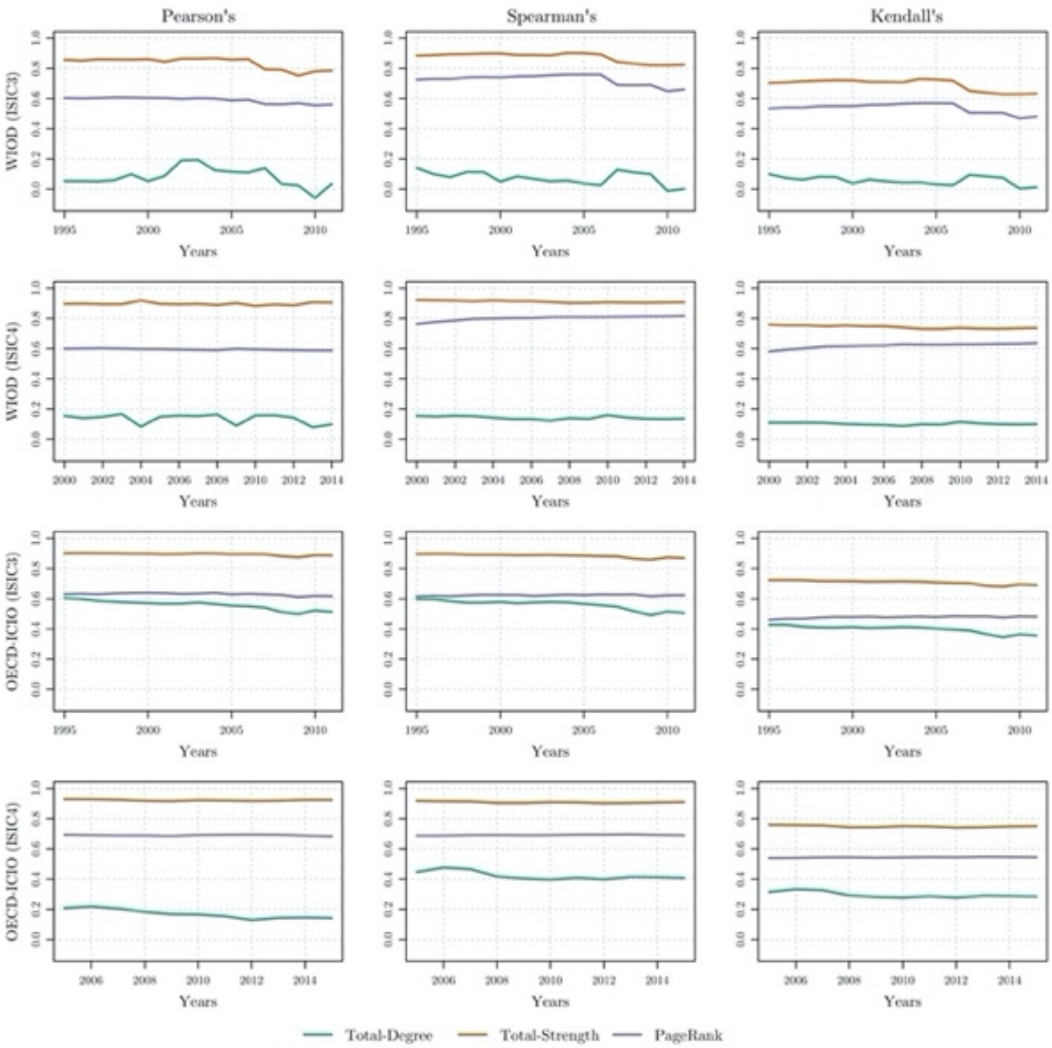

Figure 2 Correlation Coefficients of Centralities and sectoral shares of GOS
Source: Own Calculation. *Data*: WIOD, OECD

Based on the results, we observe the existence of a roughly stable co-movement between centrality measures and profit distribution for strength and PageRank centralities. For degree centrality, on the other hand, all correlation tests show a low association, with the exception of the OECD (ISIC3) economic network, in which case the dataset gives us Pearson and Spearman coefficients in the area of 0.5 – 0.6 and in the area of 0.4 for the case of Kendall correlations. A stronger association, though, is given by PageRank for all correlation types and network configurations. In particular,

imply that they are positioned at the most disconnected component of the global economic network, with no ties to the most connected part of the world economy.

the Pearson linear correlation for PageRank versus profitability, varies between 0.55 and 0.69 for all years and configurations, while Spearman's rank correlation varies between 0.6 and 0.81 and Kendall's, much lower, between 0.46 and 0.61. However, the strongest association between profit distribution and centrality is captured by strength centrality. Pearson correlation for strength-profitability varies between 0.75 and 0.92, with Spearman and Kendall rank correlations, varying between 0.82 and 0.92 and 0.62 and 0.75, respectively. A 'snapshot' of the relationships between degree, strength and PageRank centralities and sectoral profit-distribution, for 2014, is given by **Figure 3**, where we observe the highest correlations with respect to strength centrality, compared to PageRank and degree.

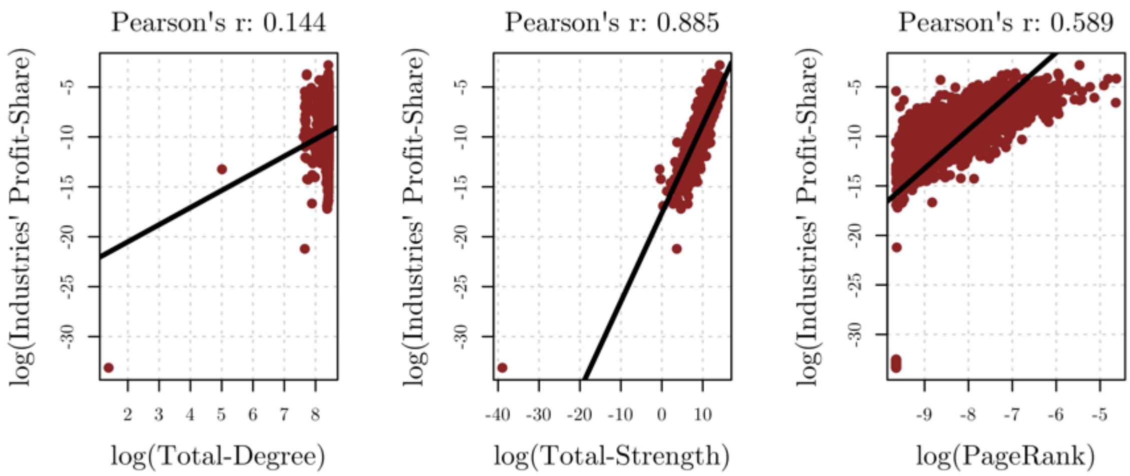

Figure 3 Correlation Coefficients of Centralities and sectoral shares of GOS, 2014
Source: Own Calculation. *Data*: WIOD IOT, 2014

The low correlation between degree centrality and profit-shares comes as no surprise. Since degree centrality captures merely the number of connection of each node-sector, and our databases cover no more than 56 economic sectors, it is evident to expect that this centrality score will not give us meaningful insights. On the contrary, the high correlation of strength and PageRank centralities underlines the fact that a relationship between the positional power of industrial sectors and the distribution of profit, exists. Moreover, it exists, not only with respect to the volume of the transactions of intermediate goods between economic sectors (strength centrality), but also with respect to the depth of those relations (PageRank centrality). As we underlined in the previous section, PageRank centrality takes into account, not only how central, and thus topologically powerful, the immediate (first tier) partners of a particular economic sector are, but also how central the partners of those partners (second tier), and the partners of the partners of those partners (third tier), and so on. For example, whereas a global sector might be characterized by very high strength centrality, due to large buyers and/or suppliers, with PageRank centrality we will in general have a lower centrality score, since we have incorporated information regarding the centrality scores of higher tier suppliers and buyers. In other words, PageRank centrality can be thought of as a successive computation of strength centrality, with each other sector's contribution to the centrality of the sector under consideration, fading with each successive stage.

The empirical tests that we have applied, strongly suggest a strong positive connection between the two variables (node centrality and profits) which, based on the respective theories, fairly represent topological and economic power, respectively. We should emphasize that the above empirical results do not establish a causal relationship between the centrality of economic sectors and their profit distribution. In this exercise, we simply want to take a first step towards the above direction, by highlighting the fact that the structures of global production, represented by the topological characteristics of the numerous fragmented production processes that consist a global value chain, can be utilized as an approximation of the positional dimension of power.

To be sure, one of the key findings of our empirical exercise is that the sectors which have managed to hold central positions within the global production process - both spatially and functionally - capture relatively higher profits. This is not necessarily because those sectors are more productive or supply the markets with more competitively priced products. Rather because they have managed to accumulate a particular dimension of power, what we have called in this paper, topological-positional power.

6 Conclusions

Even though the analysis of power relations is a crucial component of the various global production frameworks, the concrete conceptualization of power as a multidimensional concept that can be empirically and quantitatively explored needs further exploration. In this paper, we propose an analytical link between the centrality of geographically dispersed sectors, denoting their topological-positional power, and the sectoral distribution of profits.

Focusing on the network structure and, specifically, on different forms of network centrality allowed us to draw a concrete conclusion regarding the power topologies of production actors. Using available global input-output data, we show quantitatively that, it is those sectors that manage to become large buyers and/or suppliers in the global economy who receive the lion's share of the realized profitability.

The present paper can be extended at least three different research paths. The first path directs towards the empirical decomposition of the various quantifiable dimensions of power in a global production network. For instance, other variables such as capital-intensity, access to finance, productivity etc. can be considered on top of the topological-geographical and the topological-functional characteristic of each sector, in order to have a complete picture of the determining factors of profit distribution. The literature on international trade and the effects of globalization provides a wide array of theoretical approaches and empirical econometric techniques that allow for a thorough analysis of these issues (Feenstra, 1998; Milberg and Winkler, 2013; Stockhammer, 2017). The second path looks towards labour and questions regarding the relationship between the workers' bargaining power and global production structures. The third path combines the other two paths and sheds light on the functional distribution of income between labor and capital, on the basis of the centrality of each actor in the complex economic and production network of the global economy.

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Appendix

Figure 4 shows the distributions of centralities for representative years from all reference databases. Both strength and PageRank centrality measures seem to follow some type of a heavy-tail distribution, with the exception of the degree centralities, where the linear part of the CCDF[7] plot becomes almost vertical at the right-tail region, implying an exponential distribution (Cirillo, 2013). The distributions are consistent with those found in other economic networks (Cerina et al., 2015). In Table 4 we show the results of the correlation tests for the relationship between centralities and sectoral profit-shares, in log-log scales.

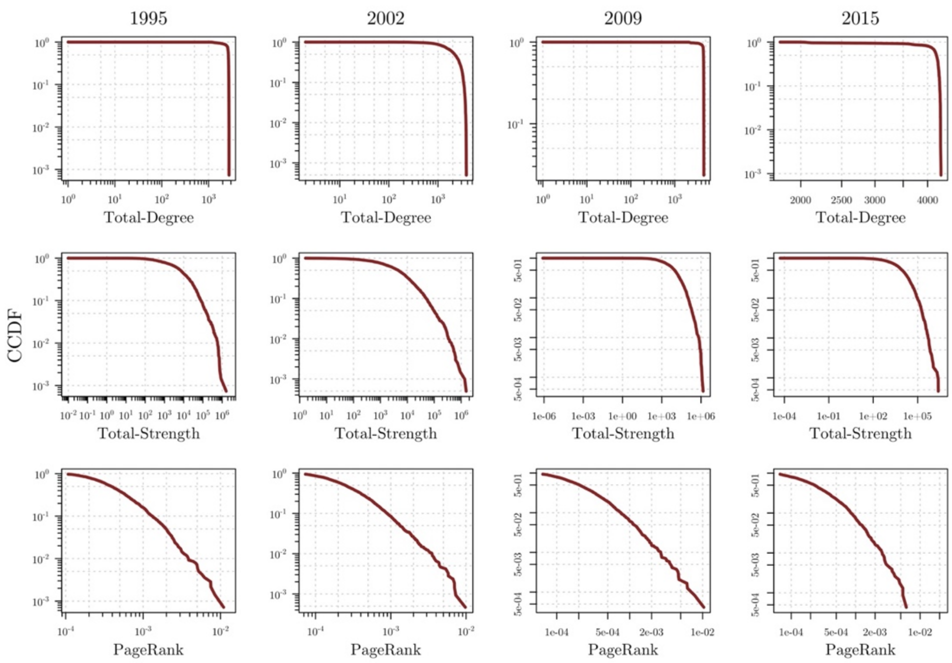

Figure 4 Distributions of Degree, Strength and PageRank Centralities, Selected Years

Source: Own Calculation. Data: WIOD-ISIC3 for 1995, OECD-ISIC3 for 2002, WIOD-ISIC4 for 2009, OECD-ISIC4 for 2015. *Note*: Plots in log-log scales.

[7] A complementary cumulative distribution function measures the probability of a variable taking values higher than a particular level and is formally defined as $\bar{F}_x = P(X > x) = 1 - P(X \leq x)$.

Table 2 Correlation Tests for Centralities against sectoral shares of GOS

		WIOD(ISIC3)			OECD(ISIC3)				WIOD(ISIC4)			OECD(ISIC4)		
Year		TD	TS	PR	TD	TS	PR	Year	TD	TS	PR	TD	TS	PR
1995	r	0.054*	0.857***	0.603***	0.604***	0.900***	0.631***	2000	0.155***	0.896***	0.599***			
		n:1270	n:1270	n:1293	n:1776	n:1776	n:1843		n:2196	n:2196	n:2339			
	ρ	0.140***	0.884***	0.725***	0.598***	0.896***	0.616***		0.155***	0.922***	0.764***			
		n:1270	n:1270	n:1293	n:1776	n:1776	n:1843		n:2196	n:2196	n:2339			
	τ	0.100***	0.703***	0.534***	0.428***	0.723***	0.461***		0.110***	0.759***	0.581***			
		n: 1270	n:1270	n:1293	n:1776	n:1776	n:1843		n:2196	n:2196	n:2339			
1996	r	0.054*	0.851***	0.601***	0.599***	0.902***	0.634***	2001	0.140***	0.897***	0.601***			
		n:1267	n:1267	n:1289	n:1777	n:1777	n:1844		n:2215	n:2215	n:2357			
	ρ	0.100***	0.887***	0.731***	0.598***	0.897***	0.620***		0.151***	0.920***	0.777***			
		n:1267	n:1267	n:1289	n:1777	n:1777	n:1844		n:2215	n:2215	n:2357			
	τ	0.075***	0.706***	0.540***	0.428***	0.724***	0.467***		0.109***	0.755***	0.594***			
		n:1267	n:1267	n:1289	n:1777	n:1777	n:1844		n:2215	n:2215	n:2357			
1997	r	0.052*	0.860***	0.603***	0.585***	0.901***	0.631***	2002	0.149***	0.894***	0.602***			
		n:1271	n:1271	n:1293	n:1780	n:1780	n:1847		n:2215	n:2215	n:2357			
	ρ	0.080***	0.893***	0.730***	0.583***	0.897***	0.618***		0.156***	0.918***	0.786***			
		n:1271	n:1271	n:1293	n:1780	n:1780	n:1847		n:2215	n:2215	n:2357			
	τ	0.063***	0.714***	0.540***	0.416***	0.723***	0.467***		0.110***	0.755***	0.603***			
		n:1271	n:1271	n:1293	n:1780	n:1780	n:1847		n:2215	n:2215	n:2357			
1998	r	0.061**	0.859***	0.607***	0.579***	0.900***	0.636***	2003	0.167***	0.894***	0.600***			
		n:1271	n:1271	n:1293	n:1805	n:1805	n:1872		n:2214	n:2214	n:2356			
	ρ	0.114***	0.894***	0.740***	0.573***	0.892***	0.623***		0.153***	0.914***	0.798***			
		n:1271	n:1271	n:1293	n:1805	n:1805	n:1872		n:2214	n:2214	n:2356			
	τ	0.083***	0.718***	0.550***	0.410***	0.717***	0.475***		0.108***	0.749***	0.615***			
		n:1271	n:1271	n:1293	n:1805	n:1805	n:1872		n:2214	n:2214	n:2356			
1999	r	0.099***	0.858***	0.606***	0.574***	0.898***	0.639***	2004	0.084***	0.919***	0.597***			
		n:1276	n:1276	n:1297	n:1819	n:1819	n:1886		n:2220	n:2220	n:2362			
	ρ	0.113***	0.897***	0.743***	0.573***	0.891***	0.627***		0.143***	0.919***	0.800***			
		n:1276	n:1276	n:1297	n:1819	n:1819	n:1886		n:2220	n:2220	n:2362			
	τ	0.081***	0.721***	0.551***	0.409***	0.717***	0.479***		0.101***	0.754***	0.617***			
		n:1276	n:1276	n:1297	n:1819	n:1819	n:1886		n:2220	n:2220	n:2362			

(continued)

Table 2 (continued)

Year		WIOD(ISIC3) TD	WIOD(ISIC3) TS	WIOD(ISIC3) PR	OECD(ISIC3) TD	OECD(ISIC3) TS	OECD(ISIC3) PR	Year	WIOD(ISIC4) TD	WIOD(ISIC4) TS	WIOD(ISIC4) PR	OECD(ISIC4) TD	OECD(ISIC4) TS	OECD(ISIC4) PR
2000	r	0.054*	0.861***	0.604***	0.570***	0.898***	0.640***	2005	0.149***	0.896***	0.597***	0.208***	0.929***	0.693***
		n:1274	n:1274	n:1298	n:1814	n:1814	n:1881		n:2215	n:2215	n:2358	n:2149	n:2149	n:2219
	ρ	0.051*	0.898***	0.740***	0.578***	0.891***	0.626***		0.134***	0.915***	0.803***	0.446***	0.918***	0.687***
		n:1274	n:1274	n:1298	n:1814	n:1814	n:1881		n:2215	n:2215	n:2358	n:2149	n:2149	n:2219
	τ	0.039**	0.720***	0.551***	0.413***	0.716***	0.478***		0.097***	0.749***	0.620***	0.314***	0.758***	0.539***
		n:1274	n:1274	n:1298	n:1814	n:1814	n:1881		n:2215	n:2215	n:2358	n:2149	n:2149	n:2219
2001	r	0.088***	0.844***	0.603***	0.566***	0.895***	0.638***	2006	0.157***	0.893***	0.594***	0.218***	0.928***	0.690***
		n:1275	n:1275	n:1298	n:1814	n:1814	n:1881		n:2224	n:2224	n:2367	n:2152	n:2152	n:2222
	ρ	0.085***	0.888***	0.748***	0.569***	0.888***	0.626***		0.134***	0.915***	0.803***	0.475***	0.915***	0.687***
		n:1275	n:1275	n:1298	n:1814	n:1814	n:1881		n:2224	n:2224	n:2367	n:2152	n:2152	n:2222
	τ	0.064***	0.710***	0.559***	0.406***	0.713***	0.481***		0.095***	0.749***	0.621***	0.332***	0.756***	0.540***
		n:1275	n:1275	n:1298	n:1814	n:1814	n:1881		n:2224	n:2224	n:2367	n:2152	n:2152	n:2222
2002	r	0.190***	0.864***	0.598***	0.567***	0.896***	0.633***	2007	0.154***	0.896***	0.592***	0.205***	0.925***	0.688***
		n:1269	n:1269	n:1292	n:1814	n:1814	n:1881		n:2227	n:2227	n:2370	n:2153	n:2153	n:2223
	ρ	0.069**	0.888***	0.749***	0.574***	0.889***	0.620***		0.123***	0.909***	0.810***	0.465***	0.914***	0.690***
		n:1269	n:1269	n:1292	n:1814	n:1814	n:1881		n:2227	n:2227	n:2370	n:2153	n:2153	n:2223
	τ	0.053***	0.709***	0.560***	0.409***	0.714***	0.476***		0.088***	0.741***	0.629***	0.326***	0.754***	0.543***
		n:1269	n:1269	n:1292	n:1814	n:1814	n:1881		n:2227	n:2227	n:2370	n:2153	n:2153	n:2223
2003	r	0.193***	0.864***	0.602***	0.574***	0.900***	0.635***	2008	0.164***	0.888***	0.590***	0.181***	0.918***	0.688***
		n:1279	n:1279	n:1300	n:1818	n:1818	n:1885		n:2213	n:2213	n:2355	n:2151	n:2151	n:2221
	ρ	0.053*	0.885***	0.756***	0.578***	0.890***	0.624***		0.140***	0.902***	0.811***	0.417***	0.904***	0.691***
		n:1279	n:1279	n:1300	n:1818	n:1818	n:1885		n:2213	n:2213	n:2355	n:2151	n:2151	n:2221
	τ	0.043**	0.707***	0.567***	0.413***	0.715***	0.479***		0.099***	0.731***	0.627***	0.291***	0.742***	0.544***
		n:1279	n:1279	n:1300	n:1818	n:1818	n:1885		n:2213	n:2213	n:2355	n:2151	n:2151	n:2221
2004	r	0.125***	0.867***	0.600***	0.564***	0.899***	0.640***	2009	0.090***	0.901***	0.599***	0.166***	0.916***	0.685***
		n:1278	n:1278	n:1301	n:1818	n:1818	n:1885		n:2204	n:2204	n:2347	n:2135	n:2135	n:2205
	ρ	0.058**	0.901***	0.760***	0.575***	0.887***	0.628***		0.135***	0.903***	0.810***	0.403***	0.904***	0.689***
		n:1278	n:1278	n:1301	n:1818	n:1818	n:1885		n:2204	n:2204	n:2347	n:2135	n:2135	n:2205
	τ	0.045**	0.730***	0.570***	0.410***	0.713***	0.482***		0.097***	0.731***	0.626***	0.281***	0.742***	0.541***
		n:1278	n:1278	n:1301	n:1818	n:1818	n:1885		n:2204	n:2204	n:2347	n:2135	n:2135	n:2205

(continued)

Table 2 (continued)

Year		WIOD(ISIC3) TD	WIOD(ISIC3) TS	WIOD(ISIC3) PR	OECD(ISIC3) TD	OECD(ISIC3) TS	OECD(ISIC3) PR	Year	WIOD(ISIC4) TD	WIOD(ISIC4) TS	WIOD(ISIC4) PR	OECD(ISIC4) TD	OECD(ISIC4) TS	OECD(ISIC4) PR
2005	r	0.115***	0.858***	0.588***	0.554***	0.895***	0.630***	2010	0.158***	0.882***	0.595***	0.164***	0.922***	0.691***
		n:1275	n:1275	n:1298	n:1817	n:1817	n:1883		n:2214	n:2214	n:2358	n:2146	n:2146	n:2216
	ρ	0.038	0.900***	0.760***	0.565***	0.885***	0.625***		0.160***	0.907***	0.811***	0.395***	0.909***	0.690***
		n:1275	n:1275	n:1298	n:1817	n:1817	n:1883		n:2214	n:2214	n:2358	n:2146	n:2146	n:2216
	τ	0.032*	0.726***	0.570***	0.402***	0.708***	0.478***		0.115***	0.738***	0.629***	0.276***	0.749***	0.543***
		n:1275	n:1275	n:1298	n:1817	n:1817	n:1883		n:2214	n:2214	n:2358	n:2146	n:2146	n:2216
2006	r	0.110***	0.861***	0.592***	0.550***	0.896***	0.634***	2011	0.159***	0.892***	0.592***	0.153***	0.920***	0.693***
		n:1279	n:1279	n:1302	n:1822	n:1822	n:1888		n:2208	n:2208	n:2351	n:2144	n:2144	n:2214
	ρ	0.026	0.892***	0.760***	0.557***	0.882***	0.629***		0.144***	0.905***	0.812***	0.408***	0.908***	0.694***
		n:1279	n:1279	n:1302	n:1822	n:1822	n:1888		n:2208	n:2208	n:2351	n:2144	n:2144	n:2214
	τ	0.026	0.718***	0.569***	0.396***	0.704***	0.484***		0.105***	0.733***	0.629***	0.286***	0.747***	0.545***
		n:1279	n:1279	n:1302	n:1822	n:1822	n:1888		n:2208	n:2208	n:2351	n:2144	n:2144	n:2214
2007	r	0.139***	0.793***	0.564***	0.541***	0.895***	0.630***	2012	0.143***	0.886***	0.590***	0.128***	0.917***	0.694***
		n:1276	n:1276	n:1299	n:1824	n:1824	n:1890		n:2217	n:2217	n:2359	n:2147	n:2147	n:2216
	ρ	0.128***	0.843***	0.690***	0.547***	0.880***	0.628***		0.136***	0.904***	0.814***	0.397***	0.902***	0.694***
		n:1276	n:1276	n:1299	n:1824	n:1824	n:1890		n:2217	n:2217	n:2359	n:2147	n:2147	n:2216
	τ	0.095***	0.651***	0.506***	0.389***	0.702***	0.483***		0.100***	0.732***	0.632***	0.276***	0.740***	0.544***
		n:1276	n:1276	n:1299	n:1824	n:1824	n:1890		n:2217	n:2217	n:2359	n:2147	n:2147	n:2216
2008	r	0.035	0.791***	0.563***	0.511***	0.881***	0.626***	2013	0.080***	0.907***	0.588***	0.142***	0.919***	0.693***
		n:1272	n:1272	n:1297	n:1816	n:1816	n:1882		n:2213	n:2213	n:2355	n:2147	n:2147	n:2217
	ρ	0.111***	0.831***	0.688***	0.517***	0.865***	0.629***		0.134***	0.906***	0.814***	0.414***	0.904***	0.696***
		n:1272	n:1272	n:1297	n:1816	n:1816	n:1882		n:2213	n:2213	n:2355	n:2147	n:2147	n:2217
	τ	0.085***	0.639***	0.506***	0.365***	0.685***	0.483***		0.098***	0.735***	0.633***	0.289***	0.742***	0.547***
		n:1272	n:1272	n:1297	n:1816	n:1816	n:1882		n:2213	n:2213	n:2355	n:2147	n:2147	n:2217
2009	r	0.024	0.753***	0.570***	0.499***	0.874***	0.612***	2014	0.099***	0.905***	0.588***	0.144***	0.924***	0.687***
		n:1258	n:1258	n:1282	n:1805	n:1805	n:1871		n:2213	n:2213	n:2357	n:2146	n:2146	n:2216
	ρ	0.100***	0.821***	0.690***	0.491***	0.858***	0.617***		0.137***	0.907***	0.818***	0.412***	0.907***	0.692***
		n:1258	n:1258	n:1282	n:1805	n:1805	n:1871		n:2213	n:2213	n:2357	n:2146	n:2146	n:2216
	τ	0.076***	0.628***	0.505***	0.345***	0.680***	0.475***		0.100***	0.738***	0.637***	0.287***	0.747***	0.546***
		n:1258	n:1258	n:1282	n:1805	n:1805	n:1871		n:2213	n:2213	n:2357	n:2146	n:2146	n:2216

(continued)

Table 2 (continued)

Year		WIOD-ISIC3 TD	WIOD-ISIC3 TS	WIOD-ISIC3 PR	OECD-ISIC3 TD	OECD-ISIC3 TS	OECD-ISIC3 PR	Year	WIOD-ISIC4 TD	WIOD-ISIC4 TS	WIOD-ISIC4 PR	OECD-ISIC4 TD	OECD-ISIC4 TS	OECD-ISIC4 PR
2010	r	-0.058**	0.781***	0.556***	0.522***	0.888***	0.620***	2015				0.141***	0.924***	0.683***
		n:1270	n:1270	n:1295	n:1819	n:1819	n:1885					n:2149	n:2149	n:2219
	ρ	-0.012	0.821***	0.649***	0.514***	0.873***	0.624***					0.407***	0.910***	0.689***
		n:1270	n:1270	n:1295	n:1819	n:1819	n:1885					n:2149	n:2149	n:2219
	τ	0.003	0.629***	0.470***	0.363***	0.695***	0.483***					0.284***	0.749***	0.544***
		n:1270	n:1270	n:1295	n:1819	n:1819	n:1885					n:2149	n:2149	n:2219
2011	r	0.035	0.785***	0.561***	0.512***	0.887***	0.618***							
		n:1269	n:1269	n:1293	n:1815	n:1815	n:1881							
	ρ	0.001	0.824***	0.661***	0.505***	0.869***	0.624***							
		n:1269	n:1269	n:1293	n:1815	n:1815	n:1881							
	τ	0.012	0.632***	0.481***	0.356***	0.690***	0.481***							
		n:1269	n:1269	n:1293	n:1815	n:1815	n:1881							

Source: Own Calculation. *Data*: WIOD, OECD. p*<0.1, p**<0.05, p***<0.01. *Notes*: r: Pearson, ρ: Spearman, τ: Kendall, n: number of industries, TD: Total-Degree, TS: Total-Strength, PR: PageRank. The total number of industries in WIOD-ISIC3, WIOD-ISIC4, OECD-ISIC3, OECD-ISIC4, is 1400, 2408, 2142 and 2304, respectively.

Supplementary Materials

Table 3 –Sectoral Coverage ISIC Rev.3 (1995-2009)

Industries of WIOD & OECD at ISIC3 level	**WIOD Codes**	**OECD Codes**
Agriculture, Hunting, Forestry and Fishing	c1	C01T05AGR
Mining and Quarrying	c2	C10T14MIN
Food, Beverages and Tobacco	c3	C15T16FOD
Textiles and Textile Products	c4	C17T19TEX
Leather, Leather and Footwear	c5	
Wood and Products of Wood and Cork	c6	C20WOD
Pulp, Paper, Paper, Printing and Publishing	c7	C21T22PAP
Coke, Refined Petroleum and Nuclear Fuel	c8	C23PET
Chemicals and Chemical Products	c9	C24CHM
Rubber and Plastics	c10	C25RBP
Other, Non-Metallic Mineral	c11	C26NMM
Basic Metals and Fabricated Metal	c12	C27MET C28FBM
Machinery, Nec	c13	C29MEQ
Electrical and Optical Equipment	c14	C30T33XCEQ C31ELQ
Transport Equipment	c15	C34MTR C35TRQ
Manufacturing, Nec; Recycling	c16	C36T37OTM
Electricity, Gas and Water Supply	c17	C40T41EGW
Construction	c18	C45CON
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	c19	
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	c20	C50T52WRT
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	c21	
Hotels and Restaurants	c22	C55HTR
Inland Transport	c23	C60T63TRN
Water Transport	c24	
Air Transport	c25	
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	c26	
Post and Telecommunications	c27	C64PTL
Financial Intermediation	c28	C65T67FIN
Real Estate Activities	c29	C70REA
Renting of M&Eq and Other Business Activities	c30	C71RMQ C72ITS C73T74OBZ
Public Admin and Defence; Compulsory Social Security	c31	C75GOV
Education	c32	C80EDU
Health and Social Work	c33	C85HTH
Other Community, Social and Personal Services	c34	C90T93OTS
Private Households with Employed Persons	c35	C95PVH
Total Number of Industries	**35**	**34**

Table 4 – The Sectoral Coverage of WIOD Rev.4 (2000-2014)

Industries of WIOD & OECD at ISIC4 level	**WIOD Codes**	**OECD Codes**
Crop and animal production, hunting and related service activities	r1	
Forestry and logging	r2	D01T03
Fishing and aquaculture	r3	
Mining and quarrying	r4	D05T06 D07T08 D09
Manufacture of food products, beverages and tobacco products	r5	D10T12
Manufacture of textiles, wearing apparel and leather products	r6	D13T15
Manufacture of wood and of products of wood and cork, etc.	r7	D16
Manufacture of paper and paper products	r8	D17T18
Printing and reproduction of recorded media	r9	
Manufacture of coke and refined petroleum products	r10	D19
Manufacture of chemicals and chemical products	r11	D20T21
Manufacture of basic pharmaceutical products and pharmaceutical preparations	r12	
Manufacture of rubber and plastic products	r13	D22
Manufacture of other non-metallic mineral products	r14	D23
Manufacture of basic metals	r15	D24
Manufacture of fabricated metal products, except machinery and equipment	r16	D25
Manufacture of computer, electronic and optical products	r17	D26
Manufacture of electrical equipment	r18	D27
Manufacture of machinery and equipment n.e.c.	r19	D28
Manufacture of motor vehicles, trailers and semi-trailers	r20	D29
Manufacture of other transport equipment	r21	D30
Manufacture of furniture; other manufacturing	r22	D31T33
Repair and installation of machinery and equipment	r23	
Electricity, gas, steam and air conditioning supply	r24	
Water collection, treatment and supply	r25	D35T39
Sewerage; waste collection, treatment and disposal activities, etc.	r26	
Construction	r27	D41T43
Wholesale and retail trade and repair of motor vehicles and motorcycles	r28	
Wholesale trade, except of motor vehicles and motorcycles	r29	D45T47
Retail trade, except of motor vehicles and motorcycles	r30	
Land transport and transport via pipelines	r31	
Water transport	r32	
Air transport	r33	D49T53
Warehousing and support activities for transportation	r34	
Postal and courier activities	r35	
Accommodation and food service activities	r36	D55T56
Publishing activities	r37	D58T60
Motion picture, video and television programme production, etc.	r38	
Telecommunications	r39	D61
Computer programming, consultancy and related activities; information service activities	r40	D62T63
Financial service activities, except insurance and pension funding	r41	
Insurance, reinsurance and pension funding, except compulsory social security	r42	D64T66
Activities auxiliary to financial services and insurance activities	r43	
Real estate activities	r44	D68
Legal and accounting activities; activities of head offices; management consultancy activities	r45	
Architectural and engineering activities; technical testing and analysis	r46	
Scientific research and development	r47	D69T82
Advertising and market research	r48	
Other professional, scientific and technical activities; veterinary activities	r49	
Administrative and support service activities	r50	
Public administration and defence; compulsory social security	r51	D84
Education	r52	D85
Human health and social work activities	r53	D86T88
Other service activities	r54	D90T96
Activities of households as employers; etc.	r55	D97T98
Activities of extraterritorial organizations and bodies	r56	–
Total Number of Industries	**56**	**36**

Table 5 – List of Countries

List of Countries in Input-Output Databases			
WIOD (1995-2011)	**WIOD (2000-2014)**	**OECD (1995-2011)**	**OECD (2005-2015)**
1. Australia	1. Australia	1. Argentina	1. Argentina
2. Austria	2. Austria	2. Australia	2. Australia
3. Belgium	3. Belgium	3. Austria	3. Austria
4. Brazil	4. Brazil	4. Belgium	4. Belgium
5. Bulgaria	5. Bulgaria	5. Brazil	5. Brazil
6. Canada	6. Canada	6. Brunei	6. Brunei
7. China	7. China	7. Bulgaria	7. Bulgaria
8. Cyprus	8. Croatia	8. Cambodia	8. Cambodia
9. Czech Rep	9. Cyprus	9. Canada	9. Canada
10. Denmark	10. Czech Rep	10. Chile	10. Chile
11. Estonia	11. Denmark	11. China	11. China
12. Finland	12. Estonia	12. Chinese Taipei	12. Chinese Taipei
13. France	13. Finland	13. Colombia	13. Colombia
14. Germany	14. France	14. Costa Rica	14. Costa Rica
15. Greece	15. Germany	15. Croatia	15. Croatia
16. Hungary	16. Greece	16. Cyprus	16. Cyprus
17. India	17. Hungary	17. Czech Republic	17. Czech Republic
18. Indonesia	18. India	18. Denmark	18. Denmark
19. Ireland	19. Indonesia	19. Estonia	19. Estonia
20. Italy	20. Ireland	20. Finland	20. Finland
21. Japan	21. Italy	21. France	21. France
22. Latvia	22. Japan	22. Germany	22. Germany
23. Lithuania	23. Latvia	23. Greece	23. Greece
24. Luxembourg	24. Lithuania	24. Hong Kong	24. Hong Kong
25. Malta	25. Luxembourg	25. Hungary	25. Hungary
26. Mexico	26. Malta	26. Iceland	26. Iceland
27. Netherlands	27. Mexico	27. India	27. India
28. Poland	28. Netherlands	28. Indonesia	28. Indonesia
29. Portugal	29. Norway	29. Ireland	29. Ireland
30. Rest of the World	30. Poland	30. Israel	30. Israel
31. Romania	31. Portugal	31. Italy	31. Italy
32. Russia	32. Rest of the World	32. Japan	32. Japan
33. Slovakia	33. Romania	33. Korea	33. Kazakhstan
34. Slovenia	34. Russia	34. Latvia	34. Korea
35. South Korea	35. Slovakia	35. Lithuania	35. Latvia
36. Spain	36. Slovenia	36. Luxembourg	36. Lithuania
37. Sweden	37. South Korea	37. Malaysia	37. Luxembourg
38. Taiwan	38. Spain	38. Malta	38. Malaysia
39. Turkey	39. Sweden	39. Mexico	39. Malta
40. UK	40. Switzerland	40. Morocco	40. Mexico
41. USA	41. Taiwan	41. Netherlands	41. Mexico
	42. Turkey	42. New Zealand	42. Morocco
	43. UK	43. Norway	43. Netherlands
	44. USA	44. Peru	44. New Zealand
		45. Philippines	45. Norway
		46. Poland	46. Peru
		47. Portugal	47. Philippines
		48. Rest of the world	48. Poland
		49. Romania	49. Portugal
		50. Russia	50. Rest of the World
		51. Saudi Arabia	51. Romania
		52. Singapore	52. Russia
		53. Slovakia	53. Saudi Arabia
		54. Slovenia	54. Singapore
		55. South Africa	55. Slovakia
		56. Spain	56. Slovenia
		57. Sweden	57. South Africa
		58. Switzerland	58. Spain

	59. Thailand	59. Sweden
	60. Tunisia	60. Switzerland
	61. Turkey	61. Thailand
	62. United Kingdom	62. Tunisia
	63. United States	63. Turkey
	64. Viet Nam	64. United Kingdom
		65. United States
		66. Viet Nam