

Tracing the Chinese Challenge to US Hegemony in Foreign Direct Investment Activities

Roman Stöllinger, University of Technology (TU Delft)

Abstract

This paper uses greenfield FDI projects to trace the Chinese challenge to the US hegemony in the realm of global investment activities. The theoretical underpinning for this quantitative analysis is the world-system approach. Following this approach, polities (countries/economies) are inextricably linked to each other via economic, political and information networks. Within these networks, polities have different positions – core, semi-periphery, periphery – which are characterised by strong asymmetries. Viewed from this perspective, the current geopolitical tensions in the world-system are the result of an ascending semi-periphery, that is China, challenging the incumbent hegemony, which has been the US since the beginning of the 20th century. The outward and inward FDI activities, including the positions of the US and China in the international division of labour confirm the hegemonic position of the US in the realm of investment as well as the semi-peripheral status of China, though with clear signs of ascent to core status. The paper also proposes a new methodology for identifying the contribution to the functional position of countries in the world-system.

Version: [17 September 2023](#)

Keywords: World-system analysis, hegemony, FDI, functional specialisation.

1. Introduction

The theoretical framework of this analysis is the world-system approach of Wallerstein (1974, 2004) and Braudel (1982). The world-system theory upholds that the current capitalist system was formed in the 15th century and that it takes the form of a world-economy, that is, a system with a unified economic space but with numerous political units ('polities') as actors¹. Another defining feature of world-systems is their stratification structure, which implies a power asymmetry in the system. More precisely, states can take the position of core countries, semi-peripheries and peripheries.

Chase-Dunn and Hall (1997) argue that while the relationships within the core are doubtlessly important for the evolution of the system and its reproduction, the (cyclical) dynamics of modern world-systems are attributable to the semi-periphery. The working hypothesis of this paper is that China, as a middle-income country but with a massive lever in global trade and investment is currently in the position of a semi-periphery which combines features (e.g. production techniques and specialisation patterns) of a core economy and of a periphery country that is politically, economically and/or technologically dependent on the core economies. Furthermore, China obviously strives for core status and, given the systemic differences, therefore needs to challenge the hegemonic position of the United States.

China is therefore working towards a rebalancing of the capitalist world-system, where the dynamics of (relative) rise and (relative) decline of core powers are defining feature of world-economies, known as 'hegemonic sequence'. Xian and Bernal-Meza (2021) refer to this sequence as "cycles of hegemony".

Changes in the relative power positions of countries can be brought about in various forms and proceed with varying speed in different domains. We focus on the economic domain and more precisely on foreign direct investments.

Two questions are of particular relevance. First the amount of foreign direct investment which is evidence of some sort of international competitiveness of the investing firm. Second, which position do countries take in GVCs and the world-economy in general. In this context, Baldwin (2013) as well as Baldwin and Lopez-Gonzalez (2015) categorise countries as factory economies on the one hand and headquarter economies on the other hand. The former are specialised in fabrication

¹ The world-economy proved to be more suitable to build a global system than previous attempts via empire building (characterised by a relatively homogenous political structure).

activities², which are associated with relatively low potential for creating value added (Shih, 1996; Shin et al., 2013; Mudambi, 2008) and low skill requirements. In contrast, headquarter economies organise and control production networks are typically responsible for strategic functions such as controlling or research and development (R&D).³ Hence, functional specialisations reflect cross-country technological asymmetries between production partners in global value chains (GVCs), which is investigated empirically by Stöllinger (2021) and Kordalska et al. (2022). Factory economies and headquarter economies have their correspondences in world-system theory where they are referred to as core economies and peripheries respectively.

The remainder of this paper is structured as follows. Section 2 presents some key concepts of world-system analysis, including the concept of hegemony and its rise and decline. Section 3 contains the quantitative analysis of the investment patterns in which the Chinese challenge to US hegemony can be identified. Section 4 concludes.

2. Hegemony and rivalry from a world-system perspective

2.1. Central features and actors in a world-system

According to Wallerstein (1974), the current modern world-system was created in the 15th century. Three aspects of this world-system deserve a short explanation. First, this world system is a so-called world-economy – a term borrowed from Fernand Braudel. After several millennia of failed attempts to create a world-empire with a political centre and tribute-paying entities, the particularity of the modern world system is that it consists of many politically independent entities which are, however, inextricably tied together economically. In other words, it is a world-economy, the glue of which is not military domination but economic domination between core and periphery. Second, it is a capitalist world-economy. For Wallerstein (1983), which is

² In the context of value-chain functions we use the terms production and the less common term fabrication interchangeably. The reason is that when referring to production activities as one function of the value chain, the term ‘fabrication function’ avoids the ambiguity implied by the term ‘production function’, which has an entirely different meaning in economics.

³ Baldwin (2006) first used the concept of ‘Factory Asia’ to describe the observed trend in Asian production processes in which Japanese companies headquartered in Japan manufacture high-tech parts in Japan and ship them to factories in East Asian countries for labour-intensive production steps, including assembly, and then distribute the final products to Western markets or back to Japan. Other countries, such as Taiwan, Singapore and Hong Kong, followed the Japanese practice. Hence the latter group of countries were referred to as ‘headquarter economies’, while the low-wage East Asian countries were labelled ‘factory economies’. This terminology is still used in the GVC literature.

governed by “the endless accumulation of capital” (Wallerstein, 1983, p. 18).⁴ Third, the modern capitalist world-economy is global in scope, linking for the first time all major landmasses as its spatial boundaries expanded to comprise the entire globe.

The subject of analysis of world system theory is – as the name suggests – are the evolution, that is the rise and decline of world-systems (Chase-Dunn and Hall, 1997) and their interdependency rather than nations. World-system analysis therefore tightly linked to globalisation. The above-mentioned

2.2. Semi-peripheries and system dynamics

Another defining feature of world-systems analysis is their stratification structure, which implies a power asymmetry in the system Wallerstein (1974). A world-economy is necessarily made up of differentiated polities which are classified as core states, semi-peripheries and peripheries. The economic relationships between these entities are, similar as in dependency theory, characterised by unequal exchange.

The relationships between core and periphery on the one hand and the spatial dimension of world-systems on the other hand.

For the authors, a systemic feature of the modern (capitalist) world-system is the ‘hegemonic sequence’, that is the rise and decline of core powers. This includes changes in the ‘status’ of polities – in the modern system mainly nation states – which may move between core and semi-periphery but also changes in the relative power position within the group of core powers, that is, changes in the international pecking order. The latter is important as the relative power positions among the core states necessarily varies over time and because there are time where one finds several core countries at a more or less equal footing, while at other occasions there may be a clear hegemon within the core region. An obvious example, for such a constellation is the British Empire in the 19th century.

While the relationships within the core are doubtlessly important for the evolution of the system and its reproduction, the (cyclical) dynamics of modern world-systems are attributable to the semi-periphery. The latter are not just a placeholder between core and periphery but fulfil a key role in the system as the carrier of social change. Semi-

⁴ In contrast to orthodox Marxist theorists, Wallerstein (1974; 1983) does not consider wage labour as the defining element of labour. On the contrary, the exploitative economic relationships rely on the fact that capitalist production methods are established in the core, while other forms of organisation (including forced labour) may prevail in the periphery and the semi-periphery.

peripheries (which may be core countries on their decline or former peripheral countries on their ascent) have sufficient political, military, and economic capacities (initially often owed to their sheer size) to deviate from the 'rules' of the existing interstate system and to challenge the core in specific areas or even niches of one of the system's networks. The contemporary 'rise of China' may fit this description and the resulting geopolitical tensions we currently observe may be seen as the result of an ascending semi-periphery (China) challenging the incumbent hegemon (the United States).

The function of semi-peripheries as carriers of social change is directly linked to the second key conceptual element in the paper, the spatial bounding of world-systems. If semi-peripheries are capable of acting 'autonomously' (that is, in line with their own interests and free from the coercion of other powers) in selected areas of the world-system, then there must be different layers or segments in this system. These layers are referred to as 'networks'. More precisely, it is argued that world-systems contain a bulk goods networks (BGN), the political-military network (PMN), prestige goods networks (PNG) and information networks (IN). Typically, the scope of these networks gets larger in exactly this order.

The key concepts, the dynamic role of the semi-periphery and hegemonic sequences as well as the more detailed depiction of the world-economy as a cascade of networks with different geographic scopes, are very interesting. And both will be of use for the work on the seminar paper on the sequence of European dominance of the South Indian town of Cochin.

Notwithstanding the general usefulness of these concepts, I see (at this stage) two potential shortcomings in the expositions, though it may very well be that more comprehensive explanations are found in previous works by Chase-Dunn.

First, the assessment that prestige goods networks tend to be more expansive than bulk trade networks is interesting though also relatively logical. It is in the end, primarily a consequence of different weight-to-value ratios. In other words, the extent of trade networks depend on the physical characteristics of the goods (storability, weight-to-value ratio, perishability,...) which in turn determine the transportation costs. The latter are further a function of the available transport technologies. What could be explained in more detail, though are the relationships between the four networks. It can be expected that a country's military strength and the extent of its PMN directly influences its trade networks. However, it could also be the other way round, so that the extent and success of the trade networks – and possibly also the

information networks – feed into the PMN, via the accumulation of profits. Moreover, the intensity of the (mutual) influences may depend on the inter-state architecture and the ‘rules’ of the world-system (mainly established by the hegemon or a small set of core countries). For example, Findlay and O’Rourke (2007), argue that during the mercantilist period, the link between ‘power and plenty’ was particularly tight. This can probably be interpreted as a close interrelation between the PMN and the trade networks. More generally, it would have been interesting to learn whether the authors see multi-level hierarchical relationships between the networks, possibly with different cycles (as described in Gotts, 2007), or whether alternatively, these networks are seen to be inter-dependent but tend to be moving in parallel chronologically and are considered to operate at the same level.

The second shortcoming I see relates to the implications of in the networks for the reproduction of the system, in particular with regards to the power inequalities and economic inequalities between the different polities in the system. I consider this to be an important point, because it could well be that both the intrinsic power asymmetries in the PNG in a world-system and the ‘unequal exchange’ (however, defined) present in trade networks in the capitalist world-economy tend to further strengthen existing inequalities (at least during the ‘calm’ segments of the hegemonic sequence). This may be very different when it come to informational networks and knowledge flows. I think it is within the realm of information networks, that knowledge transfers *could* have an equalising tendency, in line with Gerschenkron’s famous ‘advantage of backwardness’ (Gerschenkron, 1962). It can of course well be that power asymmetries and economic and technological gaps are too large in order for such equalising factors to work out.

2.3. Hegemony and rivalries

Wallerstein’s concept of hegemony is to be regarded as a fluid continuum not a state (Wallerstein, 1983, p. 102). The prevalence of a hegemon, by definition, implies a situation of great imbalance within the concert of core powers. Even a hegemon is not unconstrained in her action though, that is, is not omnipotent (Wallerstein, 1983, p. 102). Nevertheless, hegemony for Wallerstein means simultaneous advantage in the three economic domains of agro-industrial production, commerce and finance. Wallerstein (Wallerstein, 1983, p. 102) identifies three instances of hegemony in the capitalist world-economy of which two are relevant here: the United Provinces from around 1625 to 1672 and the United Kingdom from around 1815 to 1873. Matters are complicated though by the multiple networks to analyse in the approach by Chase-Dunn and Hall (1997), among which– in contrast to Wallerstein’s priority implicitly

assigned to the bulk goods networks (respectively their organisation) – there is no clear hierarchy. For example, Modelski and Thompson (1998, Table 5.2) in their analysis of world leaders⁵ in global politics also identify Portugal as a political world leader during the first half of the 16th century (1516 to 1540)⁶.

2.4. Periods of hegemony

The analysis of Modelski and Thompson (1998) is strongly focussed on the strength of the navy (measured by the number of warships) and therefore indicative of the political-military network. Also, the periods of hegemony/global leadership of the United Provinces and the United Kingdom are different from those in Wallerstein (1983). In this context, Wallerstein (1983, p. 101) defines hegemony as a situation where the rivalry among the core states is so unbalanced that a single power can de facto impose its rules upon the system in the economic, political, military and cultural domain.

In an empirical assessment of hegemonic sequences, Kwon (2011, p. 594, Table 1) compares the periodisation of hegemonic positions of Wallerstein and co-authors on the one hand with that of Modelski. This comparison is shown in Table 1.

Table 1: Periods of hegemony and global leadership, alternative perspectives

World-Economy			World Politics		
Polity	Hegemonic cycle	Hegemony	Polity	Leadership cycle	World leader
Hapsburg/Genoa	1450-1575	1526-1556	Portugal	1494-1580	1516-1540
Netherlands	1575-1672	1620-1650	Netherlands	1580-1688	1609-1640
<i>No Hegemon</i>	<i>1672-1798</i>	-	England I	1688-1792	1714-1740
England	1798-1897	1850-1873	England II	1792-1914	1815-1850
United States	1897-		United States	1914-	1945-1973

Note: All authors have an affinity to long cycles (Konratieff cycles) during which hegemony/leadership is established. Typically there is a (30-Years Wars) to pave the way for hegemony and possibly also a war of consolidation.

Source: Kwon (2011), Table 1, p. 594.

Since the focus of this paper is on trade networks and the political-military networks, the hegemonic cycles and the corresponding hegemonic sequences⁷ in the two

⁵ Modelski and Thompson (1998) prefer the term leadership to that of hegemony.
⁶ This result is derived via the concentrations in the distribution of global warships in one country (50% or greater).
⁷ In the following I will use the term hegemony synonymously with the term world leadership.

domains shown in Table 1 serves as a reminder of two historical facts. First, hegemonic positions are bound to be lost sooner or later if they can last for a century or more. Second, there are periods in history with no hegemon among the core states, even though they are rather rare. The late 17th and 18th century is such a phase of the modern world-economy. There is a third fact worth mentioning in this context which is that, the rise of a new power from the periphery is often associated with a major war. This war may or may not be associated with a loss of hegemonic leadership. In any case, the disturbance brought into the world-system is often not limited to the economic sphere but more often than not spills over to the military realm, ending in a military confrontation. The seminal but also heavily criticised contribution by Allison (2017) containing fourteen historical case studies going back as far as ancient Greece, finds that in two-thirds of the cases, the rivalry between a hegemon and a challenger ends in a war, a phenomenon which is referred to as ‘Thucydides’s Trap’.

3. Shaping of investment patterns by core countries

This section traces the development of greenfield FDI projects which have been realised around the world⁸ over the period 2003-2021. From the outward perspective, cross-border investment flows are evidence of ownership advantages of the investor firm as it reflects organisational or technological advantages over other firms (Dunning, 1979). Aggregated to the country level, the outward investment flows of a country therefore reflect high organisational and technological capabilities embodied in its firms and as such is a good proxy for technological leadership. Similarly, Wallerstein (1983) views control over investment and trade flows as one of the three key domains of a country’s hegemony, next to productive structures and financial activities.

In this respect, the figures clearly point to a leading, if not hegemonic, position of the US in the realm of cross-border investment. The US is by far the largest single investor and with its share amounting to 24% in the period 2003-2017 and only slightly less in recently, that is, in the period 2018-2021 (Table 1).

Table 2: Share of jobs created by investor countries by outward greenfield FDI projects

	2003-2017	2018-2021
USA	23.95%	23.34%
CHN	3.53%	7.16%
DEU	11.33%	10.17%

⁸ The analysis captures 74 countries globally.

JPN	13.53%	8.48%
GBR	4.60%	5.90%
FRA	4.99%	5.01%
KOR	4.85%	4.56%
TWN	4.27%	4.51%
CHE	2.70%	2.50%
CAN	1.75%	2.38%
NLD	1.96%	2.29%
HKG	1.42%	2.13%
IND	2.17%	2.12%
<i>Memo item*</i>		
EU	25%	23%

Note: Jobs in per cent of all jobs created across all destination countries. * Data for EU as a bloc excludes intra EU investments.

Source: fDi markets database, own calculations.

The direct comparison with China shows that even during the period 2018-2021, the share of US investments was three time larger than that of China. Importantly though, China's share in investments doubled between 2003-2017 and 2018-2021. This development is at the same time typical and rare. It is typical because for an ascending semi-periphery, which are the main entities perturbing and driving the dynamics of the world-system. And it is a rare development because there are not too many incidences of a semi-periphery entering the club of core states at any time period.⁹ This can be seen from the development of outward FDI shares of other relatively successful emerging markets such as India, whose shares does not show and an upward trend, at least not yet.

Equally important as the active involvement of cross-border investment activities are the types of projects. Types in this context means the business function along the value chain of industrial operations which a project serves. The functional patterns of value chains which are shaped by foreign direct investment is important because it reflects the technological position of countries in the world-economy. In general, countries with a less skilled workforce and limited technological and productive capabilities specialise in the fabrication stage of the value chain (see Stöllinger, 2021). While this has proven to be a successful strategy for a large number of developing countries to link into global manufacturing production, it also means that they occupy

⁹ There are of course many cases of countries entering the group of core states in the course of history. But this is typically a slow process and does not happen simultaneously for many countries. Therefore, in general the share of the world population living in core countries is limited too. This is a characteristic that will change for the first time in the modern world-economy once China has attained core status, which according to some authors (Li and Bernal-Meza, 2021) it already has.

a relatively unfavourable position in the international division of labour. This is because the fabrication stage typically entails less potential for capturing value added than other, more skill-intensive and organisationally and technologically more demanding value chain functions such as R&D and the organisation of value chains itself ('headquarter functions'). Countries specialising in fabrication activities have become known as 'factory economies' in the economics literature (Baldwin and Lopez-Gonzalez, 2015) because they mainly attract factories which multinational enterprise (MNEs) chose to locate in low-wage locations for efficiency reasons. In contrary, countries which are functionally specialised in knowledge-intensive pre-production activities (headquarter activities, R&D) are referred to as 'headquarter economies'.

To identify the functional profiles of countries it is useful to switch the perspective and to look at inward FDI flows and differentiated by destination markets. Moreover, it is necessary to disaggregate the data by the value chain functions where it suffices to differentiate between broad value chain functions, which are (i) the pre-production (headquarter services; R&D), (ii) the production (fabrication) and (iii) the post-production stage (sales, marketing, logistics, retail and other business services; Technical services, maintenance & training).¹⁰

The discussion focuses on the pre-production stage and the fabrication stage because they are opposing poles of functional specialisation (Kordalska et al., 2023). Table 3 shows the functional specialisation profiles as reflected in their relative functional specialisation (RFS) measure¹¹ of a set of countries, including both factory economies (those having a high RFS in fabrication) and headquarter economies (those with a high RFS in pre-production activities).

Table 3: Relative functional specialisations of selected headquarter and factory economies

Destination	Pre-production		Production (fabrication)		Post-production	
	2003-2017	2018-2021	2003-2018	2018-2022	2003-2019	2018-2023
USA	1.72	1.57	0.74	0.76	1.38	1.13
CHN	0.93	0.68	1.15	1.42	0.58	0.49
DEU	1.60	1.31	0.61	0.63	1.82	1.45
JPN	1.75	1.74	0.62	0.48	1.73	1.50
GBR	1.68	1.62	0.50	0.33	2.12	1.79
FRA	1.06	1.25	0.53	0.63	2.33	1.48

¹⁰ For the details of the activities included in these categories see Appendix.

¹¹ These measures are based on the same greenfield FDI data as the aggregate figures and captured the amount of relative jobs created by the attracted projects in the destination country. For the methodological details of the calculation see Stöllinger (2021) and Kordalska et al. (2023).

KOR	1.22	1.04	1.05	0.99	0.73	1.00
TWN	1.71	1.22	0.97	0.92	0.73	1.02
CHE	3.39	2.23	0.33	0.43	1.73	1.34
CAN	1.80	2.32	0.59	0.30	1.78	1.51
NLD	2.23	1.84	0.27	0.22	2.50	1.86
HKG	2.45	1.41	0.20	0.09	2.61	2.26
IND	1.83	1.41	0.86	0.86	1.00	1.04
SGP	2.53	2.25	0.60	0.39	1.40	1.40
SVK	0.35	0.29	1.25	1.37	0.59	0.73
HUN	0.34	0.38	1.18	1.40	0.82	0.64
VNM	0.18	0.22	1.40	1.73	0.24	0.20
LAO			1.40	1.74	0.34	0.28
MEX	0.34	0.44	1.30	1.47	0.46	0.51
TUR	0.70	0.26	1.20	1.48	0.57	0.57

Note: The Relative Functional Specialisation of a country (RFS) is the number of jobs created by inward greenfield FDI projects in the respective functions in a destination country relative to the total number of jobs created in the same country. This share is taken relative to the same share at the global level. All RFS values have been normalised to lie between -1 and +1 with zero as the neutral position. The higher the RFS, the greater is the specialisation of the destination country in that function. For details see Stöllinger (2021) and Kordalska (2023).

Source: fDi markets database, own calculations.

Starting with the US and China, the figures clearly suggest that the US is specialised as a headquarter economy in both periods shown. This is exactly what is expected of a hegemon. China in contrast, which still has the reputation of the ‘workbench’ of the world, emerges as a factory economy with a relatively high RFS score in fabrication activities. In view of the fact that China’s impressive upgrading of its production structure, as evidenced by its ongoing and well documented economic complexity/economic fitness indicators (see Tacchella et al., 2013), and its technological advances in many areas (ranging from batteries for electric cars to IT services), this specialisation pattern is somewhat surprising. Even more surprising is the fact that China’s RFS in fabrication increased from 2003-2017 to 2018-2021. The opposite is true for the RFS in pre-production activities, which together suggests that China has been solidifying its position as a factory economy in global value chains.

Hence, there are different trends in the production structures and active outward FDI activities by Chinese firms (both state-owned enterprises and private firms) on the one hand and the persistent functional specialisation patterns of China on the other hand. The former points towards China having emancipated itself from the role of a semi-periphery and having reached core status, while the later points towards China remaining a periphery. This is a rather common pattern in the dynamics of an ascending semi-periphery. It may well have varied roles and positions in the world-economy in the fields of production, trade and investment and finance at the same

point in time. Moreover, it may have a different role in economic exchanges with different countries and regions in the world. For example, China may have a core country role in dealings with African countries and some neighbouring countries in East Asia, while still being semi-peripheral with respect to developed countries.

We shall now return to the very interesting finding that China has intensified its functional role as a factory economy in recent years. The reasons for this patterns is hard to pin down. However, what can be said is that, with respect to production and export structures as well as the rise of outward cross-border investments, China is able to actively push these activities¹², including with very effective industrial policies (but also with an authoritarian stance on labour relations and recurring human rights violations). The functional profile of China – in the methodology of this paper - however, is shaped by foreign investors and their decisions which type of FDI projects they chose to realise in China.

Thus, one hypothesis which would follow from the World-System Approach is that the US are deliberately slowing down China's catching up process by refraining from realising knowledge and technology-intensive activities in China. This would be the expected behaviour by a hegemon which feels challenged by a newcomer which is exactly the US-China constellation currently observed.

A necessary condition for the US being able to slow down China's upgrading towards a headquarter economy, is that it is capable of influencing China's functional profile. This is what is going to be investigated with a novel approach that identifies the contribution of each investor country to the prevailing functional profile of destination countries. The exercise is conducted at a bilateral level, so that we allow each investor country to affect the functional profile of each destination country individually. The methodology ensures, that for the contributions of all investor countries to the shaping of the functional profile of any destination country (say China) add up to 1.¹³ At the same time, the measure for the contribution of source s to the RFS of destination c , while positively related to amount of jobs created by the investments of source s , is not just a linear function of it. Rather, it also depends on the functional investment pattern of source country s , respectively the extent to which it deviates from the global functional investment pattern in destination c .

¹² An exception to this are of course import and FDI restrictions imposed by partner countries as well as other trade and investment barriers and sanctions.

¹³ For methodological details see appendix.

Direct impact of the US on China's functional profile (and vice versa), it is relevant for the reason just outlined. Even more important in the entire world-system is, however, the impact the US and China has on other countries in the system. This impact is again the contribution to the RFS of destination countries.

The result for these contributions of selected investor and destination countries are shown in Table 4.

The key findings are that the US is in many destination countries the by far dominant investor with the highest contribution on its respective RFS. This is true for both pre-production activities (panel a) and the production stage (panel b). This is direct evidence of the US' hegemonic position in the world-system. In many destination countries such as, for example, India, Canada or Mexico, the US account for approximately 80% of the functional profile or more.

In comparison, the impact of China is still much more limited, in line with its much lower investment activities. There are also some instances, where some other country is dominant.

For example, Germany is strongly shaping Turkey's functional profile. Interestingly, Germany is not so decisive for the RFS in several Central and Eastern European countries because it is very close to the over investment patten in these economies.

Returning to the main question of the US-China rivalry, one can conclude that the US is much less dominant in shaping the RFS profile in China than in other markets. This is partly explained by the fact that China is also an attractive destination for many other investors. Another reason may be that the US have started investing less in China for strategic reasons, which is particularly true for the technology intensive pre-production activities. At the same time, it must be noted that the role of the US in shaping the RFS of Hong Kong, which is still listed as a separate economy in the data, is massive, close to 80%. Overall though, the data suggest that the US may hold back some investments in China in pre-production activities but – exactly for that reason – its grip on shaping China's functional profile is modest.

Table 4: Contributions of major investor countries to selected destination countries

(a) Pre-production activities (headquarter function, R&D)

Investor country → ↓Destination country	Investor country →								
	USA	CHN	DEU	JPN	GBR	FRA	KOR	TWN	Other
USA		1.6%	1.5%	1.9%	1.4%	1.3%	1.5%	1.6%	89.3%
CHN	3.9%		0.1%	16.4%	1.4%	0.2%	8.6%	13.3%	56.2%
DEU	69.7%	2.3%		17.2%	0.9%	0.5%	4.2%	1.0%	4.1%
JPN	50.6%	0.2%	0.1%		1.2%	0.2%	0.3%	0.3%	47.2%
GBR	8.6%	5.9%	5.0%	17.4%		1.9%	6.6%	6.3%	48.4%
FRA	0.7%	2.0%	10.1%	21.8%	21.1%		7.5%	3.8%	33.1%
KOR	4.7%	0.1%	0.0%	19.3%	1.7%	5.0%		0.1%	69.2%
TWN	50.0%	0.2%	0.5%	22.5%	0.8%	0.0%	0.3%		25.8%
CHE	27.1%	1.3%	10.3%	30.3%	5.9%	10.3%	4.0%	3.6%	7.3%
CAN	77.4%	1.9%	0.9%	4.0%	1.3%	6.4%	3.1%	2.4%	2.6%
NLD	30.1%	3.1%	13.7%	26.4%	16.6%	0.9%	3.4%	0.9%	4.9%
HKG	77.7%	0.2%	4.4%	6.8%	0.4%	0.2%	0.6%	0.6%	9.3%
IND	89.2%	0.3%	0.2%	0.0%	0.8%	0.0%	0.4%	0.2%	8.9%
SGP	91.0%	0.7%	1.8%	2.0%	1.9%	0.0%	0.1%	0.5%	2.0%
SVK	88.8%	0.5%	6.0%	0.1%	0.3%	1.4%	0.0%	0.1%	2.7%
HUN	27.3%	6.4%	45.2%	0.7%	0.5%	1.0%	3.5%	1.4%	14.1%
VNM	54.4%	4.7%	5.7%	12.2%	0.1%	0.3%	0.2%	2.0%	20.4%
MEX	83.0%	6.0%	4.4%	0.4%	0.0%	0.0%	0.1%	0.0%	6.2%
TUR	23.2%	2.0%	72.1%	0.3%	0.1%	1.2%	0.0%	0.1%	1.0%
ESP	77.7%	0.1%	2.5%	2.5%	0.0%	9.4%	0.6%	0.8%	6.4%
ITA	33.7%	1.2%	4.8%	9.3%	3.3%	7.6%	2.3%	0.1%	37.8%

(b) Production activities (fabrication)

Investor country → ↓Destination country	Investor country →								
	USA	CHN	DEU	JPN	GBR	FRA	KOR	TWN	Other
USA		1.4%	0.9%	0.7%	2.7%	1.8%	1.1%	1.9%	89.6%
CHN	8.3%		1.1%	0.3%	3.5%	2.3%	0.3%	4.0%	80.2%
DEU	31.4%	0.3%		14.6%	0.3%	1.3%	1.6%	0.0%	50.6%
JPN	30.0%	0.4%	0.2%		1.4%	0.7%	0.4%	1.5%	65.4%
GBR	32.1%	4.3%	0.3%	0.6%		4.0%	1.5%	5.8%	51.3%
FRA	28.8%	0.4%	4.9%	1.4%	3.0%		10.1%	8.7%	42.6%
KOR	1.7%	0.2%	0.0%	4.0%	1.9%	9.7%		0.0%	82.6%
TWN	20.6%	0.1%	0.4%	22.8%	1.0%	0.7%	0.5%		53.9%
CHE	62.8%	1.1%	0.4%	5.1%	0.2%	16.8%	0.9%	1.0%	11.8%
CAN	88.2%	0.4%	1.3%	2.8%	2.8%	0.4%	0.7%	1.4%	2.0%
NLD	5.9%	5.6%	4.4%	23.6%	12.3%	2.2%	10.5%	19.1%	16.5%
HKG	80.8%	2.9%	0.9%	1.1%	3.9%	4.1%	0.8%	0.2%	5.3%
IND	90.4%	0.9%	0.1%	0.4%	0.0%	0.0%	0.0%	0.2%	8.2%
SGP	75.1%	1.4%	6.1%	8.8%	0.2%	3.0%	0.2%	0.0%	5.3%
SVK	46.1%	5.6%	1.3%	31.4%	1.6%	0.9%	0.1%	2.1%	11.0%
HUN	32.5%	2.9%	0.0%	40.7%	1.0%	0.1%	0.0%	13.1%	9.7%
VNM	67.9%	0.5%	2.5%	23.1%	1.5%	0.3%	1.9%	0.6%	1.7%
LAO	70.3%	0.1%	2.3%	9.2%	1.8%	0.2%	5.5%	5.4%	5.2%
MEX	73.5%	2.2%	1.2%	12.2%	2.0%	0.7%	2.2%	3.6%	2.4%
TUR	55.3%	1.1%	21.2%	12.1%	1.8%	1.3%	1.1%	3.2%	3.1%
ITA	61.8%	2.4%	5.1%	12.2%	3.0%	0.4%	1.1%	0.6%	13.4%

Note: The contributions of each investor countries are expressed in per cent and add up to 1. The methodological details of the contribution measure are found in Appendix 2.

Source: fDi markets database, own calculations.

4. Conclusions

This paper provides an analysis of the Chinese challenge of US hegemony from a world-system perspective. In this context, FDI activities are used to describe the US as the clear hegemon in the current world-system, judged (i) its amount of investment, (ii) its own functional profile and (iii) its strong impact on the functional position of other countries in the world-system. Overall, the picture of China is still that of a semi-periphery but a semi-periphery that is clearly ascending as evidenced by the strong increase in its share of global investments, a dynamic which is not observed for other emerging markets because FDI pattern tend to very persistent. Moreover, China's functional profile is still clearly that of a factory economy which points towards a semi-peripheral position. The same is true for its very limited impact on other countries functional specialisation pattern which mirrors the hierarchical positions in the international division of labour.

Methodologically, the paper proposes a new approach to quantifying the contribution of countries to other countries' functional specialisation patterns. In future work we will supplement the descriptive evidence presented in this paper which a (gravity) model-based approach (e.g Ahn et al., 2023) to identifying the determinants of the RFS including a measure for the geopolitical fragmentation of countries based on UN voting behaviours (Bailey, 2017)

Literature

Ahn, J., Carton, B., Habib, A., Malacrino, D., Muir, D. Presbitero, A. (2023), *Geoeconomic Fragmentation and Foreign Direct Investment*, IMF World Economic Outlook, April (Chapter 4).

Allison, G.T. (2017) *Destined for War?*, The National Interest, 149, May/June.

Baldwin, R. (2013), 'Global supply chains: why they emerged, why they matter, and where they are going', in: Elms, D.K. and Low, P. (eds), *Global Value Chains in a Changing World*, Geneva.

Baldwin, R., Lopez-Gonzalez, J. (2015), 'Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses', *The World Economy*, 38(11), 1682-1721.

Bailey, M.A., Strezhnev, A. and Voeten, E. (2017), *Estimating dynamic state preferences from United Nations voting data*, *Journal of Conflict Resolution*, 61(2), 430-56.

Braudel, F. (1992), *The Perspective of the World. Civilization and Capitalism, 15th-18th Century (Volume III)*, Fontana Press.

Chase-Dunn, C., Hall, T.D. (1997) *Rise and Demise. Comparing World Systems*. Boulder, Colorado: Westview Press.

- Chase-Dunn, C., Inoue, I., Neal, T., Heimlich, E. (2015), The Development of World-Systems, *Sociology of Development*, 1, p.149-172.
- Findlay, R., O'Rourke, K.H. (2007), *Power and plenty: trade, war and the world economy in the second millennium*. Princeton University Press: Princeton.
- Kordalska, A., Olczyk, M., Stöllinger, R. and Zavorská, Z. (2022), Functional Specialisation in EU Value Chains: Methods for Identifying EU Countries' Roles in International Production Networks, *wiiw Research Reports* 461.
- Li, X. and Bernal-Meza, R. (2021), China-US rivalry: a new Cold War or capitalism's intra-core competition?, *Revista Brasileira de Política Internacional*, 64(1).
- Mudambi, R. (2008), 'Location, control and innovation in knowledge-intensive industries', *Journal of Economic Geography*, 8, S. 699 725.
- Shih, S. (1996), *Me-Too is not my Style: Challenge Difficulties, Break Through Bottlenecks, Create Values*, The Acer Foundation, Taipei. <https://www.cmlab.csie.ntu.edu.tw/~chenhsiu/reading/metoo.pdf>
- Shin, N., Kraemer, K.L. and Dedrick, J. (2012), 'Value capture in the global electronics industry: Empirical evidence for the smiling curve concept', *Industry and Innovation*, 19(2), 89-107.
- Stöllinger, R. (2021), 'Testing the Smile Curve: Functional Specialisation and Value Creation in GVCs', *Structural Change and Economic Dynamics*, 56, 93–116.
- Tacchella, A., Cristelli, M., Caldarelli, G., Gabrielli, A., and Pietronero, L. (2013), Economic complexity: Conceptual grounding of a new metrics for global competitiveness, *Journal of Economic Dynamics & Control*, 37, 1683–1691.
- Wallerstein, I. (1974)[2011], *The modern world-system The Modern World-System I Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*, University of California Press.
- Wallerstein, I. (1983), The Three Instances of Hegemony in the History of the Capitalist World-Economy, *International Journal of Comparative Sociology*, 24(1-2), pp. 100-108.
- Wallerstein, I. (2004), *World-Systems Analysis: An Introduction*. Durham; London: Duke University Press.

Appendix

Appendix 1: Mapping of activities into value chain functions

Appendix Table A.1. shows the mapping of the activities as found in the fDi markets database to the categories of value chain functions referred to in the main text.

Appendix Table A.1: Functional specialisation in FDI – Mapping of activities into functions

Activity in the fDi cross-border monitor	Value-chain functions (narrow categories)	Value-chain functions (broad categories)
Research & Development	R&D and related services	Pre-production
Design, Development & Testing		
Headquarter	Headquarter services	
Manufacturing	Production	Production
Recycling		
Extraction*		
Business Services	Sales, marketing, logistics, retail and other business services	Post-production
Logistics, Distribution & Transportation		
Retail		
Sales, Marketing & Support		
Customer Contact Centre		
Shared Services Centre		
ICT & Internet Infrastructure	Technical services, maintenance & training	
Technical Support Centre		
Education & Training		
Maintenance & Servicing		

Note: * For chemicals sector only.

Sources: fDi Markets database; authors' own classification.

Appendix 2: Methodology for identifying investor countries' contributions to relative functional specialisation (RFS) measures

A2.1 Measuring functional specialisation

The empirical analysis relies on an FDI-based approach to functional specialisation. In this approach, functional specialisations are directly derived from information on inward cross-border greenfield investment projects and the jobs created through these projects. This is made possible as the information on the function that the (inward) FDI projects serve is provided in the underlying database (see Stöllinger, 2021 for details).

Methodologically, the RFS corresponds to revealed comparative advantages (RCAs) popular in the trade literature for measuring product or industry specialisations (Balassa, 1965).¹⁴ As will be discussed in more detail below, the twist given to these RCAs is that it is applied to jobs created in inward greenfield FDI projects instead of export flows.

To facilitate the notation, we omit the time subscript in the formal definition of the RFS measure. Denoting value-chain functions by f , the *RFS* measure of any country c in value-chain function f is defined as:

$$(1) \quad RFS_c^f = \frac{J_c^f / \sum_f J_c^f}{\sum_c J_c^f / \sum_c \sum_f J_c^f},$$

where J_c^f is the number of jobs created by greenfield FDI projects serving function f in country c . Likewise, $\sum_f J_c^f$ is the total number of jobs created by greenfield FDI projects in country c across all value-chain functions. Analogous definitions apply to the number of jobs in the denominator, where jobs (or labour income in trade) are also summed up over locations to yield the EU-wide number of jobs created by greenfield FDI.

We follow the analysis by Laursen (2015) and use the RFS in a normalised form, so that the values range from -1 (no projects attracted) to +1. The normalised RFS, *normRFS*, is symmetric around 0 and is defined as:

$$(2) \quad normRFS_{j,c}^f = \frac{RFS_{j,c}^f - 1}{RFS_{j,c}^f + 1}.$$

A2.1 Investors' contributions to RFS measures

The data on greenfield FDI projects is available at a bilateral level. Therefore we can easily decompose the RFS measure in equation 1 into the greenfield FDI projects (respective the job realised through that) realised by each source country s in destination country j in the value chain function f . Therefore, equation 1 can be rewritten as the sum of investments from source s in destination j , with $s \in S$, where S is the total set of source countries.

¹⁴ The economic geography literature interprets RCA as a locational concentration measure, which is called location quotient (LQ) but is mathematically equivalent to the RCA (Hoen and Oosterhaven, 2006).

$$(1') RFS_c^f = \frac{\sum_s J_{s,c}^f / \sum_f \sum_s J_{s,c}^f}{\sum_c \sum_s J_{s,c}^f / \sum_c \sum_f \sum_s J_{s,c}^f}$$

This disaggregation of the RFS of destination country c by source country s , allows identifying the contribution of each of the individual source country to country c 's RFS. This is achieved by eliminating country s in the numerator. This gives a counterfactual RFS of country c in value chain function f , which reflects its RFS without the contribution of source country s . This counterfactual RFS can then be compared to the actual RFS with the difference capturing the contribution of the respective source country.

Before doing so, however, it is practical to slightly adjust the calculation of the actual RFS of each destination country c in value chain function f . More precisely, we eliminate in the denominator all projects from source country s so that the reference country group which is used for calculating the RFS of country c (in each value chain function f), is not the world but the world excluding source country s . This yields the following formula for the actual RFS (*actRFS*).

$$(3) actRFS_c^f = \frac{\sum_s J_{s,c}^f / \sum_f \sum_{s \neq j} J_{s,c}^f}{\sum_c \sum_{s \neq j} J_{s,c}^f / \sum_c \sum_f \sum_{s \neq j} J_{s,c}^f}$$

The reason for this slight modification will become clear shortly.

The counterfactual RFS (*cfRFS*) measures, of which there will be $S-1$ (because we do not have investments from the destination country to itself), are defined as follows.

$$(4) cfRFS_c^f = \frac{\sum_{s \neq j} J_{s,c}^f / \sum_f \sum_{s \neq j} J_{s,c}^f}{\sum_c \sum_{s \neq j} J_{s,c}^f / \sum_c \sum_f \sum_{s \neq j} J_{s,c}^f}$$

The contribution of each source country s to destination c in value chain function f , $\zeta_{s \rightarrow c}^f$, is then, in principle, determined by the difference between the actual RFS and the counterfactual RFS in destination c .

$$(5) \zeta_{s \rightarrow c}^f = actRFS_c^f - cfRFS_c^f$$

Since the RFS is a non-linear function, the sum of the contributions, $\zeta_{s \rightarrow c}^f$, is generally not equal to the deviation of the RFS of destination country from the neutral value 1.¹⁵

However, the measure for the contributions to the RFS should explain the specialisation (values above 1) or non-specialisation (values below 1) of each destination country c completely. This requires a weighting which, in addition, requires that positive and negative values of $\zeta_{s \rightarrow c}^f$ do not cancel out.¹⁶ A simple weighting which fulfils this criterion is to take the quadrat values of $\zeta_{s \rightarrow c}^f$. In a next step we sum up over all $\zeta_{s \rightarrow c}^f$ and calculate the share of the square of $\zeta_{s \rightarrow c}^f$ in the squared sum. We denote this weighted contribution of source country s to the RFS of destination c in value chain function f as $\bar{\zeta}_{s \rightarrow c}^f$:

$$(6) \quad \bar{\zeta}_{s \rightarrow c}^f = \frac{(\zeta_{s \rightarrow c}^f)^2}{(\sum_s^S \zeta_{s \rightarrow c}^f)^2}$$

$\bar{\zeta}_{s \rightarrow c}^f$ is the contribution to the total deviation of destination c from the neutral RFS value 1 in each value chain function attributable to source country s , expressed in per cent. This ensures a complete explanation of each RFS across destinations and value chain functions.

We can now summarise some key characteristics of the RFS contributions in per cent ($\bar{\zeta}_{s \rightarrow c}^f$)

1. For each $actRFS_c^f$, the sum of $\bar{\zeta}_{s \rightarrow c}^f$ over all source countries s is 1, i.e. $\sum_s^S \bar{\zeta}_{s \rightarrow c}^f = 1$.
2. When a source country s does not invest in destination j , (i.e. $J_{s,c}^f=0$), its contribution, $\bar{\zeta}_{s \rightarrow c}^f$ is zero. This property is ensured by the fact that we eliminate source country s in the denominator in the calculation of the actual RFS. This explains the adaptation of the calculation of the RFS.¹⁷

¹⁵ Note that for the calculation of the contributions, we rely on the original values of the RFS (not the normalised values). The neutral value of the original RFS of each value chain function is 1 (equal the value chain function's share in global FDI projects – excluding source country s).

¹⁶ When $\zeta_{s \rightarrow c}^f$ is positive, source country f strengthens destination c 's RFS, whereas a negative $\zeta_{s \rightarrow c}^f$, implies that source country's investments in destination c softens its RFS. This logic applies in both directions, meaning when the RFS itself is below 1 or above 1.

¹⁷ The confounding factor is that even if a source country s has realised no projects in destination c in a value chain function f , the counterfactual RFS would be different from the actual RFS because of potential projects in other value chain functions. In this case, the

3. The larger tends to be the number of projects created by a source country s in destination c , the larger tends to be the contribution $\bar{\zeta}_{s \rightarrow c}^f$, conditional on the investment profile being different from the global profile. In the extreme profile, if a source country's functional investment profile is identical to the global profile, the impact of that source country is zero, even if it is an important investor.
4. Related to the above point, the contribution $\bar{\zeta}_{s \rightarrow c}^f$ of a source country s to the RFS of a destination c is the larger the stronger, its investment profile differs from the global pattern.

The joint relevance of both importance relative to and deviation from global investments is an interesting feature of the contribution measure $\bar{\zeta}_{s \rightarrow c}^f$ as it implies that it does not automatically increase with the sheer size of investments by source county s . It is particularly appropriate for the question at hand, because it is assumed that the US may strategically deflect from the investment patterns which would result from the locational advantages of China.

contribution of this source country in value chain function f would not be zero even though it has no projects in destination c .