Received: 25 February 2022 | Accepted: 21 September 2022

DOI: 10.1111/glob.12405

ORIGINAL ARTICLE

Divergence of the world city system from national economies

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Abstract

This study shows that the position of cities in the world economy has diverged from national economies. Using data from 2016, we evaluate a network of 12,802 cities formed by the location decisions of 24,355 firms in terms of their point centrality, and show that the inter-city and inter-national systems have measurably decoupled, disrupting the previously-observed pattern in which the most powerful cities in the world city system were located in core countries, "mid-level" cities were in the semi-periphery,and the least powerful cities were in peripheral countries. Our findings support predictions that globalizing cities would diverge from national economies and that globalization would generate a new global geography that transects long-standing cleavages in the world system.

KEYWORDS
globalization, multinational corporations, network analysis, transnational urbanism, world city networks, world/global cities

INTRODUCTION

Globalization has generated a densely connected system of cities, raising questions both about the extent to which the emerging global urban hierarchy cuts across longstanding divisions in the world economy and the functions of cities within it. Alderson and Beckfield (2004) provided early answers to these questions via a network analysis of the world city system (Smith & Timberlake, 1995, 2002), using inter-city corporate headquarter-branch office ties of the world's 500 largest firms to map the world city system in the year 2000. They used measures of point centrality to identify powerful and prestigious cities as well as regular equivalence blockmodelling to identify the positions occupied and roles played by cities in the network. They then examined the degree to which the power, prestige and position/role of

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matched on to the position of the countries in which they were located in the inter-state system – core, semi-periphery and periphery (Chase-Dunn & Grimes, 1995; Wallerstein, 1974). Contrary to expectations developed in some of the foundational work on 'global' or 'world' cities (i.e., Friedmann, 1986; Sassen, 2001), Alderson and Beckfield (2004) found that the position and role of cities in the global urban hierarchy largely reflected the position of the countries in which they were located in the post-WWII world-system: Cities located in core countries were found, on average, to be more powerful and prestigious and to play a more active role in the inter-city network than cities in the semi-periphery, which were, in turn, more powerful, prestigious, and active than cities located in peripheral countries. Their analysis raised important questions about the extent to which globalization was generating the openings for city- and regional-level mobility described by scholars such as Friedmann (1995) and Sassen (2001). Rather than indicating the sort of fundamental transformation of the relationship between the inter-state and inter-city systems anticipated in such work – the emergence of a 'new geography of inequality' – their results suggested instead that the round of globalization emerging in the early 1980s was largely reproducing global North/South and East/West patterns of inequality (see also Alderson et al., 2010).

Our analysis is motivated by the continued concentration of economic power in cities since 2000 (Derudder & Taylor, 2018) coupled with substantial cross-national shifts in the global economy such as the emergence of strong East Asian national economies (Dicken, 2011). This raises anew the question of whether power in the world city system continues to align with that of national economies or position in the world-system as observed in Alderson and Beckfield (2004), or whether the great shifts seen in recent decades have brought about a divergence of these city- and national-level economic systems.

Accordingly, we assess the power, prestige, and position/role of more than 12,000 cities in the network formed in 2016 by the location decisions of more than 24,000 firms in 210 countries. We investigate the degree to which the contemporary global urban hierarchy cuts across the positions of the countries in which these cities are located in the inter-state system, measured as both the world-system position of countries in the post-WWII period *and* the position of countries in the contemporary global trade network. In this fashion, we advance and extend earlier work, using more recent data on a much wider array of firms and cities and asking not only about the extent the world city system matches on to the structure of the world-system in the period predating the current round of globalization, but also to the structure of the contemporary global trading system, a trading system that reflects a more advanced phase of globalization in which the shift of manufacturing to the developing world – the emergence of a 'new international division of labour' (NIDL) (McMichael, 2000) – has been argued to have produced a more multipolar global economy. The results of our analysis suggest that a new urban hierarchy has emerged in the course of the broadening and deepening of the NIDL, one in which the position of cities in the world city system no longer clearly mirrors the tripartite division of nation-states in the inter-state system, results that raise important questions about the mobility in the world-system and the global geography of inequality.

Mobility in the world city system

The world city hypothesis proposes that the contemporary world economy exists as a sum of largely metropolitan parts, manifesting as multiplex networks. Cities act as the world's principal accumulation sites and switchboards for transnational capital flows, affording cities varying power roughly commensurate with their connectivity to such flows, and creating a topography of a vast world city network (Friedmann, 1986). The fate of cities (and their residents) is thus argued to have become increasingly tied to their position in this space of global flows, and the more globalized the world economy, the more important their position within that space. How should this affect global inequality?

Now-classic statements of the world city hypothesis by Hymer (1972), Friedmann (1986) and Sassen (2001) offer sharply contrasting predictions. Hymer (1972) argued that relations between cities will increasingly come to mirror the hierarchical relations within the firms that link them; that is, as the as the geographical reach of the activities of firms expands, command and control functions will tend to concentrate in a small number of traditional 'headquarter cities', while their subsidiaries will tie in a growing number of less prominent cities as subordinate outposts or

'branch plant cities'. Given the advantages already enjoyed by the global cities of the North moving into the contemporary period, Hymer predicted that the core would remain core, the periphery would remain peripheral, and new areas would tend to be integrated into the system on a distinctly subordinate, peripheral basis. Hymer thus expected that globalization would effectively reproduce pre-existing patterns of global inequality. While Hymer is less clear on the extent to which this expectation was rooted in more than cumulative advantage, there is a direct link to world-systems theory (Wallerstein, 2004): The core-periphery structure of the world-system is defined in part by the concentration of managerial and technological resources in core societies. These resources are employed by core actors to coordinate production in the world economy, integrating the semi-periphery and periphery into their distinct roles in the system (McMichael, 2000). This state of affairs is necessarily reflected in corporate headquarter-subsidiary ties, which reflect a hierarchical division of labour and an inherent power differential, where headquarter locations – disproportionately located in core countries – perform key managerial and planning functions while subsidiary locations – disproportionately located in semi-peripheral and peripheral countries – fulfil production or other basic service provision functions.

While sharing Hymer's emphasis on the implosive dimension of globalization – the expectation that the command and control functions of the world economy would grow more geographically concentrated in 'world' or 'global' cities as production is dispersed across the globe – Friedmann (1986) and Sassen (2001) argue for substantial openings for mobility in the world city system in the context of globalization. For Friedman (1995), the global urban hierarchy is dynamic and achieving upward mobility within the system is a matter of attracting investment and capturing more of the command and control functions of the world economy, a task that is, in principle, open to all cities, including those outside of the Global North. Sassen (2001) offers a similar account: Globalization has further centralized control functions in global cities, a centralization made possible by advanced producer and financial services firms that have replaced manufacturing as the most profitable economic sectors. This concentration of organizational power and innovative capacity that is the hallmark of her account of global city formation is argued to be peripheralizing previously core areas and, simultaneously, bringing previously peripheral areas into the core (e.g., the decline of Detroit and the rise of Shanghai). Friedmann and Sassen thus argue that the global urban hierarchy is evolving in such a way as to transcend historic North/South and East/West divides and to sever the tight link between the power of countries in the inter-state system and the power of cities in the inter-city system.

Research on the evolving structure of the world city system notes that its uneven geography has continued to become more stratified (Derudder & Taylor, 2018), whether measured by inter-city corporate office ties (Derudder & Taylor, 2020) or transportation networks (Grubesic et al., 2008). Neoliberal trends also meaningfully affect specific industries shaping the world city system. Continued deregulation of international financial markets has made financial services corporations markedly more powerful, which has tended to make the cities hosting them more prominent in the world city system (Sassen, 2006, 2014). On the organizational behaviour of firms driving urban agglomeration, it has been shown that the more connected that an urban cluster of advanced producer services firms is to other global cities, the more firms comprising the cluster are likely to gain additional international clientele through direct contact or reputational spillovers (Bathelt & Gluckler, 2018).

The position of cities in the global urban hierarchy has been found to be associated with a range of city-level outcomes (Smith & Timberlake, 2002), with research revealing how it impacts urban education (Chow & Loo, 2017), economic inequality (Hu, 2021) and migration outcomes (Sanderson et al., 2015). Social network analysis of global cities of the sort prescribed by Smith and Timberlake (1995, 2002) has expanded to study global urban systems beyond the purely economic, measuring the ties comprising city government participation in global governance initiatives, and exploring its relationship to the world city hierarchy. For instance, transnational municipal networks of city governments, ranging from Mayors for Peace to ICLEI – Local Governments for Sustainability, connect member cities globally to mutually pursue a variety of governance goals from peace building to climate change mitigation (Kern & Bulkeley, 2009; Leffel, 2022).

This landscape of cities in global governance is stratified by cities with markedly more simultaneous memberships in these networks than others, which has been shown to be strongly associated with higher ranking in the world city

hierarchy (Acuto & Leffel, 2020). Similar to the structural centralization and peripheralization of economies seen in the world city system, the global governance landscape of transnational municipal networks is disproportionately led and coordinated by cities in more developed nations, namely Europe and North America (Bouteligier, 2013; Keiner & Kim, 2007). These developments collectively point to the world city system as increasingly relevant for understanding existing and new transnational systems. As with previous research, a critical baseline to establish in studying the world city system is understanding its relationship to the existing system of nations.

Global shifts in national economic power

The classic or 'orthodox' classification of nations into core, semi-peripheral, and peripheral positions in the world-system (hereafter OWS) used by Alderson and Beckfield (2004) reflects the structure of the world-system in first few decades of the post-WWII period (Snyder & Kick, 1979; Bollen & Appold, 1993).[1] Since that time, of course, a major shift in the global configuration of national economic power has occurred, one that is likely consequential for the world-system, the global urban hierarchy, and our central question of whether the inter-state and inter-city systems have diverged.

Pro-Keynesian sentiment characterized the post-WWII global economy, with heavy government intervention in markets, from state control of exchange rates to heavy provision of loans for firm growth. The resultant inflation increased the costs of raw materials for manufacturing industries, then located largely in more developed nations, to the extent that profits declined, and labour costs became unaffordable, causing business owners to outsource cheaper labour abroad to retain profits (Mandel, 1995).

This shift, beginning in the late 1970s and rapidly expanding through the 1980s, saw manufacturing and other labour-intensive industries from sewing to smelting relocate to less developed nations offering lower-cost labour (Arrighi et al., 2003). This marked the end of the post-WWII period of nationally led economic growth and the beginning of deregulated, neoliberal globalization, where a more multipolar structure emerged in the global economy referred to as the New International Division of Labor, or NIDL (McMichael, 2000). While more developed nations like the United Sates retained corporate headquarters to coordinate outsourced operations abroad, these existing economic superpowers collectively became less dominant in the global economy vis-à-vis the raw amount of manufacturing capital absorbed by East Asian economies, particularly China (Dicken, 2011).

This phenomenon, which accelerated through the 1990s and 2000s, is directly relevant to the geography of transnational corporations comprising the world city system. Transnational corporate offices serve as one of the principal capital transport mechanisms facilitating cross-national shifts defining the NIDL (Gereffi & Wyman, 1990; Hung, 2016). Corporations also entered new territories as neoliberal economic policies deregulated corporate expansion, spurring substantial growth in the number of firms in advanced producer services, particularly finance, needed to support this expansion (Sassen, 2014). The global headquarter-branch connections forged therein are argued to be key structural pillars upholding the tripartite structure of the world-system (Mahutga & Smith, 2011).

Gilpin (2000) argues that despite the deepening of globalization during the NIDL, national boundaries remain important barriers to the global economy. The importance of national boundaries to a global economy increasingly defined by cities rests at the heart of our inquiry: We examine the extent to which the power, prestige and role of cities is associated with the position of the countries in which they are located in the world-system in the first few decades of the post-WWII period and, to capture the global shifts in national economic power noted above, with their position in the contemporary global trade network. We thus investigate two related sets of hypotheses:

First, to the extent to which the inter-city system remains tightly coupled to the inter-state system as Hymer (1972) predicted, we expect that cities located in the core of the post-WWII world-system to be more powerful, prestigious, and play a more active role in the system than cities located in non-core countries, and likewise expect cities located in semi-peripheral countries to be more powerful, prestigious, and active than cities located in the periphery. If, however, the inter-city and inter-state systems have measurably decoupled as Friedmann (1995) and Sassen (2001)

anticipate, we would not expect the power, prestige and role of cities to be ordered in the same fashion: Cities located in peripheral countries, for example, may have grown in importance in the world city system while others located in core or semi-peripheral countries may have grown less important, a restructuring of the global urban hierarchy that will disrupt the core/semi-periphery/periphery power gradient observed by Alderson and Beckfield (2004).

Second, global shifts in economic power in recent decades have resulted in a measurable restructuring of the inter-state system. As we detail below, the position of a good number of countries in the contemporary global trading system differs measurably from their position in the post-WWII world-system (e.g., the rise of China from the periphery to core of the contemporary global trade network). If the contemporary inter-city and inter-state systems are tightly coupled, we would expect the power, position, and role of cities to be more strongly ordered – core/semi-periphery/periphery – by their position in the trade network than in the post-WWII world-system. However, to the extent to which the contemporary global trading system reflects a more advanced phase of globalization in which the shift of manufacturing to the developing world – the 'new international division of labour' – has opened up opportunities for mobility in the world city system, we would expect to see more of the decoupling anticipated by Friedmann and Sassen – the emergence of a new geography of inequality that transcends longstanding North/South and East/West divisions.

DATA AND METHODS

To generate the world city system in 2016, use information on all firms listed in the 2016 LexisNexis Directory of Corporate Affiliations (LN, 2016), hereafter LN-CA. We then account for the location of their headquarters and subsidiaries, producing a raw inter-city network that involves 25,192 locations, representing 271,813 ties between 24,355 corporations in 210 countries.

The distribution of corporations by industry offers important insight into the nature of the 2016 world city system. Business services is the most represented industry by firm counts, comprising advanced producer services such as computer programming, engineering, advertising, management, security brokers, capital investment services and holding companies. Below business services in terms of representation are banks, wholesale trade, electronics, real estate and insurance. This points to a continued expansion of advanced producer services firms and growing dominance of finance consistent with deepening neoliberal economic policy (Sassen, 2014). By comparison, the 2000 Global 500 examined by Alderson and Beckfield (2004) placed banks at the apex, followed by insurance and electronics, while securities and financial advice were among the least represented. A direct, one-to-one comparison is not possible between our data for 2016 and Alderson and Beckfield's data for 2000 as the former obviously includes a much wider array of (smaller) firms.[2] However, our data give us purchase on the activities of thousands of smaller firms that both cluster near larger ones and reach deep into the global economic hinterlands, providing a clearer view of both the apex and the peripheral frontier of the global urban hierarchy. Moreover, our inclusion of *all* firms rather than advanced producer services alone, as in the important, related line of research on inter-city networks conducted by Peter Taylor and colleagues (e.g., Taylor, 2001), allows us to create a world city network that matches, to the greatest extent possible, the breadth of the national economies to which it is compared.

The raw data from LN-CA includes firms located both in large city centres and many smaller communities within or near them. While highly granular, this does not account for the fact that many of the latter are an integral part of larger urban places. To address this issue, we spatially aggregate the nodes in the network into urban agglomerations using information from the *Atlas of the Human Planet* (Pesaresi et al., 2016). To aggregate nodes, we use Functional Urban Areas (FUAs), which delineate urban cores across the globe by taking multiple layers of population into account. In effect, FUAs expand from these urban cores to include their commuting areas, creating coherent broader urban places akin to the US Census Bureau's Commuting Zones or Metropolitan Statistical Areas. For example, Chicago's urban core extends from Highland Park in the north to Naperville and Aurora in the west and Gary (IN) in the southeast. Its FUA includes the neighbouring urban cores of Crystal Lake, Elgin, St. Charles and Joliet as well as surrounding

towns, suburbs, and villages such as Vernon Hills in the north, Leland in the west, and Valparaiso in the southeast. We enhanced the FUA data with smaller units (e.g., towns, suburbs and villages) from two other datasets that belong to the *Atlas of the Human Planet*. In sum, this approach condenses the sample from the original 25,192 cities to 12,802 aggregated units. The population of each of these units was derived from the 2015 layer of the *Atlas of the Human Planet* Functional Urban Areas data (Schiavina et al., 2019) and the settlement layers (Pesaresi et al., 2016) for smaller geographical units, which we enhanced using the same underlying population estimates as the FUA data. The original population estimates come from the Center for International Earth Science Information Network (2018) and were disaggregated from census or administrative units to grid cells.

We assess the *power* of cities based on their outdegree, closeness and betweenness. To understand how each captures an analytically distinct sense of power, it is useful to call to mind two network types from elementary network analysis – the maximally centralized star, in which one actor, A, stands at the centre of the network and all other actors connect only to A, and the maximally decentralized circle, in which A connects to two other actors, which are likewise connected to two other actors and so on until the network forms a literal circle. If the relation in question involves the exchange of resources between cities, most analysts examining the star network would conclude that city A occupies a favourable structural position, while all other cities occupy the same, equally unfavourable position. In the circle network, in contrast, all cities appear equally advantaged or disadvantaged. Freeman (1978) classic treatment of centrality suggests three distinct reasons by one would make these assessments. *Outdegree centrality*: City A in the star network is advantaged because it is more *active* than other cities. As such, city A has more *alternatives*. If a city refuses an exchange with A, A can rely on resources from other cities. Other cities in the star are less active. They are not directly involved with cities other than A and, thus, have no alternatives to exchange with A. In the circle network, all cities are equally active and thus equally advantaged or disadvantaged in terms of alternatives. With a relation of the sort we examine, the outdegree of each city – the number of ties that firms located within it send to firms located in other cities – is a clear measure of this sense of power or influence. Cities that send more ties are manifestly cities that have captured more of the control functions of the world economy. *Closeness centrality*: City A in the star network is advantaged because it is *closer* to more cities than other cities in the network (i.e., the inverse average distance of city A to all others is shorter than that connecting other cities in the star). City A is adjacent to all other cities while all others are two steps from all other cities (except A). City A has a greater power in the sense that it has greater *independence* than the others. City A can directly communicate with all others in the network while, for resources to pass between other cities in the network, they must pass through A. This gives city A in the star network a distinct structural advantage. In the circle network, in contrast, each city is equally close and, thus, equally dependent on others. *Betweenness centrality*: Finally, city A in the star network is advantaged because it stands *between* all of the other pairs of actors (i.e., all of the optimal paths connecting other cities in the star run through A while none of the optimal paths run through other cities). It therefore has greater power in the sense that it *brokers* all exchanges. If other cities in the star wish to exchange resources amongst themselves, they must do so through city A. City A thus has a distinct structural advantage in that it has the power to coordinate action and to withhold or distort information to its advantage and needs no broker for exchanges with other cities. In the circle network, each city is equally between and equally empowered to broker exchanges.

Research on the world city system indicates that, in addition to being powerful, world cities are also *prestigious* – the world/global cities are chosen over others such that, *ceteris paribus*, firms are expected to prefer to locate a subsidiary in a London, New York, or Paris, over a Knoxville, TN. We assess the prestige of cities based on their indegree, the number of ties that firms headquartered in other cities send to that city. *Indegree centrality*: City A in the star network is more prestigious in the sense that it chosen over others while other cities in the star are less prestigious in that they are not chosen by any city but A. In the circle network, all cities are equally prestigious, each being chosen by two others.[3]

We use regular equivalence blockmodelling to cluster cities according to their roles in the world city system. Pairs of nodes are regularly equivalent if they are connected to similar others – even if they are not connected to the same others. Compared to structural equivalence, which uses the proportion of shared neighbours as a measure of similarity,

regular equivalence is more general and better captures roles beyond local contexts. Practically speaking, we use the REGE algorithm (White & Reitz, 1983) in conjunction with hierarchical clustering to partition the city matrix. Using the same regular equivalence cutoff and hierarchical clustering routine employed by Alderson and Beckfield, we find 298 blocks, 92 of which are singletons, or cities that cannot be joined with others at a reasonable level of regular equivalence and are thus assigned to their own blocks.[4] We treat these 92 singleton cities as outliers and exclude them from the analysis below, focusing on the 206 non-singleton blocks summarized in Appendix Table A2.[5]

The role of each block of cities is derived following Marsden (1989). Five distinct roles are observed, defined based on their combination of above (+) or below (–) average outdegree, indegree, and ingroup preference: Primary (+,+,+), low status clique (+,–,+), high status clique (–,+,+), isolated clique (–,–,+) and isolate (–,–,–). In the analysis below, we focus on two key positions/roles for which we have clear theoretical expectations: primary and isolate, constituting, respectively, 4% and 72% of the cities in the network. Cities in *primary* blocks stand at the centre of the global urban hierarchy. They are the most active cities in the system, sending and receiving many ties from cities that play other roles (having higher than expected outdegree and indegree) and they are highly cliquish (higher than expected ingroup preference). They are the true 'world' or 'global' cities in the data. For example, the 'L-N-P-T-O' block in Appendix Table A2, consisting of just five cities – London, New York, Paris, Tokyo and Osaka – sends nearly a quarter of all ties sent in the entire network and receives more than 10% of all ties received.[6] In addition, nearly a quarter of the ties sent from cities in this block are sent to one of the four other cities in it. In contrast, cities in *isolate* blocks play a distinctly subordinate role. They are internally disconnected (having a lower than expected ingroup preference) and appear in the network only because the receive ties from cities in more active blocks (lower than expected outdegree and indegree). They are the true satellites in the metropole-satellite relationship (Frank, 1967) linking cities in the global urban hierarchy. For example, the '100 Mile House' block in Appendix Table A2 consists of 4198 cities, nearly a third of the cities in the network. Combined, they send zero ties to other cities – and thus zero ties to each other – and receive just over 2% of the ties sent in the entire network.

As noted above, we employ two measures of the world-system position of the nations in which cities are located. The first is the classic measure developed by Snyder and Kick (1979) and amended by Bollen and Appold (1993) – which we designate as the original world-system position measure or OWS – which reflects the position of countries in the world-system in the first few decades of the post-WWII period. To capture changes in the world-system since that time (e.g., the impact of the NIDL that emerged in the context of the crises of the 1970s and accelerated in the round of globalization beginning in the early 1980s), we also map the position of countries in the network of global trade circa 2016.

Cross-national trade data are sourced from the IMF Direction of Trade Statistics database (IMF, 2016), which produces a matrix of country-to-country trade values. To ensure that our results are not sensitive to our technique of clustering cities into core, semi-peripheral, and peripheral positions, we use the following two measures. The first follows Snyder and Kick's (1979) original approach and classifies countries as core, semi-peripheral or peripheral based on the results of the structural equivalence blockmodelling of the dichotomized trade data where '1' equals a non-zero value (hereafter NIDL SE). This identifies eight blocks of countries that can readily be permuted into a core that is densely interconnected – approximating a 1-block or a density of 1.0 – a disconnected periphery – approximating a 0-block or a density of 0.0 – and a semi-periphery with a density close to that of the average density of the overall trade network (i.e., 0.378), approximating the idealized core/semi-periphery/periphery structure described in Clark and Beckfield (2009).

This is a network in which core countries trade with each other and with semi-peripheral and peripheral countries, semi-peripheral countries trade primarily with the core and secondarily among themselves, and peripheral countries trade primarily with the core and very little among themselves. The second measure is inspired by Clark and Beckfield (2009) and classifies countries as core, semi-peripheral or peripheral based on clustering in the distribution of Borgatti and Everett's (2000) measure of continuous coreness (hereafter NIDL CC). In brief, the measure iteratively fits an idealized core-periphery model to the dichotomized trade data, sorting countries in terms of their 'coreness' (the closeness to the core of each country). We then examined the distribution of continuous coreness for obvious

TABLE 1 Number of countries classified as core, semi-periphery and periphery by three measures and comparison of OWS, NIDL SE and NIDL CC classifications

A.

	OWS	NIDL SE	NIDL CC
Core	22	41	54
Semi-periphery	41	84	26
Periphery	129	67	112

B.

		NIDL SE	
OWS	**Core**	**Semi-periphery**	**Periphery**
Core	16	5	1
Semi-periphery	14	22	5
Periphery	11	57	61

C.

		NIDL CC	
OWS	**Core**	**Semi-periphery**	**Periphery**
Core	16	3	3
Semi-periphery	22	10	9
Periphery	16	13	100

D.

		NIDL CC	
NIDL SE	**Core**	**Semi-periphery**	**Periphery**
Core	40	0	1
Semi-periphery	13	26	45
Periphery	1	0	66

cut-points, identifying a range of possible partitions. We identify a core, semi-periphery, and periphery based on the partition that best approximated the characteristics discussed above for NIDL SE, where the core is approximately a 1-block, the periphery is approximately a 0-block, and the semi-periphery has a density closest to the average density of the overall trade network.[7]

Panel A of Table 1 displays the number of countries in each world-system position by the OWS measure and the two measures based on the 2016 trade data. Both classifications based on trade data (i.e., NIDL SE and NILD CC) suggest an expanded core relative to the OWS, with notable entrances by Asian economies such as China, India and South Korea. To further illustrate the differences, Panel B compares the OWS classification to that derived from the blockmodelling of the 2016 trade network, NIDL SE (Spearman's $\rho = 0.505$). This reveals substantial upward and downward mobility. For instance, six countries classified as core by the OWS are downwardly mobile into the semi-periphery or periphery of the 2016 trade network and 25 countries classified as non-core by the OWS are upwardly mobile into the core of the 2016 trade network.[8] A similar pattern is observed when OWS is compared to NIDL CC (Spearman's $\rho = 0.576$) in Panel C. Finally, as one can note from Panel D, the NIDL SE and NIDL CC classifications themselves differ in largest part in terms of how many countries are classified as semi-peripheral or peripheral (Spearman's $\rho = 0.754$), as suggested by Panel A. While there are notable differences in the classification of countries by each measure, it is important to note that there is substantially more agreement at the city level (i.e., most cities in our data fall into countries with no

TABLE 2 Spearman correlation coefficients and basic statistics for measures of power and prestige

	Outdegree	Closeness	Betweenness	Indegree
Outdegree	1.000			
Closeness	0.442	1.000		
Betweenness	0.670	0.571	1.000	
Indegree	0.414	0.697	0.714	1.000
Minimum	0.000	16.910	0.000	0.000
Maximum	20211.000	52.183	9.230	8119.000
Mean	21.232	32.723	0.016	21.232
Median	0.000	32.722	0.000	2.000
SD	328.537	3.447	0.187	186.664

disagreement between the measures). For instance, the per cent diagonal agreement between the NIDL SE and NIDL CC classification of cities is 93%, while their respective agreement with the OWS measure is 76% and 74%.

To examine the extent to which the contemporary world city system matches on to the OWS, NIDL SE and NIDL CC, we estimate two types of models. First, we regress the rank of cities on our four measures of point centrality on the world-system position of the countries in which they are located using ordinary least squares. Second, we estimate a series of logistic regressions of the position/role of cities on the world-system position of the countries in which they are located.[9] If the 2016 world city system continues to match on well to the OWS and to position in the contemporary global trade network (the NIDL measures), we would expect cities located in core countries to be more powerful and prestigious than cities in non-core countries and to play a more active, integrating role in the system. We would, in turn, expect cities located in semi-peripheral countries to be more powerful and prestigious and play a more active, integrating role than cities in peripheral countries.

Thus, we would expect cities located in core countries to rank higher on outdegree, closeness, betweenness, and indegree than cities located in semi-peripheral countries, and cities located in semi-peripheral countries to rank higher than cities in peripheral countries. Similarly, we would expect cities located in core countries to have the highest odds of playing a primary role in the system (i.e., of being in a powerful and prestigious clique that is highly active with 'outsiders', or having greater than expected ingroup preference, but also greater than expected outdegree and indegree). In turn, we would expect cities located in semi-peripheral countries to have higher odds of playing a primary role that cities located in peripheral countries. Conversely, we would expect cities located in peripheral countries to have the highest odds of occupying an isolate position, being internally disconnected and having relations primarily with members of more powerful blocks (i.e., having lower than expected ingroup preference and lower than expected outdegree and indegree). Cities located in core countries, in contrast, would be expected to have the lowest odds of occupying an isolate position.

RESULTS

Descriptive statistics and the correlations among the measures of point centrality are presented in Table 2. The strongest association is between prestige (indegree) and betweenness, or position as bridge between other highly central cities in the network, meaning that prestigious cities are key sites forming those bridges. This reflects how expansion of corporate branch locations formed new bridges between cities previously unconnected or less connected to one another, many of which were already locally or regionally central. While these bridges may have been formed by new entrants into the world city system in recent decades, including those in the Global South, the same may be true

for cities at the existing apex of the hierarchy, as the next table shows the most the most prestigious (indegree) cities are also the most powerful (outdegree). As comparison of the mean and median of the measures indicates, they are highly skewed. Accordingly, we rank-transform outdegree, closeness, betweenness and indegree before estimating regressions.

Table 3 reports the top 50 cities across each of the centrality measures, with Tokyo as top-ranked in both outdegree and indegree centrality, and New York top-ranked in closeness and betweenness. The presence of Shanghai, Hong Kong and Beijing in the top 50 illustrates that while New York, London and Tokyo maintain their roles as the traditional summits of the global urban hierarchy, they now coexist with the rapidly emergent Chinese cities (Ni et al., 2011; Timberlake et al., 2020). This is reflective of the differing functions served by the cities, where Shanghai is the site of incoming foreign capital as the financial centre, Beijing as the political centre (Lai, 2012) and Hong Kong as the traditional gateway city into mainland China (Meyer, 2000). The same may be said for Kuala Lumpur, Osaka, Seoul and Singapore, all of which have high centrality scores.

Tables 4–6 report the results of regressions assessing the association between the world-system position of the country in which a city is located and its power, prestige and position/role in the global urban hierarchy. Tables 4 and 5 report results for our four measures of point centrality – outdegree, closeness, betweenness and indegree – across our three different measures of the position of countries in the inter-state and global trading systems, the OWS and the 2016 NIDL SE and NIDL CC, investigating the extent to which the world city system matches on to the post-WWII inter-state system and, by two similar measures, to positions in the contemporary world trading system. In each model, we adjust for the population of each city, which we expect to be positively related to the power and position of each city: Larger cities tend, on average, to have more firms and thus more ties to the world city system (e.g., Alderson & Beckfield, 2004; Chase-Dunn & Manning, 1999).[10] By either a permutation test or a standard two-tailed test, population (log 10) is positively and significantly associated with all four measures of point centrality, meaning that larger cities have higher indegree, are closer, more between and have a higher indegree than smaller cities.

As one can note, by the classic OWS measure (i.e., Models 1, 4, 7 and 10), cities located in core countries are generally more powerful (significantly greater outdegree, closeness and betweenness) than cities located in semi-peripheral or peripheral countries and are likewise more prestigious (i.e., have higher indegree). Specifically, the results in Model 1 in Table 4 mean that cities located in semi-peripheral countries have an outdegree that, on average, is around 1813 ranks lower than cities located in core countries, while cities located in peripheral countries have an outdegree that is 2447 ranks lower. We conduct Wald tests to determine whether the observed differences between semi-peripheral and peripheral location are statistically significant for each measure. In the case of Model 1, the difference between the semi-periphery and periphery is, as indicated by the Wald test, itself significant by a permutation test.

Remarkably, then, the position that countries occupied in the world-system in first few decades after WWII continues to be reflected in the distribution of power and prestige in the world city system today: Cities in core countries are more central to the network of world cities than cities in non-core countries, a finding that is consistent with what Alderson and Beckfield (2004) reported based on data for 2000 for a far more restricted set of firms. Note, however, that, by the OWS measure, we also find evidence of significant restructuring outside of the core. In contrast to expectations that we can derive from Hymer (1972) and the results reported by Alderson and Beckfield (2004), Wald tests indicate that the semi-periphery is neither significantly more close (Model 4), more between (Model 7), nor does it have significantly higher indegree (Model 10) than the periphery. In this sense, the contemporary period appears to have ushered in a new dynamic of centralization and marginalization with some cities in the old periphery growing in power and prestige while others in the old semi-periphery have declined. For example, using the OWS measure, we find that cities from peripheral economies such as Dammam (Saudi Arabia), Changshu and Xi'an (China), as well as Kuwait City, have all seen large increases in indegree (prestige). Doha (Qatar), Manama (Bahrain), and Warsaw (Poland) – also peripheral by the OWS measure – have gained most in outdegree (power) and host several major headquarters by 2016. In the case of Xi'an (China), this move was arguably a direct result of development policy. In 2010, Xi'an used subsidies from the provincial government to forge the city into an 'International Metropolis', constructing industrial campuses and attracting foreign investment and multinational companies (Jaros, 2016). Regarding 'downwardly

TABLE 3 Ranking of cities on power and prestige

Rank	Outdegree	Value	Closeness	Value	Betweenness	Value	Indegree	Value
1	Tokyo	20,211	New York	52.19	New York	9.23	Tokyo	8119
2	New York	18,359	Paris	51.45	Paris	7.83	New York	7266
3	London	11,998	Tokyo	51.14	Tokyo	7.31	London	6678
4	Paris	11,844	London	50.74	Chicago	5.29	Singapore	4906
5	Chicago	5814	Chicago	50.14	London	5.04	Paris	4741
6	Osaka	5337	Zurich	49.55	Zurich	3.53	Los Angeles	4340
7	San Jose	4516	Stockholm	49.16	Stockholm	3.41	Hong Kong	4010
8	Stockholm	4287	Toronto	49.00	Minneapolis	3.08	Shanghai	3339
9	Boston	4179	Los Angeles	48.76	Houston	3.08	Chicago	3205
10	Los Angeles	3885	Boston	48.74	Helsinki	2.79	Toronto	3115
11	Zurich	3783	Munich	48.64	Toronto	2.79	Sydney	2930
12	Washington	3459	Philadelphia	48.64	Philadelphia	2.58	Kuala Lumpur	2831
13	Dallas	3387	Washington	48.62	Dallas	2.57	San Jose	2609
14	Munich	3356	Houston	48.60	Munich	2.49	Houston	2482
15	Toronto	2941	Singapore	48.57	Osaka	2.39	Dallas	2320
16	Houston	2862	Dallas	48.39	Los Angeles	2.39	Philadelphia	2223
17	Hong Kong	2627	San Jose	48.29	Boston	2.06	Milan	2207
18	Singapore	2576	Minneapolis	48.27	Mannheim	2.01	Bangkok	2167
19	Philadelphia	2573	Helsinki	48.26	Vienna	1.91	Seoul	2075
20	Helsinki	2517	Hong Kong	48.18	Dublin	1.85	Madrid	2028
21	Nagoya	2300	Dublin	48.10	Washington	1.81	Atlanta	1955
22	Minneapolis	2253	Frankfurt	48.04	Denver	1.73	Washington	1882
23	Amsterdam	2241	Atlanta	48.03	Atlanta	1.72	Stockholm	1878
24	Seoul	2202	Amsterdam	48.01	Vancouver	1.72	Osaka	1868
25	Sydney	2152	Milan	47.94	Dortmund	1.66	Vienna	1838
26	Kuala Lumpur	2133	Dortmund	47.89	Sydney	1.60	Zurich	1747
27	Mannheim	2044	Copenhagen	47.80	Montreal	1.59	Amsterdam	1731
28	Dublin	1989	Brussels	47.79	Brussels	1.58	São Paulo	1704
29	Nashville	1931	St. Louis	47.75	Mumbai	1.57	Melbourne	1701
30	Frankfurt	1917	Osaka	47.74	Dusseldorf	1.52	Frankfurt	1673
31	Atlanta	1906	Madrid	47.74	Moscow	1.50	Miami	1647
32	Stuttgart	1879	Detroit	47.73	Stuttgart	1.48	Johannesburg	1622
33	Beijing	1849	Rotterdam	47.73	Nashville	1.47	Boston	1534
34	Miami	1795	Shanghai	47.72	St. Louis	1.46	Munich	1492
35	Denver	1696	Stuttgart	47.63	Oslo	1.46	Brussels	1489
36	Dusseldorf	1672	Sydney	47.63	Cleveland	1.45	New Taipei	1482
37	Mumbai	1639	Vienna	47.56	Hamburg	1.43	Mexico City	1403
38	Copenhagen	1635	Seoul	47.54	Beijing	1.43	Beijing	1394
39	Cleveland	1587	Mannheim	47.46	Frankfurt	1.38	Minneapolis	1381

(Continues)

TABLE 3 (Continued)

Rank	Outdegree	Value	Closeness	Value	Betweenness	Value	Indegree	Value
40	Vienna	1568	Montreal	47.41	Amsterdam	1.33	Detroit	1375
41	Detroit	1539	Cleveland	47.39	San Jose	1.33	Warsaw	1362
42	St. Louis	1536	Miami	47.33	Milan	1.29	Oslo	1355
43	Dortmund	1534	Denver	47.30	Copenhagen	1.29	Copenhagen	1342
44	Madrid	1509	Cologne	47.27	Nagoya	1.26	Rotterdam	1321
45	Rotterdam	1445	Charlotte	47.26	Detroit	1.23	Jakarta	1280
46	New Taipei	1422	Hamburg	47.26	Madrid	1.23	Barcelona	1241
47	Hamburg	1416	Oslo	47.26	Hong Kong	1.20	Denver	1228
48	Milan	1394	Mumbai	47.24	Singapore	1.16	Mumbai	1206
49	Montreal	1393	Melbourne	47.17	Seoul	1.13	Helsinki	1167
50	Oslo	1345	Milwaukee	47.14	Delhi	1.11	Moscow	1156

TABLE 4 Regression models of rank-transformed measures of network centrality

	Outdegree			Closeness		
	OWS	NIDL SE	NIDL CC	OWS	NIDL SE	NIDL CC
	1	2	3	4	5	6
Semi-periphery (*SP*)	−1812.586***	−1621.843***	−1681.309***	−1829.114***	−1208.857***	−1453.366***
	(114.040)	(131.538)	(234.219)	(88.761)	(102.647)	(182.743)
Periphery (*P*)	−2447.226***	−1110.483***	−1635.543***	−1668.943***	−743.577**,+++	−886.635***
	(116.999)	(284.622)	(237.911)	(91.063)	(222.107)	(185.623)
Population (log10)	1531.851***	1289.903***	1280.345***	1423.565***	1232.145***	1222.229***
	(33.107)	(31.524)	(31.598)	(25.768)	(24.600)	(24.654)
Constant	−2931.953***	−2427.686***	−2474.715***	1441.186***	1813.589***	1787.250***
	(124.951)	(124.846)	(125.341)	(97.253)	(97.425)	(97.794)
Wald test *SP* − *P*	***					*
N	12732	12732	12732	12732	12732	12732
R^2	0.147	0.120	0.115	0.197	0.167	0.163

Note: Standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (permutation tests).
$^{+}p < 0.05$, $^{++}p < 0.01$, $^{+++}p < 0.001$ (standard two-tailed tests, when different from permutation tests).

mobile' cities from the semi-periphery, Maracaibo (Venezuela), the centre of the oil industry, declined in indegree from 2000 to 2016, when most other cities have seen slight increases. Similarly, most of the cities with headquarters in 2000 have seen increases in power, but Kuopio's (Finland) has declined, and Caracas's (Venezuela) power has stagnated.

Results for position in the contemporary global trading system, whether derived by structural equivalence block-modelling (NIDL SE) or partitioning of each city's continuous coreness (NIDL CC) are broadly similar: Cities located in countries in the core of the contemporary global trading network are generally more powerful than cities located in countries in the semi-periphery and periphery (i.e., have higher outdegree, closeness and betweenness). They are more prestigious as well by the NIDL CC measure, but as results presented in Model 11 indicate, cities located in the

TABLE 5 Regression models of rank-transformed measures of network centrality

	Betweenness			Indegree		
	OWS	NIDL SE	NIDL CC	OWS	NIDL SE	NIDL CC
	7	8	9	10	11	12
Semi-periphery (*SP*)	−1922.241***	−935.917***	−1221.614***	−1636.798***	−929.050***	−1405.349***
	(121.074)	(139.568)	(248.050)	(106.650)	(122.830)	(218.181)
Periphery (*P*)	−2087.355***	−712.245*	−655.883*,++	−1831.711***	4.310	−802.486***
	(124.215)	(301.996)	(251.960)	(109.417)	(265.779)	(221.620)
Population (log10)	2057.195***	1817.868***	1809.035***	2113.521***	1901.328***	1905.671***
	(35.148)	(33.448)	(33.464)	(30.961)	(29.437)	(29.435)
Constant	−3625.269***	−3168.268***	−3184.959***	−2730.106***	−2315.424***	−2359.166***
	(132.658)	(132.468)	(132.743)	(116.854)	(116.582)	(116.759)
Wald test *SP* − *P*					**	+
N	12732	12732	12732	12732	12732	12732
R^2	0.213	0.189	0.188	0.270	0.249	0.249

Note: Standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (permutation tests).
$^{+}p < 0.05$, $^{++}p < 0.01$, $^{+++}p < 0.001$ (standard two-tailed tests, when different from permutation tests).

TABLE 6 Regression models of network role. Logistic estimates (odd ratios)

	Primary			Isolate		
	OWS	NIDL SE	NIDL CC	OWS	NIDL SE	NIDL CC
	13	14	15	16	17	18
Semi-periphery (*SP*)	0.078***	0.373***	0.489*	3.841***	2.500***	2.887***
	(0.013)	(0.069)	(0.137)	(0.291)	(0.203)	(0.422)
Periphery (*P*)	0.026***	0.232**,+++	0.141***	5.127***	1.545**	2.234***
	(0.005)	(0.081)	(0.046)	(0.398)	(0.236)	(0.294)
Population (log10)	16.905***	6.905***	7.036***	0.317***	0.429***	0.431***
	(1.572)	(0.450)	(0.463)	(0.009)	(0.009)	(0.009)
Wald test *SP* − *P*	***		**	***,++	**	
N	12641	12641	12641	12641	12641	12641
Pseudo-R^2	0.511	0.387	0.389	0.172	0.137	0.134

Note: Standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (permutation tests).
$^{+}p < 0.05$, $^{++}p < 0.01$, $^{+++}p < 0.001$ (standard two-tailed tests, when different from permutation tests).

periphery of the contemporary global trading system are not significantly different from cities located in core countries by the NIDL SE measure.

Both contemporary measures also reveal that the power of cities outside of the core is generally not significantly associated with their position in the global trade network. Cities located in semi-peripheral countries do not have significantly higher outdegree (Models 1 and 2), nor are they more between than cities located in peripheral countries (Models 8 and 9). In terms of closeness, we find that, while there is no significant difference between cities located in

semi-peripheral and peripheral countries by the NIDL SE measure (Model 5), the results for NIDL CC (Model 6) indicate that peripheral cities are actually significantly closer than semi-peripheral cities. This notable finding is echoed in the results for prestige (Models 11 and 12): By both measures, cities located in peripheral countries are more prestigious – have higher indegree – on average than cities located in semi-peripheral countries.

As with our findings based on the classic OWS measure, the key finding for NIDL SE and NIDL CC is notable: While cities in the core of the contemporary global trade network tend to be more powerful and prestigious, the power and prestige of cities outside the core is not strongly associated with position in the network and, when it is (e.g., Models 6, 11 and 12), our findings run counter to the expectation of a power and prestige gradient in which cities located in core countries are more advantaged than cities in semi-peripheral countries, which are in turn more advantaged than cities in peripheral countries. This provides additional evidence of a new dynamic of centralization and marginalization in the contemporary period – the new international division of labour is not simply reproducing earlier patterns of inequality in the world city system.

Table 6 presents results for two key roles that emerge from the regular equivalence blockmodelling of the world city network: Primary and isolate. As noted above, the versions of the world city hypothesis that motivate our analysis yield the clearest expectations regarding these two positions/roles: To the extent that position in the post-WWII world-system, or the contemporary global trading system, is associated with the role that cities play in the world city system, we would expect cities located in core countries to be more likely to play an active, primary role in the system than cities located in semi-peripheral countries, which, in turn, would be expected to have higher odds of membership in a primary block than cities located in peripheral countries. Similarly, we would expect cities located in peripheral countries to be more likely to play a passive, isolate role in the system than cities located in semi-peripheral countries, which, in turn are expected to have higher odds of membership in an isolate block than cities located in core countries.[11] To the extent to which a new global urban hierarchy is evolving in the context of the new international division of labour, however, we would not expect the roles played by cities in the system to be as closely associated with their position in the post-WWII world-system or the contemporary global trading system.

Results for the classic or 'orthodox' OWS measure (Models 13 and 16) are consistent with the latter expectation above and with the findings of Alderson and Beckfield (2004). Relative to cities located in core countries, semi-peripheral cities have significantly lower odds of playing a primary role in the system, the odds for peripheral cities are lower still, and the difference in the odds ratios between cities located in semi-peripheral and peripheral countries is itself significant. Likewise, relative to cities located in core countries, semi-peripheral cities have significantly higher odds of playing an isolate role in the system, the odds for peripheral cities are higher still – roughly five times higher – and the difference in the odds ratios between cities located in semi-peripheral and peripheral countries is significant. Once again, then, we find that the position that countries occupied in the world-system in first few decades after WWII continues to be reflected in roles that they play in the world city system today.

Our findings for the position in the contemporary global trading system are broadly similar, but, again, there are some interesting results. Relative to cities located in core countries, non-core cities have significantly lower odds of playing a primary role in the system and significantly higher odds of being consigned to the isolate role. While the odds ratios in Models 14 and 15 are ordered in a fashion consistent with the idea that cities located countries occupying a peripheral position in the global trade network are disadvantaged relative to semi-peripheral cities, the difference between semi-peripheral and peripheral cities is significant only in the case of NIDL CC. Turning to the isolate position (Models 17 and 18), one can note that the odds ratios are not ordered in a way that suggests a disadvantaged periphery and, indeed, in the case of NIDL SE, the observed advantage of cities locate in peripheral countries relative to semi-peripheral cities is significant. That is, while peripheral cities are about 1.5 times more likely to play an isolate role than core cities, semi-peripheral cities are 2.5 times more likely. Taken together, these results indicate that, while cities located in core countries in the contemporary global trade network are more likely to play an active, role in the system, and less likely to be consigned to a passive, isolate role, position in the contemporary global trade network is not as strongly or consistently stratifying as the position of a city's country in the post-WWII world-system.

DISCUSSION AND CONCLUSIONS

The world city system observed by Alderson and Beckfield (2004) was one in which the initial phase of the contemporary round of globalization further centralized power in key cities in core countries and largely relegated cities in non-core countries to subordinate positions. It was also one in which cities located in semi-peripheral countries were generally more powerful, prestigious and active than cities located in peripheral countries. Our results suggest that a new urban hierarchy has since emerged in the wake of the broadening and deepening of the NIDL, one in which the position of cities in the world city system no longer clearly reflects the tripartite division of nation-states in the inter-state system. Rather than cleanly reproducing (or intensifying) existing cross-national economic power structures, we find notable slippage between the maps of the world city system and the world-system. We see this divergence empirically in the fact that the position and role cities in peripheral countries are presently either (a) statistically indistinguishable from cities in semi-peripheral countries or – as in the case of closeness, indegree, or the odds of playing the isolate role – (b) more central or active on average than cities in the semi-periphery. This suggests that mobility within the global urban hierarchy may not be as heavily shaped by national economic power as it once was. Cities housed within those nations most peripheral in cross-national trade are no longer, as a rule, distinctly disadvantaged, a fact that can be explained by the post-NIDL corporate expansion involving mass outsourcing to cities in peripheral states, where urbanization has occurred at a remarkably higher rate than most everywhere else (Myers, 2021; Smith, 1996).

Our results lend support to expectations of scholars of 'world' or 'global' cities such as Friedmann (1986) and Sassen (2001) who predicted that the geography of power in the networked system of cities would extend beyond, or diverge from, the boundaries of national economies. The national boundaries observed here are those defined by the world-system both before (OWS) and after the cross-national power shifts that followed the deepening of the New International Division of Labor (NIDL) after the late 1970s (NIDL SE and NIDL CC). This divergence represents a significant shift from Alderson and Beckfield's (2004) analysis of the world city hierarchy, in which city ranking in the world city hierarchy aligned with national position in the world-system. In that earlier period of globalization, the world city hierarchy reflected Hymer's (1972) vision of world cities, where power in the world city system largely reflected cross-national economic power structures.

In the contemporary era, the more multipolar distribution of economic power among nations that emerged from the NIDL is also evident in the world city hierarchy. In less developed countries, global corporate branch expansion has connected new urban nodes to the world economy, making others yet more central to the existing network. A more multipolar structure beyond the traditional primacy of New York, London, Paris and Tokyo also emerged as cities such as Shanghai and Hong Kong approach the top ranks (Taylor & Derudder, 2020; Timberlake et al., 2020).

While the nation-state remains a centrally important regulatory entity influencing constituent city economies, and while the market has not replaced the state (Gilpin, 2000), the modern restructuring of the global urban hierarchy has created new openings for mobility in the world economy for cities. While the greatest concentration of power is seen in cities within core countries, we do not see alignment with the mid-level growth expected in semi-peripheral and stagnating growth expected in peripheral countries (Clark & Beckfield, 2009; Mahutga & Smith, 2011).

The fact that the inter-city system no longer smoothly matches on to the tripartite inter-state system raises a number of important questions about the global geography of inequality, the role of nation-states with it, and the factors shaping the fortunes of cities and their residents across the globe. In non-core countries, how has the relationship between city- and national-level position in the world economy changed? Cities articulate their respective national economies into the larger world economy (Derudder & Taylor, 2018), yet advanced producer services clustering in cities would appear to have diverged from collective, national-level patterns of international trade. Does this divergence denote that national trade patterns are generated by a non-urban geography, or a separation between the most globalized services industries and trade? It is also important to note that, owing to the difference in the sample of firms we employ relative to Alderson and Beckfield (2004), we are not able to do the sort of direct

comparison that would enable one to determine the extent to which cities located in core countries have become more or less advantaged relative to the non-core over time. Instead, our results simply establish that they continue to be advantaged on average. Future research based on a consistent set of firms and cities could address this critical question.

The observed industrial primacy of business services in our world city hierarchy, from capital investment services to computer programming services, reflects the new industrial composition of the neoliberal era, where advanced producer services define corporate power (Sassen, 2014). This distinctly urban industrial geography transports dense flows of finance globally, increasingly unattached to any physical commodities, generating vast new quantities of wealth. Whether this form of global economic exchange is growing distant from international trade processes and how it affects the urban-national economic relationship will be another important agenda item in future research.

Further, does the world city hierarchy stratify and shape emergent political systems of world cities? Global governance initiatives by cities have expanded considerably in the last few decades, particularly transnational municipal networks dedicated to solving problems from economic development to conflict resolution to climate change. While these expanding political systems of global cities are thought to represent the extension of democratic processes beyond the sovereign nation-state (Alger, 1990, 2014), it is also shown that position in the world city hierarchy is positively associated with greater participation by city governments in these networks (Acuto & Leffel, 2020). Given increasing centralization and marginalization in the world city hierarchy (Sassen, 2006), one wonders if these governance networks are expanding representation for cities in world affairs, or if the influence of the world city hierarchy on this landscape is only exacerbating inequality.

These questions about shifts in multi-scalar economic geography are core agenda items for future research, and further areas of inquiry include the relationship of the world city system measured by the location decisions of firms to the system measured by other means and how the spatially bound unit of the urban may be changing.

One may also consider if and how scalar boundaries themselves are changing. Literature on the increasingly complex nature of socioeconomic boundaries within contemporary, neoliberal globalization debates the spatial nature of urban processes. Brenner and colleagues argue that the neoliberal era has seen an extension of the urban fabric beyond the space-bound city, where understanding urban processes requires the disregard of territorially bound urban boundaries (Brenner et al., 2011; Brenner & Schmid, 2015). However, Storper and Scott (2016) suggest this devalues the nodality and agglomeration in urban economic geography, where physical boundaries and distance still matter a great deal.

What remains axiomatic to understanding new global urban morphologies is the relational, network-oriented approach prescribed by Smith and Timberlake (1995, 2002). As globalization continues to weave the fabric of human contact, a relational approach will further expose unique and otherwise unseen power, functions and landscapes of cities.

ACKNOWLEDGEMENT

The authors extend thanks to Xiulian Ma at the Chinese Academy of Governance for providing data critical for this study.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data used in this study is available at https://github.com/hmarahre/Divergence-of-the-World-City-System-from-National-Economies.

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ENDNOTES

[1] Snyder and Kick's (1979) analysis is based on the structural equivalence blockmodelling of four dichotomous relations: trade (between 1963 and 1967), military interventions (between 1948 and 1967), diplomatic relations (circa 1963 or 1964), and treaties (in effect during the 1946–1965 period). It has been widely used in quantitative research on the world-system, being cited more than 1000 times (Google Scholar 2021). We employ their measure as amended by Bollen and Appold (1993) and Bollen and Appold (1993), who reclassified a small subset of cases.

[2] This raises the question of the extent to which the results reported below are driven by the much larger sample of firms we employ relative to Alderson and Beckfield (2004). Robustness checks using only the Global 500 in 2016 support our main conclusion that the clean ordering of core/semi-periphery/periphery that Alderson and Beckfield report based on data for the 2000 Global 500 is no longer apparent by 2016.

[3] The precise technique used to calculate each measure of point centrality exactly follows that detailed in Alderson and Beckfield (2004).

[4] Alderson and Beckfield (2004) used 75.3% similarity and 'average' linkage hierarchical clustering (HC). While UCINET's documentation reports using single linkage hierarchical clustering, the actual routine is much closer to average linkage HC. To be precise, UCINET's REGE routine runs an automatic HC routine that is closest to average HC but does not exactly match any of the HC routines available in UCINET.

[5] The results are substantively identical when the singleton blocks are included in the analyses reported in Tables 6 and Appendix Table A1 below.

[6] Other blocks in Table A2 are labelled by the alphabetical order of the cities appearing within it (e.g., Amsterdam is, in alphabetical order, the first of the 110 cities appearing in the "Amsterdam" block and it is labelled as such).

[7] Details on the calculation of each measure and classification of each country in the data are available upon request.

[8] While the motivation for our focus on the contemporary global trade network is discussed above, it may raise the question of how our classification of countries would differ if the analysis incorporated other relations (as does the OWS). In supplementary analyses, we find that the trade matrix used to produce the NIDL classifications is strongly correlated, for instance, with the countryXcountry matrices of FDI and portfolio investment and that the classification of countries by a multirelational version of NIDL SE does not differ strongly from what we find based on trade alone. In the small proportion of cases that would be reclassified as core, semi-peripheral, or peripheral in a version of NIDL SE incorporating trade, FDI, and portfolio investment – 15 of 202 countries in the data – countries would 'revert' to the classification indicated by OWS and, thus, the results would not differ overall from those reported below.

[9] Network data violate a number of the assumptions of regression analysis (e.g., the assumption that observations are independent). In all models we thus report the results of permutation tests in which we first estimate OLS or logistic regressions, randomly permute the rows of the dependent variable, and then re-estimate the regression. Doing so 1000 times yields a '*p*-value' that represents the proportion of random permutations that yield a parameter estimate as large as that observed. By this robust alternative, for instance, we indicate an estimate as 'significant' at the 0.05 level if an estimate as large as that observed is unlikely to have occurred by chance (i.e., the proportion of coefficients as large was less than 0.05 or less than 1 in 20). We report the results of classical significance tests (which are inappropriate) when they differ from those of the permutation tests.

[10] The population threshold at which cities enter the network varies notably based on their world system position. By the OWS measure, for example, the average city in the semi-periphery is six times larger than the average city in the core, and the average peripheral city is about nine and a half times larger.

[11] While we do not have strong expectations for the other roles that emerge from the blockmodelling, we present results of the same analysis for high-status, low-status and isolated cliques in Appendix Table A1 for the interested reader. Cities in these blocks constitute, respectively, around 5%, 1% and 18% of the cities in the network.

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How to cite this article: Leffel, B., Marahrens, H., & Alderson, A. S. (2023). Divergence of the world city system from national economies. *Global Networks*, *23*, 459–477. https://doi.org/10.1111/glob.12405