

GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Legal theory of finance: Evidence from global financial networks

Prince Kwasi Sarpong and Jujith Deodutt

Cogent Economics & Finance (2019), 7: 1593071



Received: 04 April 2018
Accepted: 30 January 2019
First Published: 20 March 2019

*Corresponding author: Prince Kwasi Sarpong, Centre for Financial Planning Studies, Cape Town, South Africa E-mail: Pk.sarpong@cfps.co.za

Reviewing editor:
Ercolano Salvatore, Università degli Studi del Sannio, Italy

Additional information is available at the end of the article

GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Legal theory of finance: Evidence from global financial networks

Prince Kwasi Sarpong^{1*} and Jugjith Deodutt²

Abstract: Katharina Pistor proposed the Legal Theory of Finance (LTF), based on the premise that finance is legally constructed. In this paper, we apply network science to provide empirical evidence from global financial networks (GFN) to support the argument of the LTF. Using data from the World Bank and IMF, we confirm that the GFN is indeed hierarchical. We also show that the depth of interconnectedness in the GFN is increasing. The United States is the most important node in the GFN but temporarily lost its position to the United Kingdom in 2008. This paper shows that the most important node in the GFN can temporarily shift during major global financial events. The United Kingdom has also lost its position in the GFN to Switzerland on several measures of centrality. We further confirm that there is no evidence of a flattening of the GFN. Although some emerging economies have improved significantly in terms of GDP and international reserves, these improvements have not reflected in their positions in the GFN. We propose that the approach to regulating the global financial system should focus on more stringent



Jugjith Deodutt & Prince Kwasi Sarpong

ABOUT THE AUTHORS

Dr Prince Kwasi Sarpong is the Academic Director of Centre for Financial Planning Studies based in Cape Town, South Africa. His research areas include network science, financial markets behaviour and behavioural finance.

Mr Jugjith Deodutt is a Senior Lecturer at the School of Accounting, Economics and Finance at the Westville of University of KwaZulu-Natal in Durban, South Africa. His research areas include network science and financial reporting analysis.

PUBLIC INTEREST STATEMENT

Research and debates on financial market behaviors have largely ignored the legal aspects of financial markets although financial instruments are simply legal contractual obligations the drafting and enforcement of which involve one form of legal institution or another. In proposing the *Legal Theory of Finance* (LTF), Katharina Pistor (Pistor, 2013b) argued that finance and law are co-constituted and the behavior of financial markets can be better understood through the lenses of the LTF. The LTF argues that finance is hierarchical and thus the stringent enforcement of legal obligations in financial markets is dependent on one's hierarchy in the global financial network (GFN). In finance, therefore, law is elastic. In this study, we provide empirical evidence to corroborate the assertions of Pistor (2013b) and show that the GFN is indeed hierarchical. There has not been any major shift in the hierarchy of GFN. We find however that in the early periods of the Global Financial Crisis, the United States temporarily lost its status as the most important node in the global financial network. We also find that the United Kingdom has lost its position as the most important node in the global banking network to Switzerland although it continues to hold the largest global cross-border banking deposits in the world.

rules for the most central countries in the GFN. This could be more effective in ensuring stability in the global financial system.

Subjects: Network Theory; Political Economy; Banking

Keywords: legal theory of finance; elasticity of law; network science; eigenvector centrality; betweenness centrality; degree centrality

JEL classification: G15; G20; G29

1. Introduction

Majority of economic and finance theories presume, and often implicitly, a system of law and adjudication. This is due to the fact that institutions such as property, government regulations, and contracts usually involve systems for creating and enforcing laws, which in most cases, albeit not inevitably, involve some form of judicial system (Posner, 2014). Given that there are sometimes substantial economic consequences from judicial decisions, judicial decision-making is a critical subject of economic analysis (Stephenson, 2009). The argument that law shapes finance implies that the legal system, theoretically, can be differentiated from the economy, therefore, the independent causative influence of the law on finance can be empirically measured (Deakin, 2013). Research and debates on financial markets have however mostly ignored the legal aspects of financial markets despite the fact that financial instruments are simply legal contractual obligations which are drafted and enforced through one kind of legal institution or another.

In proposing the *Legal Theory of Finance* (LTF), Katharina Pistor (Pistor, 2013b) argues that finance and law are co-constituted and financial markets can be better understood through the lenses of the LTF. The LTF argues that finance is hierarchical and thus the stringent enforcement of legal obligations in financial markets depends on one's hierarchy in the financial network. In finance, the law is elastic. Furthermore, the narrow focus of legal minds on microeconomics, contribute to financial crises through the reinforcement of faith in the ability of markets to produce optimal outcomes with minimal regulatory oversight (McCluskey, Pasquale, & Taub, 2017). This misguided faith points to the need for a new economic analysis of law which is responsive to theories of financial instability and other macroeconomic conditions (McCluskey et al., 2017).

Pistor (2013b) proposed the Legal Theory of Finance (LTF) as a foundation for a political economy of finance (PEF) and argues that the legal construct of finance is of first-order significance in describing and forecasting the behavior of financial markets globally. PEF is a critical area in the field of finance because "*Politics picks out the actual from a space of the possible marked out by economics.*" (Kapadia, 2013, p. 437) (emphasis in original).

Although researchers acknowledge the importance of the global financial system, established perspectives in international political economy (IPE) seldom provide definitive models of the global financial system. In the terminology of network theory, the prevailing assumption is that the global financial network is flat, particularly, arguments on networks are usually part of a theoretical package that involves the establishment of a "flat ontology" claiming that power is not hierarchical or top-down and advocate the "flattening out" of society (Joseph, 2010). The implicit assumption that the global financial system is flat, is followed by the belief—usually promulgated more explicitly—that globally, the distribution of power is also flattening (Oatley, Winecoff, Pennock, & Danzman, 2013). Oatley et al. (2013) provide empirical evidence to suggest that financial interdependence is better depicted as a hierarchical network instead of a flat network. The global financial system is a strongly hierarchical system with the United States at the center of the network while almost all other countries are located at the periphery (Oatley et al., 2013; Poon, 2003). A country's location in this hierarchical system has important implications for its legal treatment during periods of crisis and beyond (Pistor, 2013b; Winecoff, 2015) therefore, the ideal of equality of all before the law is in conflict with the inherent hierarchy of finance (Pistor, 2013a).

In this study, we apply methodologies in network science to provide empirical evidence to support Pistor's (2013b) assertion on the hierarchical nature of finance. The global financial network is hierarchical in nature. The hierarchical architecture of the GFN is responsible for the elasticity of law in finance. There is an increasing interconnectedness among countries in the GFN. Using cross-border banking and portfolio data from the Bank for International Settlements (BIS) we find that the United Kingdom lost its position as the most important node in the global banking network to Switzerland although it still has the largest cross-border banking deposits in the world. Data from the Coordinated Portfolio Investment Survey (CPIS) of the International Monetary Fund (IMF), shows that the United States is the most important node in the global financial network. In 2008 however, the United Kingdom temporarily replaced the United States as the most important node. CPIS covers total cross-border portfolio assets and includes holdings of equity securities, and long- and short-term debt securities. The study further shows that although some emerging economies particularly China, India and Brazil have achieved significant economic improvements over time, with China currently the second largest economy in the world (India 7th, Brazil 9th) according to the IMF (IMF, 2017), these emerging economies have not been able to make it among the top 10 nodes in the GFN.

2. Law and finance

According to Pistor (2013a), the relevance of law to finance is now well recognized, in part due to the literature on *law and finance* by La Porta, et al., (1998, 2008). Legal theories give emphasis to two interrelated mediums (political and adaptability) through which law shapes finance. First, the political medium argues that legal traditions differ in terms of the primacy they attribute to private property rights contrasted with the rights of the state. Protecting private contracting rights is fundamental to financial development (La Porta et al., 1998). According to this argument, English common law, on one hand, developed into protecting owners of private property against the crown. This emboldened owners of private property to confidently transact, which in turn led to positive results on financial development (North & Weingast, 1989). On the other hand, the political medium holds that the German and French civil codes in the nineteenth century were developed to solidify state power by setting the prince above the law (Hayek, 1960, p. 166–7). Over time, the dominance of the state over the judiciary created legal traditions that paid more attention to the power of the state with less attention paid to the rights of individual investors (Mahoney, 2001). In general, the political medium suggests that the civil law tradition encourages the development of institutions that promote state power with negative consequences on financial development. The political medium emphasizes the extent to which the state influences the judiciary and highlights the difference between civil law and common law countries (Beck, Demirgüç-Kunt, & Levine, 2003).

Second, the adaptability medium posits that there are differences in how legal traditions evolve as circumstances change (Hayek, 1960) and legal traditions that efficiently adapt to reduce the gap between the contractual needs of the economy and the capabilities of the legal system will promote financial development more effectively than systems that are rigid (Merryman, 1985).

Although not unanimous, an instrumental element of literature on comparative law argues that, as judges deal with changing and unforeseen conditions on a case-by-case basis, common law evolves efficiently (Posner, 2014). A number of scholars argue that because common law gives significant discretion to judges, inefficient laws are contested in the courts and with repeated litigations, inefficient rules are replaced with efficient rules (Bailey & Rubin, 1994; Priest, 1977; Rubin, 1977, 1982). These authors submit that legal systems that do not permit jurisprudence (the laws created by judges) in the dispute-resolution process, and instead, depend on changes in statutory law, do not evolve efficiently and this has a negative impact on finance.

Law is more fundamental to modern finance than recognized in the extant literature. Law allocates power to regulators both private and public; offers authority to private and public financial instruments; and validates financial instruments generated from private contracts if

they are consistent with the law. Arguably, law's significance to finance has increased with the transition from relational finance to entity and ultimately, market-based finance: Financial instrument fungibility in anonymous markets is dependent on credible contractual commitments that can be enforced in a court of law without prior investigation into the creditworthiness of the originator, borrower or intermediary. Therefore, "law is not just an add-on to but is "in" finance" (Pistor, 2013a, p. 311).

In a 2014 essay, Ted Hamilton, a Harvard Law student reflected that the most repeated word in his first-year curriculum was not liberty, or justice, or order, but efficiency, which he argues, reduces law to the goal of economic gain maximization without evaluating that gain. Law students are taught that efficiency means wealth maximization and learn to treat legal questions as objective problems of counting divorced from complex moral, social and political analysis (Hamilton, 2014). Fisman, Jakiela, Kariv, and Markovits (2015) provide empirical findings to confirm that the emphasis on efficiency can affect students' views. This interpretation of economics in law, however, is partial on two fronts. First, it is not complete. To a large extent, it ignores new economic issues and theories. Secondly, it is usually biased. It privileges the standpoints of the most powerful players in the economy by presenting legal rules in favor of these players' interests as incontrovertible economic truth (McCluskey et al., 2017).

In a legally constructed system, the ability to influence the making of rules and the framing of markets is a source of political and economic power in itself as it establishes comparative advantages in good times and in downturns, the prevailing rules are suspended or relaxed to prevent the system from collapsing. A critical examination of the legal architecture of financial markets consequently brings to light the Janus face of law in finance whereby the credence law grants to financial contracts is crucial, but the inflexibility that accompanies credible commitments can hasten the collapse of financial markets during periods of crises (Pistor, 2013a). This outcome can be averted through refinancing or renegotiating financial commitments thus consequently shelving ex ante regulations or contracts. The evidence from the different financial markets proves that in times of crisis, resourceful public and private actors rewrite the rules of the game. For example, central banks directly intervene in forex markets to protect their currencies and private actors who make huge gains from unregulated markets during bull periods seek out lender of last resort services from central banks to survive their comeuppance during extreme bear markets (Pistor, 2013a).

3. Legal theory of finance

The LTF posits that financial markets are constructed legally and ensconced in a hybrid location between market and state, private and public. At the same time, financial markets display certain characteristics that often place them in direct tension with obligations stipulated in law or contracts. This is especially so during times of financial crisis when stringent enforcement of legal obligations would lead to the self-destruction of the financial system. This law-finance paradox is usually resolved through the suspension of the thorough execution of the law where the survival of the system is in jeopardy. This occurs at the apex of the financial hierarchy (Pistor, 2013b).

LTF is an inductive theory. The four fundamental arguments of the LFT are: 1) financial instruments are legally constituted; 2) law contributes to the instability in financial markets; 3) there is a pecking order of the modes of payment, implying an inherent hierarchical nature of finance; and 4) there is an inverse relationship between the obligatory nature of contractual and legal commitments on one hand and the hierarchical nature of finance on the other, where law tends to be more elastic at the apex and binding on the periphery of the financial system (Pistor, 2013b).

First, finance is legally constituted because financial systems are a complex, interdependent network of contractual obligations connecting market participants to each other. Therefore, what is owed by one has to be financed by assets or claims of a third party. Second, fundamental uncertainty coupled with liquidity constraints make financial markets inherently unstable. As

a result of these conditions, binding, pre-determined, non-negotiable legal obligations can accelerate the occurrence of a financial crisis and in the worst case, the crash of the financial system (Pistor, 2013b). Third, public and private entities create, issue and trade financial instruments. In normal times, most financial instruments appear as close substitutes to official or state money in the sense that they can easily be bought and sold for one another or for cash. However, when too many investors seek to change their portfolio of assets at the same time, some assets will no longer find takers as investors flee to safety: They buy cash or close cash substitutes, such as reputable corporate or government bonds. This implies that finance is not flat, but hierarchical (Mehrling, 2013). Finally, when a legal system is committed to the rule of law, it applies the law regardless of status or identity. However, a closer analysis of contractual relations, regulations and laws in finance reveals that the ideal of equality before the law is nonexistent. Instead, law is elastic. The elasticity of law means the probability that ex ante legal obligations will be relaxed or shelved in the future. The higher such probability, the more elastic the law is (Pistor, 2013b).

Generally, law is relatively elastic at the apex of the system and inelastic on the periphery. It is therefore at the periphery where default is very likely to culminate in involuntary exit. On the contrary, at the apex where the survival of the system is at stake, the law is more elastic by design and/or because the ultimate backstop of the system uses its discretionary power to do what is necessary to prevent the system from crashing¹ (Pistor, 2013b). The hierarchical nature of financial systems is due to mutualization at scale where balance sheets that have access to larger economic catchment areas impose liquidity discipline or elasticity on smaller balance sheets, and set the terms on which these smaller balance sheets operate (Kapadia, 2013). Drezner (2008) and Simmons (2001) have argued that financial power emanates from market size and identified the US and Europe as the most powerful states in the GFN. Market size and structural prominence may not be completely separable, either as attributes of interest or as a basis of power (Wincoff, 2015).

Swap contracts between major central banks, for example, that are designed to protect the global payment system covers only seven pages of text although they deal with billions of dollars, pounds, francs, euros, yens.² Although the swap transactions are similar, the form can alter depending on who the contracting parties are and their position in the GFN. The GFN is replete with similar treatment of contracting parties depending on their positions in the hierarchical financial system (Pistor, 2013b). Elasticity of law is also evident in the approach with which central banks bail out certain institutions. By bailing out the financial system, central banks mutualize or socialize private debt—a political act of redistribution—which goes directly contrary to the legal and contractual foundations of the financial system they plan to rescue (Pistor, 2013a). Anush Kapadia argues that given the ascent of integrated financial markets, the popular definition Max Weber gives to the state as a community that asserts monopoly over the means of coercion must be restated as a “*human community that successfully claims the apex of a hierarchical credit system because it is legitimate within a given territory*” (Kapadia, 2013, p. 439) (emphasis in original).

4. Some evidence on the elasticity of law in finance

4.1. Global financial crisis

As major financial companies were bailed out by the United States government or the Federal Reserve Bank, homeowners, on the other hand, faced foreclosures and bankruptcies in accordance with the law and received no liquidity support from the government or the Fed. Homeowners in the United States can, therefore, be construed to be on the periphery of the financial system in the United States. The peripheral position of homeowners in the United States, however, compares favorably to their counterparts in Spain or Hungary. For example, in Spain and many countries, mortgage-backed securities are full recourse loans unlike that of the United States meaning in the event of a heavy decline in the value of the homes, homeowners were still liable for the full amount they contracted for (Ghent & Kudlyak, 2011). In Hungary, 75% of home loans were issued

in foreign currencies—Swiss franc or euro—so homeowners' debts increase as these currencies appreciated relative to the local currency, by about 40% during the crisis (Rona-Tas & Guseva, 2013). This confirms that the global real estate market is hierarchical with homeowners at the periphery bearing not only the full credit risk but also the currency risk with the difference between periphery and apex more pronounced due to the limited means to redistribute loss in the transitional realm (Pistor, 2013b).

4.2. ECB monetary policy guidelines

The elasticity of law was also evident in the market for asset-backed securities which qualify as eligible collateral in the amended ECB Monetary Policy Guidelines. This new policy covered even triple-B as opposed to triple-A securities in the previous document (Bonavita, 2016). However, the critical credit facility—access to the discount window—maintained by the central banks was only granted to commercial banks. The ECB monetary policy had migrated from discount window lending to open market operations but the list of ECB-eligible collateral was nevertheless applicable (Tarkka, 2009). This elastic collateral guidelines that lowered the collateral eligibility requirements of the ECB benefited only those market participants who had access to the ensuing liquidity. Banks populated the apex of the financial system and happened to be the only beneficiaries of the inherent elasticity of law as well as the recipients of the privately created money that was generated (Haar, 2016).

The introduction of a new “countercyclical” regulatory dimension for banks was one of the most innovative qualities of Basel III (Amorello 2016). This component was operationalized in 2013 in the European prudential framework contained in the CRR/CRD IV package. Although European legislators have welcomed the uniform implementation of these rules because it creates a level playing field for banks and investment firms, Amorello (2016) argues that there are serious competitive disadvantages for small banks. This is because the big banks are encouraged to take advantage of the arbitrage opportunities hidden in the CRR/CRD IV countercyclical provisions but the same opportunities are not made available to smaller banks.

4.3. Vulture funds and peripheral states

In the context of sovereign debt, “vulture funds” are hedge funds that invest in sovereign debts which they consider weak or have a high probability of default. The investment strategies of these hedge funds are called “vulture” because of their predatory tactics. These funds are not creditors, but private funds that acquire at a discount, the distressed debt on the secondary market with the hope of profiting by suing the debtor for more than the acquisition price of the debt (Sourbron & Vereeck, 2017). To ensure favorable rulings from the courts, vulture funds choose “creditor-friendly jurisdictions”. These jurisdictions are usually the United Kingdom and the United States. However, they are increasingly suing in debtor countries, where the level of technical details involved in the adjudication process overwhelm the weak legal systems.³

The cases brought by these vulture funds are mostly protracted with a median estimated recovery period of six years and an average of 50–333% annualized returns. Such claims in some cases are equivalent to as much as 12–13% of the GDP of the debtor state.⁴ The following are selected cases of elasticity of law in relation to sovereign debt.

4.3.1. Republic of Argentina v. NML Capital, Ltd

In sovereign debt restructuring, we find another example of the elasticity of law as the desire for political power and financial stability collide. The inclusion of a *pari passu* clause in an underlying contract is one way to persuade potential sovereign debt creditors that a threat of a future cessation of payments following a restructuring is highly unlikely. This clause *inter alia*, prevents selective payments of participants of the restructuring to encourage creditors to consent to a restructuring proposal. This was however not the case in the Republic of Argentina v. NML Capital, Ltd⁵ where Argentina passed the Lock Law in a bid to avert any recommencement of negotiations with holdouts. The Second Circuit Court of Appeals, however,

did not adhere to the narrow interpretation of the *pari passu* clause with the implication that it would only disallow formal subordination; instead, it relied on a broader interpretation of the clause which prohibited Argentina from paying other creditors without paying the holdouts.⁶

This ruling while welcoming for a small group of well-connected investors, and it is horrendous for the rest of the world, particularly states that will face debt crises in the future (Guzman & Stiglitz, 2016). This broad and elastic interpretation of the *pari passu* clause leads to differential payments to bondholders and eventually undercuts productive and promising restructuring practices and carry a high price for the global financial system. It will encourage other funds to hold out making it impossible to restructure debt (Guzman & Stiglitz, 2016; Weidemaier, 2013).

4.3.2. *Donegal International v. Zambia*

The Zambian government purchased agricultural equipment from Romania in 1979 and by 1984, the government could not service the debt, which was about US\$30 million including interest. In 1999, Romania sold the debt to Donegal International for about \$3 million, equivalent to 11% of the face value of the debt. In 2003, under controversial circumstances that involved claims of corruption and bribery of public officials, Zambia signed an agreement with Donegal International which included a waiver of sovereign immunity from lawsuit, pay around \$15 million of the then \$44 million face value, agreeing to penal interest rates and to have any disputes resolved under English law in the event of default. Zambia made three installment payments adding up to \$3.4 million and thereafter ceased payments alleging that the agreement was riddled with corruption and signed without the necessary authority.⁷ Donegal International, however, waited until 2006 and initiated litigation in courts in the United Kingdom seeking US\$55 million. The English High Court on February 2007, ruled in favor of Donegal albeit for an amount of US\$15.4 million. The Zambian government acknowledged the judgment and reassigned funds originally allocated for health programs to pay off the debt (Laryea, 2010).

4.3.3. *Greece and the pressure to settle*

There are instances where a state begins the negotiation process to restructure its debt with private bondholders only for vulture funds to exercise their hold out rights or rather buy up the distressed bonds in the secondary market. These funds then exploit the weak position of the debtor country on the brink of default by placing it under additional pressure. The debtor country may yield to this pressure and accept a detrimental settlement as a means to avoid costly and extended process against an aggressive litigator. This was the case in 2012 when the Greece government agreed to pay €436 million in settlement on its debt restructuring case with several holdouts. Greece apparently yielded to pressure, and chose to pay off the holdout investors to avoid litigation with the vulture funds, given the unstable and sensitive political situation in the country during that period (Guzman & Stiglitz, 2016).

In September 2015, The United Nations overwhelmingly endorsed nine principles on sovereign debt restructuring with only six countries voting against. The countries in opposition to these principles are however the major jurisdictions (this includes the United States) for sovereign lending; thus, these principles are unlikely to be effective (Guzman & Stiglitz, 2016). Unresolved sovereign debt issues are harming debtor nations, their creditors and their citizens and can create significant systemic threats to the global financial system (Schwarcz, 2017). According to the Human Rights Council of the United Nations (UN), vulture funds reveal the unjust nature of the existing financial system, and directly affects human rights in debtor States.⁸ A critical examination of the various cases in the past, from the Third World Debt Crisis of the 1980s involving governments in Latin America, Eastern Europe, Africa and Asia, to the Eurozone crisis, it becomes obvious that the elasticity of law works against countries on the periphery and in favor of the holdout bondholders positioned at the apex (Haar, 2016).

5. The global financial network

In one way or another, the biggest questions of our time, ranging from the production of goods and services, sustainable development, job creation and poverty alleviation, financial security for the aging population around the world, etc., are linked to the global financial system, its efficiency, its fairness and its stability. The last few decades have witnessed a number of financial crises, with each successive crisis being deeper, more global, and more destructive than the previous. The global financial system has become very big, highly interconnected, and so complex that experts are in disagreement on whether it is under-regulated, overregulated, or regulated albeit in a completely ineffective way.

Researchers are progressively employing network science to grasp the complexities of the global financial system. A network is a collection of actors—nodes in network terminology—and relationships—ties connecting nodes. In the global financial system, the actors are made up of financial institutions, non-financial institutions, sovereign entities as well as individuals and the ties are the financial contracts actors enter into among themselves. The advantage of adopting a network science approach to understanding financial systems is that it emanates empirically from the relationships that actors really hold instead of making assumptions about the behavior of the agents within the system. The resultant structures are therefore not biased towards any theoretical perspective or normative approach imposed “by the eye of the researcher”. The modeling by network theory, on the contrary, could validate behavioral assumptions economic theories make (Kenett & Havlin, 2015).

Social networks have been intensively studied because they depict patterns of human interactions and their structure controls the extent to which information (and diseases) spread (Sornette, 2017). A similar, behavioral reaction to the fear of infection can be observed in the financial markets. Financial networks spawn chains of claims. During periods of stress, these chains can intensify uncertainties about the actual exposure to counterparties. “Who is really at the end of the chain—Warren Buffett or Bernard Madoff?”. Networks have significant effects on the dynamics of financial instrument pricing through their impact on counterparty uncertainty (Haldane, 2009, p. 14). Counterparties face Knightian uncertainty—which is different from risk—on the exact structure of the network because counterparty risk is not only unknown but also unknowable, therefore, the higher the network dimensionality, the greater the uncertainty (Haldane, 2009).

In *The Architecture of Complexity*, Herbert Simon discusses how networks, both social and physical, exhibit a hierarchical structure. This is not an evolutionary accident. For many networks, hierarchy develops naturally. It is the consequence of a Darwinian selection process where it is only the hierarchical structures that survive to maturity (Simon, 1962). Pistor (2013b) however contends that the specific manifestation of financial networks is anything but natural. The countries that are at the top of the global hierarchy find themselves there as a result of historical contingencies such as winning world wars (in case of the United States) or being beneficiaries of cold wars (as in the case of Germany). Their position has further been solidified by the fact that they (the G7) also coordinated the global financial regulations established in the Basel Accords and the Basel Concordat, and not coincidentally, by the prowess of the international financial institutions they house (Pistor, 2013b).

In a hierarchical network, one country acts as the financial center to which other national financial systems are connected. The other countries are directly connected to only a few other countries, and majority of their connections to other countries are through the central country (Oatley et al., 2013). In a hierarchical international financial system, the probability of a banking crisis spreading to other countries is a function of the origin of the crisis. Since countries on the periphery are connected to only a few other countries, with the few existing ties being relatively weak, any banking crisis in a peripheral country tends to have a very limited effect on the balance sheets of banks of other countries. Furthermore, although countries on the periphery attract assets from the apex, these assets for any single peripheral country are insignificant relative to the total

bank capital of the center. Therefore, it is highly unlikely that an isolated banking crisis in the periphery will inflict significant losses on the center that could trigger a systemic banking crisis in the center. This makes hierarchical systems highly resilient to banking crisis at the periphery (Oatley et al., 2013).

A banking crisis in the apex, on the other hand, can spread throughout the system. Because many countries are connected to the apex, crises at the apex can reduce the value of the assets for many countries at the periphery. The concentration of assets in the apex—a characteristic of a hierarchical system—renders the global financial system vulnerable to crises in the apex. Hierarchical systems, therefore, have dual global consequences of stabilizing the system against majority of the shocks that occur but occasionally causing banking crises in the apex that destabilize the system (Oatley et al., 2013).

Interconnected networks possess a tipping point or knife-edge characteristic. Connections serve as a shock absorber within a given range where the system functions as a mutual insurance mechanism that disperses and dissipates disturbances thus connectivity engenders robustness. The system can, however, flip to the wrong side of the knife-edge when a certain threshold is breached and in such scenarios, interconnectedness acts as a shock-amplifier as losses cascade. The system in this circumstance becomes a mutual incendiary mechanism instead of a mutual insurance device (Haldane, 2013). Gai and Kapadia (2010) applied techniques borrowed from the epidemiological literature to confirm that greater interconnectedness minimizes the probability of widespread default, however, dense financial networks exhibit “robust-yet-fragile” characteristic thus the probability of contagion is generally low, but when it occurs the effects are widespread and difficult to isolate. (Chinazzi, Fagiolo, Reyes, & Schiavo, 2013) also report that higher interconnectedness minimizes the intensity of crisis, as it allows shocks to dissipate faster. However, the hierarchical nature of financial networks implies that countries that are situated at the periphery are more vulnerable in periods of crisis.

Furthermore, the Global Financial Crisis led to changes in the topology of the GFN and the time evolution of its statistical properties although core-periphery structure of the GFN did not change. Some scholars, however, argue that the BRICs (Brazil, Russia, India and China) will play a more significant role in the GFN, and China will emerge as the *primus inter pares* of this group where others also argue that the centrality of the United States will be replaced by a US-EU condominium. Thus, the hierarchical structure of the GFN will be replaced by a flat one (Drezner, 2009; Helleiner & Kirshner, 2012, 2008). The three areas where the robustness of the financial network can be improved are: regulating; mapping; and restructuring (Haldane, 2013).

6. Data

The data from this study is obtained from the World Bank and IMF. We use the consolidated banking statistics for both banking and non-banking sectors from the Bank for International Settlements (BIS) with data available for 162 states in December 1977, 196 states in December 1997 and 212 and 215 states for December 2007 and June 2017 respectively. Table 1 presents the network statistics using data from BIS for 1977, 1997, 2007 and 2017. Table 2 present network statistics using CPIS data for 2001, 2008 and 2016. The second columns of Tables 3–6 contain data on the total banking and non-banking sector liabilities of selected countries for this study.

Data available from the database of BIS contains only interbank deposits for less than 30 countries, we, therefore, build a second network using the Coordinated Portfolio Investment Survey (CPIS) of the International Monetary Fund and comprises total cross-border portfolio assets, holdings of equity securities, and long- and short-term debt securities. We use available data from all foreign portfolio assets for 201 states in December 2001, 218 states in December 2008 and 227 states in December 2016. The second columns of Tables 7–9 contain the total cross-border

Table 1. Network statistics BIS

	1977	1997	2007	2017
Average degree	11.142	15.232	23.302	33.888
Graph density	0.069	0.077	0.110	0.158
Avg. path length	1.938	1.944	1.904	1.844

Table 2. Network statistics CPIS

	2001	2008	2016
Average degree	17.327	22.812	28.216
Graph density	0.086	0.105	0.125
Avg. path length	1.803	1.719	1.694

portfolio holdings in the selected countries for our study. Appendix 1 to Appendix 7 contains network statistics on all the countries included in the study.

7. Network analysis

In this section, we apply some measures in network science to examine the global financial network. We investigate the centrality of countries within the global financial network using four measures of centrality, that are commonly used in network science, namely: betweenness, degree, closeness, and eigenvector. We also measure graph density and average path length. Knowledge of the amount and distribution of network connectivity enables us to study the structural features of the GFN and the relative importance of nodes within this structure. These measures are important for understanding the behavior of the network.

7.1. Degree centrality

Degree centrality is the number of links incident upon a node. This can be interpreted in terms of the sudden risk of a node catching whatever flows through the network. In a directed network where ties have direction, there are two separate measures of degree centrality: indegree and outdegree. Indegree is the number of ties directed to the node and outdegree is the number of ties the node directs to other nodes.

7.2. Closeness centrality

We investigate the closeness centrality value of countries within the global financial network. Closeness centrality is measured based on the distance of each country to every other country in the network. Closeness centrality for country i is given as:

$$(b_i) = \left[\sum_{j=1}^g d(b_i, b_j) \right]^{-1} \tag{1}$$

where d is the path distance between banks i and j . A country is construed to be important if it is relatively close to all other countries. Closeness centrality denotes the influence of a node on the entire network.

7.3. Betweenness centrality

Betweenness centrality depicts how well situated a node is in terms of paths that it lies on. Betweenness centrality of country i in the network is measured as:

$$B(b_i) = \sum_{j < k} \frac{g_{jk}(b_i)}{g_{jk}} \tag{2}$$

Table 3. BIS consolidated banking statistics—1977

Rank	Country	Total liabilities (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	88,570	135.00	150.00	285.00	0.96	6390.74	1.00
2	France	39,771	126.00	140.00	266.00	0.90	5218.03	0.97
3	Germany	25,354	111.00	124.00	235.00	0.83	2860.39	0.91
4	Luxembourg	0.00	109.00	119.00	228.00	0.81	2901.79	0.87
5	Belgium	28,989	108.00	122.00	230.00	0.81	2785.90	0.87
6	Japan	7282	66.00	63.00	129.00	0.63	427.39	0.69
7	United States	73,839	62.00	62.00	124.00	0.62	401.49	0.66
8	Sweden	3362	60.00	57.00	117.00	0.61	352.13	0.63
9	Switzerland	77,482	55.00	57.00	112.00	0.61	343.91	0.60
10	Netherlands	25,407	43.00	41.00	84.00	0.58	125.49	0.53
17	Brazil	6387	11.00	11.00	22.00	0.52	0.08	0.27
24	Argentina	4631	10.00	10.00	20.00	0.52	0.08	0.26
28	Soviet Union	4473	10.00	10.00	20.00	0.52	0.08	0.25
31	South Africa	1059	10.00	9.00	19.00	0.51	0.08	0.25
36	India	1950	9.00	8.00	17.00	0.51	0.08	0.24
52	China	2541	8.00	8.00	16.00	0.51	0.08	0.22
59	Nigeria	791	8.00	8.00	16.00	0.51	0.08	0.21

Table 4. BIS consolidated banking statistics: BIS 1997

Rank	Country	Total liabilities (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	1,255,251	169.00	190.00	359.00	0.98	6947.50	1.00
2	France	361,655	167.00	170.00	337.00	0.89	5941.88	0.99
3	Switzerland	517,838	164.00	188.00	352.00	0.97	6289.17	0.98
4	Germany	465,653	140.00	152.00	292.00	0.82	3193.26	0.91
5	Luxembourg	227,547	130.00	169.00	299.00	0.88	3172.06	0.84
6	Belgium	181,837	128.00	179.00	307.00	0.92	3600.96	0.84
7	Japan	729,500	103.00	106.00	209.00	0.69	1342.44	0.75
8	United States	1,192,700	104.00	120.00	224.00	0.72	1646.27	0.75
9	Sweden	34,380	94.00	102.00	196.00	0.68	919.58	0.71
10	Ireland	53,932	82.00	78.00	160.00	0.63	934.60	0.64
23	South Africa	9000	14.00	13.00	27.00	0.52	0.02	0.26
28	China	65,078	13.00	14.00	27.00	0.52	0.02	0.26
37	Russia	14,806	13.00	13.00	26.00	0.52	0.02	0.26
44	Argentina	36,613	12.00	13.00	25.00	0.52	0.02	0.24
45	Brazil	60,108	12.00	13.00	25.00	0.52	0.02	0.24
47	India	20,993	12.00	12.00	24.00	0.51	0.02	0.24
78	Nigeria	4461	10.00	7.00	17.00	0.51	0.02	0.21

Table 5. BIS consolidated banking statistics: BIS 2007

Rank	Country	Total liabilities (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	5,212,740	184.00	205.00	389.00	0.97	6228.53	1.00
2	Switzerland	1,676,148	183.00	201.00	384.00	0.95	5448.84	0.99
3	France	1,172,837	183.00	192.00	375.00	0.92	5034.64	0.99
4	Germany	2,075,225	167.00	179.00	346.00	0.87	3269.83	0.96
5	Belgium	742,015	158.00	189.00	347.00	0.91	3403.02	0.92
6	Luxembourg	891,302	151.00	177.00	328.00	0.86	2878.95	0.90
7	South Korea	83,026	148.00	81.00	229.00	0.62	945.89	0.89
8	Chinese Taipei	138,220	140.00	104.00	244.00	0.66	1793.87	0.85
9	Austria	135,875	122.00	149.00	271.00	0.77	1437.97	0.81
10	Denmark	170,129	122.00	144.00	266.00	0.76	1603.90	0.80
24	Brazil	67,016	34.00	52.00	86.00	0.57	36.91	0.39
33	South Africa	60,181	23.00	21.00	44.00	0.53	0.52	0.33
34	China	281,943	22.00	23.00	45.00	0.53	0.35	0.32
38	Russia	232,145	21.00	21.00	42.00	0.53	0.13	0.31
39	India	49,537	21.00	21.00	42.00	0.53	0.11	0.31
41	Argentina	29,386	21.00	20.00	41.00	0.52	0.12	0.31
87	Nigeria	36,781	14.00	14.00	28.00	0.52	0.00	0.23

Table 6. BIS consolidated banking statistics: BIS 2017

Rank	Country	Total Liabilities (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	Switzerland	662,119	203.00	212.00	415.00	0.99	3901.75	1.00
2	Belgium	431,984	190.00	206.00	396.00	0.96	3006.40	0.97
3	France	1,178,770	186.00	195.00	381.00	0.92	2500.26	0.95
4	United Kingdom	4,084,290	186.00	206.00	392.00	0.96	2933.43	0.95
5	Denmark	171,663	177.00	191.00	368.00	0.90	2216.37	0.93
6	Luxembourg	900,401	178.00	198.00	376.00	0.93	2416.54	0.92
7	South Korea	119,156	171.00	154.00	325.00	0.78	1582.45	0.90
8	Germany	1,442,919	160.00	183.00	343.00	0.87	1587.35	0.87
9	Austria	99,910	158.00	197.00	355.00	0.93	2113.08	0.86
10	Chinese Taipei	248,738	159.00	198.00	357.00	0.93	2439.89	0.85
21	United States	3,420,831	91.00	148.00	239.00	0.76	479.45	0.60
22	South Africa	44,437	91.00	110.00	201.00	0.67	472.06	0.58
28	Brazil	91,338	44.00	60.00	104.00	0.58	33.36	0.39
33	China	713,439	28.00	28.00	56.00	0.54	0.21	0.32
39	India	67,259	27.00	27.00	54.00	0.53	0.10	0.31
42	Argentina	22,091	27.00	27.00	54.00	0.53	0.07	0.31
69	Nigeria	26,698	24.00	22.00	46.00	0.53	0.03	0.29
74	Russia	137,735	25.00	24.00	49.00	0.53	0.11	0.29

Table 7. Total foreign portfolio assets: CPIS 2001

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United States	3,105,841	66	122	188	0.719424	1242.20601	1
2	United Kingdom	1,289,876	62	108	170	0.682594	475.789563	0.962269
3	Germany	1,167,313	61	94	155	0.649351	339.577947	0.960013
4	France	776,583	60	93	153	0.649351	354.995721	0.940836
5	Netherlands	705,536	60	93	153	0.649351	390.213597	0.936253
6	Italy	579,551	58	116	174	0.704225	920.227504	0.915162
7	Japan	540,800	58	81	139	0.623053	286.645998	0.910206
8	Switzerland	218,587	57	121	178	0.716846	856.830988	0.90189
9	Canada	319,795	56	83	139	0.626959	272.054646	0.89217
10	Luxembourg	525,324	55	138	193	0.763359	1291.279158	0.882848
24	Russia	26,254	46	26	72	0.510204	85.801083	0.769223
25	Brazil	81,399	45	62	107	0.581395	177.002908	0.751578
26	Argentina	25,154	46	32	78	0.530504	33.892572	0.742457
31	China	20,417	38	0	38	0	0	0.667554
40	India	15,521	36	0	36	0	0	0.615622
41	South Africa	19,895	35	41	76	0.547945	77.408811	0.615565
77	Nigeria	370	16	0	16	0	0	0.309923

Table 8. Total foreign portfolio assets: CPIIS 2008

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	2,807,752	72	155	227	0.777778	1448.659277	1
2	United States	6,395,458	71	127	198	0.704545	668.232037	0.988072
3	France	2,074,807	69	138	207	0.733108	769.182544	0.965975
4	Germany	2,742,396	69	115	184	0.680251	263.020762	0.965975
5	Netherlands	1,518,841	69	124	193	0.7	470.689816	0.959317
6	Luxembourg	1,483,186	68	154	222	0.775	973.437728	0.952481
7	Ireland	1,005,120	68	118	186	0.684543	458.334242	0.952472
8	Canada	632,040	67	88	155	0.62536	136.851461	0.944864
9	Cayman Islands	1,312,301	67	68	135	0.584906	109.572701	0.94394
10	Switzerland	470,142	67	133	200	0.72093	598.046203	0.940608
13	China	265,317	62	0	62	0	0	0.89003
21	Brazil	204,944	60	80	140	0.604457	241.306515	0.861835
23	Russian Federation	74,404	60	50	110	0.554987	100.265068	0.859117
31	India	198,402	54	38	92	0.527981	30.287851	0.769033
33	South Africa	66,837	52	63	115	0.581769	154.109333	0.762256
47	Argentina	13,376	42	39	81	0.535802	9.441203	0.648802
99	Nigeria	1987	21	0	21	0	0	0.346026

Table 9. Total foreign portfolio assets: CPIIS 2016

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector Centrality
1	United States	12,990,563	79	116	195	0.675758	531.5116	1
2	United Kingdom	3,803,554	77	165	242	0.793594	1244.787395	0.990064
3	Germany	2,864,659	76	136	212	0.719355	305.990482	0.985741
4	Ireland	1,727,323	76	140	216	0.728758	369.154525	0.98501
5	Netherlands	2,057,739	75	132	207	0.710191	346.36158	0.976496
6	Cayman Islands	2,867,494	72	138	210	0.724026	398.76992	0.973433
7	Luxembourg	3,075,087	74	177	251	0.828996	1356.742817	0.971679
8	France	3,085,208	76	149	225	0.750842	630.472339	0.969611
9	Japan	2,129,430	73	126	199	0.696875	256.449283	0.964918
10	Switzerland	924,891	72	151	223	0.755932	565.903477	0.961788
11	Brazil	414,477	74	103	177	0.648256	394.92982	0.95538
15	China, P.R.: Mainland	844,369	70	124	194	0.692547	217.349643	0.946727
28	South Africa	164,933	64	74	138	0.597855	91.91698	0.87178
29	Russian Federation	152,844	67	81	148	0.605978	79.920683	0.873421
30	India	418,455	64	50	114	0.55611	78.747081	0.872399
42	Argentina	56,742	55	36	91	0.533493	3.285962	0.800659
78	Nigeria	77,356	35	0	35	0	0	0.537761

Where g_{jk} is the number of shortest paths between j and k and $g_{jk}(b_i)$ is the number of shortest paths between country j and k that country i resides on. Betweenness centrality is based on the concept that a vertex is central if it is required to connect to other pair of vertices. A node with a high betweenness centrality has the potential of influencing the spread of information through the network.

7.4. Eigenvector centrality

The eigenvector centrality is given as:

$$C(G, \beta) = (I - \beta G)^{-1} G \mathbf{1} \quad (3)$$

where β is the weight, G is the adjacency matrix and I is the identity matrix. Eigenvector centrality is based on the concept that a given node is more central when there are more connections within its local network. More connections in its local network imply that the node is more powerful. Relative scores are assigned to all nodes in the network based on the concept that being connected to high-scoring nodes contribute more to the score of a given node than equal connections to nodes lower scores.

7.5. Graph density

The magnitude of financial contagion reveals a kind of transitional phase: so far as the extent of negative shocks that affect financial markets are sufficiently small, a more densely connected financial system enhances financial stability (Acemoglu, Ozdaglar, & Tahbaz-Salehi, 2015). In mathematics, a dense graph is a graph in which the number of edges is close to the maximal number of edges. The opposite—a graph with only a few edges—is a sparse graph. For directed simple graphs, the graph density is defined as:

$$D = \frac{|E|}{|V|(|V| - 1)} \quad (4)$$

where E is the number of edges and V is the number of vertices in the graph.

7.6. Average path length

Average path length is a concept in network topology that is defined as the average number of steps along the shortest paths for all possible pairs of network nodes. It is a measure of the efficiency of information or mass transport on a network. The average path length is given as:

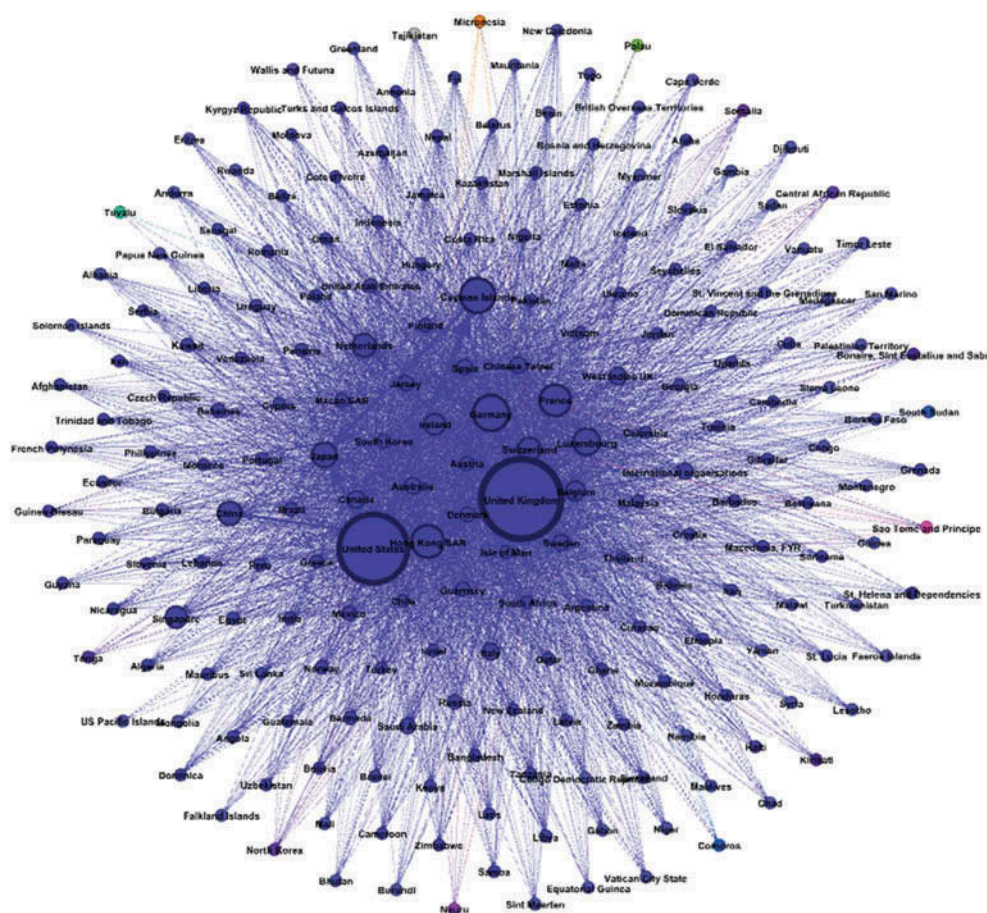
$$AvPL = \frac{\sum_{i \geq j} l(i, j)}{\frac{n(n-1)}{2}} \quad (5)$$

8. Results

The weighted, directed networks constructed from both BIS and CPIS data indicate that in line with the LTF, the contemporary global financial system is hierarchical. Our result from BIS and CPIS shows that the average degree increased from 11.142 to 33.888 and 17.327 to 28.216, respectively. This implies that there is an increasing interconnectedness among countries in the global financial network. (Chinazzi et al., 2013) report that higher interconnectedness minimizes the severity of crisis, as adverse shocks to dissipate quicker in a highly connected network.

Furthermore, the graph density increased from 0.069 to 0.158 for BIS data and 0.086 to 0.125 for CPIS data. The average path length of the global financial network has also decreased over time. When the magnitude of negative shocks to financial institutions is appropriately small, a more densely connected financial network augments financial stability. Yet, beyond a certain point, a densely connected financial network becomes more fragile as the dense interconnectedness acts as a means for propagating shocks, therefore, the same features that contribute to resilience under certain conditions may act as significant sources of systemic risk under other conditions (Acemoglu et al., 2015).

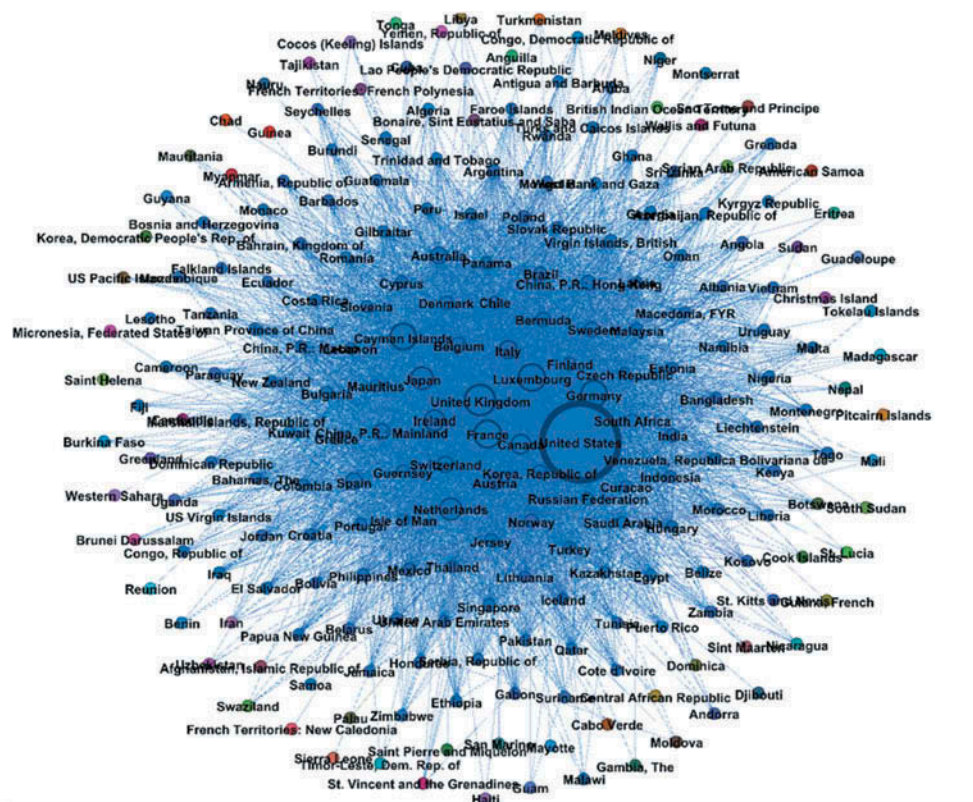
Figure 1. BIS cross-border banking network as at June 2017.



Results from BIS data (Figure 1 and Table 6) show that the United Kingdom lost its position as the most important node in the GFN to Switzerland as measured by our selected measures of centrality (Appendix 1.4). It, however, remains the country with the largest amount of cross-country banking and non-banking sector holdings followed by the United States as at June 2017. Possibly, Brexit—the prospective withdrawal of the United Kingdom from the European Union—may have contributed to the decline in centrality of the United Kingdom in the cross-border banking and non-banking GFN. In a referendum on 23 June 2016, 51.9% of the United Kingdom electorate who participated in the referendum voted to leave the European Union. The United Kingdom government invoked Article 50 of the Treaty on the European Union on 29 March 2017. The UK is thus due to leave the EU on 29 March 2019 (BBC, 2017). Sowells (2017), for example, argues that Brexit could have a major impact on financial services in the United Kingdom, depending on how it unfolds while. For the first time since 1930, the City of London lost in British political life. For the past 30 years, no other country has benefited more from the free movement of capital within advanced economies than the City but London’s status is potentially threatened due to the Brexit vote (Thompson, 2016).

Results from CPIS data (Figure 2 and Table 9) on the other hand show that the United States is the most important node in the GFN on cross-border portfolio holdings. United States, however, lost its position in all our selected measures of centrality including the most important node in the GFN on cross-border portfolio holdings in 2008 to the United Kingdom although it still had the largest holdings in cross-border portfolio followed by the United Kingdom in that year (Table 8). Results from December 2016 however shows that United States has reclaimed its number one

Figure 2. CPIS cross-country portfolio holdings December 2016.



position on all measures of centrality. Our findings are in line with Chinazzi et al. (2013) who report in the *Post-Mortem Examination of the International Financial Network* that in 2008, the United Kingdom replaced the United States as the number one country using the binary hub centrality (BHC) measure although core-periphery structure of the GFN did not change. In line with Wincoff (2015), we find that there is a continuation of the prominence of the United States as the most important node in the GFN and a lack of emergence of any of the major emerging economies into the core of the GFN.

Table 10 shows the GDP of the selected countries in this study and Table 11 shows foreign-exchange reserves of these countries. From Tables 10 and 11, it can be seen that some emerging economies have improved significantly in terms of GDP and international reserves. China, for example, as at 2017 was the second largest economy by GDP in the world and held the largest foreign reserves, improving significantly from its position in 1977. Brazil, Argentina and India have also shown significant improvements in GDP from 1977 to 2017. Although all these emerging countries have made significant improvements in terms of GDP and international reserves relative to other advanced countries included in Table 5 to Table 9, none of these emerging economies have been able to make it among the top ten in our network metrics. Table 3 to Table 11, therefore, confirm that among the most significant 10 nodes in GFN, there has been no evidence of flattening. Contrary to Simmons (2001) and Drezner (2008), we find that an increasing market size did not translate into increase in ranking or prestige among the most important nodes in the GFN.

The apex of the GFN is mainly populated by the United States and Western European countries. Data from BIS shows that the United Kingdom was at the apex and thus the most important node of the GFN in 1977, 1997, and 2007 but Switzerland replaced the United Kingdom as the most important node in 2017. Data from CPIS, on the other hand, shows the United States as the most central country although it lost its position in 2008 to the United Kingdom and regained top

Table 10. GDP (US\$)

	1977	1997	2007	2017
United States	2 085 951 000 000	8 608 515 000 000	14 477 635 000 000	19 390 604 000 000
Japan	721 411 786 537	4 414 732 843 544	3 552 182 311 653	12 237 700 479 375
Germany	598 226 205 424	2 218 689 375 141	3 439 953 462 907	3 677 439 129 777
France	410 279 486 494	1 552 483 628 029	3 074 359 743 898	2 622 433 959 604
United Kingdom	263 066 457 352	1 452 884 917 959	2 657 213 249 384	2 597 491 162 898
Brazil	176 171 284 312	961 603 952 952	1 397 084 345 950	2 582 501 307 216
China	174 938 098 827	883 199 625 325	1 299 705 247 686	2 055 505 502 225
Netherlands	125 395 875 999	410 320 300 470	1 201 111 768 410	1 577 524 145 963
India	119 866 746 574	404 926 534 140	1 122 679 154 632	1 530 750 923 149
Sweden	93 136 775 103	292 859 000 000	479 913 034 322	678 887 336 848
Belgium	83 283 328 419	286 519 135 327	471 821 105 940	637 590 419 269
Argentina	56 781 000 101	264 477 727 279	388 691 445 387	492 681 283 049
South Africa	40 649 724 011	254 813 599 459	319 423 370 134	416 595 666 397
Nigeria	36 035 407 725	152 586 154 514	299 033 511 000	375 770 713 743
Luxembourg	3 922 895 892	82 826 146 132	287 530 508 431	349 419 343 614
Switzerland	—	35 822 342 618	166 451 213 396	324 871 968 807
Russia	—	19 731 912 494	50 888 134 410	62 404 461 275
			na	na

Source: World Bank

position in 2016. Data from both BIS and CPIS shows that the top 10 most important nodes in the GFN are mainly the United States and Western European countries. Regardless of the significant improvement in GDP and international foreign reserves by emerging countries particularly China, India, Brazil and Russia, none of these countries have been able to make it among the top 10 nodes in the GFN. This shows that there is no flattening of the GFN contrary to Drezner (2009), Kirshner (2008) and Helleiner and Kirshner (2012).

The hierarchical nature of the GFN explains why law tends to be relatively more elastic at the apex and less elastic at the periphery. The given the centrality of the nodes at the apex to other nodes in the network, a strict application of the law *ex ante* during periods of stress may pose systemic risk to the network as a whole which may lead to the collapse of the system with devastating consequences. Peripheral nodes pose negligible systemic risk to the network given the minimal connections of these nodes to other nodes in the network. A stringent application of legal commitments of such nodes even in periods of stress, therefore, pose no risk to network as the collapse of such nodes has negligible consequence to the network.

We find that almost all the countries in Latin America, Eastern Europe, Africa and Asia with the exception of Japan, are all found at the periphery of the GFN. These countries have relatively low centrality measures. Since countries on the periphery are connected to only a few other countries with the few existing ties being relatively weak, any crisis in a peripheral country will have a very limited effect on the balance sheets other countries within the GFN. By virtue of their position and size of balance sheets, it becomes obvious the elasticity of law in the GFN will not work in their favor.

Overall, the most central countries in the GFN has remained relatively unchanged over time. Our results are partially contrary to Oatley et al. (2013) who conclude that global crises are not sufficient to change the system structure of the GFN arguing that there must be a large gap between the underlying distribution of fitness and the existing hierarchical structure. On the other hand, our study supports the argument of Oatley et al. (2013) that the United States is the most important node in the GFN and the center of the network.

9. Conclusion

Prevailing finance and economic theories implicitly assume a system of laws which are taken as given and thus a critical analysis of the influence of law in finance is largely ignored in the study of financial market behavior. Pistor's (2013b) LTF, however, throws some light on the fact that law is "in" finance and prices through the misconstrued implicit assumption of equality before the law, which according to the LTF, is in direct conflict with finance given its hierarchical nature. In this study, we test the hierarchical assertion of the LTF using data from the Bank for International Settlements (BIS) and Coordinated Portfolio Investment Survey (CPIS) from the International Monetary Fund (IMF). In line with the LTF, we find that the GFN is a hierarchical network with the United States at the apex surrounded by other western European countries and Japan with other countries at the periphery using data from CPIS. Our data from BIS reveal that the United Kingdom has lost its position as the most important node in the GFN in all our measures of centrality. Furthermore, no emerging economy has been able to make it among the top 10 most central nodes in the global finance network although these economies have made significant improvements in GDP and international reserves with China, for example, ranked as the second largest economy and the largest holder of international reserves. There is, therefore, no evidence of a flattening of the GFN.

The elasticity of law is a function of one's position within the GFN and thus countries at the apex continue to receive preferential treatment. Countries at the periphery of the GFN, on the other hand, suffer the negative consequences of the elasticity of law. The contemporary financial system is in conflict with the idea of equality of all before the law. The elasticity of law in finance, however, can be attributed to the architecture of the GFN. Given its hierarchical nature, the nodes at the apex of the GFN are very critical for the survival of the network as a whole and therefore a stringent application of the law in times of stress may not only negatively affect the nodal state but also all other states connected to this state

due to its centrality and may, therefore, pose a systemic risk to the whole network. Peripheral nodes, on the other hand, do not enjoy such centrality and thus any stringent application of the law, no matter how debilitating, will not pose any significant risk to the network.

Subsequent to the Global Financial Crisis, financial regulations globally distinguish between financial institutions based on the systemic risk they pose to the financial system. These “systemically important” institutions are subjected to more stringent regulations than other smaller institutions within the financial network. Our evaluation of the GFN reveals that this argument is also applicable to countries at the apex of the GFN. The hierarchical nature implies that some countries are more central than others and therefore pose systemic risk to the GFN while others can fail with no systemic consequences. The approach to regulating the global financial system should, therefore, focus on more stringent rules for the most central countries. This could be more effective in ensuring stability in the global financial system.

Funding

The authors received no direct funding for this research.

Author details

Prince Kwasi Sarpong¹

E-mail: Pk.sarpong@cfps.co.za

Jugjith Deodutt²

E-mail: DEODUTTJ@ukzn.ac.za

¹ Centre for Financial Planning Studies, Cape Town, South Africa.

² School of Accounting, Economics and Finance, University of KwaZulu-Natal, Durban, South Africa.

Citation information

Cite this article as: Legal theory of finance: Evidence from global financial networks, Prince Kwasi Sarpong & Jugjith Deodutt, *Cogent Economics & Finance* (2019), 7: 1593071.

Notes

1. Ben Bernanke, the former chairman of the Federal Reserve Bank of the US, famously defined this role as “we do everything it takes” to save the financial system.
2. The agreements can be found at: https://www.newyorkfed.org/markets/liquidity_swap.html.
3. “Vulture Funds and Poor Country Debt: Recent Developments and Policy Responses”, Jubilee USA Network, Briefing Note No. 4, April 2008, p. 3.
4. African Development Bank, “Vulture Funds in the Sovereign Debt Context”, at: <http://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/african-legal-supportfacility/vulture-funds-in-the-sovereign-debt-context/>.
5. 727 F.3d 230 (2d Cir. 2013), cert. denied, 134 S. Ct. 2819 (2014).
6. Republic of Argentina v. NML Capital, Ltd., (2d Cir. 26 October 2012) (Nos. 12–105) p 18.
7. A/HRC/14/21, 20 April 2010, para. 24.
8. A/HRC/33/54.

Cover image

Source: Author.

References

- Acemoglu, D., Ozdaglar, A., & Tahbaz-Salehi, A. (2015). Systemic risk and stability in financial networks. *The American Economic Review*, 105(2), 564–608. doi:10.1257/aer.20130456
- Amorello, L. (2016). Europe goes ‘countercyclical’: A legal assessment of the new countercyclical dimension of the CRR/CRD IV package. *European Business Organization Law Review*, 17(1–2), 137–171. doi:10.1007/s40804-016-0032-4
- Bailey, M. J., & Rubin, P. H. (1994). A positive theory of legal change. *International Review of Law and Economics*, 14(4), 467–477. doi:10.1016/0144-8188(94)90027-2
- BBC. (2017). Article 50: Theresa May to trigger Brexit process next week. [Online] Retrieved from <http://www.bbc.com/news/uk-politics-39325561>
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2003). Law and finance: Why does legal origin matter? *Journal of Comparative Economics*, 31(4), 653–675. doi:10.3386/w9379
- Bonavita, J. (2016). Asset securitisation in Germany: Risk transfer or legal transformation? *European Business Organization Law Review*, 17(1–2), 15–39. doi:10.1007/s40804-016-0029-z
- Chinazzi, M., Fagiolo, G., Reyes, J. A., & Schiavo, S. (2013). Post-mortem examination of the international financial network. *Journal of Economic Dynamics and Control*, 37(8), 1692–1713. doi:10.1016/j.jedc.2013.01.010
- Deakin, S. (2013). The legal theory of finance: Implications for methodology and empirical research. *Journal of Comparative Economics*, 41(2), 338–342. doi:10.1016/j.jce.2013.03.005
- Drezner, D. W. (2008). *All politics is global: Explaining international regulatory regimes*. Princeton, NJ: Princeton University Press.
- Drezner, D. W. (2009). Bad debts: Assessing China’s financial influence in great power politics. *International Security*, 34(2), 7–45. doi:10.1162/isec.2009.34.2.7
- Fisman, R., Jakiela, P., Kariv, S., & Markovits, D. (2015). The distributional preferences of an elite. *Science*, 349(6254), aab0096. doi:10.1126/science.aab0096
- Gai, P., & Kapadia, S. (2010). Contagion in financial networks. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science*, 4662120(2401). doi:10.1098/rspa.2009.0410
- Ghent, A. C., & Kudlyak, M. (2011). Recourse and residential mortgage default: Evidence from US states. *Review of Financial Studies*, 24(9), 3139–3186. doi:10.1093/rfs/hhr055
- Guzman, M., & Stiglitz, J. E. (2016). How hedge funds held Argentina for ransom. Retrieved from <https://www8.gsb.columbia.edu/faculty/jstiglitz/sites/jstiglitz/files/How%20Hedge%20Funds%20Held%20Argentina%20for%20Ransom%20-%20The%20New%20York%20Times.pdf>
- Haar, B. (2016). Freedom of contract and financial stability through the lens of the legal theory of finance (LTF)-LTF approaches to ABS, pari passu-clauses, CCPs, and Basel III. *Sustainable architecture for finance in Europe*, 141. Retrieved from <https://ssrn.com/abstract=2831713>

- Haldane, A. (2009). Rethinking financial network. *Speech delivered at the Financial Student Association*. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.177.1008&rep=rep1&type=pdf>
- Haldane, A. G. (2013). Rethinking the financial network. In S. A. Jansen, E. Schtoter & N. Stehr (Eds.), *Fragile stabilität–Stabile fragilität* (pp. 243–278). Wiesbaden: Springer VS.
- Hamilton, T. (2014). Why law school's love affair with economics is terrible for the American legal system. Retrieved from https://www.salon.com/2014/07/26/why_law_schools_love_affair_with_economics_needs_to_stop/
- Hayek, F. (1960). *The constitution of liberty*. Chicago, IL: The University of Chicago Press.
- Helleiner, E., & Kirshner, J. (Eds.). (2012). *The future of the dollar*. Ithaca, NY: Cornell University Press.
- IMF. (2017). Download entire world economic outlook database. Retrieved from <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/download.aspx>
- Joseph, J. (2010). The problem with networks theory. *Labor History*, 51(1), 127–144. doi:10.1080/00236561003654826
- Kapadia, A. (2013). Europe and the logic of hierarchy. *Journal of Comparative Economics*, 41(2), 436–446. doi:10.1016/j.jce.2013.03.013
- Kenett, D. Y., & Havlin, S. (2015). Network science: A useful tool in economics and finance. *Mind & Society*, 14(2), 155–167. doi:10.1007/s11299-015-0167-y
- Kirshner, J. (2008). Dollar primacy and American power: What's at stake? *Review of International Political Economy*, 15(3), 418–438. doi:10.1080/09692290801928798
- La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1998). Law and finance. *Journal of Political Economy*, 106(6), 1113–1155. doi:10.1086/250042
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (2008). The economic consequences of legal origin. *Journal of Economic Literature*, 46(2), 285–332. doi:10.1257/jel.46.2.285
- Laryea, T. (2010). Donegal v. Zambia and the persistent debt problems of low-income countries. *Law and Contemporary Problems*, 73(4), 193–200. Retrieved from <http://www.jstor.org/stable/25800676>
- Mahoney, P. G. (2001). The common law and economic growth: Hayek might be right. *Journal of Legal Studies*, 2(30), 503–525. doi:10.1086/322053
- McCluskey, M., Pasquale, F., & Taub, J. (2017). Law and economics: Contemporary approaches. *Yale Law & Policy Review*, 35(1), 297–308. Retrieved from <https://ylpr.yale.edu/law-and-economics-contemporary-approaches>
- Mehrling, P. (2013). The inherent hierarchy of money. In L. Taylor, A. Rezaei, & T. Michl (Eds.), *Social fairness and economics: Economic essays in the spirit of Duncan Foley* (pp. 169–394). London: Taylor & Francis.
- Merryman, J. H. (1985). *The civil law tradition: An introduction to the legal systems of Western Europe and Latin America*. Palo Alto, CA: Stanford Univ. Press.
- North, D., & Weingast, B. (1989). Constitutions and commitment: The evolution of institutions governing public choice in Seventeenth-Century England. *The Journal of Economic History*, 49(4), 803–832. Retrieved from <http://www.jstor.org/stable/2122739>
- Oatley, T., Winecoff, W. K., Pennock, A., & Danzman, S. B. (2013). The political economy of global finance: A network model. *Perspectives on Politics*, 11(1), 133–153. doi:10.1017/S1537592712003593
- Pistor, K. (2013a). Law in finance. *Journal of Comparative Economics*, 41(2), 311–314. doi:10.1016/j.jce.2013.03.002
- Pistor, K. (2013b). Legal Theory of finance. *Journal of Comparative Economics*, 41(2), 315–330. doi:10.1016/j.jce.2013.03.003
- Poon, J. P. (2003). Hierarchical tendencies of capital markets among international financial centers. *Growth and Change*, 34(2), 135–156. doi:10.1111/1468-2257.00211
- Posner, R. A. (2014). *Economic analysis of the law*. Alphen aan den Rijn, Netherlands: Wolters Kluwer Law & Business.
- Priest, G. L. (1977). The common law process and the selection of efficient rules. *Journal of Legal Studies*, 6(1), 65–82. doi:10.1086/467563
- Rona-Tas, A., & Guseva, A. (2013). Information and consumer credit in Central and Eastern Europe. *Journal of Comparative Economics*, 41(2), 420–435. doi:10.1016/j.jce.2013.03.012
- Rubin, P. H. (1977). Why is the common law efficient? *Journal of Legal Studies*, 6(1), 51–64. doi:10.1086/467562
- Rubin, P. H. (1982). Common law and statute law. *Journal of Legal Studies*, 11(2), 205–233. doi:10.1086/467698
- Schwarz, S. L. (2017). A model-law approach to restructuring unsustainable sovereign debt. *Center for International Governance Innovation, Issue Policy brief No. 64*. Retrieved from <https://www.cigionline.org/publications/model-law-approach-restructuring-unsustainable-sovereign-debt>
- Simmons, B. A. (2001). The international politics of harmonization: The case of capital market regulation. *International Organization*, 55(3), 589–620. doi:10.1162/00208180152507560
- Simon, H. (1962). The Architecture of Complexity. *Proceedings of the American Philosophical Society*, 106(6), 467–482. Retrieved from <http://www.jstor.org/stable/985254>
- Sornette, D. (2017). *Why stock markets crash: Critical events in complex financial systems*. Princeton, NJ: Princeton University Press.
- Sourbron, L. A., & Vereeck, L. (2017). To pay or not to pay? Evaluating the Belgian law against vulture funds. *Journal of Globalization and Development*, 8(1). doi:10.1515/jgd-2017-0010
- Sowels, N. (2017). Brexit and UK-based financial services. *Revue Française De Civilisation Britannique. French Journal of British Studies*, 22(XXII–2). doi:10.4000/rfcb.1331
- Stephenson, M. C. (2009). Legal realism for economists. *The Journal of Economic Perspectives*, 23(2), 191–211. doi:10.1257/jep.23.2.191
- Tarkka, J. (2009). The North European model of early central banking. In H. Herrmann (Ed.), *Designing central banks* (pp. 34–65). London: Taylor & Francis.
- Thompson, H. (2016). The city meets democratic politics. In H. Thompson, L. Talani (Eds.), et al., *The impact of Brexit on the city and the British economic model, policy network and Sheffield Political Economy Research Institute, 'diverging capitalisms' series, brief 1, 18 July 2016*. Retrieved from http://www.policy-network.net/publications_detail.aspx?ID=6120
- Weidemaier, M. (2013). Sovereign debt after NML v. Argentina. *Capital Markets Law Journal*, 8, 123–131. doi:10.1093/cmlj/kmt004
- Winecoff, W. K. (2015). Structural power and the global financial crisis: A network analytical approach. *Business and Politics*, 17(3), 495–525. doi:10.1515/bap-2014-0050

Appendix 1. Rank of countries by eigenvector centrality (BIS)

Table A1.1. BIS rank of countries by eigenvector centrality—1977

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	88 570.00	135	150	285	0.96	6390.74	1
2	France	39 771.00	126	140	266	0.9	5218.03	0.97
3	Germany	25 354.00	111	124	235	0.83	2860.39	0.91
4	Luxembourg	—	109	119	228	0.81	2901.79	0.87
5	Belgium	28 989.00	108	122	230	0.81	2785.9	0.87
6	Japan	7 282.00	66	63	129	0.63	427.39	0.69
7	United States	73 839.00	62	62	124	0.62	401.49	0.66
8	Sweden	3 362.00	60	57	117	0.61	352.13	0.63
9	Switzerland	77 482.00	55	57	112	0.61	343.91	0.6
10	Netherlands	25 407.00	43	41	84	0.58	125.49	0.53
11	Denmark	3 040.00	31	48	79	0.59	109.85	0.43
12	Ireland	2 044.00	29	15	44	0.53	19.09	0.41
13	Bahamas	20 827.00	12	11	23	0.52	0.15	0.29
14	Canada	12 598.00	12	12	24	0.52	0.15	0.29
15	Austria	7 297.00	11	12	23	0.52	0.08	0.27
16	Australia	1 034.00	11	10	21	0.52	0.08	0.27
17	Brazil	6 387.00	11	11	22	0.52	0.08	0.27
18	Spain	9 415.00	11	12	23	0.52	0.08	0.27

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
19	Finland	1 373.00	11	13	24	0.52	0.42	0.27
20	Italy	14 145.00	11	12	23	0.52	0.08	0.27
21	Norway	2 808.00	11	11	22	0.52	0.08	0.27
22	Panama	7 294.00	11	11	22	0.52	0.08	0.27
23	Portugal	1 243.00	11	10	21	0.52	0.08	0.27
24	Argentina	4 631.00	10	10	20	0.52	0.08	0.26
25	Hong Kong SAR	7 223.00	10	11	21	0.52	0.08	0.26
26	Indonesia	2 369.00	10	9	19	0.51	0.08	0.26
27	Mexico	5 348.00	10	11	21	0.52	0.08	0.26
28	Soviet Union	4 473.00	10	10	20	0.52	0.08	0.25
29	Chile	890.00	10	8	18	0.51	0.08	0.25
30	Singapore	7 816.00	10	12	22	0.52	0.08	0.25
31	South Africa	1 059.00	10	9	19	0.51	0.08	0.25
32	Colombia	1 348.00	9	9	18	0.51	0.08	0.24
33	Liberia	1 306.00	9	9	18	0.51	0.08	0.24
34	Peru	470.00	9	9	18	0.51	0.08	0.24
35	Venezuela	8 390.00	9	9	18	0.51	0.08	0.24
36	India	1 950.00	9	8	17	0.51	0.08	0.24
37	Turkey	593.00	9	11	20	0.52	0.08	0.24
38	International organisations	7 053.00	9	9	18	0.51	0.08	0.24
39	Egypt	2 763.00	9	9	18	0.51	0.08	0.23
40	Israel	3 852.00	9	9	18	0.51	0.08	0.23
41	Yugoslavia	2 372.00	9	8	17	0.51	0.08	0.23

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
42	Philippines	1 840.00	9	9	18	0.51	0.08	0.23
43	Poland	443.00	9	12	21	0.52	0.08	0.23
44	Iran	6 976.00	9	8	17	0.51	0.08	0.23
45	Saudi Arabia	22 508.00	9	8	17	0.51	0.08	0.23
46	Cayman Islands	13 925.00	9	10	19	0.52	0.08	0.23
47	Hungary	1 034.00	9	9	18	0.51	0.08	0.23
48	Malaysia	1 981.00	8	8	16	0.51	0.08	0.22
49	Chinese Taipei	3 536.00	8	9	17	0.51	0.08	0.22
50	Bermuda	4 069.00	8	9	17	0.51	0.08	0.22
51	Ecuador	632.00	8	9	17	0.51	0.08	0.22
52	China	2 541.00	8	8	16	0.51	0.08	0.22
53	Greece	3 470.00	8	9	17	0.51	0.08	0.22
54	Pakistan	640.00	8	6	14	0.51	0.02	0.21
55	Algeria	2 027.00	8	8	16	0.51	0.08	0.21
56	Iraq	4 568.00	8	7	15	0.51	0.08	0.21
57	Kuwait	4 835.00	8	7	15	0.51	0.08	0.21
58	Libya	3 070.00	8	5	13	0.51	0.02	0.21
59	Nigeria	791.00	8	8	16	0.51	0.08	0.21
60	Serbia and Montenegro	1 077.00	9	7	16	0.51	0.08	0.21
61	Bulgaria	517.00	8	8	16	0.51	0.08	0.21
62	Romania	213.00	8	9	17	0.51	0.15	0.21
63	Bahrain	3 362.00	8	8	16	0.51	0.15	0.21
64	South Korea	3 045.00	7	8	15	0.51	0.08	0.2

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
65	Thailand	1 189.00	7	8	15	0.51	0.08	0.2
66	Netherlands Antilles	2 316.00	7	8	15	0.51	0.08	0.2
67	Lebanon	3 798.00	7	7	14	0.51	0.08	0.2
68	Morocco	925.00	7	7	14	0.51	0.08	0.2
69	Uruguay	1 092.00	7	7	14	0.51	0.08	0.2
70	Czechoslovakia	476.00	7	7	14	0.51	0.08	0.2
71	Cuba	256.00	7	8	15	0.51	0.06	0.19
72	Syria	704.00	7	6	13	0.51	0.08	0.19
73	Angola	157.00	7	3	10	0.5	0	0.19
74	Trinidad and Tobago	766.00	7	5	12	0.51	0.08	0.19
75	United Arab Emirates	2 498.00	6	7	13	0.51	0.08	0.18
76	Kenya	840.00	6	6	12	0.51	0.08	0.18
77	Congo Democratic Republic	400.00	6	6	12	0.51	0.08	0.18
78	Yemen	1 057.00	6	5	11	0.51	0.06	0.18
79	Bolivia	184.00	6	6	12	0.51	0.08	0.18
80	Cote d'Ivoire	525.00	6	6	12	0.51	0.08	0.18
81	Cyprus	413.00	6	4	10	0.51	0.06	0.17
82	Malta	690.00	6	2	8	0.5	0	0.17
83	Tunisia	365.00	6	5	11	0.51	0.08	0.17
84	Tanzania	304.00	6	4	10	0.5	0.02	0.17
85	Sudan	154.00	6	7	13	0.51	0.08	0.17

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
86	New Zealand	313.00	6	8	14	0.51	0.06	0.17
87	German Democratic Republic	471.00	6	6	12	0.5	0.08	0.16
88	Andorra	89.00	5	3	8	0.5	0	0.16
89	Dominican Republic	11.00	5	2	7	0.5	0	0.16
90	Ethiopia	249.00	5	3	8	0.5	0.06	0.16
91	Gabon	161.00	5	5	10	0.51	0.08	0.16
92	Iceland	122.00	5	5	10	0.51	0.08	0.16
93	Jordan	664.00	5	5	10	0.51	0.08	0.16
94	Madagascar	61.00	5	3	8	0.5	0	0.16
95	Mauritania	61.00	5	4	9	0.5	0.08	0.16
96	Mauritius	53.00	5	2	7	0.5	0.06	0.16
97	Mozambique	103.00	5	3	8	0.5	0	0.16
98	Oman	247.00	5	5	10	0.51	0.08	0.16
99	Somalia	139.00	5	1	6	0.49	0	0.16
100	Vietnam	96.00	5	6	11	0.51	0.06	0.15
101	Albania	63.00	5	0	5	0	0	0.14
102	West Indies UK	266.00	5	5	10	0.51	0	0.14
103	Afghanistan	172.00	4	1	5	0.48	0	0.13
104	Bangladesh	97.00	4	4	8	0.5	0.02	0.13
105	Costa Rica	152.00	4	5	9	0.51	0.02	0.13
106	Myanmar	22.00	4	3	7	0.5	0	0.13
107	Papua New Guinea	177.00	4	2	6	0.5	0	0.13
108	Paraguay	103.00	4	2	6	0.5	0	0.13

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
109	Benin	34.00	4	2	6	0.5	0	0.13
110	Cameroon	89.00	4	5	9	0.51	0.06	0.13
111	Guatemala	139.00	4	5	9	0.51	0.06	0.13
112	Senegal	73.00	4	5	9	0.51	0.06	0.13
113	Togo	43.00	4	4	8	0.51	0.06	0.13
114	Uganda	97.00	4	2	6	0.5	0	0.13
115	Guinea	27.00	4	4	8	0.5	0.02	0.12
116	Vanuatu	79.00	4	4	8	0.51	0.08	0.12
117	Rwanda	102.00	4	1	5	0.45	0.02	0.12
118	Zambia	153.00	4	6	10	0.51	0.06	0.12
119	Zimbabwe	55.00	4	2	6	0.5	0	0.12
120	Mali	13.00	4	1	5	0.48	0	0.12
121	North Korea	45.00	4	7	11	0.51	0	0.12
122	Ghana	143.00	4	4	8	0.5	0	0.12
123	Sri Lanka	204.00	3	3	6	0.5	0	0.1
124	Qatar	594.00	3	5	8	0.51	0	0.1
125	Sierra Leone	72.00	3	3	6	0.5	0	0.1
126	Djibouti	50.00	3	2	5	0.49	0	0.1
127	Malawi	98.00	3	2	5	0.5	0	0.1
128	Burundi	52.00	3	1	4	0.45	0	0.1
129	Belize	18.00	3	2	5	0.5	0.06	0.1
130	Congo	66.00	3	4	7	0.5	0	0.1
131	Haiti	9.00	3	1	4	0.48	0	0.1
132	Niger	29.00	3	3	6	0.5	0.06	0.1

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
133	Honduras	90.00	3	4	7	0.5	0.02	0.09
134	Nepal	59.00	3	0	3	0	0	0.09
135	Gambia	22.00	3	3	6	0.5	0	0.09
136	El Salvador	72.00	3	4	7	0.51	0.06	0.09
137	Vatican City State	97.00	3	0	3	0	0	0.09
138	Fiji	142.00	3	2	5	0.5	0.06	0.09
139	Gibraltar	78.00	3	1	4	0.49	0	0.09
140	Brunei	1 258.00	3	1	4	0.49	0	0.08
141	Central African Republic	19.00	2	1	3	0.48	0	0.07
142	Jamaica	52.00	2	4	6	0.51	0	0.07
143	Macao SAR	24.00	2	0	2	0	0	0.07
144	Cape Verde	11.00	2	0	2	0	0	0.07
145	Guinea-Bissau	8.00	2	0	2	0	0	0.07
146	Sao Tome and Principe	20.00	2	0	2	0	0	0.07
147	Cambodia	23.00	2	0	2	0	0	0.07
148	Botswana	39.00	2	2	4	0.5	0	0.06
149	Nicaragua	41.00	2	5	7	0.51	0	0.06
150	Suriname	130.00	2	1	3	0.49	0	0.06
151	Burkina Faso	13.00	2	1	3	0.48	0	0.06
152	Laos	5.00	2	1	3	0.48	0	0.06
153	Barbados	26.00	1	2	3	0.49	0	0.03
154	Guyana	43.00	1	2	3	0.5	0	0.03

(Continued)

Table A1.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
155	British Overseas Territories	8.00	1	0	1	0	0	0.03
156	Chad	13.00	1	1	2	0.48	0	0.03
157	Comoros	3.00	1	0	1	0	0	0.03
158	French Polynesia	8.00	1	1	2	0.45	0	0.03
159	Equatorial Guinea		0	2	2	0.5	0	0
160	Namibia	4	0	0	0	0	0	0
161	US Pacific Islands	16	0	0	0	0	0	0
162	Tonga	0	0	0	0	0	0	0

Table A1.2. BIS rank of countries by eigenvector centrality—1997

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	1 255 251.00	169	190	359	0.98	6947.5	1
2	France	361 655.00	167	170	337	0.89	5941.88	0.99
3	Switzerland	517 838.00	164	188	352	0.97	6289.17	0.98
4	Germany	465 653.00	140	152	292	0.82	3193.26	0.91
5	Luxembourg	227 547.00	130	169	299	0.88	3172.06	0.84
6	Belgium	181 837.00	128	179	307	0.92	3600.96	0.84
7	Japan	729 500.00	103	106	209	0.69	1342.44	0.75
8	United States	1 192 700.00	104	120	224	0.72	1646.27	0.75
9	Sweden	34 380.00	94	102	196	0.68	919.58	0.71
10	Ireland	53 932.00	82	78	160	0.63	934.6	0.64
11	Denmark	42 318.00	72	111	183	0.7	763.08	0.6
12	Finland	20 649.00	57	60	117	0.59	212.63	0.52
13	Netherlands	255 547.00	53	53	106	0.58	146.38	0.51
14	Australia	27 080.00	27	26	53	0.53	24.37	0.34
15	Bermuda	20 210.00	14	13	27	0.52	0.02	0.26
16	Canada	62 010.00	14	14	28	0.52	0.02	0.26
17	Chinese Taipei	36 719.00	14	12	26	0.51	0.02	0.26
18	Hong Kong SAR	304 573.00	14	14	28	0.52	0.02	0.26
19	Indonesia	12 033.00	14	14	28	0.52	0.02	0.26
20	Italy	206 525.00	14	14	28	0.52	0.02	0.26
21	Malaysia	13 126.00	14	14	28	0.52	0.02	0.26
22	Singapore	222 435.00	14	14	28	0.52	0.02	0.26
23	South Africa	9 000.00	14	13	27	0.52	0.02	0.26
24	South Korea	41 838.00	14	13	27	0.52	0.02	0.26

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
25	Austria	49 299.00	13	13	26	0.52	0.02	0.26
26	Bahamas	153 350.00	13	13	26	0.52	0.02	0.26
27	Cayman Islands	380 239.00	13	14	27	0.52	0.02	0.26
28	China	65 078.00	13	14	27	0.52	0.02	0.26
29	Czech Republic	8 299.00	13	12	25	0.51	0.02	0.26
30	Greece	34 026.00	13	13	26	0.52	0.02	0.26
31	Hungary	3 366.00	13	13	26	0.52	0.02	0.26
32	Mexico	43 263.00	13	13	26	0.52	0.02	0.26
33	Norway	6 059.00	13	13	26	0.52	0.02	0.26
34	Philippines	9 705.00	13	12	25	0.51	0.02	0.26
35	Poland	15 483.00	13	13	26	0.52	0.02	0.26
36	Portugal	48 185.00	13	13	26	0.52	0.02	0.26
37	Russia	14 806.00	13	13	26	0.52	0.02	0.26
38	Spain	106 160.00	13	14	27	0.52	190.02	0.26
39	Turkey	22 928.00	13	13	26	0.52	0.02	0.26
40	Egypt	23 351.00	12	12	24	0.51	0.02	0.24
41	Iceland	387.00	12	12	24	0.51	0.02	0.24
42	Israel	14 719.00	12	12	24	0.51	0.02	0.24
43	Tanzania	1 257.00	12	8	20	0.51	0.02	0.24
44	Argentina	36 613.00	12	13	25	0.52	0.02	0.24
45	Brazil	60 108.00	12	13	25	0.52	0.02	0.24
46	Chile	14 105.00	12	13	25	0.52	0.02	0.24
47	India	20 993.00	12	12	24	0.51	0.02	0.24
48	Panama	38 486.00	12	12	24	0.51	0.02	0.24

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
49	Thailand	9 465.00	12	14	26	0.52	0.02	0.24
50	International organisations	80 776.00	12	13	25	0.52	0.02	0.24
51	New Zealand	4 589.00	12	12	24	0.51	0.02	0.24
52	Bahrain	19 389.00	12	11	23	0.51	0.02	0.24
53	Saudi Arabia	54 268.00	12	11	23	0.51	0.02	0.24
54	Cyprus	7 310.00	12	10	22	0.51	0.02	0.24
55	Jordan	7 645.00	11	7	18	0.51	0.01	0.23
56	Kenya	3 214.00	11	10	21	0.51	0.02	0.23
57	Liberia	11 728.00	11	10	21	0.51	0.02	0.23
58	Pakistan	3 680.00	11	10	21	0.51	0.02	0.23
59	Syria	10 316.00	11	7	18	0.51	0.02	0.23
60	Venezuela	23 701.00	11	12	23	0.51	0.02	0.23
61	Zambia	409.00	11	6	17	0.51	0.01	0.23
62	Bulgaria	2 730.00	11	11	22	0.51	0.02	0.23
63	Romania	2 612.00	11	13	24	0.52	0.02	0.23
64	Netherlands Antilles	76 961.00	11	12	23	0.51	0.02	0.23
65	Libya	7 108.00	11	6	17	0.51	0.01	0.22
66	United Arab Emirates	48 036.00	11	9	20	0.51	0.02	0.22
67	West Indies UK	2 210.00	11	9	20	0.51	0.02	0.22
68	Iran	6 687.00	11	12	23	0.51	0.02	0.22
69	Sri Lanka	1 617.00	10	9	19	0.51	0.02	0.21
70	Colombia	9 042.00	10	11	21	0.51	0.02	0.21

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
71	Cuba	1 153.00	10	8	18	0.51	0.02	0.21
72	Ethiopia	1 128.00	10	8	18	0.51	0.02	0.21
73	Lebanon	16 081.00	10	11	21	0.51	0.02	0.21
74	Morocco	6 636.00	10	10	20	0.51	0.02	0.21
75	Uruguay	9 483.00	10	10	20	0.51	0.02	0.21
76	Vietnam	1 350.00	10	9	19	0.51	0.02	0.21
77	Kuwait	14 447.00	10	10	20	0.51	0.02	0.21
78	Nigeria	4 461.00	10	7	17	0.51	0.02	0.21
79	Oman	3 566.00	10	9	19	0.51	0.02	0.21
80	Barbados	10 421.00	10	7	17	0.51	0.01	0.21
81	Ghana	1 071.00	10	11	21	0.51	0.02	0.21
82	Zimbabwe	719.00	10	9	19	0.51	0.02	0.21
83	Algeria	6 701.00	10	9	19	0.51	0.02	0.21
84	Latvia	584.00	10	9	19	0.51	0.02	0.21
85	Slovakia	1 777.00	10	11	21	0.51	0.02	0.21
86	Andorra	7 632.00	10	6	16	0.51	0.02	0.21
87	Gibraltar	6 998.00	10	8	18	0.51	0.02	0.21
88	Malta	2 388.00	10	9	19	0.51	0.02	0.2
89	Ukraine	1 884.00	10	8	18	0.51	0.02	0.2
90	Peru	7 201.00	9	10	19	0.51	0.02	0.2
91	Cote d'Ivoire	1 537.00	9	8	17	0.51	0.02	0.2
92	Yemen		9	7	16	0.51	0	0.2
93	Mozambique	744	9	4	13	0.5	0.01	0.19
94	Tunisia	2522	9	9	18	0.51	0.02	0.19

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
95	Papua New Guinea	470	9	7	16	0.51	0.01	0.19
96	Croatia	3329	9	8	17	0.51	0.02	0.18
97	Estonia	524	9	10	19	0.51	0.02	0.18
98	Bolivia	1430	8	9	17	0.51	0.02	0.18
99	Costa Rica	3461	8	7	15	0.51	0.01	0.18
100	Ecuador	3952	8	10	18	0.51	0.02	0.18
101	Jamaica	1078	8	8	16	0.51	0.02	0.18
102	Niger	172	8	4	12	0.5	0.01	0.18
103	Senegal	757	8	7	15	0.51	0.02	0.18
104	Trinidad and Tobago	1266	8	6	14	0.51	0	0.18
105	Iraq	1631	8	8	16	0.51	0.01	0.18
106	Angola	1721	8	7	15	0.51	0.02	0.18
107	Qatar	2846	8	9	17	0.51	0.02	0.18
108	Bangladesh	974	8	5	13	0.51	0	0.18
109	Belize	539	8	5	13	0.51	0	0.18
110	Uganda	688	8	7	15	0.51	0.02	0.18
111	Kazakhstan	515	8	8	16	0.51	0.02	0.17
112	Nepal	575	8	5	13	0.5	0	0.17
113	Slovenia	2958	8	8	16	0.51	0.02	0.17
114	Armenia	63	7	4	11	0.5	0.02	0.16
115	Gabon	532	7	7	14	0.51	0.02	0.16
116	Georgia	278	7	4	11	0.5	0.01	0.16
117	Brunei	752	7	2	9	0.5	0	0.16

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
118	Burundi	277	7	4	11	0.5	0.01	0.16
119	Cameroon	754	7	7	14	0.51	0.02	0.16
120	Dominican Republic	1991	7	6	13	0.51	0.01	0.16
121	Guatemala	2439	7	7	14	0.51	0.01	0.16
122	Guinea	210	7	7	14	0.51	0.02	0.16
123	Haiti	526	7	2	9	0.48	0	0.16
124	Mauritania	267	7	4	11	0.5	0.02	0.16
125	Paraguay	1248	7	7	14	0.51	0.01	0.16
126	Rwanda	347	7	3	10	0.5	0.01	0.16
127	Sudan	958	7	4	11	0.5	0	0.16
128	Vanuatu	2706	7	4	11	0.5	0	0.16
129	Gambia	117	7	4	11	0.5	0	0.16
130	Togo	217	7	4	11	0.5	0.01	0.16
131	Sierra Leone	108	7	2	9	0.5	0	0.16
132	Nicaragua	309	7	6	13	0.51	0	0.16
133	Botswana	650	7	4	11	0.5	0	0.16
134	Vatican City State	1804	7	0	7	0	0	0.16
135	Mauritius	937	7	8	15	0.51	0.02	0.15
136	Malawi	177	7	3	10	0.5	0	0.15
137	Turks and Caicos Islands	469	7	4	11	0.5	0.01	0.15
138	Albania	246	6	5	11	0.51	0.02	0.14
139	Belarus	441	6	6	12	0.51	0.02	0.14
140	Benin	180	6	4	10	0.5	0.01	0.14

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
141	Cambodia	66	6	2	8	0.48	0	0.14
142	Congo	272	6	6	12	0.51	0.02	0.14
143	Madagascar	721	6	6	12	0.51	0.02	0.14
144	Mali	181	6	3	9	0.5	0	0.14
145	North Korea	170	6	8	14	0.51	0.01	0.14
146	Afghanistan	269	6	2	8	0.49	0	0.14
147	Uzbekistan	400	6	6	12	0.51	0.01	0.14
148	El Salvador	1697	6	8	14	0.51	0.01	0.14
149	Congo Democratic Republic	967	6	6	12	0.51	0.02	0.14
150	Djibouti	415	6	2	8	0.48	0	0.14
151	Dominica	99	6	4	10	0.5	0.01	0.14
152	Macao SAR	10,495	6	7	13	0.51	0.02	0.14
153	Suriname	453	6	2	8	0.5	0	0.14
154	Myanmar	88	6	4	10	0.5	0	0.14
155	Central African Republic	82	6	3	9	0.5	0	0.14
156	Aruba	739	6	5	11	0.5	0.02	0.14
157	Honduras	1257	6	7	13	0.51	0.01	0.14
158	Nauru	136	6	2	8	0.5	0	0.13
159	Seychelles	146	6	4	10	0.5	0.01	0.13
160	Fiji	344	7	4	11	0.5	0	0.13
161	Macedonia, FYR	233	6	3	9	0.5	0.01	0.13
162	Namibia	170	6	4	10	0.5	0.01	0.13
163	Burkina Faso	121	5	1	6	0.47	0	0.12

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
164	Chad	61	5	2	7	0.5	0	0.12
165	Comoros	31	5	2	7	0.5	0	0.12
166	Grenada	43	5	4	9	0.5	0.01	0.12
167	Lesotho	47	5	2	7	0.5	0	0.12
168	Guinea-Bissau	40	5	2	7	0.5	0	0.12
169	Azerbaijan	137	5	3	8	0.5	0	0.11
170	Somalia	70	5	1	6	0.47	0	0.11
171	British Overseas Territories	407	5	5	10	0.51	0.02	0.11
172	Cape Verde	44	5	3	8	0.5	0	0.11
173	St. Vincent and the Grenadines	506	5	5	10	0.5	0.01	0.11
174	Turkmenistan	263	4	7	11	0.51	0	0.1
175	Bosnia and Herzegovina	243	4	4	8	0.5	0	0.1
176	Equatorial Guinea	33	4	3	7	0.5	0	0.1
177	Samoa	41	4	1	5	0.49	0	0.1
178	Moldova	196	4	2	6	0.5	0	0.1
179	Kyrgyz Republic	82	4	3	7	0.5	0	0.1
180	Laos	24	4	1	5	0.41	0	0.1
181	Sao Tome and Principe	10	4	2	6	0.5	0	0.09
182	French Polynesia	164	4	4	8	0.5	0.02	0.09
183	New Caledonia	46	4	4	8	0.5	0	0.09
184	Guyana	120	4	3	7	0.5	0	0.09

(Continued)

Table A1.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
185	Swaziland	270	3	4	7	0.5	0	0.08
186	Mongolia	60	3	2	5	0.5	0	0.07
187	US Pacific Islands	95	3	2	5	0.5	0	0.07
188	St. Lucia	40	3	1	4	0.47	0	0.07
189	Bhutan	9	3	2	5	0.5	0	0.07
190	Maldives	24	3	4	7	0.5	0	0.07
191	Tajikistan	42	2	2	4	0.5	0	0.05
192	Falkland Islands	54	2	0	2	0	0	0.05
193	Solomon Islands	50	2	1	3	0.47	0	0.05
194	Tonga	7	2	0	2	0	0	0.05
195	Kiribati	7	1	0	1	0	0	0.03
196	Wallis and Futuna	38,271	2	1	3	0.39	195	0.01
197	Jersey	0	0	1	1	0.28	0	0
198	Tuvalu	1	0	0	0	0	0	0

Table A1.3. BIS rank of countries by eigenvector centrality—2007

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	5 212 740.00	184	205	389	0.97	6228.53	1
2	Switzerland	1 676 148.00	183	201	384	0.95	5448.84	0.99
3	France	1 172 837.00	183	192	375	0.92	5034.64	0.99
4	Germany	2 075 225.00	167	179	346	0.87	3269.83	0.96
5	Belgium	742 015.00	158	189	347	0.91	3403.02	0.92
6	Luxembourg	891 302.00	151	177	328	0.86	2878.95	0.9
7	South Korea	83 026.00	148	81	229	0.62	945.89	0.89
8	Chinese Taipei	138 220.00	140	104	244	0.66	1793.87	0.85
9	Austria	135 875.00	122	149	271	0.77	1437.97	0.81
10	Denmark	170 129.00	122	144	266	0.76	1603.9	0.8
11	Sweden	183 216.00	120	115	235	0.69	1008.27	0.79
12	Ireland	593 731.00	118	129	247	0.72	1225.53	0.78
13	Australia	108 268.00	115	132	247	0.73	1516.16	0.75
14	Japan	760 453.00	107	109	216	0.67	769.47	0.74
15	Jersey	588 344.00	106	188	294	0.9	2207.76	0.73
16	United States	4 162 507.00	81	101	182	0.66	464.44	0.63
17	Finland	100 606.00	73	78	151	0.61	264.57	0.59
18	Netherlands	1 082 033.00	57	57	114	0.58	77.88	0.53
19	Canada	153 553.00	56	52	108	0.57	101.96	0.5
20	Macao SAR	26 216.00	52	62	114	0.58	144.85	0.47
21	Guernsey	194 526.00	47	55	102	0.57	69.23	0.45
22	Chile	28 509.00	43	47	90	0.56	47.05	0.44
23	Mexico	77 607.00	35	26	61	0.53	10.34	0.39
24	Brazil	67 016.00	34	52	86	0.57	36.91	0.39

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
25	Isle of Man	91 584.00	30	31	61	0.54	6.96	0.36
26	Greece	80 462.00	32	32	64	0.54	13.28	0.35
27	Italy	411 813.00	26	25	51	0.53	1.49	0.35
28	Spain	362 477.00	26	27	53	0.53	12.83	0.35
29	Norway	180 129.00	25	24	49	0.53	0.89	0.34
30	Hong Kong SAR	664 479.00	24	23	47	0.53	0.64	0.34
31	Singapore	513 137.00	24	21	45	0.53	0.54	0.34
32	Cayman Islands	1 882 665.00	24	25	49	0.53	0.97	0.33
33	South Africa	60 181.00	23	21	44	0.53	0.52	0.33
34	China	281 943.00	22	23	45	0.53	0.35	0.32
35	Malaysia	46 355.00	22	19	41	0.52	0.19	0.32
36	Israel	51 792.00	22	16	38	0.52	0.05	0.32
37	Panama	99 504.00	22	20	42	0.52	0.22	0.32
38	Russia	232 145.00	21	21	42	0.53	0.13	0.31
39	India	49 537.00	21	21	42	0.53	0.11	0.31
40	Thailand	39 003.00	21	18	39	0.52	0.08	0.31
41	Argentina	29 386.00	21	20	41	0.52	0.12	0.31
42	Saudi Arabia	163 993.00	21	19	40	0.52	0.25	0.31
43	Portugal	129 837.00	22	23	45	0.53	0.76	0.31
44	Indonesia	12 811.00	20	20	40	0.52	0.1	0.3
45	Bermuda	111 953.00	20	20	40	0.52	0.14	0.3
46	Bahamas	428 171.00	21	22	43	0.53	0.39	0.3
47	United Arab Emirates	110 771.00	20	19	39	0.52	0.22	0.3

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
48	Cyprus	47 445.00	20	18	38	0.52	0.29	0.3
49	Peru	15 423.00	20	18	38	0.52	0.12	0.3
50	Philippines	25 951.00	19	19	38	0.52	0.1	0.3
51	Turkey	61 259.00	19	22	41	0.53	0.17	0.29
52	Romania	8 647.00	19	18	37	0.52	0.22	0.29
53	Pakistan	16 033.00	19	17	36	0.52	0.06	0.29
54	New Zealand	22 208.00	19	19	38	0.52	0.11	0.29
55	Bahrain	43 415.00	20	22	42	0.53	0.48	0.29
56	Venezuela	53 522.00	19	20	39	0.52	0.25	0.28
57	Malta	16 222.00	19	18	37	0.52	0.42	0.28
58	Poland	45 825.00	18	19	37	0.52	0.04	0.28
59	Czech Republic	21 292.00	19	20	39	0.52	0.05	0.28
60	West Indies UK	252 362.00	19	21	40	0.53	0.39	0.27
61	Netherlands Antilles	155 629.00	19	16	35	0.52	0.12	0.27
62	Iran	35 483.00	17	18	35	0.52	0.03	0.27
63	Hungary	11 407.00	17	18	35	0.52	0.11	0.27
64	Morocco	13 192.00	17	15	32	0.52	0.05	0.27
65	Uruguay	13 370.00	18	17	35	0.52	0.05	0.27
66	Bulgaria	8 505.00	17	19	36	0.52	0.11	0.27
67	Jordan	17 171.00	16	15	31	0.52	0	0.26
68	Slovakia	4 451.00	17	16	33	0.52	0.04	0.26
69	Colombia	15 910.00	17	16	33	0.52	0	0.26
70	International organisations	243 853.00	18	17	35	0.52	0	0.26

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
71	Kuwait	51 354.00	16	18	34	0.52	0.05	0.26
72	Kenya	9 573.00	16	16	32	0.52	0	0.26
73	Oman	10 728.00	15	18	33	0.52	0.03	0.25
74	Vietnam	6 329.00	15	16	31	0.52	0	0.25
75	Ukraine	20 636.00	16	17	33	0.52	0.03	0.25
76	Mauritius	27 226.00	16	16	32	0.52	0.11	0.25
77	Egypt	40 642.00	16	19	35	0.52	0	0.25
78	Bangladesh	5 052.00	15	14	29	0.52	0	0.25
79	Liberia	17 662.00	15	15	30	0.52	0	0.24
80	Lebanon	33 938.00	15	16	31	0.52	0	0.24
81	Iceland	21 920.00	15	16	31	0.52	0.04	0.24
82	Belize	7 938.00	15	11	26	0.51	0.08	0.24
83	Latvia	4 355.00	15	15	30	0.52	0	0.24
84	Paraguay	1 664.00	15	10	25	0.51	0	0.24
85	Sri Lanka	2 757.00	14	16	30	0.52	0	0.24
86	Guatemala	3 918.00	14	10	24	0.51	0	0.24
87	Nigeria	36 781.00	14	14	28	0.52	0	0.23
88	Ghana	1 514.00	14	14	28	0.52	0	0.23
89	Andorra	8 568.00	15	12	27	0.51	0.05	0.23
90	Gibraltar	25 425.00	15	14	29	0.52	0.08	0.23
91	Costa Rica	6 817.00	14	17	31	0.52	0	0.23
92	Tunisia	8 513.00	14	14	28	0.52	0	0.23
93	Iraq	1 912.00	14	11	25	0.51	0	0.23
94	Syria	25 329.00	14	12	26	0.51	0	0.23

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
95	Tanzania	2 882.00	14	13	27	0.52	0	0.23
96	Belarus	4 762.00	14	9	23	0.51	0	0.23
97	Croatia	14 966.00	14	14	28	0.52	0	0.23
98	Estonia	3 464.00	14	14	28	0.52	0	0.23
99	Barbados	39 530.00	14	13	27	0.52	0	0.23
100	Bolivia	3 511.00	14	10	24	0.51	0	0.23
101	Algeria	12 006.00	14	11	25	0.51	0	0.23
102	Jamaica	2 734.00	14	16	30	0.52	0	0.22
103	Qatar	18 026.00	13	15	28	0.52	0	0.22
104	Slovenia	6 960.00	13	14	27	0.52	0	0.22
105	Seychelles	3 382.00	13	9	22	0.51	0	0.22
106	Brunei	3 701.00	13	8	21	0.51	0.04	0.22
107	Macedonia, FYR	1 192.00	13	11	24	0.51	0	0.22
108	Zambia	1 083.00	13	8	21	0.51	0	0.21
109	Malawi	217.00	13	10	23	0.51	0.04	0.21
110	Ecuador	5 406.00	13	13	26	0.51	0.02	0.21
111	Botswana	2 495.00	13	7	20	0.51	0.04	0.21
112	Marshall Islands	6 599.00	12	11	23	0.51	0	0.21
113	Cuba	1 836.00	13	12	25	0.51	0.03	0.21
114	Georgia	1 064.00	12	11	23	0.51	0	0.21
115	Bosnia and Herzegovina	6 447.00	12	9	21	0.51	0	0.2
116	Ethiopia	932.00	12	7	19	0.51	0	0.2
117	Libya	80 140.00	12	10	22	0.51	0	0.2

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
118	Dominican Republic	7 536.00	12	14	26	0.52	0	0.2
119	Nicaragua	720.00	12	10	22	0.51	0	0.2
120	Yemen	7 607.00	12	12	24	0.51	0	0.2
121	Cote d'Ivoire	2 528.00	12	10	22	0.51	0	0.2
122	Kazakhstan	11 992.00	12	19	31	0.52	0	0.2
123	Zimbabwe	1 032.00	12	12	24	0.51	0	0.2
124	Trinidad and Tobago	8 064.00	13	10	23	0.51	0	0.2
125	Cambodia	495.00	11	7	18	0.51	0	0.19
126	Swaziland	750.00	11	5	16	0.5	0	0.19
127	Mongolia	683.00	11	5	16	0.5	0	0.19
128	Nepal	1 179.00	11	6	17	0.51	0	0.19
129	British Overseas Territories	2 521.00	11	5	16	0.5	0	0.19
130	Dominica	185.00	11	5	16	0.5	0	0.18
131	Samoa	4 883.00	11	7	18	0.51	0	0.18
132	Mozambique	1 350.00	11	10	21	0.51	0.02	0.18
133	Turks and Caicos Islands	1 439.00	11	6	17	0.51	0	0.18
134	Angola	9 260.00	11	9	20	0.51	0.05	0.18
135	Serbia	6 577.00	10	9	19	0.51	0	0.17
136	Azerbaijan	2 887.00	10	13	23	0.52	0	0.17
137	Albania	1 327.00	10	10	20	0.51	0	0.17
138	Senegal	1 706.00	10	11	21	0.51	0	0.17

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
139	Armenia	708.00	10	7	17	0.51	0	0.17
140	Myanmar	360.00	10	4	14	0.49	0	0.17
141	St. Vincent and the Grenadines	3 046.00	10	6	16	0.51	0	0.17
142	Uganda	1 749.00	10	9	19	0.51	0	0.17
143	Laos	1 265.00	10	9	19	0.51	0	0.17
144	Afghanistan	1 598.00	10	8	18	0.51	0	0.16
145	North Korea	457.00	10	11	21	0.51	0	0.16
146	Cape Verde	1 637.00	9	5	14	0.5	0	0.16
147	Sudan	2 103.00	9	8	17	0.51	0	0.16
148	Madagascar	1 482.00	9	7	16	0.51	0	0.16
149	Mauritania	723.00	9	6	15	0.51	0	0.16
150	Moldova	845.00	9	8	17	0.51	0	0.16
151	Vatican City State	2 290.00	9	1	10	0.49	0	0.16
152	Guinea	472.00	9	4	13	0.5	0	0.16
153	Namibia	539.00	9	9	18	0.51	0	0.16
154	Sierra Leone	186.00	9	3	12	0.5	0	0.16
155	Mali	431.00	9	7	16	0.51	0	0.16
156	Papua New Guinea	1 180.00	9	8	17	0.51	0	0.16
157	Honduras	3 965.00	9	11	20	0.51	0	0.16
158	Uzbekistan	5 677.00	9	8	17	0.51	0	0.15
159	Burundi	345.00	8	7	15	0.51	0	0.14
160	Cameroon	4 987.00	8	10	18	0.51	0	0.14
161	Montenegro	760.00	8	7	15	0.51	0	0.14

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
162	Benin	368.00	8	5	13	0.5	0	0.14
163	Togo	418.00	8	6	14	0.5	0	0.14
164	Congo	695.00	8	7	15	0.51	0	0.14
165	Gabon	1 241.00	8	10	18	0.51	0	0.14
166	French Polynesia	1 131.00	8	8	16	0.51	0	0.14
167	Vanuatu	915.00	8	7	15	0.51	0	0.14
168	Turkmenistan	9 667.00	8	6	14	0.51	0	0.14
169	El Salvador	2 512.00	8	12	20	0.51	0	0.14
170	Aruba	1 367.00	8	8	16	0.51	0	0.13
171	Palestinian Territory	761.00	7	4	11	0.5	0	0.13
172	Burkina Faso	344.00	7	10	17	0.51	0	0.13
173	Congo Democratic Republic	1 324.00	7	8	15	0.51	0	0.13
174	Rwanda	673.00	7	5	12	0.5	0	0.13
175	Niger	122.00	7	3	10	0.5	0	0.13
176	Chad	344.00	7	6	13	0.51	0	0.12
177	Kyrgyz Republic	254.00	7	5	12	0.5	0	0.12
178	Maldives	130.00	7	7	14	0.51	0	0.12
179	Eritrea	53.00	7	2	9	0.49	0	0.12
180	Fiji	195.00	7	5	12	0.5	0	0.12
181	Guyana	604.00	7	3	10	0.49	0	0.12
182	Greenland	139.00	7	3	10	0.48	0	0.11
183	Djibouti	648.00	6	7	13	0.51	0	0.11
184	San Marino	1 610.00	6	3	9	0.5	0	0.11

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
185	Gambia	237.00	6	7	13	0.51	0	0.11
186	New Caledonia	1 245.00	6	8	14	0.5	0	0.11
187	Equatorial Guinea	747.00	6	2	8	0.49	0	0.11
188	Grenada	90.00	6	4	10	0.5	0	0.11
189	St. Lucia	342.00	6	4	10	0.5	0	0.11
190	Suriname	901.00	6	2	8	0.49	0	0.11
191	Haiti	670.00	6	7	13	0.51	0	0.1
192	Somalia	54.00	5	2	7	0.48	0	0.09
193	Lesotho	34.00	5	3	8	0.48	0	0.09
194	Tajikistan	191.00	5	4	9	0.5	0	0.09
195	Nauru	27.00	5	1	6	0.4	0	0.08
196	US Pacific Islands	237.00	5	5	10	0.5	0	0.08
197	Sao Tome and Principe	72.00	5	2	7	0.48	0	0.08
198	Central African Republic	95.00	4	1	5	0.48	0	0.08
199	Faeroe Islands	271.00	4	8	12	0.51	0	0.07
200	Timor Leste	15.00	4	1	5	0.49	0	0.06
201	Guinea-Bissau	52.00	3	0	3	0	0	0.06
202	Bhutan	405.00	3	1	4	0.43	0	0.06
203	Solomon Islands	158.00	3	2	5	0.44	0	0.05
204	Tonga	15.00	3	3	6	0.5	0	0.05
205	Wallis and Futuna	—	4	4	8	0.5	0	0.05
206	Falkland Islands	150.00	3	1	4	0.49	0	0.05
207	Kiribati	132.00	3	3	6	0.5	0	0.05

(Continued)

Table A1.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
208	Comoros	58.00	2	3	5	0.5	0	0.04
209	St. Helena and Dependencies	12.00	2	2	4	0.5	0	0.03
210	Tuvalu	1.00	1	0	1	0	0	0.02
211	Micronesia	17.00	1	3	4	0.5	0	0.02
212	Palau	5.00	1	1	2	0.4	0	0.01

Table A1.4. BIS rank of countries by eigenvector centrality—2017

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
1	Switzerland	662 118.57	203	212	415	0.99	3901.75	1
2	Belgium	431 984.06	190	206	396	0.96	3006.4	0.97
3	France	1 178 769.71	186	195	381	0.92	2500.26	0.95
4	United Kingdom	4 084 290.02	186	206	392	0.96	2933.43	0.95
5	Denmark	171 662.63	177	191	368	0.9	2216.37	0.93
6	Luxembourg	900 400.59	178	198	376	0.93	2416.54	0.92
7	South Korea	119 155.88	171	154	325	0.78	1582.45	0.9
8	Germany	1 442 918.64	160	183	343	0.87	1587.35	0.87
9	Austria	99 909.79	158	197	355	0.93	2113.08	0.86
10	Chinese Taipei	248 738.21	159	198	357	0.93	2439.89	0.85
11	Ireland	552 885.58	155	186	341	0.88	1679.94	0.85
12	Spain	178 664.62	153	192	345	0.91	1697.16	0.84
13	Australia	262 480.21	151	187	338	0.89	1949.89	0.82
14	Hong Kong SAR	1 248 834.52	149	185	334	0.88	1666.39	0.82
15	Sweden	259 562.92	131	185	316	0.88	1381.96	0.75
16	Isle of Man	41 971.26	126	203	329	0.95	1537.88	0.73
17	Japan	763 021.72	112	120	232	0.69	509.14	0.69
18	Guernsey	115 062.96	102	158	260	0.79	785.31	0.63
19	Jersey	191 320.52	97	177	274	0.85	704.86	0.62
20	Finland	71 048.83	93	89	182	0.63	321.37	0.6
21	United States	3 420 831.22	91	148	239	0.76	479.45	0.6
22	South Africa	44 436.54	91	110	201	0.67	472.06	0.58
23	Canada	316 173.62	72	155	227	0.78	389.02	0.51
24	Netherlands	684 870.55	71	77	148	0.61	138.67	0.51

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
25	Macao SAR	81 641.06	60	118	178	0.69	230.02	0.45
26	Mexico	128 317.50	52	46	98	0.56	33.93	0.43
27	Chile	28 754.53	49	106	155	0.66	107.77	0.42
28	Brazil	91 337.81	44	60	104	0.58	33.36	0.39
29	Greece	48 742.44	38	40	78	0.55	12.38	0.36
30	Norway	99 295.39	28	27	55	0.53	0.1	0.32
31	Portugal	43 019.07	28	28	56	0.54	0.17	0.32
32	Thailand	45 893.43	28	24	52	0.53	0.1	0.32
33	China	713 438.73	28	28	56	0.54	0.21	0.32
34	Italy	283 520.46	28	27	55	0.53	0.19	0.32
35	Israel	39 155.74	27	25	52	0.53	0.06	0.31
36	United Arab Emirates	177 160.00	27	27	54	0.53	0.09	0.31
37	Bahamas	136 516.71	27	23	50	0.53	0.04	0.31
38	Poland	33 945.44	27	24	51	0.53	0.06	0.31
39	India	67 259.36	27	27	54	0.53	0.1	0.31
40	Czech Republic	25 271.85	27	20	47	0.52	0.06	0.31
41	Panama	66 503.68	27	26	53	0.53	0.1	0.31
42	Argentina	22 091.21	27	27	54	0.53	0.07	0.31
43	Venezuela	33 685.02	27	20	47	0.52	0.04	0.31
44	Turkey	37 645.64	27	26	53	0.53	0.11	0.31
45	Malaysia	31 581.96	26	24	50	0.53	0.08	0.31
46	Vietnam	15 388.85	26	22	48	0.53	0.06	0.31
47	Qatar	41 016.14	26	25	51	0.53	0.04	0.31
48	Indonesia	21 324.68	26	22	48	0.53	0.08	0.3

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
49	Hungary	15 304.92	26	24	50	0.53	0.12	0.3
50	Uruguay	15 428.85	26	20	46	0.52	0.01	0.3
51	Colombia	17 597.50	26	22	48	0.53	0.04	0.3
52	Egypt	33 878.08	26	24	50	0.53	0.04	0.3
53	Peru	32 903.15	26	27	53	0.53	0.1	0.3
54	Singapore	600 879.49	26	26	52	0.53	0.05	0.3
55	West Indies UK	310 452.32	26	22	48	0.53	0.06	0.3
56	Cyprus	47 104.75	26	24	50	0.53	0.06	0.3
57	Oman	14 370.10	25	22	47	0.53	0.07	0.3
58	Kuwait	108 502.66	25	21	46	0.53	0.03	0.3
59	Philippines	22 617.07	25	22	47	0.53	0.08	0.3
60	Saudi Arabia	222 559.46	25	24	49	0.53	0.08	0.3
61	Ukraine	9 858.30	25	21	46	0.53	0.04	0.3
62	Bulgaria	13 830.83	25	22	47	0.53	0.05	0.3
63	Costa Rica	6 179.11	25	21	46	0.53	0.05	0.3
64	Bermuda	92 977.72	25	24	49	0.53	0.04	0.3
65	Pakistan	11 298.19	25	23	48	0.53	0.04	0.3
66	Malta	15 884.07	25	22	47	0.53	0.04	0.29
67	Morocco	7 828.94	24	23	47	0.53	0.03	0.29
68	Zambia	2 230.68	24	17	41	0.52	0.03	0.29
69	Nigeria	26 697.95	24	22	46	0.53	0.03	0.29
70	Bolivia	6 622.43	24	18	42	0.52	0	0.29
71	Kenya	13 009.20	24	20	44	0.52	0.01	0.29
72	Lebanon	42 813.34	24	24	48	0.53	0.01	0.29

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
73	Libya	44 056.15	24	12	36	0.51	0	0.29
74	Russia	137 734.47	25	24	49	0.53	0.11	0.29
75	Sri Lanka	2 334.01	24	20	44	0.52	0.08	0.29
76	Trinidad and Tobago	7 825.05	24	16	40	0.52	0	0.29
77	Slovenia	7 658.86	24	18	42	0.52	0	0.29
78	New Zealand	24 355.03	24	24	48	0.53	0.05	0.29
79	Angola	26 690.49	24	16	40	0.52	0	0.29
80	Romania	7 556.03	24	21	45	0.53	0.03	0.29
81	Ecuador	7 664.23	24	19	43	0.52	0	0.29
82	Bangladesh	12 048.35	24	19	43	0.52	0.01	0.28
83	Bahrain	29 119.23	23	21	44	0.53	0	0.28
84	Georgia	1 546.70	23	19	42	0.52	0.03	0.28
85	Serbia	3 918.71	23	19	42	0.52	0.04	0.28
86	Azerbaijan	5 666.05	23	18	41	0.52	0.01	0.28
87	Cayman Islands	1 382 540.46	24	26	50	0.53	0.05	0.28
88	Iraq	5 992.48	23	17	40	0.52	0	0.28
89	Senegal	1 215.21	23	15	38	0.52	0	0.28
90	Algeria	8 084.68	23	16	39	0.52	0	0.28
91	Iran	14 891.90	23	19	42	0.52	0.01	0.28
92	Nepal	4 637.03	23	15	38	0.52	0.01	0.28
93	Croatia	6 871.31	23	20	43	0.52	0.01	0.28
94	Latvia	6 042.70	23	19	42	0.52	0	0.28
95	Estonia	3 563.46	24	16	40	0.52	0.01	0.28
96	Jordan	15 511.16	23	23	46	0.53	0.04	0.28

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
97	Liberia	10 215.64	23	21	44	0.53	0.03	0.28
98	Dominican Republic	7 653.95	23	16	39	0.52	0	0.28
99	Ethiopia	2 295.78	22	17	39	0.52	0	0.28
100	Swaziland	1 231.59	23	12	35	0.51	0.01	0.27
101	Belarus	4 893.44	22	17	39	0.52	0.03	0.27
102	Kazakhstan	26 156.84	22	20	42	0.52	0.01	0.27
103	Gabon	1 325.63	22	13	35	0.52	0	0.27
104	Ghana	3 933.56	22	22	44	0.53	0.03	0.27
105	Mauritius	20 730.76	22	22	44	0.53	0.01	0.27
106	Mozambique	3 219.93	22	17	39	0.52	0.01	0.27
107	Seychelles	12 308.14	22	17	39	0.52	0.01	0.27
108	Guatemala	5 757.56	22	21	43	0.53	0.01	0.27
109	Tunisia	5 623.66	22	19	41	0.52	0	0.27
110	Macedonia, FYR	1 470.86	22	15	37	0.52	0	0.27
111	Tanzania	2 344.63	22	19	41	0.52	0.01	0.27
112	Iceland	7 143.31	22	16	38	0.52	0.01	0.27
113	Cote d'Ivoire	2 020.81	21	18	39	0.52	0	0.27
114	Laos	1 433.64	21	14	35	0.52	0	0.27
115	Paraguay	2 497.19	22	17	39	0.52	0	0.27
116	Uganda	2 679.64	21	20	41	0.52	0	0.26
117	Zimbabwe	1 020.36	21	16	37	0.52	0	0.26
118	Botswana	1 861.74	21	14	35	0.52	0	0.26
119	Congo Democratic Republic	1 560.65	21	13	34	0.51	0.03	0.26

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
120	Myanmar	1 231.24	21	14	35	0.52	0.01	0.26
121	El Salvador	2 638.36	21	15	36	0.52	0	0.26
122	Malawi	459.69	21	14	35	0.52	0	0.26
123	Belize	14 086.63	21	16	37	0.52	0.01	0.26
124	Brunei	2 760.70	21	19	40	0.52	0.01	0.26
125	Congo	1 655.13	21	12	33	0.51	0.01	0.26
126	Honduras	5 898.50	21	14	35	0.52	0	0.26
127	Jamaica	2 368.72	21	16	37	0.52	0	0.26
128	Nicaragua	1 712.30	21	15	36	0.52	0	0.26
129	Slovakia	4 852.03	20	17	37	0.52	0	0.26
130	Kyrgyz Republic	1 208.33	20	11	31	0.51	0	0.26
131	Papua New Guinea	794.97	20	15	35	0.52	0	0.26
132	Yemen	835.08	20	12	32	0.51	0	0.26
133	Afghanistan	2 770.64	20	12	32	0.51	0.01	0.26
134	Andorra	3 361.80	21	14	35	0.52	0.01	0.26
135	Suriname	1 198.26	20	9	29	0.51	0	0.26
136	Cameroon	1 912.26	20	15	35	0.52	0	0.26
137	Uzbekistan	16 766.68	20	15	35	0.52	0.01	0.25
138	Cambodia	2 990.11	20	16	36	0.52	0	0.25
139	Curacao	20 837.31	21	19	40	0.52	0.01	0.25
140	International organisations	264 124.61	21	20	41	0.52	0.05	0.25
141	Syria	2 021.34	20	10	30	0.51	0	0.25
142	Barbados	52 150.20	20	20	40	0.52	0.01	0.25

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
143	Namibia	1 229.69	20	16	36	0.52	0	0.25
144	Gibraltar	11 692.81	20	17	37	0.52	0.05	0.25
145	Sierra Leone	346.11	19	11	30	0.51	0	0.24
146	Rwanda	366.20	19	12	31	0.51	0	0.24
147	Armenia	631.28	19	15	34	0.52	0	0.24
148	Albania	2 145.46	19	13	32	0.52	0	0.24
149	Fiji	348.81	19	12	31	0.51	0.01	0.24
150	Madagascar	1 351.04	19	13	32	0.52	0	0.24
151	Marshall Islands	15 795.30	19	20	39	0.52	0.01	0.24
152	Benin	262.55	19	12	31	0.51	0	0.24
153	Cuba	3 581.83	19	13	32	0.52	0	0.23
154	St. Vincent and the Grenadines	1 849.27	19	12	31	0.51	0.01	0.23
155	Moldova	1 561.47	18	13	31	0.52	0	0.23
156	Bosnia and Herzegovina	2 180.26	18	16	34	0.52	0.01	0.23
157	Haiti	672.48	18	9	27	0.51	0	0.23
158	Guinea	438.48	18	10	28	0.51	0	0.23
159	Dominica	430.26	18	7	25	0.51	0	0.23
160	Mali	517.84	17	15	32	0.52	0	0.22
161	Mongolia	787.17	17	13	30	0.52	0	0.22
162	St. Lucia	667.14	18	7	25	0.51	0	0.22
163	Vanuatu	515.07	17	10	27	0.51	0	0.22
164	Gambia	307.88	17	13	30	0.52	0	0.22
165	Maldives	644.21	17	13	30	0.52	0	0.22

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
166	Montenegro	483.00	17	12	29	0.51	0	0.22
167	Burkina Faso	250.91	17	12	29	0.51	0	0.22
168	French Polynesia	1 041.26	17	9	26	0.51	0	0.22
169	Vatican City State	1 625.57	17	5	22	0.5	0	0.22
170	Niger	227.83	16	10	26	0.51	0	0.22
171	Turks and Caicos Islands	1 287.06	17	13	30	0.52	0	0.22
172	Sudan	534.14	16	11	27	0.51	0	0.21
173	British Overseas Territories	1 321.60	17	8	25	0.51	0	0.21
174	Cape Verde	1 566.41	17	5	22	0.5	0	0.21
175	Aruba	988.80	16	11	27	0.51	0	0.2
176	Togo	350.42	15	11	26	0.51	0	0.2
177	New Caledonia	1 499.11	15	7	22	0.51	0	0.2
178	Palestinian Territory	929.57	15	10	25	0.51	0	0.2
179	San Marino	416.31	15	6	21	0.51	0	0.2
180	Grenada	172.56	15	7	22	0.51	0	0.19
181	Tajikistan	423.98	15	5	20	0.5	0	0.19
182	Lesotho	567.87	15	5	20	0.51	0	0.19
183	Eritrea	772.49	14	2	16	0.5	0	0.18
184	Timor Leste	588.53	14	4	18	0.5	0	0.18
185	Burundi	187.95	14	12	26	0.51	0	0.18
186	Mauritania	756.37	14	12	26	0.51	0	0.18
187	Turkmenistan	24 995.08	13	11	24	0.51	0	0.18
188	Guyana	408.37	14	6	20	0.51	0	0.18

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
189	Samoa	19 123.47	14	11	25	0.51	0	0.17
190	Equatorial Guinea	342.50	12	7	19	0.51	0	0.16
191	Somalia	34.35	12	6	18	0.51	0	0.16
192	Bhutan	349.98	12	1	13	0.48	0	0.16
193	Guinea-Bissau	142.85	12	5	17	0.5	0	0.16
194	Bonaire, Sint Eustatius and Saba	159.81	12	3	15	0.5	0	0.16
195	Chad	197.73	12	6	18	0.51	0	0.15
196	Sint Maarten	480.60	12	4	16	0.5	0	0.15
197	Faeroe Islands	256.39	11	6	17	0.51	0	0.15
198	Central African Republic	95.94	11	6	17	0.51	0	0.15
199	Falkland Islands	241.32	11	5	16	0.5	0	0.14
200	Greenland	259.74	10	6	16	0.51	0	0.14
201	Solomon Islands	359.05	10	7	17	0.51	0	0.14
202	North Korea	93.08	12	7	19	0.51	0	0.14
203	Tonga	106.40	10	4	14	0.5	0	0.13
204	Kiribati	134.51	10	2	12	0.5	0	0.13
205	Djibouti	701.84	9	8	17	0.51	0	0.12
206	Comoros	71.36	8	4	12	0.5	0	0.11
207	Sao Tome and Principe	83.58	8	4	12	0.5	0.01	0.11
208	St. Helena and Dependencies	12.34	8	3	11	0.5	0	0.1
209	South Sudan	9.37	6	2	8	0.5	0	0.08
210	Wallis and Futuna	2.04	6	6	12	0.51	0	0.08
211	Nauru	58.32	5	3	8	0.49	0	0.07

(Continued)

Table A1.4. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closeness centrality	Betweenness centrality	Eigenvector centrality
212	Micronesia	28.14	4	3	7	0.5	0	0.06
213	US Pacific Islands	370.17	4	2	6	0.49	0	0.05
214	Tuvalu	37.58	3	1	4	0.48	0	0.04
215	Palau	3.65	3	1	4	0.48	0	0.04

Appendix 2. Rank of countries by eigenvector centrality (CPIS)

Table A2.1. CPIS rank of countries by eigenvector centrality—2001

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentality
1	United States	3 105 840.59	66	122	188	0.719	1242.206	1.000
2	United Kingdom	1 289 876.34	62	108	170	0.683	475.790	0.962
3	Germany	1 167 312.87	61	94	155	0.649	339.578	0.960
4	France	776 582.98	60	93	153	0.649	354.996	0.941
5	Netherlands	705 536.33	60	93	153	0.649	390.214	0.936
6	Italy	579 551.40	58	116	174	0.704	920.228	0.915
7	Japan	540 800.28	58	81	139	0.623	286.646	0.910
8	Switzerland	218 587.37	57	121	178	0.717	856.831	0.902
9	Canada	319 794.82	56	83	139	0.627	272.055	0.892
10	Luxembourg	525 324.41	55	138	193	0.763	1291.279	0.883
11	Cayman Islands	416 538.07	55	59	114	0.580	120.733	0.878
12	Belgium	155 709.98	53	110	163	0.685	627.502	0.860
13	Sweden	174 550.57	53	76	129	0.612	231.459	0.858
14	Australia	162 671.77	53	51	104	0.567	84.084	0.846
15	Spain	285 066.91	52	60	112	0.580	60.685	0.845
16	Ireland	177 597.22	53	57	110	0.578	74.021	0.844
17	Austria	109 891.05	51	99	150	0.662	417.164	0.825
18	Denmark	74 903.00	51	88	139	0.641	319.833	0.822
19	Bermuda	170 828.27	49	81	130	0.625	201.256	0.806
20	Mexico	85 643.45	50	0	50	0.000	0.000	0.805
21	Norway	50 038.88	48	60	108	0.583	80.250	0.798

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentrality
22	China, P.R.: Hong Kong	96 699.50	47	20	67	0.490	9.516	0.776
23	Finland	153 567.88	48	25	73	0.519	8.363	0.772
24	Russian Federation	26 254.26	46	26	72	0.510	85.801	0.769
25	Brazil	81 399.37	45	62	107	0.581	177.003	0.752
26	Argentina	25 153.78	46	32	78	0.531	33.893	0.742
27	Korea, Republic of	79 565.50	44	56	100	0.570	119.871	0.742
28	Singapore	50 693.44	42	43	85	0.552	52.548	0.716
29	Portugal	59 283.96	42	46	88	0.559	103.287	0.703
30	Israel	26 656.86	39	24	63	0.518	7.257	0.689
31	China, P.R.: Mainland	20 416.80	38	0	38	0.000	0.000	0.668
32	Greece	68 182.03	38	54	92	0.567	42.953	0.665
33	Venezuela, Republica Bolivariana de	10 754.44	38	17	55	0.482	12.133	0.663
34	Panama	13 182.38	37	42	79	0.522	87.855	0.658
35	Turkey	16 900.55	39	21	60	0.501	34.558	0.653
36	Poland	12 916.01	36	43	79	0.551	15.589	0.643
37	Taiwan Province of China	41 206.94	36	0	36	0.000	0.000	0.634
38	Thailand	12 061.64	35	23	58	0.489	10.238	0.626
39	Netherlands Antilles	64 355.72	38	60	98	0.580	126.032	0.625
40	India	15 520.84	36	0	36	0.000	0.000	0.616
41	South Africa	19 895.37	35	41	76	0.548	77.409	0.616
42	Philippines	12 946.54	35	25	60	0.480	7.041	0.608

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentrality
43	Bahamas, The	8 083.97	34	47	81	0.549	28.111	0.603
44	Hungary	16 026.27	34	42	76	0.551	12.637	0.594
45	Indonesia	5 466.22	34	24	58	0.503	73.675	0.592
46	Colombia	6 389.15	33	22	55	0.506	11.615	0.591
47	New Zealand	16 676.15	35	19	54	0.488	13.020	0.580
48	Virgin Islands, British	14 456.26	34	0	34	0.000	0.000	0.570
49	Malaysia	22 551.13	32	63	95	0.590	179.366	0.569
50	Peru	3 070.73	29	0	29	0.000	0.000	0.556
51	Iceland	3 615.93	29	32	61	0.529	8.924	0.552
52	Ukraine	1 285.94	30	4	34	0.423	12.405	0.545
53	Cyprus	1 529.07	30	68	98	0.597	172.131	0.535
54	Chile	8 385.78	28	52	80	0.563	25.342	0.535
55	Ecuador	1 463.42	27	0	27	0.000	0.000	0.510
56	Jersey	39 874.49	29	62	91	0.588	37.137	0.501
57	Bulgaria	4 532.62	27	19	46	0.501	4.189	0.496
58	Guernsey	14 572.47	28	103	131	0.673	212.995	0.473
59	Croatia	3 594.41	25	0	25	0.000	0.000	0.467
60	Romania	1 445.19	26	10	36	0.485	6.739	0.465
61	Czech Republic	2 267.47	24	37	61	0.541	69.823	0.460
62	Uruguay	1 903.31	24	39	63	0.542	11.590	0.449
63	Egypt	1 214.09	24	27	51	0.506	5.706	0.440
64	Liberia	1 788.87	21	0	21	0.000	0.000	0.416
65	Slovak Republic	2 056.79	21	38	59	0.542	15.576	0.412

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentrality
66	Jamaica	622.83	19	0	19	0.000	0.000	0.370
67	Mauritius	652.65	21	27	48	0.503	86.338	0.368
68	Gibraltar	3 001.84	19	0	19	0.000	0.000	0.359
69	Lithuania	954.39	19	0	19	0.000	0.000	0.357
70	Dominican Republic	458.44	18	0	18	0.000	0.000	0.352
71	Estonia	698.70	18	21	39	0.514	2.267	0.352
72	Slovenia	1 887.38	18	0	18	0.000	0.000	0.351
73	Morocco	1 364.36	16	0	16	0.000	0.000	0.331
74	Qatar	924.11	18	0	18	0.000	0.000	0.330
75	Barbados	390.56	16	0	16	0.000	0.000	0.316
76	Cote d'Ivoire	858.55	16	0	16	0.000	0.000	0.316
77	Nigeria	369.74	16	0	16	0.000	0.000	0.310
78	Costa Rica	410.43	15	21	36	0.461	3.599	0.299
79	Pakistan	469.22	15	0	15	0.000	0.000	0.285
80	Lebanon	553.06	15	53	68	0.568	11.372	0.284
81	Kazakhstan	338.25	15	11	26	0.461	7.497	0.282
82	Jordan	298.74	16	0	16	0.000	0.000	0.281
83	Sri Lanka	368.01	14	0	14	0.000	0.000	0.278
84	Trinidad and Tobago	1 372.08	14	0	14	0.000	0.000	0.276
85	Isle of Man	533.29	16	68	84	0.601	84.396	0.275
86	Vietnam	190.80	14	0	14	0.000	0.000	0.274
87	Bosnia and Herzegovina	36.11	13	0	13	0.000	0.000	0.273
88	Guatemala	355.87	14	0	14	0.000	0.000	0.268

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentality
89	Latvia	386.54	13	0	13	0.000	0.000	0.266
90	Tunisia	1 628.31	14	0	14	0.000	0.000	0.263
91	US Virgin Islands	259.95	15	0	15	0.000	0.000	0.247
92	Iran	373.95	13	0	13	0.000	0.000	0.242
93	Papua New Guinea	308.94	11	0	11	0.000	0.000	0.236
94	Ghana	263.40	12	0	12	0.000	0.000	0.236
95	Zimbabwe	202.21	12	0	12	0.000	0.000	0.234
96	Liechtenstein	324.85	11	0	11	0.000	0.000	0.229
97	El Salvador	170.20	12	0	12	0.000	0.000	0.223
98	Serbia, Republic of	42.34	11	0	11	0.000	0.000	0.220
99	Bahrain, Kingdom of	217.26	12	50	62	0.565	8.212	0.209
100	Saudi Arabia	2 016.33	13	0	13	0.000	0.000	0.208
101	Macedonia, FYR	49.83	10	0	10	0.000	0.000	0.205
102	Oman	230.35	11	0	11	0.000	0.000	0.180
103	Albania	175.04	9	0	9	0.000	0.000	0.179
104	Marshall Islands, Republic of	70.99	8	0	8	0.000	0.000	0.176
105	Belize	114.43	9	0	9	0.000	0.000	0.174
106	Bolivia	108.52	8	0	8	0.000	0.000	0.162
107	Georgia	77.10	8	0	8	0.000	0.000	0.160
108	Algeria	116.58	8	0	8	0.000	0.000	0.152
109	Kenya	62.18	7	0	7	0.000	0.000	0.146
110	Andorra	37.83	7	0	7	0.000	0.000	0.141
111	Botswana	56.60	7	0	7	0.000	0.000	0.137

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentrality
112	Nicaragua	107.92	7	0	7	0.000	0.000	0.135
113	Puerto Rico	32.14	7	0	7	0.000	0.000	0.133
114	Malta	210.35	6	38	44	0.543	0.603	0.132
115	Namibia	26.33	6	0	6	0.000	0.000	0.128
116	Senegal	327.52	6	0	6	0.000	0.000	0.127
117	Aruba	407.06	6	5	11	0.439	0.000	0.125
118	United Arab Emirates	81.83	7	0	7	0.000	0.000	0.124
119	Monaco	83.63	6	0	6	0.000	0.000	0.119
120	Gabon	109.82	5	0	5	0.000	0.000	0.112
121	Turks and Caicos Islands	114.94	5	0	5	0.000	0.000	0.101
122	Bangladesh	16.01	5	0	5	0.000	0.000	0.098
123	Moldova	160.87	5	0	5	0.000	0.000	0.097
124	Antigua and Barbuda	75.21	5	0	5	0.000	0.000	0.096
125	Gambia, The	23.41	4	0	4	0.000	0.000	0.091
126	Kuwait	406.09	6	0	6	0.000	0.000	0.090
127	Zambia	5.62	4	0	4	0.000	0.000	0.089
128	Malawi	21.16	4	0	4	0.000	0.000	0.081
129	Mozambique	11.00	4	0	4	0.000	0.000	0.081
130	Cuba	7.33	3	0	3	0.000	0.000	0.067
131	Vatican	45.94	3	0	3	0.000	0.000	0.066
132	Congo, Democratic Republic of	1.35	3	0	3	0.000	0.000	0.066

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentality
133	Vanuatu	10.08	3	4	7	0.426	0.000	0.066
134	Grenada	8.55	3	0	3	0.000	0.000	0.065
135	Cameroon	47.01	3	0	3	0.000	0.000	0.064
136	French Territories: French Polynesia	27.83	3	0	3	0.000	0.000	0.064
137	Lesotho	2.73	3	0	3	0.000	0.000	0.061
138	Belarus	7.35	3	0	3	0.000	0.000	0.057
139	Uzbekistan	3.54	3	0	3	0.000	0.000	0.056
140	Libya	2.05	3	0	3	0.000	0.000	0.056
141	Madagascar	3.91	3	0	3	0.000	0.000	0.055
142	Paraguay	17.56	3	0	3	0.000	0.000	0.055
143	Tanzania	8.36	3	0	3	0.000	0.000	0.054
144	Anguilla	10.08	3	0	3	0.000	0.000	0.053
145	Niger	11.47	3	0	3	0.000	0.000	0.048
146	Sudan	0.58	3	0	3	0.000	0.000	0.047
147	Uganda	19.82	2	0	2	0.000	0.000	0.046
148	American Samoa	49.98	2	0	2	0.000	0.000	0.044
149	Yemen, Republic of	0.77	2	0	2	0.000	0.000	0.044
150	Wallis and Futuna	2.83	2	0	2	0.000	0.000	0.044
151	Burundi	0.03	2	0	2	0.000	0.000	0.043
152	Kyrgyz Republic	0.74	3	0	3	0.000	0.000	0.041
153	Honduras	60.88	2	0	2	0.000	0.000	0.040
154	US Pacific Islands	26.65	2	0	2	0.000	0.000	0.040
155	China, P.R.: Macao	78.76	2	44	46	0.557	0.577	0.039

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentality
156	Guinea-Bissau	11.02	2	0	2	0.000	0.000	0.039
157	Myanmar	5.49	2	0	2	0.000	0.000	0.038
158	Angola	9.36	2	0	2	0.000	0.000	0.038
159	Dominica	0.61	2	0	2	0.000	0.000	0.037
160	Suriname	0.89	2	0	2	0.000	0.000	0.036
161	Swaziland	0.56	2	0	2	0.000	0.000	0.035
162	West Bank and Gaza	1.13	2	0	2	0.000	0.000	0.035
163	Brunei Darussalam	1.88	2	0	2	0.000	0.000	0.033
164	Turkmenistan	17.11	2	0	2	0.000	0.000	0.033
165	Guiana, French	1.04	2	0	2	0.000	0.000	0.032
166	Montserrat	5.30	2	0	2	0.000	0.000	0.031
167	Central African Republic	1.06	1	0	1	0.000	0.000	0.024
168	Mali	4.00	1	0	1	0.000	0.000	0.024
169	Samoa	1.77	1	0	1	0.000	0.000	0.023
170	Ethiopia	0.01	1	0	1	0.000	0.000	0.022
171	Iraq	0.06	1	0	1	0.000	0.000	0.022
172	Niue	1.40	1	0	1	0.000	0.000	0.022
173	San Marino	0.02	1	0	1	0.000	0.000	0.022
174	St. Kitts and Nevis	31.33	1	0	1	0.000	0.000	0.022
175	Guinea	3.84	1	0	1	0.000	0.000	0.022
176	Palau	1.30	1	0	1	0.000	0.000	0.022
177	St. Vincent and the Grenadines	1.81	1	0	1	0.000	0.000	0.022

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentrality
178	Haiti	0.12	1	0	1	0.000	0.000	0.022
179	Burkina Faso	2.58	1	0	1	0.000	0.000	0.022
180	Congo, Republic of	0.24	1	0	1	0.000	0.000	0.022
181	Cook Islands	0.36	1	0	1	0.000	0.000	0.022
182	Sao Tome and Principe	1.05	1	0	1	0.000	0.000	0.022
183	Solomon Islands	0.58	1	0	1	0.000	0.000	0.022
184	Somalia	0.19	1	0	1	0.000	0.000	0.022
185	Togo	2.87	1	0	1	0.000	0.000	0.022
186	French Territories: New Caledonia	0.02	1	0	1	0.000	0.000	0.021
187	Rwanda	0.96	1	0	1	0.000	0.000	0.021
188	British Indian Ocean Territory	351.81	1	0	1	0.000	0.000	0.021
189	Chad	0.09	1	0	1	0.000	0.000	0.020
190	Guadeloupe	4.05	1	0	1	0.000	0.000	0.020
191	Mauritania	13.13	1	0	1	0.000	0.000	0.020
192	Faroe Islands	6.66	1	0	1	0.000	0.000	0.020
193	Greenland	4.28	1	0	1	0.000	0.000	0.020
194	Saint Helena	4.49	1	0	1	0.000	0.000	0.014
195	Cambodia	31.47	1	0	1	0.000	0.000	0.014
196	Maldives	2.77	1	0	1	0.000	0.000	0.014
197	Syrian Arab Republic	0.26	1	0	1	0.000	0.000	0.013
198	Armenia, Republic of	0.06	1	0	1	0.000	0.000	0.012

(Continued)

Table A2.1. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigencentality
199	Micronesia, Federated States of	1.35	1	0	1	0.000	0.000	0.011
200	Seychelles	0.39	1	0	1	0.000	0.000	0.009
201	Korea, Democratic People's Rep. of	3.80	1	0	1	0.000	0.000	0.007
202	St. Lucia	0.00	0	0	0	0.000	0.000	0.000

Table A2.2. CPIS rank of countries by eigenvector centrality—2008

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
1	United Kingdom	2 807 751.49	72	155	227	0.778	1448.659	1.000
2	United States	6 395 458.38	71	127	198	0.705	668.232	0.988
3	France	2 074 807.15	69	138	207	0.733	769.183	0.966
4	Germany	2 742 396.44	69	115	184	0.680	263.021	0.966
5	Netherlands	1 518 841.31	69	124	193	0.700	470.690	0.959
6	Luxembourg	1 483 186.15	68	154	222	0.775	973.438	0.952
7	Ireland	1 005 120.01	68	118	186	0.685	458.334	0.952
8	Canada	632 039.71	67	88	155	0.625	136.851	0.945
9	Cayman Islands	1 312 300.53	67	68	135	0.585	109.573	0.944
10	Switzerland	470 141.65	67	133	200	0.721	598.046	0.941
11	Belgium	342 049.91	64	117	181	0.685	295.509	0.897
12	Australia	517 919.93	63	42	105	0.543	24.698	0.896
13	China, P.R.: Mainland	265 317.21	62	0	62	0.000	0.000	0.890
14	Italy	1 358 586.26	63	117	180	0.685	235.817	0.889
15	Spain	1 143 916.90	63	38	101	0.540	21.662	0.884
16	Austria	384 872.75	62	114	176	0.678	239.542	0.880
17	China, P.R.: Hong Kong	182 593.25	61	92	153	0.633	155.503	0.873
18	Norway	187 543.62	61	111	172	0.670	422.152	0.872
19	Japan	1 161 377.35	62	94	156	0.636	149.148	0.871
20	Sweden	340 461.41	61	114	175	0.676	401.296	0.862
21	Brazil	204 944.13	60	80	140	0.604	241.307	0.862
22	Finland	213 861.39	61	55	116	0.570	58.237	0.861
23	Russian Federation	74 403.88	60	50	110	0.555	100.265	0.859
24	Mexico	111 803.97	58	20	78	0.500	4.355	0.836

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
25	Bermuda	295 394.72	58	84	142	0.611	320.028	0.834
26	Denmark	193 833.27	58	124	182	0.698	308.781	0.829
27	Korea, Republic of	210 836.99	54	94	148	0.638	111.459	0.800
28	Greece	265 849.19	57	60	117	0.573	39.193	0.793
29	Virgin Islands, British	55 607.66	55	0	55	0.000	0.000	0.791
30	Turkey	60 454.65	54	37	91	0.534	24.336	0.783
31	India	198 402.39	54	38	92	0.528	30.288	0.769
32	Jersey	264 994.56	53	95	148	0.635	230.501	0.763
33	South Africa	66 837.01	52	63	115	0.582	154.109	0.762
34	Singapore	87 181.72	51	51	102	0.562	25.508	0.754
35	Portugal	248 210.05	49	58	107	0.568	159.000	0.742
36	Poland	68 281.02	49	40	89	0.543	13.589	0.730
37	Guernsey	59 513.20	49	108	157	0.666	162.552	0.719
38	Thailand	28 823.83	45	63	108	0.576	173.335	0.694
39	Netherlands Antilles	124 358.81	48	75	123	0.603	74.722	0.687
40	Panama	20 838.49	45	46	91	0.545	30.535	0.683
41	New Zealand	32 955.58	45	9	54	0.471	1.109	0.680
42	Iceland	14 970.26	44	47	91	0.554	31.219	0.666
43	Malaysia	52 316.64	43	66	109	0.585	75.204	0.666
44	Indonesia	38 529.09	45	33	78	0.531	14.442	0.665
45	Bahamas, The	13 553.29	45	37	82	0.533	14.461	0.664
46	Israel	59 759.67	46	47	93	0.554	21.653	0.663
47	Argentina	13 375.72	42	39	81	0.536	9.441	0.649
48	Hungary	50 636.62	42	70	112	0.590	36.886	0.643

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
49	Taiwan Province of China	86 871.10	43	0	43	0.000	0.000	0.639
50	Kazakhstan	5 436.51	41	50	91	0.558	31.084	0.636
51	Czech Republic	24 888.11	40	71	111	0.596	43.853	0.634
52	Venezuela, Republica Bolivariana de	11 001.90	41	17	58	0.494	1.752	0.634
53	Philippines	21 507.83	43	9	52	0.476	0.777	0.632
54	United Arab Emirates	21 945.56	43	0	43	0.000	0.000	0.632
55	Chile	17 258.02	41	57	98	0.564	30.567	0.627
56	Cyprus	19 350.51	41	94	135	0.631	63.270	0.624
57	Peru	9 183.43	39	0	39	0.000	0.000	0.605
58	Ukraine	5 630.25	39	2	41	0.439	1.613	0.601
59	Colombia	13 572.17	38	34	72	0.528	5.043	0.580
60	Egypt	10 890.79	35	47	82	0.541	36.844	0.549
61	Qatar	7 176.17	34	0	34	0.000	0.000	0.517
62	Isle of Man	4 403.93	32	66	98	0.588	32.263	0.512
63	Uruguay	4 970.30	32	61	93	0.568	47.148	0.498
64	Ecuador	905.62	31	0	31	0.000	0.000	0.496
65	Mauritius	4 569.67	32	101	133	0.644	429.785	0.496
66	Morocco	3 228.81	30	0	30	0.000	0.000	0.486
67	Pakistan	2 675.63	30	11	41	0.479	2.905	0.479
68	Lithuania	3 624.30	29	0	29	0.000	0.000	0.467
69	Liberia	3 834.62	27	0	27	0.000	0.000	0.465
70	Tunisia	4 030.19	30	0	30	0.000	0.000	0.460
71	Croatia	6 048.00	29	0	29	0.000	0.000	0.457

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
72	Bahrain, Kingdom of	9 883.72	30	58	88	0.573	45.178	0.453
73	Saudi Arabia	9 653.33	30	0	30	0.000	0.000	0.450
74	Vietnam	3 224.73	27	0	27	0.000	0.000	0.443
75	Georgia	337.73	28	0	28	0.000	0.000	0.442
76	Gibraltar	1 886.03	25	39	64	0.540	3.539	0.435
77	Dominican Republic	1 189.75	26	0	26	0.000	0.000	0.434
78	Bulgaria	2 663.71	28	43	71	0.547	7.516	0.430
79	Romania	5 032.02	27	18	45	0.501	3.705	0.428
80	Marshall Islands, Republic of	5 601.85	25	0	25	0.000	0.000	0.422
81	Slovak Republic	12 783.09	26	58	84	0.567	21.360	0.422
82	Barbados	1 381.16	25	44	69	0.543	5.534	0.417
83	Slovenia	5 632.68	26	0	26	0.000	0.000	0.414
84	Papua New Guinea	3 252.84	25	0	25	0.000	0.000	0.411
85	Ghana	671.62	24	0	24	0.000	0.000	0.401
86	Estonia	2 983.13	24	63	87	0.577	15.769	0.399
87	Malta	2 616.72	25	27	52	0.520	0.716	0.396
88	Costa Rica	725.31	24	49	73	0.547	10.666	0.394
89	Jamaica	926.94	23	0	23	0.000	0.000	0.388
90	Latvia	1 451.72	24	76	100	0.596	95.901	0.387
91	Trinidad and Tobago	1 928.27	23	0	23	0.000	0.000	0.385
92	Sri Lanka	882.70	24	0	24	0.000	0.000	0.378
93	Kuwait	3 584.50	24	57	81	0.568	93.381	0.372
94	Lebanon	2 052.34	22	77	99	0.599	46.787	0.361

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
95	Liechtenstein	2 435.91	21	0	21	0.000	0.000	0.359
96	El Salvador	1 203.09	22	0	22	0.000	0.000	0.359
97	Aruba	4 274.42	20	43	63	0.541	1.421	0.354
98	Oman	712.15	22	0	22	0.000	0.000	0.350
99	Nigeria	1 986.97	21	0	21	0.000	0.000	0.346
100	Puerto Rico	89.88	21	0	21	0.000	0.000	0.342
101	Serbia, Republic of	2 008.09	21	0	21	0.000	0.000	0.333
102	Kenya	365.71	20	0	20	0.000	0.000	0.327
103	Jordan	1 579.46	21	0	21	0.000	0.000	0.322
104	Guatemala	480.43	19	0	19	0.000	0.000	0.318
105	Belize	146.27	18	0	18	0.000	0.000	0.316
106	Seychelles	93.01	18	0	18	0.000	0.000	0.303
107	Zambia	193.90	17	0	17	0.000	0.000	0.291
108	US Virgin Islands	1 382.26	18	0	18	0.000	0.000	0.285
109	Iraq	938.14	17	0	17	0.000	0.000	0.282
110	Macedonia, FYR	255.57	16	0	16	0.000	0.000	0.275
111	Cote d'Ivoire	660.10	15	0	15	0.000	0.000	0.266
112	Bosnia and Herzegovina	560.90	16	0	16	0.000	0.000	0.262
113	Gabon	384.26	14	0	14	0.000	0.000	0.246
114	Faroe Islands	346.21	13	0	13	0.000	0.000	0.236
115	Azerbaijan, Republic of	230.51	13	0	13	0.000	0.000	0.212
116	Albania	177.36	11	0	11	0.000	0.000	0.195
117	Zimbabwe	123.87	11	0	11	0.000	0.000	0.191

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
118	Senegal	170.88	11	0	11	0.000	0.000	0.191
119	Antigua and Barbuda	37.98	11	0	11	0.000	0.000	0.184
120	Grenada	26.92	10	0	10	0.000	0.000	0.182
121	Iran	620.08	11	0	11	0.000	0.000	0.177
122	Bangladesh	462.52	11	0	11	0.000	0.000	0.174
123	Falkland Islands	8.48	8	0	8	0.000	0.000	0.153
124	Botswana	324.62	9	0	9	0.000	0.000	0.153
125	Fiji	75.62	8	0	8	0.000	0.000	0.153
126	Mongolia	86.12	8	0	8	0.000	0.000	0.149
127	Monaco	24.55	8	0	8	0.000	0.000	0.148
128	Honduras	206.13	9	0	9	0.000	0.000	0.145
129	Anguilla	198.59	9	0	9	0.000	0.000	0.145
130	Armenia, Republic of	65.11	8	0	8	0.000	0.000	0.144
131	Nicaragua	112.74	8	0	8	0.000	0.000	0.144
132	Bolivia	49.15	8	0	8	0.000	0.000	0.143
133	Congo, Republic of	102.97	8	0	8	0.000	0.000	0.142
134	Andorra	268.56	8	0	8	0.000	0.000	0.139
135	Algeria	76.39	8	0	8	0.000	0.000	0.139
136	Swaziland	26.76	9	0	9	0.000	0.000	0.135
137	Namibia	664.46	8	0	8	0.000	0.000	0.135
138	Paraguay	59.23	8	0	8	0.000	0.000	0.132
139	Cambodia	65.98	8	0	8	0.000	0.000	0.132
140	Cuba	213.55	7	0	7	0.000	0.000	0.118
141	Montenegro	83.06	7	0	7	0.000	0.000	0.114

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
142	Sudan	290.55	9	0	9	0.000	0.000	0.112
143	Kyrgyz Republic	135.48	7	0	7	0.000	0.000	0.111
144	St. Vincent and the Grenadines	240.49	6	0	6	0.000	0.000	0.109
145	St. Lucia	66.57	6	0	6	0.000	0.000	0.108
146	Moldova	72.74	7	0	7	0.000	0.000	0.103
147	Uganda	185.60	6	0	6	0.000	0.000	0.101
148	Cameroon	127.57	6	0	6	0.000	0.000	0.100
149	Tanzania	66.33	6	0	6	0.000	0.000	0.100
150	Mozambique	113.10	6	0	6	0.000	0.000	0.095
151	Guam	37.60	6	0	6	0.000	0.000	0.095
152	Congo, Democratic Republic of	79.84	5	0	5	0.000	0.000	0.094
153	Guinea	12.38	5	0	5	0.000	0.000	0.092
154	Belarus	11.54	6	0	6	0.000	0.000	0.084
155	Angola	220.40	5	0	5	0.000	0.000	0.082
156	Nepal	44.81	5	0	5	0.000	0.000	0.081
157	Niger	15.88	5	0	5	0.000	0.000	0.077
158	Turks and Caicos Islands	2.99	4	0	4	0.000	0.000	0.076
159	Greenland	32.90	4	0	4	0.000	0.000	0.071
160	Suriname	6.54	4	0	4	0.000	0.000	0.069
161	Madagascar	52.14	4	0	4	0.000	0.000	0.067
162	Yemen, Republic of	101.32	5	0	5	0.000	0.000	0.067
163	Malawi	15.11	4	0	4	0.000	0.000	0.061

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
164	Cook Islands	25.64	4	0	4	0.000	0.000	0.060
165	Maldives	27.10	4	0	4	0.000	0.000	0.056
166	Libya	22.53	4	0	4	0.000	0.000	0.056
167	Guadeloupe	8.54	3	0	3	0.000	0.000	0.055
168	Mali	5.24	4	0	4	0.000	0.000	0.055
169	Tokelau Islands	4.32	3	0	3	0.000	0.000	0.054
170	China, P.R.: Macao	240.22	3	53	56	0.568	0.756	0.053
171	Guyana	89.13	3	0	3	0.000	0.000	0.052
172	Syrian Arab Republic	68.91	5	0	5	0.000	0.000	0.051
173	Reunion	29.61	3	0	3	0.000	0.000	0.049
174	Uzbekistan	1.61	3	0	3	0.000	0.000	0.048
175	Ethiopia	3.28	3	0	3	0.000	0.000	0.047
176	Sierra Leone	55.32	3	0	3	0.000	0.000	0.046
177	West Bank and Gaza	13.97	3	0	3	0.000	0.000	0.046
178	Togo	46.81	3	0	3	0.000	0.000	0.045
179	Burundi	5.21	3	0	3	0.000	0.000	0.043
180	French Territories: French Polynesia	27.83	2	0	2	0.000	0.000	0.037
181	St. Kitts and Nevis	0.10	2	0	2	0.000	0.000	0.037
182	Lesotho	6.46	2	0	2	0.000	0.000	0.035
183	Eritrea	75.99	2	0	2	0.000	0.000	0.033
184	Myanmar	0.09	2	0	2	0.000	0.000	0.031
185	Cabo Verde	59.31	2	0	2	0.000	0.000	0.030
186	Brunei Darussalam	14.06	2	0	2	0.000	0.000	0.030

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
187	Niue	0.59	2	0	2	0.000	0.000	0.027
188	US Pacific Islands	5.90	2	0	2	0.000	0.000	0.026
189	Djibouti	14.37	2	0	2	0.000	0.000	0.026
190	Gambia, The	0.94	1	0	1	0.000	0.000	0.020
191	Haiti	0.00	1	0	1	0.000	0.000	0.020
192	Lao People's Democratic Republic	1.30	1	0	1	0.000	0.000	0.020
193	Norfolk Island	61.36	1	0	1	0.000	0.000	0.020
194	Sao Tome and Principe	10.23	1	0	1	0.000	0.000	0.020
195	Kiribati	1.00	1	0	1	0.000	0.000	0.020
196	Central African Republic	0.30	1	0	1	0.000	0.000	0.020
197	French Territories: New Caledonia	0.58	1	0	1	0.000	0.000	0.020
198	Montserrat	0.94	1	0	1	0.000	0.000	0.020
199	Equatorial Guinea	5.57	1	0	1	0.000	0.000	0.019
200	Christmas Island	0.77	1	0	1	0.000	0.000	0.019
201	Cocos (Keeling) Islands	0.25	1	0	1	0.000	0.000	0.019
202	Somalia	5.57	1	0	1	0.000	0.000	0.019
203	Tajikistan	26.78	1	0	1	0.000	0.000	0.019
204	Burkina Faso	2.95	1	0	1	0.000	0.000	0.019
205	Micronesia, Federated States of	0.02	1	0	1	0.000	0.000	0.019

(Continued)

Table A2.2. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
206	Afghanistan, Islamic Republic of	3.57	1	0	1	0.000	0.000	0.018
207	British Indian Ocean Territory	1.57	1	0	1	0.000	0.000	0.018
208	Turkmenistan	0.12	1	0	1	0.000	0.000	0.017
209	Samoa	4.00	1	0	1	0.000	0.000	0.017
210	Guiana, French	2.00	1	0	1	0.000	0.000	0.017
211	Saint Pierre and Miquelon	2.00	1	0	1	0.000	0.000	0.017
212	Guinea-Bissau	7.21	1	0	1	0.000	0.000	0.015
213	Solomon Islands	0.04	1	0	1	0.000	0.000	0.014
214	Comoros	4.80	1	0	1	0.000	0.000	0.010
215	Mayotte	8.20	1	0	1	0.000	0.000	0.010
216	Western Sahara	57.50	1	0	1	0.000	0.000	0.010
217	American Samoa	0.20	1	0	1	0.000	0.000	0.008
218	Mauritania	4.95	1	0	1	0.000	0.000	0.008

Table A2.3. CPIS rank of countries by eigenvector centrality—2016

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
1	United States	12 990 563.26	79	116	195	0.676	531.512	1.000
2	United Kingdom	3 803 554.43	77	165	242	0.794	1244.787	0.990
3	Germany	2 864 658.70	76	136	212	0.719	305.990	0.986
4	Ireland	1 727 322.96	76	140	216	0.729	369.155	0.985
5	Netherlands	2 057 739.35	75	132	207	0.710	346.362	0.976
6	Cayman Islands	2 867 494.40	72	138	210	0.724	398.770	0.973
7	Luxembourg	3 075 087.02	74	177	251	0.829	1356.743	0.972
8	France	3 085 208.54	76	149	225	0.751	630.472	0.970
9	Japan	2 129 430.70	73	126	199	0.697	256.449	0.965
10	Switzerland	924 890.74	72	151	223	0.756	565.903	0.962
11	Brazil	414 476.49	74	103	177	0.648	394.930	0.955
12	Spain	989 004.21	72	46	118	0.551	18.806	0.954
13	Canada	1 538 217.44	70	109	179	0.662	115.518	0.950
14	Australia	1 006 719.94	71	63	134	0.576	61.014	0.947
15	China, P.R.: Mainland	844 369.15	70	124	194	0.693	217.350	0.947
16	China, P.R.: Hong Kong	474 670.25	70	89	159	0.623	108.468	0.931
17	Singapore	301 829.68	68	28	96	0.517	28.454	0.929
18	Sweden	653 899.01	69	125	194	0.695	234.405	0.926
19	Belgium	611 357.86	71	122	193	0.688	232.620	0.921
20	Korea, Republic of	507 128.31	68	123	191	0.690	347.231	0.902
21	Mexico	338 885.05	67	42	109	0.543	26.556	0.901
22	Italy	1 257 355.20	69	143	212	0.736	447.772	0.899
23	Turkey	112 531.74	69	64	133	0.576	77.432	0.896

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
24	Bermuda	530 000.04	65	122	187	0.686	353.211	0.894
25	Virgin Islands, British	223 115.86	65	0	65	0.000	0.000	0.890
26	Finland	299 461.54	66	99	165	0.641	111.267	0.889
27	Denmark	371 365.33	65	141	206	0.731	260.639	0.882
28	South Africa	164 932.83	64	74	138	0.598	91.917	0.877
29	Russian Federation	152 844.30	67	81	148	0.606	79.921	0.873
30	India	418 454.58	64	50	114	0.556	78.747	0.872
31	Norway	318 297.81	64	113	177	0.668	301.194	0.872
32	Israel	97 389.84	61	65	126	0.578	72.124	0.864
33	Jersey	282 955.98	62	99	161	0.643	115.147	0.859
34	Poland	124 141.11	63	54	117	0.556	33.444	0.849
35	Austria	368 575.51	63	127	190	0.699	146.417	0.848
36	United Arab Emirates	68 133.66	63	0	63	0.000	0.000	0.842
37	Chile	68 368.51	61	109	170	0.660	461.543	0.831
38	New Zealand	78 163.89	59	8	67	0.443	0.937	0.828
39	Indonesia	171 080.01	60	59	119	0.573	108.948	0.821
40	Portugal	114 999.66	60	74	134	0.593	103.664	0.818
41	Malaysia	113 601.85	59	86	145	0.613	147.976	0.809
42	Argentina	56 742.08	55	36	91	0.533	3.286	0.801
43	Greece	33 943.09	59	52	111	0.553	14.913	0.800
44	Panama	44 344.64	57	82	139	0.604	146.894	0.796
45	Guernsey	114 531.14	57	137	194	0.722	257.402	0.782

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
46	Taiwan Province of China	259 003.85	55	0	55	0.000	0.000	0.781
47	Colombia	61 158.88	55	39	94	0.535	21.017	0.778
48	Peru	30 943.81	54	56	110	0.565	15.483	0.776
49	Cyprus	21 029.05	55	95	150	0.635	114.149	0.766
50	Thailand	103 767.71	51	86	137	0.614	209.833	0.743
51	Venezuela, Republica Bolivariana de	17 983.92	52	7	59	0.451	8.389	0.738
52	Philippines	65 625.43	49	29	78	0.521	10.287	0.714
53	Isle of Man	12 218.43	49	83	132	0.613	117.463	0.699
54	Czech Republic	46 883.98	52	80	132	0.609	136.595	0.696
55	Qatar	29 142.40	49	0	49	0.000	0.000	0.678
56	Kazakhstan	13 033.65	48	55	103	0.562	23.749	0.673
57	Curacao	129 186.22	48	82	130	0.609	71.147	0.669
58	Romania	22 068.13	48	46	94	0.548	7.962	0.669
59	Slovenia	21 889.09	49	86	135	0.614	72.917	0.666
60	Croatia	11 182.49	49	0	49	0.000	0.000	0.666
61	Bulgaria	5 806.82	48	73	121	0.593	26.460	0.666
62	Bahamas, The	18 499.79	47	0	47	0.000	0.000	0.662
63	Morocco	8 483.11	48	0	48	0.000	0.000	0.660
64	Egypt	10 164.70	46	30	76	0.521	32.873	0.651
65	Mauritius	35 365.90	44	105	149	0.650	286.309	0.649
66	Ukraine	17 092.62	46	3	49	0.447	1.652	0.640
67	Saudi Arabia	11 932.83	43	88	131	0.618	70.399	0.613

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
68	Iceland	10 881.26	44	52	96	0.560	6.797	0.610
69	Sri Lanka	10 785.50	39	0	39	0.000	0.000	0.595
70	Marshall Islands, Republic of	15 279.69	40	0	40	0.000	0.000	0.579
71	Slovak Republic	27 329.84	43	63	106	0.572	13.463	0.575
72	Uruguay	10 910.75	37	0	37	0.000	0.000	0.574
73	Bahrain, Kingdom of	8 014.28	41	0	41	0.000	0.000	0.573
74	Vietnam	11 112.64	38	0	38	0.000	0.000	0.569
75	Costa Rica	5 527.83	38	49	87	0.552	31.886	0.569
76	Lithuania	11 243.04	39	75	114	0.599	26.384	0.560
77	Oman	3 202.10	40	0	40	0.000	0.000	0.555
78	Nigeria	7 735.69	35	0	35	0.000	0.000	0.538
79	Jordan	6 287.41	37	0	37	0.000	0.000	0.530
80	Georgia	3 549.44	35	0	35	0.000	0.000	0.516
81	Azerbaijan, Republic of	3 785.76	34	0	34	0.000	0.000	0.515
82	Dominican Republic	9 951.78	35	0	35	0.000	0.000	0.513
83	Latvia	6 695.06	37	84	121	0.613	75.907	0.513
84	Serbia, Republic of	7 569.68	35	0	35	0.000	0.000	0.499
85	Kenya	5 654.22	32	0	32	0.000	0.000	0.498
86	Liechtenstein	6 385.54	34	0	34	0.000	0.000	0.498
87	Tunisia	4 400.12	34	0	34	0.000	0.000	0.497
88	Ghana	6 610.02	32	0	32	0.000	0.000	0.494
89	Estonia	2 194.10	34	91	125	0.625	33.642	0.491

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
90	Ecuador	9 473.95	32	0	32	0.000	0.000	0.485
91	Liberia	13 464.91	32	0	32	0.000	0.000	0.482
92	Cote d'Ivoire	8 235.11	30	0	30	0.000	0.000	0.476
93	Pakistan	10 131.56	30	26	56	0.513	9.492	0.470
94	Mongolia	3 469.69	32	41	73	0.533	3.709	0.469
95	Lebanon	14 421.53	30	97	127	0.635	138.099	0.466
96	Paraguay	2 047.60	30	0	30	0.000	0.000	0.459
97	Honduras	1 726.39	29	7	36	0.442	0.360	0.457
98	Barbados	4 184.11	29	0	29	0.000	0.000	0.454
99	Guatemala	1 580.79	29	0	29	0.000	0.000	0.452
100	El Salvador	3 767.45	28	0	28	0.000	0.000	0.446
101	Gabon	1 773.77	28	0	28	0.000	0.000	0.440
102	Puerto Rico	1 699.42	29	0	29	0.000	0.000	0.436
103	Trinidad and Tobago	1 960.01	27	0	27	0.000	0.000	0.434
104	Senegal	1 367.23	27	0	27	0.000	0.000	0.432
105	Kuwait	1 323.87	30	45	75	0.541	35.187	0.430
106	Belarus	1 230.45	28	13	41	0.452	7.949	0.420
107	Namibia	1 428.05	26	0	26	0.000	0.000	0.417
108	Papua New Guinea	2 282.33	26	0	26	0.000	0.000	0.411
109	Angola	1 868.64	26	0	26	0.000	0.000	0.407
110	Macedonia, FYR	883.40	29	29	58	0.515	2.605	0.405
111	Zambia	2 973.31	25	0	25	0.000	0.000	0.400
112	Jamaica	1 552.75	25	0	25	0.000	0.000	0.399

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
113	Armenia, Republic of	1 022.47	26	0	26	0.000	0.000	0.389
114	Bangladesh	2 606.08	24	51	75	0.551	9.521	0.370
115	Montenegro	483.55	28	0	28	0.000	0.000	0.368
116	Iraq	1 432.61	23	0	23	0.000	0.000	0.360
117	Belize	199.52	23	0	23	0.000	0.000	0.360
118	US Virgin Islands	1 962.39	24	0	24	0.000	0.000	0.357
119	Ethiopia	664.63	22	0	22	0.000	0.000	0.346
120	Faroe Islands	1 186.90	23	0	23	0.000	0.000	0.336
121	Cameroon	1 017.95	20	0	20	0.000	0.000	0.326
122	China, P.R.: Macao	2 505.02	21	69	90	0.590	8.754	0.323
123	Tanzania	1 019.17	19	0	19	0.000	0.000	0.314
124	Gibraltar	846.49	19	66	85	0.585	9.352	0.304
125	Seychelles	251.14	19	0	19	0.000	0.000	0.299
126	Mozambique	562.24	18	0	18	0.000	0.000	0.288
127	Togo	332.08	18	0	18	0.000	0.000	0.284
128	Bolivia	221.94	17	29	46	0.522	0.125	0.278
129	Aruba	883.21	17	0	17	0.000	0.000	0.276
130	Monaco	281.31	17	0	17	0.000	0.000	0.266
131	Rwanda	244.16	16	0	16	0.000	0.000	0.262
132	Cambodia	649.92	17	0	17	0.000	0.000	0.257
133	Uganda	439.79	16	0	16	0.000	0.000	0.254
134	Suriname	213.80	16	0	16	0.000	0.000	0.253
135	Botswana	323.55	15	0	15	0.000	0.000	0.244

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
136	Bosnia and Herzegovina	254.75	16	0	16	0.000	0.000	0.238
137	Albania	340.03	15	28	43	0.513	1.792	0.230
138	Zimbabwe	376.31	14	0	14	0.000	0.000	0.225
139	Congo, Republic of	234.04	12	0	12	0.000	0.000	0.202
140	Algeria	611.73	13	0	13	0.000	0.000	0.199
141	Burundi	164.67	13	0	13	0.000	0.000	0.199
142	Grenada	68.51	11	0	11	0.000	0.000	0.185
143	Iran	278.59	11	0	11	0.000	0.000	0.154
144	Antigua and Barbuda	66.74	9	0	9	0.000	0.000	0.148
145	Fiji	83.40	8	0	8	0.000	0.000	0.140
146	Congo, Democratic Republic of	589.65	8	0	8	0.000	0.000	0.126
147	Falkland Islands	139.67	7	0	7	0.000	0.000	0.114
148	Niger	94.57	7	0	7	0.000	0.000	0.112
149	Nicaragua	145.90	6	0	6	0.000	0.000	0.100
150	St. Vincent and the Grenadines	152.24	7	0	7	0.000	0.000	0.100
151	Burkina Faso	37.04	6	0	6	0.000	0.000	0.099
152	Cuba	647.00	6	0	6	0.000	0.000	0.097
153	Andorra	14.31	6	0	6	0.000	0.000	0.093
154	Lao People's Democratic Republic	1 561.96	6	0	6	0.000	0.000	0.092
155	Mauritania	73.49	5	0	5	0.000	0.000	0.086

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
156	Turks and Caicos Islands	354.74	5	0	5	0.000	0.000	0.085
157	Greenland	91.52	5	0	5	0.000	0.000	0.084
158	Samoa	25.34	5	0	5	0.000	0.000	0.081
159	US Pacific Islands	35.60	5	0	5	0.000	0.000	0.081
160	Swaziland	142.63	5	0	5	0.000	0.000	0.080
161	Cook Islands	19.52	5	0	5	0.000	0.000	0.079
162	Myanmar	387.57	5	0	5	0.000	0.000	0.079
163	St. Kitts and Nevis	3.96	5	0	5	0.000	0.000	0.077
164	Sudan	29.05	6	0	6	0.000	0.000	0.077
165	Malawi	55.60	5	0	5	0.000	0.000	0.076
166	Nepal	50.44	5	0	5	0.000	0.000	0.075
167	Mali	7.22	5	0	5	0.000	0.000	0.071
168	Maldives	1.46	5	0	5	0.000	0.000	0.069
169	Guyana	15.53	4	0	4	0.000	0.000	0.067
170	French Territories: French Polynesia	133.27	4	0	4	0.000	0.000	0.066
171	Uzbekistan	25.91	4	0	4	0.000	0.000	0.065
172	Madagascar	83.84	4	0	4	0.000	0.000	0.064
173	Bonaire, Sint Eustatius and Saba	328.18	4	0	4	0.000	0.000	0.062
174	Libya	51.31	4	0	4	0.000	0.000	0.062
175	Cocos (Keeling) Islands	2.68	4	0	4	0.000	0.000	0.060
176	Kyrgyz Republic	67.89	4	0	4	0.000	0.000	0.059

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
177	Moldova	21.72	4	0	4	0.000	0.000	0.057
178	Syrian Arab Republic	108.16	5	0	5	0.000	0.000	0.055
179	Sint Maarten	58.34	3	0	3	0.000	0.000	0.051
180	Benin	4.00	3	0	3	0.000	0.000	0.051
181	Brunei Darussalam	85.73	3	0	3	0.000	0.000	0.050
182	Timor-Leste, Dem. Rep. of	9.66	3	0	3	0.000	0.000	0.049
183	Tokelau Islands	13.01	3	0	3	0.000	0.000	0.049
184	Turkmenistan	29.95	3	0	3	0.000	0.000	0.049
185	Dominica	7.83	3	0	3	0.000	0.000	0.047
186	Guam	26.93	3	0	3	0.000	0.000	0.045
187	Eritrea	0.53	3	0	3	0.000	0.000	0.043
188	Cabo Verde	110.24	3	0	3	0.000	0.000	0.037
189	Guadeloupe	30.09	2	0	2	0.000	0.000	0.035
190	Tajikistan	40.28	2	0	2	0.000	0.000	0.035
191	Anguilla	32.94	2	0	2	0.000	0.000	0.035
192	St. Lucia	3.47	2	0	2	0.000	0.000	0.035
193	Afghanistan, Islamic Republic of	4.08	2	0	2	0.000	0.000	0.033
194	Montserrat	1.36	2	0	2	0.000	0.000	0.032
195	Gambia, The	2.55	2	0	2	0.000	0.000	0.032
196	South Sudan	1.25	2	0	2	0.000	0.000	0.032
197	San Marino	35.28	2	0	2	0.000	0.000	0.031
198	Christmas Island	19.41	2	0	2	0.000	0.000	0.031

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
199	Yemen, Republic of	46.62	3	0	3	0.000	0.000	0.031
200	Haiti	0.54	2	0	2	0.000	0.000	0.031
201	Korea, Democratic People's Rep. of	3.30	2	0	2	0.000	0.000	0.030
202	Central African Republic	83.51	2	0	2	0.000	0.000	0.029
203	Kosovo	0.15	2	24	26	0.507	0.000	0.028
204	American Samoa	0.62	1	0	1	0.000	0.000	0.018
205	Guinea	2.34	1	0	1	0.000	0.000	0.018
206	Pitcairn Islands	5.66	1	0	1	0.000	0.000	0.018
207	Sierra Leone	34.08	1	0	1	0.000	0.000	0.018
208	Mayotte	0.50	1	0	1	0.000	0.000	0.017
209	Sao Tome and Principe	7.29	1	0	1	0.000	0.000	0.017
210	Wallis and Futuna	24.35	1	0	1	0.000	0.000	0.017
211	West Bank and Gaza	82.75	1	32	33	0.515	0.000	0.017
212	French Territories: New Caledonia	24.89	1	0	1	0.000	0.000	0.017
213	Saint Helena	0.50	1	0	1	0.000	0.000	0.016
214	Nauru	10.31	1	0	1	0.000	0.000	0.016
215	British Indian Ocean Territory	0.29	1	0	1	0.000	0.000	0.016
216	Tonga	3.25	1	0	1	0.000	0.000	0.016
217	Guiana, French	56.88	1	0	1	0.000	0.000	0.015
218	Western Sahara	0.07	1	0	1	0.000	0.000	0.015

(Continued)

Table A2.3. (Continued)

Rank	Country	Total value (\$Mn)	Indegree	Outdegree	Degree	Closness centrality	Betweenness centrality	Eigenvector centrality
219	Saint Pierre and Miquelon	6.20	1	0	1	0.000	0.000	0.013
220	Micronesia, Federated States of	0.93	1	0	1	0.000	0.000	0.013
221	Chad	0.47	1	0	1	0.000	0.000	0.013
222	Lesotho	0.80	1	0	1	0.000	0.000	0.012
223	Reunion	0.10	1	0	1	0.000	0.000	0.012
224	Djibouti	0.34	1	0	1	0.000	0.000	0.008
225	Malta	—	0	28	28	0.522	0.000	0.000
226	Hungary	—	0	83	83	0.607	0.000	0.000
227	Palau	—	0	1	1	0.404	0.000	0.000



© 2019 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.



***Cogent Economics & Finance* (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.**

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com



© 2019 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license. This work is licensed under the Creative Commons Attribution License creativecommons.org/licenses/by/4.0/ (the "License"). Notwithstanding the ProQuest Terms and Conditions, you may use this content in accordance with the terms of the License.