

GLOBALIZATION, SECURITY, AND ECONOMIC WELL-BEING

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Globalization and interconnected economies are topics of keen interest to me, both from my academic background and also from my position in international shipping. The container and advances in information technology, coevolving with advances in business organization, are perhaps more than any other combination of factors responsible for trade as we know it today—characterized by disaggregated supply chains and trade focused on tasks, not goods—a topic explored in detail later. Before going in depth about globalization, security, and economic well-being, a quote from one of my favorite authors will set the stage: “Economies have become so interdependent due to advances in transportation and communication technology that actions in one country produce nearly instantaneous effects in many others. Consequently conflict between states is futile

since damage to one economy necessarily translates into damage to others, including that of the aggressor.”

You might be tempted to ascribe this argument to Thomas Friedman in *The World Is Flat* (Farrar, Straus, Giroux, 2005) or another from the multitude of gospels of globalization popular today, but in fact it is the argument advanced by the Nobel Prize-winning British economist Norman Angell in his famous *The Great Illusion*, published in 1910. At the time Angell published his book, the world was hurtling toward the catastrophe of World War I, which brought the first great age of globalization to a close. I study Angell’s work because he was a perpetual optimist, a brilliant

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thinker, and a skilled economist, and his story reminds us that even the best and brightest can get something as complex as the global economy drastically wrong. Today when people contemplate globalization and interconnected, interdependent economies, the outsourcing of jobs, trade displacing locally produced goods, access to vital commercial pathways, and the other hallmarks we consider unique to our age, it is important to remember we have been through this before and that leaders of the day badly misunderstood the dynamics then in play.

The first great age of globalization is generally considered to have begun with the repeal of the Corn Laws in Britain in 1846. This was also the height of the Industrial Revolution, with discontinuous advances in methods of production. The huge leaps in transport and communications technology Angell spoke about were the steamship, the railroad, and the telegraph—all every bit as disruptive then as disaggregated supply chains, containerization, and the Internet are today. While today we worry about access to the Strait of Hormuz and the Suez Canal, then it was the Bosphorus and Strait of Gibraltar. Then, as now, tensions arose as developing economies were accused of using cheap local resources to invade the distant markets of more advanced countries.

At that time, the roles were somewhat reversed, and it was the flood of cheap agricultural products from a comparatively backward but rapidly developing United States into the more mature and sophisticated markets of England and Europe that was the issue. Among other effects, this trade released local newly surplus labor from agricultural work and triggered rural-to-urban internal labor migrations in those countries, England in particular, which in turn fed the insatiable demand for cheap labor to keep the cogs in the machinery of the Industrial Revolution turning. Social dynamics in those countries were permanently altered, as was the global distribution of power, launching the golden age of the British Empire. Much as is the case today, advances in one facet of economic activity produced unanticipated consequences both within and across borders. Alexander Gerschenkron, in his seminal work *Bread and Democracy in Germany* (Cornell Univ. Press, 1989), lays out how the ways in which countries dealt with those consequences set in motion the train of events that culminated in World War I, even while the most learned men of the day, such as Angell, failed to comprehend the nature of globalization, what it meant, and the effect it was having on society. Consequently the leaders of the day were incapable of correctly responding to the policy and security challenges they faced.

There are those who counter that this time is different from the last in a fundamental way. The last age of globalization was built entirely on advances in technology. This time, the advances in technology are buttressed by a stabilizing institutional structure such as the World Trade Organization (WTO) for trade, a structure that is intended to institutionalize all aspects of global integration,

including trade. Anyone placing stock in that view should be greatly concerned over the spectacular failure that is the Doha Round and over the proliferation of bilateral and regional trade agreements in place of broad multilateral advances. Our trading system has become what Jagdish Bhagwati, one of the preeminent trade economists of our time, calls a “spaghetti bowl” in his *Termites in the Trading System* (Oxford Univ. Press, 2008)—a complex, increasingly opaque mass of overlapping, sometimes contradictory, trade relationships that produce consequence pathways difficult to anticipate. Such agreements are also called “preferential trade agreements,” for the positive spin, but another view calls them “discriminatory trade agreements,” as they are meant to exclude all but the privileged few who are members, contrary to the intent of the WTO and the multilateral trade process. So if the institutional structure of the WTO is what makes some think this time is different, the foundation of that institution is in an advanced state of decay, and every bilateral trade agreement knocks another large chunk out of it.

The first great age of globalization lasted about two-thirds of a century. The second great age of globalization, where we are now, began with the end of World War II. It took a quarter-century to get back to where we had left off at the close of the first in terms of overall economic integration, but in some areas the loss was permanent. The United Kingdom, for example, is still not at the same level of export intensity that it previously was. Since the beginning of this age of globalization, we have witnessed discontinuous changes in the global political economy, driven again by dramatic advances in communications and transport technologies coevolving with advances in methods of production and business organization. We are nearly at the point on the time line of globalization, about two-thirds of a century, where the last age imploded, plunging the world into three decades of darkness. Given that we are approaching the point at which the last age of globalization failed, it is a useful exercise to examine the characteristics of the current one. Given the events we are witnessing around the world, one wonders whether there is some natural age limit for a globalization process after which the strain on society gets to be too much and our ability to manage complexity is overtaken by the complexity we face. The system then demands some sort of reset, and perhaps we are at that point now. Such resets are never graceful.

The U.S. Navy’s “Cooperative Strategy for 21st Century Seapower” notes that today’s global economies are tightly interconnected but does not explain the meaning of that phrase, something Angell and his contemporaries clearly got wrong in their age.¹ Many understand globalization as cheap sneakers on Walmart shelves made by exploited labor in far-off places. This is a reflection of the general understanding of interdependence, one promoted heavily by some segments in society and all too readily accepted by the public in times of

economic turmoil, as we see now. This view focuses on division of labor, some level of exploiting comparative advantage, with all making what they make best and trading what they have for what they need, and in the process becoming mutually and voluntarily dependent on each other, their well-being intertwined—the Ricardian wine-and-cheese-trade relationship from Economics 101. Or, as a just-released report from the Council on Foreign Relations describes it, “Globalization also allows each country to concentrate its scarce resources of people and ideas in those activities with which it is well suited compared with the rest of the world. It can then export these goods and services for imports of other products that can be enjoyed in greater variety and at lower prices.”²

This is, however, a strikingly narrow view of globalization, and in truth it is a definition more fitting of the last age of globalization than the current one. This age is vastly more complicated than that. We no longer simply trade what we make for what we do not make but need. We now trade in order to get what we need *to make what we make*. Before, we were self-sufficient in some but not all of what we needed, and we could trade the excess of what we made to fill the gaps. Now, we are self-sufficient in nothing but make everything—the trade in tasks mentioned earlier. I belabor the point because this is a major leap in complexity as compared to the last age of globalization. It is apparently not as well appreciated as it should be, as evidenced by the definition the Council on Foreign Relations uses, and it has profound implications across a number of policy areas. It might be appropriate to make a pen-and-ink change to your copy of the new maritime strategy and strike out words like “interdependent economies” and replace them with “interdependent production process across economies.”

If the last age was too complex for policy makers to manage competently, imagine how much more so this one is—the tremendous advances in global economic complexity have not been matched by corresponding advances in political or policy skill, evidence of which you can see by simply picking up a newspaper virtually anywhere in the world these days. The current age of globalization is certainly showing signs of stress, buffeted by the same but magnified forces of demographics, politics, change in the global political order, and international instability that disrupted the last. As the last great age showed us, the forward march of globalization is neither inevitable nor reversible: we cannot slide easily backward into a better previous time when the pressure gets to be too much, and when globalization breaks, it does so violently, permanently altering the trajectory of history.

The balance of my article will therefore be spent exploring a few pertinent high-level economic aspects of globalization in an attempt to understand them. (It is important to note that while I view globalization as an economic process, owing to my academic and professional background, many in other disciplines

view it as a different set of forces.) Along the way we will dispel some of the common myths surrounding globalization that persist and sadly influence both public opinion and policy. To paraphrase Norman Angell, policy is not driven by facts but by the public's opinion of facts.

The first myth we should address, and perhaps one of the most relevant to readers of this quarterly, is that 90 percent of world trade moves by water. That is simply not true. A more correct rendering of that phrase would be that 90 percent of world trade in physical goods (merchandise trade) as measured by volume moves by water. When measured by value, the number is closer to 65 percent. The first key issue is that of trade in physical goods versus total trade. In 2010, according to the WTO, there was \$18.8 trillion in total world trade, of which \$3.7 trillion, or about 19.5 percent, was in services. These services are considered very high value and critical (e.g., transportation services, financial services, and communications). Much of this trade moves on fiber-optic backbones, not ships—and in fact, as you will see further on, goods can no longer move on ships without a robust and parallel flow in information. This means that cyber warriors are doing every bit as much to ensure the smooth flow of trade as are those standing watches on the bridges of ships in the Strait of Hormuz.

The second key issue associated with this myth is that given the difference in trade as measured by value versus volume, it is clear that a lot of high-value goods move by means other than water, principally air. The importance to the global economy of aviation supply-chain networks cannot be overemphasized. Such supply chains are responsible for the global movement of such critical items as pharmaceuticals and medical equipment, electronics, automotive parts, and computers. It is also clear that we must pay attention to global supply-chain critical nodes other than the more commonly discussed port system in marine supply chains. The largest air cargo terminal in the world is Nashville, Tennessee, and the third largest is Anchorage, Alaska. These places do not register on the list of critical nodes in the marine supply chain. Air supply chains are faster in cycle times, meaning they fail faster in the event of disruption. They also carry goods with more time sensitivity and lower tolerance for supply-chain disruption.

One example that certainly made the news is the Iceland volcano eruptions of spring 2010. The airspace closure resulting from the ash cloud was hugely disruptive for travel in Europe, but it was also devastating to farmers in Kenya. Europe is the major market for fresh fruits, vegetables, and flowers from Kenyan farms, and such products are delivered via an aviation supply chain that was shut down—meaning rotting product on runways. It is not hard to extrapolate failed farms to social unrest and to the outbreak of conflict in the Horn of Africa due to a volcano in Iceland. I would guess that Kenyan farmers and peace in the Horn of Africa were not high on the list of endangered stakeholders when the potential for

an eruption was first contemplated in Iceland, but that is the way causality pathways work now. In the United States, 40 percent of all finished pharmaceuticals, 80 percent of all ingredients for drugs mixed here, and 100 percent of the most common isotopes for nuclear-medicine procedures are imported and delivered via an aviation supply chain and are dispensed within hours of landing. This means that grounding all flights in response to an aviation security threat would rapidly translate into a health-care crisis.

The aviation supply-chain business continues to innovate, as the pharmaceuticals industry shows. In response to soaring demand, drugs are currently the biggest growth segment for air cargo, and service offerings are being refined and specialized (“specialized” being a code word for an increasingly efficient but rigid and unforgiving supply chain). A recent example is the innovation of highly specialized containers with active temperature-control features allowing the transport of pharmaceuticals in temperatures between two and eight degrees Celsius. Clearly this type of cargo is highly perishable, hence time sensitive, and completely intolerant of delays in the supply chain, however induced.

At this point readers in the maritime-security world may be asking themselves, “Why is this guy writing about aviation supply chains? That’s not what we do.” First, we keep seeing that 90-percent-by-water statistic, but also you can no longer meaningfully separate various supply-chain vectors; in practice these are not stovepiped but are all interdependent processes. You cannot have international trade in physical goods without a robust international trade in services. Aviation supply chains depend on marine supply chains to function properly, and marine supply chains are likewise dependent on aviation supply chains. Both depend on robust truck and train connectors. A friend of mine in the cruise-ship industry tells me of a cruise ship coming into Miami. As usual, a Coast Guard boarding party met it outside the port. But the party decided to review paperwork more extensively than usual, resulting in the ship’s being delayed. Airlines in Miami orient their schedules around cruise-ship arrival times; consequently, flights were held, and soon enough the disruption rippled across the entire U.S. air-passenger network. This is just one example of how different transport vectors interact in ways you might not expect.

A critical mistake made in supply-chain security thinking is that sometimes you can break it apart and study individual components to understand the behavior of the overall system. You cannot make that assumption, and decisions made that way will be flawed. Likewise, vulnerability is not about the physical ease or difficulty of attack on any particular node or vector in the supply chain. It is not—instead, vulnerability is a matter of how the system behaves, how it fails, and how quickly it can be made to recover once a particular node or vector has

been disrupted. That is a very different view. Some things we may view as tangential must be accommodated, because the system will fail if we do not.

The goods that move by water (to return to them) are no longer simply boxes of manufactured goods made in competition with local labor, and that leads to our next myth, by far the most important—the idea that the “made in” label has any relevance at all in today’s version of trade. Unfortunately, much policy is driven by that meaningless anachronism from the first age of globalization. During that age we actually traded goods, and the “made in” label had meaning. But now, as mentioned, we trade in tasks: a specific widget is actually manufactured in a variety of places, the “made in” label denoting only where it received final assembly. Here is the most dramatic effect of the combination of containerization and the Internet. More than 50 percent of containerized trade is now in component-level goods, meaning parts or inputs into factories rather than ready-for-retail goods heading for store shelves. Roughly 45 percent of a Boeing 767 aircraft with a “Made in America” label plate is actually composed of imported parts. In the 787 Dreamliner that figure is more like 70 percent, including such crucial parts as wings and engines; Boeing’s role in that airplane has been described as reduced to little more than project management, design, assembly, and test operation.

In the U.S. air-tanker program that was recently in the news, for example, the Boeing plane in question, billed as made in the United States, is actually made in eight countries. The U.S. Congressional Research Service did a study for Congress on the key issues of that airplane program and provided a list of countries where various components are made. The Czech Republic is listed as the source of airframe parts; I am no airplane expert, but my understanding is the airplane will not work well without an airframe. Likewise, the flaps, also critical parts, are made in Indonesia. The avionics are not specifically listed, but of course, we know that the “made in” label is not completely true anyway; they contain components made from rare earths (all avionics do), which are virtually sole-sourced in China, which in turn is not on the list of contributing countries. My guess is that for each of those eight countries listed, if you followed the trails of the components with their respective “made in” labels, they would take you to a multitude of other countries. Clearly, the notion that the production of the air tanker is not subject to events in faraway places is false. A “Made in America” label plate does nothing other than manage a perception.

The fact is, we frequently have no idea where something “made in America”—or anywhere else—is really made. A loaf of bread sold in a local market can have ingredients from up to fourteen different countries. Perhaps the only stage of its production in the United States is the bakery, which puts the “Made in America” label on it. Perhaps the only thing that the American business provides is the heat

necessary to bake it—and there is a good chance that those BTUs came from oil from Canada, so even the heat is imported. All we can say for sure is that the last stop on the loaf’s production path is in the United States, before being turned over to the customer—and there is nothing wrong with that.

Another facet of trade in tasks is that in many areas positive economies of scale exist, meaning there may be only one or a few plants globally that produce low-value but critical components. The effects of disruption of a single plant in one part of the world that produces some innocuous but critical component, like an electronic power switch, can cascade to disrupt production processes all over the world. It is important to note that the system does not distinguish among disruptions owing to natural disasters, criminals, or bad policy. The system reacts to them all the same way, and that reaction is not good. While criminals get the press, a far greater danger to our collective freedom to leverage global pathways of commerce are the twin “isms” of nationalism and protectionism, with unwarranted fear close behind.

Disruptions to supply chains no longer mean just not having your favorite brand on the shelf; they now mean closed factories, unemployment, and social stress in areas far removed from the initial disruption. The value-added of goods with a “Made in China” label can be as low as 6 percent and usually does not exceed 20 percent, meaning that most of what is in such products comes from someplace other than China. Increasingly that is the United States; China is our largest customer by a very wide margin in terms of containerized exports and a major customer of our agricultural products. The now ubiquitous iPhone has a “Made in China” label on it, but China is actually responsible for a relatively small amount of the production effort for an iPhone—something on the order of 5 percent. Japan is actually responsible for the majority of it, with Germany and Korea as close runners-up.

The United States itself is also a major contributor to that production pattern. A Federal Reserve Bank of Chicago study at the height of the “Great Recession” showed that the proportion of the average value of a typical car sporting a “Made in America” label actually generated in the United States is only about 75 percent. But that figure is highly contentious, and U.S. domestic content ranges widely. A Toyota Sequoia, a “Japanese” car, was noted to have 80 percent U.S. content (the highest of any car); the Jeep Patriot, an “American” car, had only 66 percent (the irony of its name is amusing).³ So if you want to buy an American car, you need to buy it from a Japanese company. In addition, in terms of the actual assembly process those cars, “made” in Detroit, probably cross the U.S.-Canadian border five times, meaning not only that the parts are sourced globally but that actual assembly is something of an international activity.

As an indicator of how policy can affect trade, approximately one million dollars of trade crosses the U.S.-Canadian border every minute, twenty-four hours a day, 365 days a year. The thickening of that border as a result of post-9/11 security procedures has erased all cost advantages achieved through the North American Free Trade Agreement, bringing a huge deadweight loss to both the American and Canadian economies.

Overall, the WTO estimates that about 80 percent of the value of goods exported by the United States represents U.S. domestic content, a statistic that excludes such indirect-value components as energy. To compare that with the roughly 20 percent of a typical Chinese export highlights the complexity of today's trade relationships and complicates finger-pointing over who are the offenders in what are perceived as unfair trade relationships.

One implication of all this is that economic sanctions affect not just targeted countries but every country along a sanctioned good's supply chain, often including the country invoking the sanctions to begin with. The fact is that the targeted country is likely to feel directly relatively little of the actual overall effect of the sanction. It also causes some level of discomfort to read articles and news such as of a RAND report recently released offering as a potential cyber-warfare tactic the disruption of a target country's shipping system in order to inflict economic pain—the implication being that such pain would be contained to the target country.⁴ As the foregoing demonstrates, it could not be so contained but would in fact amount to an attack on a multitude of countries, widely divergent in economic-versus-security relationships. It is difficult to determine who would be on what side in such circumstances.

The root of the issue is the way we measure things—our methods of accounting have not kept up with global business practices. Since we now trade in tasks—involving a very fine level of supply-chain disaggregation to the activity level, where the distinction between goods and services gets blurry—the old measure of production, gross domestic product (GDP) in real or nominal currency, presents an inaccurate picture of actual economic activity.⁵ More importantly from both a policy and public perception standpoint, it gives a distorted picture of actual trade imbalances. This is critically important, because as Alejandro Jara, deputy general of the WTO, puts it, “We know in times of crisis the pressure from public opinion can push in the wrong direction. In the absence of objective statistics demonstrating the interconnectivity of the modern production system, it is to be feared that false and obsolete will remain the panoply of the most popular remedies.” Every complex problem has a simple solution, one that is easy to understand, is easy to explain, and fits well in a sound bite but is totally wrong. That is where we are today.

The problem in a nutshell is that the old measure of GDP was based on gross flows, hence double- or triple-counting some aspects of economic activity and failing to take into account trade in intermediate goods. A more informative statistic is the value-added content of trade, whereby the flow of goods is recorded by assigning to each country of origin the value it imbeds in final goods, rather than just attributing all the value to the last places that touch them. The WTO is working on such a system of measurement, but trade tension and poorly designed policy will be the order of the day until policy makers understand, adopt, and communicate it to their respective constituencies.⁶ Adoption of such a measure of trade flows would also highlight something that few seem to appreciate fully, because of the distortions induced by current accounting. That is, there is a stark difference now between many countries' security alliances and their economic alliances. With whom a country is allied from a military perspective and on whom its economy depends to function are now frequently completely at odds. Security alliances and high politics are the province of the government elite, but economic alliances are the province of the general population and are where cultural and social, as well as economic, bonds are built. Thus, while virtually all countries say that in a serious crisis the security alliance would prevail, in the end we simply will not know which side a given country will take until that time comes and the internal battle between elites and the populace is waged.

A related myth is the notion that the phrase "owned by" has any meaning when applied to the owners of means of production these days. Frequently now the owners of means both of production and of distribution are international, with the location of "headquarters" being more an accident of history than some current, overt business decision. The roots of ownership and economic beneficiaries of productive activity are no longer easily identifiable. A fascinating recent example of this sort of "globalized ownership" is what has been described as "the battle for the future of copper" that played out in 2012 when Minmetals, a Chinese state-owned mining company, launched a hostile takeover of Equinox Minerals. In itself this was cause for great interest, as hostile takeovers are not the typical strategy for Chinese firms. Equinox is an Australian company that has a nominal office in Toronto and is listed on the Toronto Stock Exchange. One of the world's top twenty copper producers, Equinox has as its main asset a massive copper mine in Zambia and is building a copper-gold mine in Saudi Arabia. At the time Minmetals launched its hostile takeover bid, Equinox itself was in the middle of attempting a hostile takeover of Lundin Mining, a Toronto-listed firm whose primary mining activity is in Sweden and Portugal, with smaller interests in Ireland and Spain.

It is clear how very complicated international ownership structures can get these days and consequently how unpredictable can be the effects of policies like

sanctions. In the Equinox example, nine countries were involved. From a security perspective, there were some in Canada who called on the government to block the Minmetal bid as contrary to national security—even though none of Equinox’s assets were actually in Canada and beneficial ownership was in Australia, making the national security angle hard to comprehend. In reality, the only thing Canadian about Equinox was a file at the Toronto Stock Exchange.

This is reminiscent of a Chinese National Offshore Oil Company (CNOOC) attempt in 2005 to buy the U.S. oil producer Unocal, a company headquartered in San Francisco, California, but whose assets were primarily in the Gulf of Thailand. That proposed transaction generated huge amounts of anxiety in the United States and eventually action in Congress to block it, born of a desire not to surrender U.S. oil assets to a foreign company—though none of Unocal’s oil assets were actually in the United States. CNOOC went on instead to buy Calgary-based PetroKazakhstan, Inc., a Canadian company whose assets were, as the name suggests, in Kazakhstan. It was in fact the largest private integrated oil firm in that country, although it also owned a stake in Canada’s oil sands. So the oil from Canada used to bake that bread mentioned earlier was probably bought from a Chinese oil company.

The Dubai Ports World (DPW) fiasco is also an instructive case. Here a failure to appreciate international linkages in the shipping industry and the political reaction to the proposed takeover of a third-tier terminal in New York by Dubai Ports World, as part of a large acquisition of P&O assets, turned what should have been a nonevent into a potentially serious disruption to U.S. supply chains connecting to the Horn of Africa, Iraq, and Afghanistan. What everyone failed to realize was that DPW controlled Salalah, in Oman, a critical transshipment node in material flowing to Iraq; Port Qasim, Pakistan, a critical supply-chain node for goods flowing to Afghanistan; and Djibouti, the port of entry for goods supporting U.S. activity in the Horn of Africa. So if DPW wanted to disrupt U.S. supply chains, it did not need to buy a third-rate port in the United States (already owned by a foreign company, by the way) to do that—it could, and can, do it at will in the many foreign ports it controls on which the U.S. military is dependent.

By focusing on the local rather than global picture, a serious potential disruption to military supply chains was manufactured where none should have been. Fortunately, the DPW folks reacted with admirable restraint and defused the situation, but that may not happen the next time, when circumstances and actors may be different. As we think through complex ownership structures like Minmetals/Equinox, it is important to remember these are firms engaged in the normal course of business in full compliance with international and relevant domestic laws. If this is what the ownership picture looks like for legitimate firms trying to be transparent, imagine how it would look with illegitimate actors

deliberately trying to conceal and deceive. One industry notorious for this is, of course, my own, where ownership is frequently nested in multiple shell companies spanning several countries. The registry, or flag, of the ship is unrelated to wherever ownership really sits, and the ship is operated by a management firm headquartered in yet another country employing crew members from none of the above—and that for a legitimate operation. The number of seams to be exploited for unsavory purposes is obvious, but so also is the potential to disrupt legitimate shipping, acting in conformance with international law, in an effort to close those seams.

The foregoing discussion was meant to point out that we no longer know with any certainty where anything is truly made, hence where supply-chain disruptions might occur or how disruptions might propagate through the global production system. Further, there is no way to know where the effect of deliberate actions, sanctions, cyber attacks, or physical attacks will ultimately be felt, or who will be on what side in the event of conflict. The world is a far more complicated place than you would expect from looking at a “made in” label.

Another topic that needs to be explored is the nature of physical supply chains. It is a fact that in global trade the most efficient method of moving goods from A to B is rarely a straight line. Trade is moved in networks of networks that are themselves interconnected and completely dependent on the smooth flow of information across yet other networks. Disruptions in a rail network ripple out and manifest themselves as disruptions to ship networks. Disruptions in one port propagate out into disruptions into other ports. Ports themselves are not perfect substitutes for each other, owing to advances in ship technology, with attendant implications for resilience. Containers often move through relay ports, entering on one ship and leaving on another, and yet never “leaving” the port—that is, never going through the typical security apparatus found at the gates. The large Asian ports process in excess of eighty thousand containers every day. Individual ships carry fifteen to eighteen thousand containers, enough to fill a train 110 kilometers long if off-loaded at once, carrying cargo for thousands of customers whose identities are just numbers or bar codes on the containers. Prince Rupert, on the west coast of Canada, is a new containerport with enhanced rail infrastructure supported by upgraded roads and highways. Prince Rupert provides direct service to CentrePort, a state-of-the-art intermodal inland port in Winnipeg, Manitoba. This advanced multimodal system is designed to off-load a container directly from the ship in Prince Rupert to a train and have its contents in Chicago within a hundred hours. Prince Rupert is also one of the very few containerports in North America that can handle the largest post-Panamax ships (i.e., too big for the Panama Canal) common in the Asia/Europe trade, a capability in which the United States is woefully lacking.

Container shipping is a step in the manufacturing process, an extension of the factory itself, a conveyor belt between factories linking assembly lines. While speed is important, the critical issues are consistency, reliability, and predictability. Uncertainty is to be avoided at all costs, as uncertainty requires buffer stocks to compensate for it, stocks that are expensive and to be held to the absolute minimum. That means when we say in my company that we will have your box to you Tuesday, we mean Tuesday, because we know if we are late, you may have to shut down a manufacturing line. As in any conveyor belt linking assembly lines, a disruption to any part of the system becomes a disruption to the whole system. The sheer volume of activity can overwhelm even the most robust physical detection system, unless it slows the process down to a crawl, presenting significant disruptions to trade.

Another important issue to consider is that a significant component of the total value imbedded in transportation is information. Today's modern system of trade is completely dependent on the uninterrupted flow of accurate information. Without it, trade simply will not happen. So while we have spent billions hardening ports and thickening borders, the most vulnerable portion of the global system of trade is the information component. Container yards are now fully automated, largely run by robots. In the container yard I see through my office window, if a human is detected inside the yard (by automatic sensors, of course) everything is automatically shut down. This intricate dance is controlled by incredible levels of information and computer technology. A container itself has nothing on it other than a box number and a bar code, and without access to computerized information systems you can have no idea where it came from or where it is going. Consider those eighty thousand containers flowing through a large Asian port every day, or the eighteen thousand on a ship you may be boarding, identified only by numbers, and the critical importance of information should be clear.

The other aspect of information that is increasingly important is the role, hinted at above, of shipping as extensions of the manufacturing process. Like every part of the process, manufacturers need information about what is happening at that particular step in order to control it properly, and that information is an important component of the total value of a shipper's service. You do not need a complex plot, with a bomb on a pier, to disrupt trade; you need a three-hundred-dollar computer and a connection to the Internet. One no longer needs to achieve physical proximity to cause physical damage.

Ship, port, and connecting transportation technology continue to coevolve with production methods and business management practices. The container completely revolutionized world trade and altered balances of power in ways that have not yet completely played out but that draw worrying parallels to the ways

the steamship altered balances of power in the last globalization age. One area I think about often is the technology that will make containers obsolete. I do not know what that technology will be, and I doubt it will come from my industry, but it is the technology that the ships you are building today will have to contend with.

To say that the world's economies are interdependent does not adequately, or even remotely, express the true nature of today's global economic activity. Vulnerabilities exist everywhere, the most serious being those obscured by the very complexity of the system. But it is imperative that those charged with regulating and protecting the system of global trade have a good appreciation of what it is they are regulating and protecting. The system will propagate disruptions, and there will be failures as a result of actions taken by those that mean to do us or the system harm, such as transnational actors or terrorist groups. But like any complex, adaptive, self-organizing system, given time and latitude the system will rewire itself and recover from such actions. The global system is far too large and complex for such groups, on their own, to do lasting harm. There is, of course, one set—and only one set—of international actors who really have the capacity and wherewithal to do permanent damage or even destroy the trading system. That group is the states themselves. I reject out of hand the notion that conflict among major powers is no longer possible; I do not make the same mistake Angell did. States will always do what is in their best interest to do, and when they calculate it is in their best interest to fight, they will do so. This means they will calculate first the probability that in fighting they will be better off if they win, and second, the probability that if they fight they *will* win.

Thirty years ago the information needed to make those calculations was relatively clean. That is no longer the case today. As we noted in the GDP discussion, a significant measure of both economic prowess and trade imbalance used today is badly distorted and does not provide accurate information on which to base policies that in the past have led to conflict and in fact directly contributed to the demise of the last age of globalization. The wide and growing gap between security and economic alliances for individual states no longer allows states to gauge accurately which side their bread is truly buttered on or to estimate accurately on which side a potential ally or adversary will judge his own to be buttered. The demise of the meaning of the “made in” label means we can no longer gauge with any accuracy where the incidence of a specific trade sanction will fall or where failures in the global supply chain may manifest themselves. The continued use of a “made in” label that does not convey accurate information may actually make things worse, by giving a false sense of security that we know where critical things we need are made, hence where we can afford to take risks in foreign policy. Trade in tasks means we can no longer accurately predict where and what will be the

effects of particular courses of action, an ambiguity that can, among other things, influence the final choice between a security or economic relationship.

The spaghetti bowl of bilateral and regional trade agreements that have replaced multilateral advances has resulted in pathways for trade disruptions that cannot be anticipated with any certainty. When we measure the wrong things and measure them incorrectly, the potential for miscalculation is high. As the last age of globalization showed us, globalization is not inevitable, and it is not reversible, but it is breakable. It also showed us—and it is the one thing Norman Angell got right—that when it breaks, the consequences are catastrophic.

NOTES

- This article is adapted from an address delivered on 19 October 2011 to the Twentieth International Seapower Symposium at the Naval War College in Newport, Rhode Island.
1. J. T. Conway, G. Roughead, and T. W. Allen, “A Cooperative Strategy for 21st Century Seapower,” October 2007, available at www.navy.mil/; repr. *Naval War College Review* 61, no. 1 (Winter 2008), pp. 7–19.
 2. Council on Foreign Relations, *U.S. Trade and Investment Policy*, Task Force Report 67 (New York: Independent Task Force, September 2011).
 3. See “What Is an American Car?,” *Wall Street Journal*, 26 January 2009. Also see Thomas Klier and James Rubenstein, “Who Really Made Your Car?,” *Chicago Fed Letter* (October 2008), www.chicagofed.org/.
 4. James Dobbins et al., *Conflict with China: Prospects, Consequences, and Strategies for Deterrence* (Santa Monica, Calif.: RAND, November 2011).
 5. Trade in tasks generally means breaking down the production process into very fine units of value add (tasks) and distributing where that activity or set of tasks occurs. Frequently there is a significant information component in such tasks. The economics literature is growing on this topic as a branch of offshoring theory. A good general introduction can be found in the 2011 OECD paper *Trade in Tasks* (Paris: Organisation for Economic Co-operation and Development, 2011), available at www.oecd-ilibrary.org/.
 6. See “Measuring Trade in Value-Added: An OECD-WTO Joint Initiative,” *OECD*, 15 March 2012, www.oecd.org/.