9
Revising a Long-term Perspective on Kondratieff Phenomena

SILVER MEDAL

William R. Thompson

For many analysts, Kondratieff waves (K-waves) are a curiosity or worse – an exercise in numerology or a sure bet way to pick stocks. For others, K-waves represent a way to capture the long-term rhythm of coming and going technological regimes. New technology is not introduced at a constant rate. It comes and goes in spurts. These spurts shape the nature and timing of economic growth and other related processes. But I would take it even further and argue that K-waves are fundamental to an understanding of world politics.[1] They have become, and increasingly so, part of its very bedrock. To ignore their impact is akin to acting as if tsunamis are occasional maritime nuisances or serious earthquakes only passing tremors.

Most but not all K-wave analyses focus on the past two centuries. One reason is that this is time frame that Kondratieff himself focused on. Another reason is that the data are better and more readily available than they are for earlier periods. Presumably, more recent periods also seem more relevant. But one of the costs of an emphasis on current or more recent events is that we lose track of some of the factors that were (and still are) important to the emergence of K-wave phenomena. A case in point is the Modelski and Thompson (1996) claim that K-waves can be discerned back as far as the Chinese Song dynasty. The patterns were not all that strong in earlier times as they are today. Gradually, they became stronger.

Table 1 lists the lead economies and the Kondratieff waves numbers in the first column. The indicators column lists some examples of the areas in which the lead economy excelled. The third and fourth columns date start-up phases in which the way is prepared for the activities that are fully realized in the high growth phases. Start-up phases tend to be what other analysts refer to as downswings. High growth phases represent upswings of the Kondratieff.

[1] I began as a Kondratieff skeptic (Thompson and Zuk 1982; Thompson 1988) but abruptly switched to the Kondratieff advocate column when I realized that the historical production data I was working with clearly revealed K-wave-like patterns.

Table 1. Nineteen Kondratieff Waves

Lead Economies	Indicators	Start-up Phase	High Growth Phase
Northern Song			
K1	Printing/paper	930–960	960–990
K2	Chanpa rice/iron	990–1030	1030–1060
Southern Song			
K3	Public finance	1060–1090	1090–1120
K4	Maritime trade	1120–1160	1160–1190
Genoa			
K5	Champagne Fairs	1190–1220	1220–1250
K6	Black Sea Trade	1250–1280	1280–1300
Venice			
K7	Galley Fleets	1300–1320	1320–1355
K8	Pepper	1355–1385	1385–1430
Portugal			
K9	Guinea Gold	1430–1460	1460–1494
K10	Indian Pepper	1494–1516	1516–1540
Netherlands			
K11	Baltic/Atlantic Trade	1540–1560	1560–1580
K12	Eastern Trade	1580–1609	1609–1640
Britain I			
K13	Amerasian Trade	1640–1660	1660–1688
K14	Amerasian Trade	1688–1713	1713–1740
Britain II			
K15	Cotton, Iron	1740–1763	1763–1792
K16	Railroads, Steam	1792–1815	1815–1850
United States			
K17	Steel, Chemicals, Electrics	1850–1873	1873–1914
K18	Motor Vehicles, Aviation, Electronics	1914–1945	1945–1973
K19	Information Technology	1973–2000	2000–2030

Source: Modelski and Thompson 1996

This long perspective on K-waves asserts several distinctive generalizations about its nature. One is that K-waves collectively have roughly a millennial history. As noted, most analysts focus only on the last two hundred years or so. It is rare to find an analysis that makes an explicit case for why we should presume that K-waves began in the 19th century. It is just something that is taken for granted. Second, and very much related to the origins of K-waves, is the assertion that K-waves are first generated by a lead economy – the world center of economic innovation for a given era – and then diffused unevenly to the rest of the world (Reuveny and Thompson 2004; Thompson and Reuveny 2010).

Although Kondratieff himself relied extensively on British and U.S. data for the periods during which Britain and the United States were lead economies, the 'national' origins of K-waves remains a minority proposition.

Each lead economy has experienced at least two K-waves, with Britain enjoying a full quartet. The United States may be going through a third one but that does not guarantee a fourth. Halfway through the K-wave iteration, global wars (1494–1508, 1580–1609, 1688–1713, 1792–1815, and 1914–1945) began to separate the two waves. Leading the coalition that wins the global war became increasingly helpful in bringing about a second post-war wave. Yet the second wave era in general tended to be marked by other states eventually catching up to the lead economy's head start while the first wave in the set was distinguished by the lead economy's jumping ahead of the field of rivals.

Also associated with this mid-millennial development is the gradual emergence of the global system leadership status for the lead economy. After the global war has resolved questions of which state/economy has moved successfully to the head of the global hierarchy, the new system leader has an opportunity to shape some of the rules and institutions concerning long-distance trade and industrialization.[2] Moving more or less in tandem with this status is the tendency for the system leader to have developed a commanding lead in global reach capabilities (Modelski and Thompson 1988). After all, it is in its own best interest to possess the types of capabilities necessary for policing and protecting maritime trade routes and access to resources deemed vital to the continued functioning of the world economy.

Implicit to this interpretation are the ideas that K-waves are or have become foundational for the dynamics of global politics. More specifically, each wave represents the life-cycle of introducing and playing out (or making more routine) radical new technology in the lead economy and elsewhere. There need not be anything mystical about the 40–60 year observed, rough periodicity of the upswings and downswings. The impact of new technology is not constant.[3] Nor is it perpetual. K-waves are S-waves in form. The impact is initially limited, builds and then decays. K-wave periodicity charts attempt to capture the timing of these S-waves albeit imperfectly.

It is time to add a few more generalizations to these older ones. One new generalization is that lead economies package variable leads in commerce, technology, and energy. A commercial lead implies predominance in long-distance trade, often of a maritime nature. A technological lead means that the

[2] Note that the global system is not a synonym for the whole world. Global politics are about regulating and preserving inter-regional transactions. A respectable proportion of international relations is entirely intra-regional.

[3] The impacts are not equal in impact either. Each cluster of innovations represent just that – a cluster of new technologies – with variable implications for how radical the changes in economy and society that are wrought as a consequence of their introduction.

lead economy is recognized for its distinctive ability to create software and hardware that makes economic production and exchange more feasible. Technology thus encompasses gadgets that make workers more powerful (windmills or assembly lines for instance) and effective and the development of new ships and trade routes that make exchange possible in ways that did not exist before. Transportation innovations, for that matter, have been central to the history of technological development.

Energy leads, finally, involve some type of breakthrough in developing new energy sources that are not absolutely necessary for the emergence of radical new technology. However, in the absence of a new and relatively inexpensive energy regime, it would be difficult, if not impossible, to optimize the impact of the new technology. Relatively inexpensive energy is necessary to attain the scale of production required for broad market distribution. Otherwise, the new technology may remain restricted to elite consumption – which can still matter but not as much as if consumption moves beyond elite circles. The automobile is the best example in the 20th century. Once assembly line innovations were introduced, motor vehicles could be turned out quickly and inexpensively. Steam engines and electricity were experimented with but petroleum combined with internal combustion engines won out as the most readily available and reliable fuel source.

A second new generalization is that it makes some difference how lead economies combine commercial, technological, and energy leadership. Those lead economies that manage to combine all three have the most impact on the world economy of their times. Successively, one can also say that the nature of the technological leads has meant that each of these 'trifecta' lead economies has out-performed and out-impacted its predecessor(s) especially in the case of the most recent examples (see Table 2).[4]

Table 2. Attributes of Successive System Leaders

	Commercial Lead	**Technological Lead**	**Energy Lead**
1	2	3	4
Song China	No	Yes	No
Genoa	Yes (but delimited spatially)	No (European maritime lead)	No
Venice	Yes (but delimited spatially)	No (European maritime lead that became more industrial)	No
Portugal	Yes (but delimited spatially)	No (European maritime lead)	No

[4] A trifecta bet requires the bettor to pick the first three finishers in a race, usually involving horses or greyhounds.

1	2	3	4
Netherlands	Yes (Europe and East-West trade)	Yes (Europe)	Yes (Peat/wind)
Britain I	Yes (Europe and Atlantic trade)	No	No
Britain II	Yes	Yes	Yes (coal)
United States I	Yes	Yes	Yes (electricity/petroleum)

The interaction between technology and energy helps to explain one analytical disagreement in international relations discourse. Only the leadership long cycle argument makes a case for 9 successive lead economies, albeit of uneven significance, over the millennia. Most foci on the structure of world politics either assumes the absence of hierarchy altogether or focuses on some combination of the Netherlands, Britain, and the United States. Of these three, the United States is usually viewed as possessing the strongest claim to the system leader/hegemon status, with Britain trailing in a weak second position. World-system analysts add the Netherlands but most other schools of thought do not. The reason for these disagreements about historical script have to do with the generalization that lead economies that combine all three types of lead (commerce, technology, and energy) have the strongest foundation for impacting world politics and economics. We remember them because they made a bigger impression than the other lead economies and the most recent cases have also made the biggest impression because their foundations for playing strong roles have been so much greater than their predecessors.

Song China made considerable headway in breaking free of agrarian constraints on economic development but ultimately failed to make a breakthrough. Genoa, Venice, and Portugal were transient leaders specializing in long-distance trade, controlling trade routes, and focusing primarily on maritime technology. The Dutch followed their path in dominating European trade, and to a lesser extent, Asian-European trade. But the Dutch also pursued the Chinese path in developing technology that depended on converting heat into mechanized power, thereby enhancing what it had to trade. The Dutch energy combination of windmills and peat, even so, could only do so much in terms of heat conversion. The British initially specialized in Asian and American trade, like most of its predecessors. Heating needs, however, led to increasing reliance on coal which, in turn, led to the invention of steam engines. Coal and steam engines made the breakthrough that had eluded both the Chinese and the Dutch. The United States initially piggybacked on the coal-steam engine breakthrough and went on to make its own energy transition contribution in terms of electricity and petroleum.

Returning to new generalizations, a third proposition is that only very enthusiastic advocates of renewables foresee the advent of a new energy transition away from carbon-based fuels prior to the end or near-end of the 21st century. It is not clear what the implications are for the world environment if the transition away from carbon fuels is as protracted as that. It does suggest, at the very least, more unpleasantness as opposed to less due to the acceleration of global warming. It also suggests a lesser probability of system leader transition in the 21st century or, alternatively, a transition to a new, strong systemic leadership which would require inexpensive energy as a prerequisite (Zakhirova and Thompson 2014). Furthermore, if the introduction of new technology is concentrated within a single lead economy and no single lead economy is possible, is it not also possible that the Kondratieff wave rhythm would be changed fundamentally?

There are of course other reasons for thinking that a singular lead economy might be an endangered species.[5] But if the hierarchical structure of the system is changing fundamentally, no singular lead economy might translate to the introduction of less new technology. Or, it might be that new technology will be introduced in a less concentrated way – both temporally and geographically.[6] Multiple lead economies might set up equally multiple technological life cycles that do not move together in a synchronized way. If so, the impact of the Kondratieff wave could become much less discernable. Or, if the multiple lead economies are regionally distributed, regions may experience K-waves with different periodicities. If new technologies are introduced in different places at different times, the better known, 40–60 year wave might simply be flattened into a less disruptive schedule of seemingly random rise and fall of new technological paradigms – much along, ironically, the lines of orthodox economic reasoning.

With all of the analyses done on Kondratieff wave phenomena to date, we have spent little time asking how these patterns emerged and where they might be going. The revised long-term perspective I have sketched in this paper suggests one answer for how they emerged. Where they might be heading remains an open question. But we have no reason to assume that K-wave form and periodicity are carved in stone. Things change; K-waves may too.

References

Chase-Dunn Ch., Kwon R., Lawrence K., and Inoue H. 2011. Last of the Hegemons: U.S. Decline and Global Governance. *International Review of Modern Sociology* 37 (1): 1–29.

[5] See, for instance, the arguments in Chase-Dunn *et al.* (2011); Grinin and Korotayev (2014); and Thompson (2015).

[6] A number of Kondratieff wave analysts have the impression that the pace of introducing new technology is accelerating.

Grinin L., and Korotayev A. 2014. Globalization Shuffles Cards of the World Pack: In Which Direction is the Global Economic-Political Balance Shifting? *World Futures: The Journal of New Paradigm Research* 70 (8): 515–545.

Modelski G., and Thompson W. R. 1988. *Sea Power in Global Politics, 1494–1993*. London: Macmillan.

Modelski G., and Thompson W. R. 1996. *Leading Sectors and World Powers: The Coevolution of Global Politics and Economics*. Columbia: University of South Carolina Press.

Reuveny R., and Thompson W. R. 2004. *Growth, Trade and Systemic Leadership*. Ann Arbor: University of Michigan Press.

Thompson W. R. 1988. *On Global War: Historical-Structural Approaches to World Politics*. Columbia, SC: University of South Carolina Press.

Thompson W. R. 2015. *Inching Toward The Primus inter Pares Model and the End of Systemic Leadership as We have Come to Know it?* Paper to be delivered to the annual meeting of the International Studies Association, New Orleans, Louisiana, February.

Thompson W. R., and Reuveny R. 2010. *Limits to Globalization and North-South Divergence*. London: Routledge.

Thompson W. R., and Zuk G. 1982. War, Inflation and Kondratieff's Long Waves. *Journal of Conflict Resolution* 26: 621–44.

Zakhirova L., and Thompson W. R. 2014. *The U.S. – China Race to Renewable Energy: Who is Winning and Does it Matter?* Paper delivered to the annual meeting of the International Studies Association-West. Pasadena, California. September.