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Economic rents and the contours of conflict in the data-driven economy

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Centre for International
Governance Innovation

CIGI Papers No. 245 – July 2020

Economic Rents and the Contours of Conflict in the Data-driven Economy

Dan Ciuriak



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About the Author

Dan Ciuriak is a senior fellow at CIGI, where he is exploring the interface between Canada's domestic innovation and international trade and investment, including the development of better metrics to assess the impact of Canada's trade agreements on innovation outcomes. Based in Ottawa, Dan is the director and principal of Ciuriak Consulting, Inc. Dan is also a fellow in residence with the C. D. Howe Institute, a distinguished fellow with the Asia Pacific Foundation of Canada and an associate with BKP Economic Advisors GmbH of Munich, Germany. Previously, he had a 31-year career with Canada's civil service, retiring as deputy chief economist at the Department of Foreign Affairs and International Trade (now Global Affairs Canada).

Executive Summary

While history allows many narratives to be spun, the contours of conflict, both internal and between states, can be seen as aligned with the contest over control of the most valuable productive assets of an age — from the wars of territorial acquisition of the feudal era when land was the main source of economic rents, to the wars of mercantilist expansion when the economies of scale generated by the machinery of mass production became the main source of rent, to the resource-rent-fuelled oil wars of the modern era, and, in recent decades, the proliferating conflicts over intellectual property (IP).

With the digital transformation we are seeing the emergence of a new type of economy — the data-driven economy, in which data is the essential factor of production. Data generates massive rents, fuels the rise of superstar firms and generates powerful incentives for strategic trade and investment policy. The emergence of this new economy signals a new era of conflict, on new battlegrounds and with new tools or weapons, between new coalitions within and between countries. This conflict is already upon us. The vast rents prospectively at play in the data-driven economy arguably constitute a major (perhaps *the* major) trigger for the open trade and technology war between the United States and China. They also are at the heart of the brewing conflicts over taxation of digital platform firms.

This paper describes the contours of the conflicts that are to be expected with the digital transformation as it realigns interests; compares these expectations with actual developments; and comments on the strategies of the main protagonists and the implications for the rules-based system of international commerce.

Introduction

In the era of continuous and steadily accelerating technological change that started with the Industrial Revolution, economies and societies were repeatedly transformed in ways that can be traced to ownership of the essential and scarce factor of production of the day and command of the economic rents that flowed to that factor. The digital transformation is now ushering in a new economic era, in which the economy is again being reordered by new technologies based on a new essential capital asset — data. The emergent data-driven economy promises to be similar to, but distinct in a number of ways from, its knowledge-based economy predecessor. However, it is very different from the industrial era based on machinery of mass production, which the knowledge-based economy itself succeeded, and the land-based feudal era before it (Ciuriak 2018a). These differences can be related to the ways in which data is different from the productive assets that underpinned the economy of preceding eras.

This paper briefly sets out this thesis and describes the contours of the conflicts that are to be expected with the digital transformation as it realigns the interests of social groups, companies and countries. It concludes with some inferences concerning the nature of these conflicts for policy makers tasked with navigating the coming period of turbulence.

The Historical Evolution of Economic Rents and Sources of Conflict

While history allows many narratives to be spun, the contours of conflict, both internal and between states, can be seen as aligned with the contest over rents. We are presently in the midst of a technologically driven transition into a new kind of economy built on big data, machine learning and artificial intelligence (AI). It is of interest to examine previous transitions driven by technological advance to see what can be learned about the possible implications for economic, social and political orderings. As the following stylized account

shows, the historical transitions had truly profound impacts. They serve notice for what is to come with the transition to the data-driven economy.

In the feudal era, when land was the main source of wealth, wars were fought between states for territorial acquisition; internal strife was over rights to land. The bone of contention was the rents that accrued to this critical factor of production. Military power depended on the size of land holdings (which determined the size of conscript armies that could be raised to defend one's own realm and to conquer other territories in order to exact rents from them — “tribute” in the terminology of some empires). The history of this era is the history of kings and conquerors, of wars fought over land for the rents it generated by foot soldiers — literally “boots on the ground.” More subtly, it also included the internal conflicts over the enclosure of the land commons to concentrate rents. Ownership of land created the social ordering of lords and peasants and the serving class (“manorialism”). This is the world depicted in its dying days in the television series *Downton Abbey*.

With the Industrial Revolution, which coincided with the integration of the so-called “empty” lands of the New World, which boasted fabulous new granaries, land ceased — temporarily, at least — to be scarce in this new economic context. There was now a seemingly endless extensive margin of land to erode rents accruing to land, and so the machinery of mass production brought into play by the Industrial Revolution became the main source of rents.

Since minimum efficient scale was large relative to the size of domestic markets in the early period of industrialization, access to export markets became critical for exploiting the economies of scale of mass production. What unfolded was an era of mercantile expansion that exploited the new transport technologies of steam-powered rail and shipping to seek new markets.

Framed in this manner, the logic of England's pivot to capital with the revocation of the Corn Laws, a move advocated by David Ricardo in his famous pamphlet that sketched out the idea of comparative advantage, snaps into focus. This shift also underscores that a country does not, in fact, have permanent interests as Lord Palmerston had intoned. Technology had changed England's interests. Manchester had become the “factory of the world.”

In this mercantile era, control of transportation and logistics (ports) was highly advantageous. This was an age of navies and “gunboat diplomacy” to open up markets. A quintessential example of the spirit of the age was the Opium Wars against China. More generally, the age incentivized the acquisition of colonies that would serve as captive markets and sources of raw materials at advantageous terms for the colonizer.

This original Mercantilism 1.0 was reinforced by the specie flow monetary system of the day. Under this monetary system, trade deficits would result in the outflow of monetary reserves (gold). An outflow of gold would, in turn, reduce the money supply and create deflationary pressures that could push countries into debt-deflation-driven depressions.¹

The rush for colonies by the European industrial powers in the late 1800s to extract their colonial surpluses (Fischer 2016; Bagchi 2002; Milanovic 2003) is thus aligned with the economic logic of the era. As the world ran out of spaces to colonize, the great powers turned their guns on each other in what was now a zero-sum game of rent capture. The “great” wars of the twentieth century by this account can thus be seen as endogenous to the economic conditions and institutions of the day. The resource-rent-fuelled oil wars of the modern era continued that tradition.

The industrial era also witnessed the emergence of internal strife within countries over the division of rents between capital and the new “worker” class called into existence by industrialization and its corollary of urbanization. The union movement was the means for workers to contest the rents accruing to the owners of capital; an important thread in the vast literature on wage determination is the institutional framework for rent sharing and specifically the role of unionization, which raised the bargaining power of workers over the division of rents.

There was also an evolution in social structures based on the wealth that went with the capture of rents, from the landed gentry of the feudal era to the industrial tycoons of the capitalist era (the “nouveau riche” of their day). The location

¹ For a discussion of the rationale behind the mercantilist emphasis on exports in the context of the specie flow system of international monetary adjustment and the implications of balance of payments deficits for prices, see Wilby (1981). The risk of depression in a context of over-indebtedness that is created by a fall in prices that raises the real value of debt was first formally articulated by Irving Fisher (1933).

of power also shifted from the manors of rural Europe to the industrial cities of Manchester and Philadelphia, each in their turn laying claim to being the “workshop of the world.” New partisan ideologies were conceived to defend the interests of the conflicted classes — “capitalism” and “labourism” (a.k.a. “socialism”) as written down by Ayn Rand and Karl Marx. In a remarkable echo of the internal polarization between capital and labour, an international polarization between “capitalist” and “socialist” societies emerged as a result of the twentieth-century wars initiated by the internal logic of mercantilist capitalism, including the wars of ideological persuasion of the post-World War II era. The irony of the age was that not only were these wars ruinous, they were pointless, since the structural motive — capture of manufacturing rents — had already been largely eradicated by economic progress, as discussed.

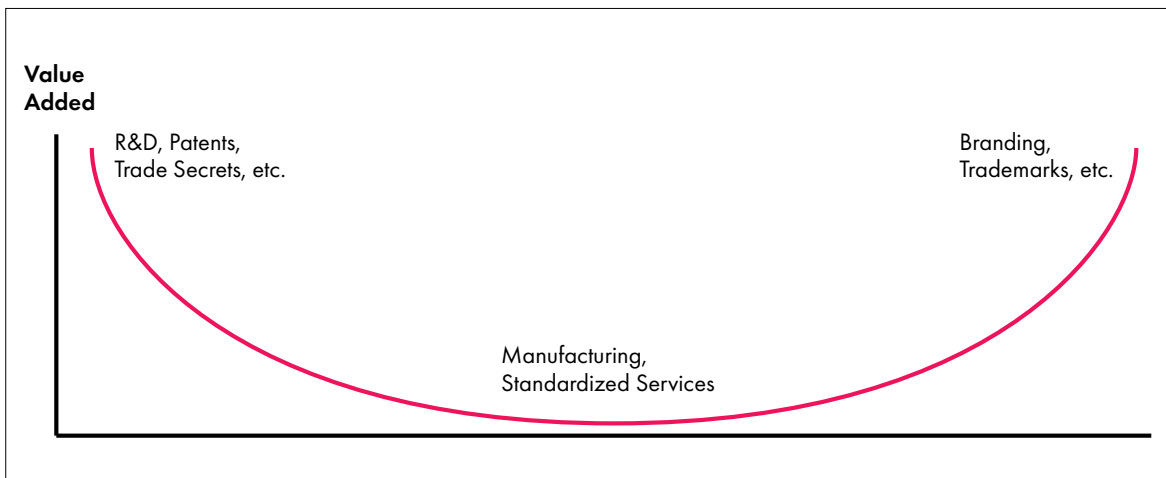
With the growth of the global economy in the postwar era, the size of markets rapidly came to exceed the minimum efficient scale of production of most goods — at least when production was organized in vertically integrated plants. The quest for rents then led in two directions.

One was to “unbundle” production into value chains to allow more specialized firms to extract still unexploited economies of scale (and the rents that go with them) within the production process (Baldwin 2016). The other was to focus on capturing value from the intangible elements of commerce — IP such as patents and branding, and control of distribution.

This shift is neatly described by the “smile curve” of value capture as the industrial era morphed into the knowledge-based economy (see Figure 1). Manufacturing and standardized services, which are now at the bottom of the curve, no longer command rents — these have been competed away by the proliferation of firms globally that had attained minimum efficient scale. Value, and the wealth that flows from control of the sources of value, now is located on the upper edges of the curve in the form of patents and other IP associated with the creation of products and in the form of branding and trademarks that capture markets for those products.

As an aside, insofar as workers were able to get a share of the rents during the era of

Figure 1: The Smile Curve



Source: Author, based on the “smiling curve” originally developed in 1992 by Stan Shih, the founder of Taiwan computer manufacturer Acer. See Taylor (2017) and Baldwin, Ito and Sato (2014) for an exposition. See Ye, Meng and Wei (2015) for an application of the firm-level smile curve to national economies.

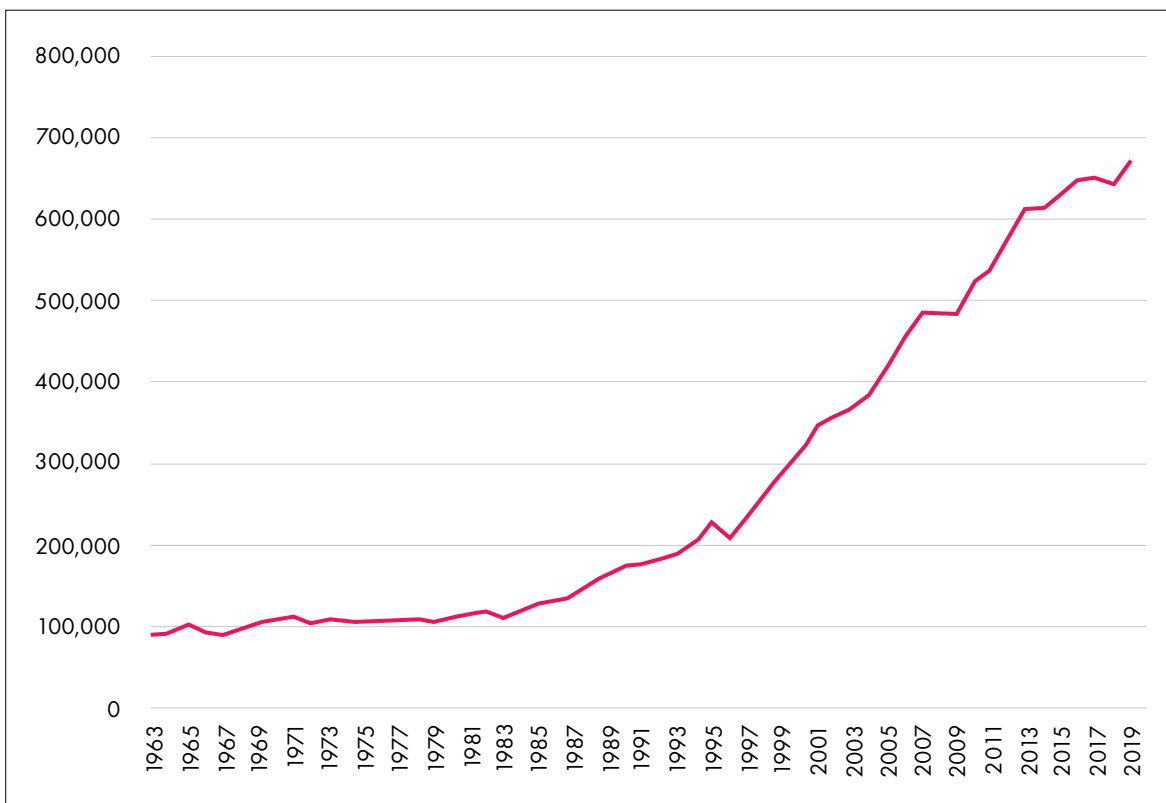
scale economies, jobs were “good jobs” (Katz et al. 1989). As the smile curve shows, good manufacturing jobs are gone because the rents from manufacturing are gone. China and union-busting may come in for the blame, but the scaling up of the global economy was the root cause.

In the knowledge-based economy, intangible assets with public-good attributes became the key to generating wealth. An economy based on intangibles is very different from one based on industrial production. These differences were not apparent immediately as it took time to build up the stock of intangible assets. However, over the decades, the changes became transformative, with new frictions emerging within and between

economies. Societies were reordered as wealth shifted from the industrial centres to the technology campuses and the blue-suited industrialists were displaced in the social hierarchy by tech CEOs in jeans holding forth through a clip-on microphone on a big stage in front of a big screen.

The leading IP jurisdiction — the United States — was an early mover in recognizing its interests. A useful marker for this recognition is the Bayh-Dole Act of 1980, which coincided with the point of inflection of the pace of patenting in the United States (see Figure 2). By extension, this serves as a convenient marker for the start of the knowledge-based economy era.

Figure 2: US Patent Applications – Total, 1963–2019



Data source: US Patent Office, www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm.

Rents flow to the owners of IP only if there is legal protection. Rent capture in the knowledge-based economy thus depends on expanding the scope of protected IP and on intensifying enforcement. In the international dimension, rent capture by the owners of IP requires expanding the suite of IP-related treaties to which countries are signatories.

It was not long before the United States moved to introduce new means to strengthen IP protection abroad to access international rents, starting with the Omnibus Trade and Competitiveness Act of 1988, which introduced the Special 301 Report, first published in 1989. Using Special 301 as leverage, and Fast Track/Trade Promotion Authority marching orders that set out ambitious IP protection objectives for US trade policy, the United States pioneered the introduction of IP protection into trade agreements, starting with the Canada-US Free Trade Agreement in 1989, and the North American Free Trade Agreement that followed. The United States was also the main *demandeur* for the inclusion of Trade-Related Aspects of Intellectual Property Rights (TRIPS) in the 1995 World Trade Organization (WTO) Agreement and pushed strongly for the Anti-Counterfeiting Trade Agreement, which, however, failed to achieve ratification and remains dormant, and the progressive ratcheting up of criminal penalties for infringement in the Trans-Pacific Partnership (TPP) agreement concluded in 2016 (Ciuriak 2019a).

The introduction of IP chapters fundamentally changed the nature of trade agreements, since these agreements now enabled international rent capture not by exploiting economies of scale through liberalized trade but by excluding rival products through restricted trade. The push for internationalization of IP protection primarily served to channel rents into the handful of leading knowledge-based economies. Moreover, the extent of protection likely went too far from a globally optimal public policy perspective (Jaffe and Lerner 2004). This latter outcome can be attributed to the strategic gaming of the system. In this strategic game, the leading IP-generating economies were able to offset negative impacts on their own innovation dynamism by rent extraction from abroad (Ciuriak 2017). A new fault line thus emerged internationally between the IP haves and the IP have-nots. While basic IP protection is far from an unadulterated bad for

developing economies,² this was not a type of economy in which most countries (and certainly most developing countries) could participate — as the aphorism goes, IP is created where the talent is and paid for where the protection is — and the talent was concentrated in the handful of leading innovation hotspots, including through the “brain drain” out of other jurisdictions.

The international polarization of interests over IP rents was sharply delineated in the WTO, whose Doha Round foundered in part on the conflict over TRIPS. The impasse at the WTO triggered a shift of trade negotiation into regional/bilateral agreements such as the TPP, in which the leading IP powers were able to use asymmetric bargaining power to advance their IP agendas. As for the rest, they pursued “South-South” agreements that avoided the issue.

As the share of intangibles grew, the intensity of frictions rose. In 1976, the share of the Standard & Poor’s 500 market capitalization of firms that were comprised of intangible assets was only 16 percent; by the 2010s, this had risen to the 80–90 percent range. Enforcement of IP rights had in fact become the biggest source of economic rent capture.

The conflict that emerged was more of a melee than a structured battle between organized coalitions. Much of it was firm-on-firm, fought out in the courts in infringement suits and often settled through mega-billion-dollar patent licensing agreements between the major firms. Some of it was predatory litigation mounted by patent enforcement entities (a.k.a., “patent trolls”), which assembled large holdings of non-performing IP acquired at low prices and scanned firms for innovations colourable as infringement of the often vague and broad patents that had been issued prolifically by patent offices. Some of it played out in business strategies, which included defensive moves to ensure “freedom to operate” and offensive moves to establish own patents as “standards essential patents.” And some of it was between shifting coalitions advocating for fair use versus IP rights promoters.

2 Establishing property rights is generally understood as essential for markets to develop. See, for example, de Soto (2000) and Maskus (2000) for discussions. For a recent survey of the causal link between IP protection and growth, which concludes with the somewhat dissenting view that causality findings reflect mostly prior beliefs, see Gold, Morin and Shadeed (2017).

Internationally, however, a battle line did form. In 2011, the US International Trade Commission (USITC) estimated that China observing US IP laws could raise the rate of return to US capital by 0.4 percent (USITC 2011). While this is a small number, a structural increase in the return on equities of this magnitude implied a boost to the value of US capital by hundreds of billions of dollars — bankable windfall benefits (Ciuriak 2017). The scene was set for the future trade and technology war.

With the digital transformation, we are seeing the emergence of yet another new type of economy — the data-driven economy, in which data is the essential factor of production. The lesson from similar shifts in the past is that this signals the transition to a new economic era, in which a major new source of rents triggers new conflicts, both internal and external, on new battlegrounds, with new tools and weapons, between new coalitions. The contours of conflict are again changing.

The Data-driven Economy Will Be Shaped by the Nature of Data

Big data, assembled from ubiquitous sensors, is growing at such a rate that it is estimated that 90 percent of all data ever collected was captured in the last few years. It is driving ever-more-powerful machine-learning engines and techniques and generating increasingly sophisticated and powerful AI. It is the essential and definitive capital asset of this age.

Big data exploits previously unattainable innovation in three major ways (the margins of gain vary across use cases but appear to be sufficiently significant to drive disruption):

- increasing efficiency and reducing costs for established industries through business and production process innovation;
- enabling the generation of new products and disruption of existing markets, reshaping industries (for example, the emergence of a “personal mobility” sector that promises

to subsume and displace several industries such as automobile manufacturing, rental fleet management and taxi service); and

- introducing new industries altogether (for example, data analytics and a service industry for data storage and processing, such as cloud computing).

Several factors combine to make this economy unusually predisposed to market failure:

- Given steep investment costs to capture, classify and curate (all functions that are also cost centres) and to successfully monetize data (the profit centres), the data-driven economy features steep economies of scale.
- The data-driven economy also features powerful economies of scope through relational databases that enhance the value of the individual types of data.
- Network externalities are present in many use cases; in two-sided markets, this can cause “tipping” toward one dominant provider and thus the emergence of “superstar firms.”
- Irreducible information asymmetry is inherent in big data since it provides information that is not accessible otherwise. This information edge can be thought of as an industrial-strength “sixth sense” with all the evolutionary advantages that this implies for those who possess it. It constitutes the “original sin” of the data-driven economy, in that it is the fundamental source of value for markets, yet is itself a source of market failure (Ciuriak 2018b).

These market failures result in a “winner-take-most” competitive context, which in turn drives strategic trade and investment policies, inevitably giving rise to conflicts. A foretaste of this is provided by the industrial policy conflict over dynamic random access memory chips between the United States, Japan, Korea and Europe in 1980, which inspired James A. Brander and Barbara J. Spencer (1985) to coin the term “strategic trade policy.” The parallels between the current US-China trade and technology war and the earlier “Red Sun Rising” episode with Japan are elaborated in Ciuriak (2019b).

The data-driven economy also features a new acceleration in the pace of innovation through the advent of machine learning, which industrializes

the very act of learning, building on the industrialization of research and development (R&D) in the knowledge-based economy era. This new acceleration is set in sharp relief by the experience of first training a computer to play Go based on human strategies and then allowing a computer to learn by playing against itself, telescoping hundreds of years of play into mere days. The second-generation version beat the first version 100–0 in match play. Similarly, an AI that trained for 10 months, playing the equivalent of 45,000 human years of the video game Dota 2 against versions of itself, beat a champion team of human players (Simonite 2019). Machine learning is now being used to optimize the process of selecting algorithms, a second-order application of the technique, and being coupled with ever faster, ever-more-powerful computer processors tailored for this purpose (Ciuriak 2019c). These capabilities are now accelerating research into a COVID-19 vaccine: the technology companies Baidu and Google DeepMind were able to predict the structure of the viral protein based on its genetic code much faster than would have been possible otherwise (Amoroso 2020). Acceleration creates disruptive frictions that generate turbulence.

The shift of creation from the human mind into the machine-learning space also shifts the source of competitive advantage to economies that invest heavily in computing capacity and data engineers, eroding the entrenched advantage of those countries based on laboriously accumulated elite human capital. To paraphrase Frederick the Great, discovery is now dominated by those with the largest server banks and corps of data analysts and engineers (see, for example, Tim Cook’s statement regarding why Apple invested in operations in China; Leibowitz 2017). This shift in competitive advantage has major implications for the capture of rents, which in turn creates a tinderbox for conflict.

Within societies, the data-driven economy already has witnessed a steep expansion of the rent share of income, which naturally concentrates wealth. Prospectively, this tendency will be intensified with the coming deployment of machine knowledge capital (AI applications). These applications will compete away both functions and income currently captured by white-collar professional workers who trade on human knowledge capital and intensify machine competition for manual labour by making robots more flexible.

While jobs will not likely disappear (the principle of comparative advantage suggests that work will be reassigned between machines and humans but labour markets will clear), returns to labour will be reduced by intense competition from AI, which captures rents for the owners of the data-based IP — the aforementioned machine knowledge capital.

This income and wealth shift will build on and intensify the shift of rents from labour to capital in the knowledge-based economy era. The smile curve thus is predicted to shift down and become more U-shaped as the lower slopes of the curve, which represent rents accruing to white-collar work, are depressed due to the shift of rents up to the owners of the new AI-based capital assets. This redistribution promises to foment strife.

Finally, the data-driven economy introduces new vulnerabilities to societies, externally and internally. The advent of fifth-generation (5G) networks promises to transform the vast network of internet and telecommunications infrastructure developed to allow for the open and rapid exchange of information and services from a passive utility into a veritable digital nervous system for the economy that can be attacked anonymously from abroad. This is not a hypothetical proposition: “kill switches” inserted into foreign countries’ electrical grids, which could be used to disable them at times of kinetic war, have long been a national security concern; the Internet of Things expands enormously the risk landscape. Social networks, meanwhile, can be used to manipulate public opinion using the powerful data-driven techniques developed for advertising. Technology is creating new battlespaces and, data is creating new weaponry to contest these spaces.

Conflict is predicted by all these conditions — and it has already broken out — both within states and between states.

Discussion and Conclusions

This paper argues that the relatively scarce and valuable productive asset of an age plays a powerful role in shaping that age’s economic, social and political organization. The conservation

and optimization of the use of this asset not only determines the characteristics of the economy but also influences the shape of political polarities internally and structures international conflicts externally. In the feudal age, this asset was arable land; in the industrial era, it was the machinery of mass production; in the knowledge-based economy that developed in the post-1980 era, it was IP. As a corollary of this framing, the emergence of data as the new essential asset of the modern age and the flowering of a data-driven economy will similarly have a powerful influence in shaping internal politics and international relations. The developments in the early years of the data-driven economy do not disappoint this intuition.

The Contours of Conflict in the Data-driven Economy

As regards domestic political polarizations, these are forming along the wealth spectrum of the age of data, echoing the internal political polarizations around the basis for sharing of the rents in the economy, between the lords and the commoners in the manorial feudal era and between capital and urban labour in the industrial era. At one end of the spectrum is a still-inchoate but ever-widening constituency of those who do not capture rents in the knowledge-based and data-driven economy. At the other end are those who do capture rents. The nomenclature of the politics of this era has yet to settle but what appears to be taking shape is a rather protean “populism” on one end and “elites” on the other (Moffitt 2016; Mudde and Kaltwasser 2017). This is the framing that US President Donald Trump puts forward, pitting his “Make America Great Again” populist constituency against the technology giants (see, for example, Zuidijk 2020). What the face of populism looks like in any particular country may depend on which social groups dominate the have-nots (perhaps a coalition of the proverbial hamburger flipper, Uber driver or Amazon “fulfillment centre” service worker in one country; a generation bereft of opportunity finding a cause for rebellion in another; or an identitarian movement in a third). But the elite of the data-driven era will be the chief executive officers of technology and data and their entourage.

As regards international conflict, this is also aligning with the contest over data rents, including a major escalation of the previously low-level conflict between the United States and China and the opening of a new front between the United

States and the European Union and, to a lesser extent, between the European Union and China. The US pivot to Asia, which had been initiated in the knowledge-based era with a primary focus on capturing rents from traditional IP, gained new wind in its sails from the emergence of China as the major rival in the data-driven economy, as the United States reacted to China’s stated ambitions to be a (the) world leader in the new general-purpose technologies of data/AI/machine learning. Meanwhile, where the United States and the European Union had common purpose in advancing an IP-strengthening agenda in the knowledge-based economy era, in the data-driven world, the United States is the rent collector and the European Union is the rent payer. Not surprisingly, the European Union has moved to capture data rents by taxing the major digital corporations active in its jurisdiction, and the United States is moving to punish it for doing so. At the same time, the European Union has redefined its posture vis-à-vis China, with particular focus on the acquisition of “vulnerable assets.”

In short, the contours of conflict in today’s world are assuming a shape consistent with the expectations flowing from an analysis based on data rents analysis. This is not the only narrative purporting to describe the evolution of the global economy and the sources of friction; however, there is no denying that money wants to talk, and it does appear that it is being given the floor and, arguably, exerting influence.

Structural Features

There are three notable structural features about the way in which these conflicts are unfolding.

First, the skewed capture of rents in the modern knowledge-based and data-driven economy, which creates a tinderbox for societal conflict, has deep structural roots in the nature of this economy. The skewing of income and wealth in the advanced knowledge-based economies thus promises to be exacerbated rather than naturally corrected as the age of data progresses. As distributional indicators move sharply away from historical zones or established “solution spaces” (Ciuriak 2018c), societies that do not move decisively to arrest and retrace these trends risk potentially severe disruption driven by unpredictable populist politics. The economic crisis induced by COVID-19 has accelerated many trends with problematic implications for jobs, wages and income

distribution — in fact, as the real economy has plunged, equity markets have soared, exacerbating the wealth inequalities. It has often been remarked that it is a shame to waste a crisis. Never has this adage been more apposite. Societies need to take advantage of the pandemic-induced crisis to reset income and wealth distribution for the age of data.

Second, the fragmentation being observed internationally is not creating natural coalitions with obvious bargaining chips to exchange in negotiations. In the consumer- and society-facing aspects of the data-driven economy, China evolved separately from the rest of the world behind its Great Firewall. Accordingly, the main contest for rents in these areas boils down to the United States, which hosts global champions that capture the vast bulk of the market, versus the rest of the world, which captures little. Interestingly, whereas domestically US populist politics align against the technology giants, internationally, US interests align with them. This makes for particularly challenging governance issues for the United States and likely militates against an international accord being reached. Moreover, China is not in this picture.

In core technologies, meanwhile, the friction breaks down differently and awkwardly. The United States, apparently surprised by China's rapid progress on 5G networks but unwilling to concede this advance despite not having a national champion, has mounted a relentless, full-spectrum geo-economic blitzkrieg to slow down China's advance and, in particular, the progress of its national champion, Huawei, involving:

- explicit prohibitions on the sale of US technology by US firms to an expanding “entity” list of Chinese firms (which extends to foreign firms where up to 25 percent of the technology used in their products originated in the United States);
- curtailment of Chinese investment in the United States and forced unwinding of existing investments;
- a “China initiative” established by the Justice Department targeting Chinese nationals for scrutiny for IP theft (including the use of extradition treaties to reach Chinese nationals abroad, the basis for the apprehension of Huawei executive Meng Wanzhou);

- a (failed) attempt to exclude Chinese technology experts from participating in international standards-setting bodies;
- directives to US universities to review their technology partnerships with Chinese entities and, indeed, to withdraw from them, on pain of losing US federal government funding;
- persuasion to limit the flow of US finance to Chinese firms; and
- intense diplomatic efforts to restrict Chinese 5G technology deployment in third countries, including promoting the “5G Clean Path” program (US Department of State 2020), which appears to signal full decoupling in at least some critical technologies.

At the same time — and tellingly, for this thesis — the US government has openly mused about acquiring a national champion (FitzGerald and Krouse 2020) by buying one of the European contenders — Ericsson or Nokia (the latter had previously swallowed Lucent, the last US entry in this field, through its acquisition of Alcatel-Lucent). The European Union, however, has moved to safeguard its strategic assets at a time of vulnerability.

Third, while the structure of the conflict flows from the economics of the data-driven economy and thus over things that in principle are negotiable (however complex the negotiating framework might be), the framing of the conflict in national security and values terms — things that are not negotiable — paints the parties into hostile positions.

Implications

What does all this portend for the global economy, in particular in light of the disruption generated by the COVID-19 pandemic and the telescoping of likely a decade's worth of economic and social organizational change into the first years of the 2020s?

With regard to the international apportionment of taxes on the profits of multinational digital enterprises, an accord in this area would settle the division of rents by treaty rather than by conflict. However, not surprisingly, given the structure of interests, the United States has walked away from the negotiating table and threatened tariff reprisals against countries levying such a tax. Indeed, it is difficult to see a

stand-alone agreement being reached. A broader negotiation is required that would provide opportunities for a balance of concessions covering other digital commerce issues that need to be resolved as part of the adaptation of the WTO for the digital transformation (Ciuriak 2019d).

On core technologies, the US pushback on Huawei opens up the field for the European companies (and Samsung) but at a cost to its own supply chain firms, which lose sales to China, and a cost to all other countries that face much higher prices for 5G. Within the European Union, the gains from capture of greater market share in core technologies is uneven in this superstar world; Finland and Sweden come out ahead from the technology war, but countries capturing benefits indirectly through the supply chain (for example, the United Kingdom with ARM and the Netherlands with ASML and its semiconductor lithography tool) and the remainder that pay higher prices for 5G come out behind. Outside of Europe, the decoupling rhetoric (which is quite elevated in the United States; see Helberg 2020) is met with discomfort as countries have no interest in choosing (see, for example, Ford 2020). Moreover, the idea is generally fraught with problems for the globally integrated information technology supply chain (Roach 2020; Wyne 2020; Bloomberg 2020).

China, which has been capturing the domestic rents in the consumer- and society-facing applications while stealing a march on the 5G build-out internationally, in principle has something to give to secure its continued international expansion — access to its domestic market. However, this would require a major step for China's domestic governance. China has expressed interest in joining the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, which would provide it a forum in which to negotiate digital market access in a non-hostile venue. This should be encouraged.

In the default context in which there is no negotiated settlement, the intensification of the technology war has given a powerful boost to China's R&D effort in computer chip development (China's President Xi Jinping announced a US\$1.4 trillion investment program over the period to 2025 to promote China's technological independence; *The Economist* 2020). How quickly China can replace US-controlled technology in its supply chain is an open question (Ernst 2020). However, given its established base of scientific capability, China's path to the technology frontier

is open — it is mainly a question of time. Given the acceleration in the pace of innovation due to the role of machine learning, the fact that convergence is faster than pushing out the technology frontier with new science, and the urgency that the technology war injects into China's development program, that day will come soon enough — if not necessarily soon enough to save Huawei, given the multiple choke points currently controlled by the United States. Third-country suppliers facing loss of their market in China also have powerful incentives to find workarounds, raising a fear expressed in US technology circles that the export restrictions will undermine them (Swanson and McCabe 2020; *The Economist* 2020).

The pandemic-driven economic crisis has accelerated the digital transformation in the consumer- and society-facing areas, while delaying the build-out of the next-generation infrastructure. The US and Chinese internet giants benefit from the shift online of economic activity; China benefits additionally as the delay in infrastructure build-out provides it additional time to catch up technologically. Overall, however, the lie of the land is little changed for the geo-economic contest going forward.

In conclusion, a rules-based system is efficient for the regulation of trade when competitive market conditions apply — which was perhaps unusually and fortuitously the case in the postwar period when, briefly, economies were characterized by constant returns to scale and the labour share of income was constant. However, in the contest for international rents, geo-economic and geopolitical power runs roughshod over rules. That is the situation facing the international community in the coming years. The critical factor going forward is to de-escalate the rhetoric on national security and values, which are not negotiable and potentially put the parties onto a path to mutually ruinous conflict, and instead place the emphasis on the sharing of rents, which is a negotiable issue that can be addressed by an institutional framework already in place — the WTO.

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