Common and seemingly universal political beliefs, when applied within systems of unanticipated size or degree of connectivity, have the potential to become massively destructive.

I'll be showing you an example here that's both familiar and surprising.
1/46

You might interpret this example as demonstrating a bug in capitalism, but that's not my point.

The larger point is that conventional political reasoning without systems thinking can be, and in fact has become, dangerous.
2/46

The example I'll be building below shows that business behavior we accept as normal, moral, sometimes even required by law in small and medium-size settings, can scale up perversely and exhibit antisocial, even dangerous, effects in large, highly connected settings.
3/46

Adam Smith's Invisible Hand is not benign at scale, and it is producing a dangerous systemic effect in large public-stock corporations: a compulsion to grow that cannot be controlled from within. In the case of Big Oil, that is leading us into environmental disaster.
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This essay is in four parts.

A. ZIPF'S LAW SHOWS UP WHEREVER THERE IS COMMUNICATION IN MARKETS.

B. ZIPF'S LAW AT SCALE LEADS TO SYSTEMIC INEQUITY.

C. DOMINANT PUBLIC-STOCK CORPORATIONS DON'T KNOW HOW TO SHRINK.

D. BIG OIL IS IN A BOX.

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A. ZIPF'S LAW SHOWS UP WHEREVER THERE IS COMMUNICATION IN MARKETS.

What I'm calling "Zipf's Law" here is related to the "Pareto Principle" and the "80/20 Rule", but it is a more general expression of the idea, as I'll show through some examples.

https://en.wikipedia.org/wiki/Zipf%27s_law

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George Zipf was a linguist who, among other things, studied the distributions of word frequencies. From the Wikipedia article: "...given some corpus of natural language utterances, the frequency of any word is inversely proportional to its rank in the frequency table."

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That means that when you sort the words in a corpus by frequency of occurrence with the most common word first, you will find a close mathematical relationship between each word's rank (order number) and the number of times it occurs in the corpus.
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Zipf's-law results can be presented as "Ranked-order Distributions". Ranked-order distributions have different horizontal axes from, say, frequency distributions in statistics.
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In a ranked-order distribution the horizontal axis is not a measurement. Instead, you sort all the measurements and present them in descending order on the horizontal axis, with the frequency of occurrence often shown as the height of a vertical bar.
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Zipf's Law gives you a "Power-law Ranked-order Distribution". The term "power" refers to the exponent K in the formula in the accompanying graphic.
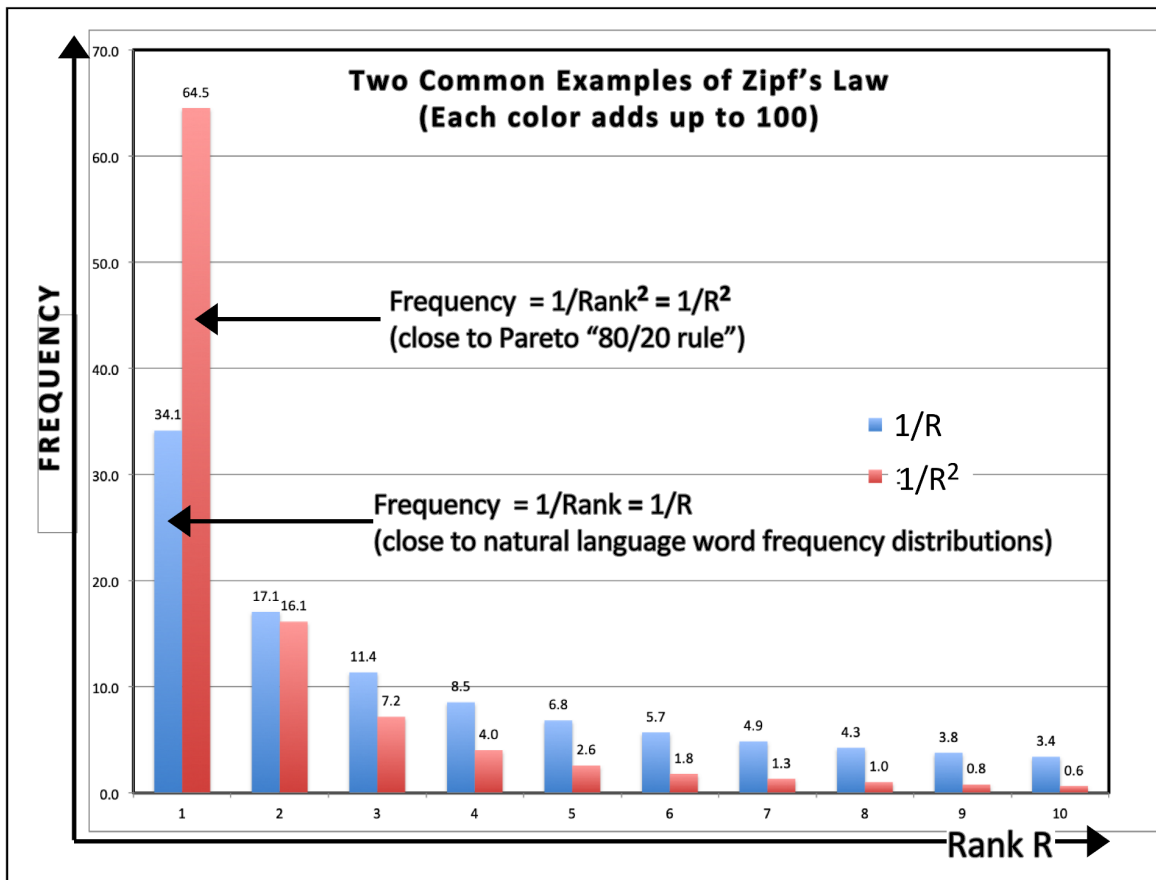
https://en.wikipedia.org/wiki/Power_law

Power-law Ranked-order Distribution
Frequency = $1/Rank^K$
(K is a small constant like 1 or 2)
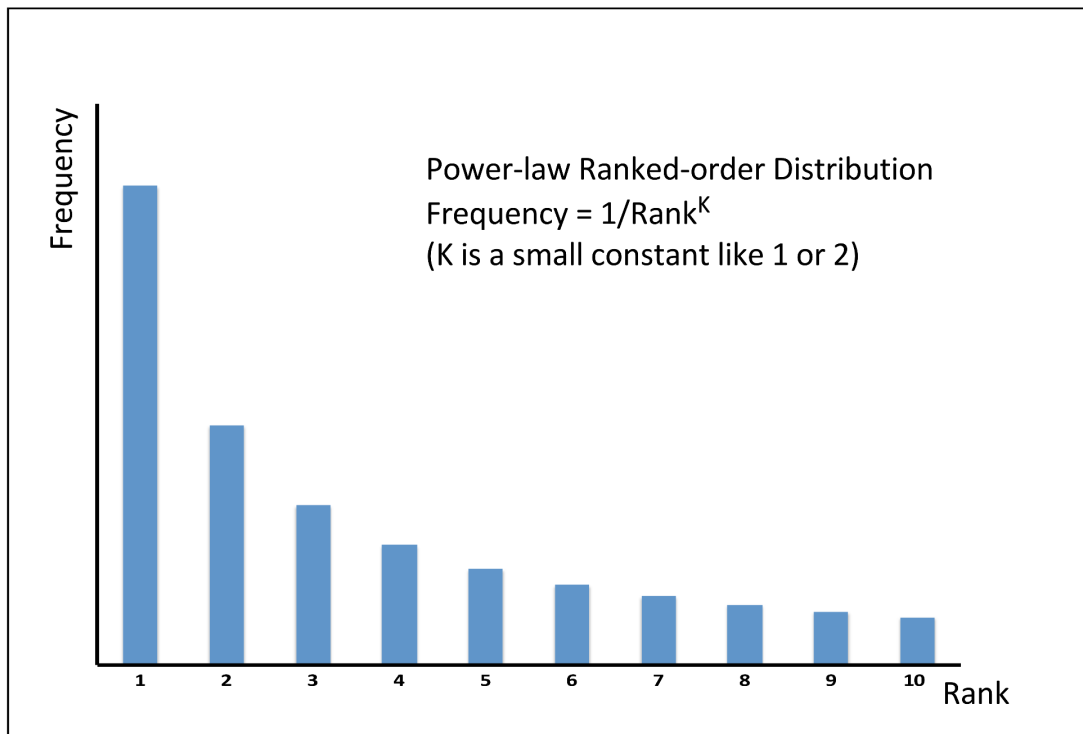
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Here are two common examples of Zipf's Law: the Pareto "80/20 Rule" and word frequency distribution.

Two Common Examples of Zipf's Law
(Each color adds up to 100)

Frequency $= 1/Rank^2 = 1/R^2$
(close to Pareto "80/20 rule")

Frequency $= 1/Rank = 1/R$
(close to natural language word frequency distributions)

- 1/R
- $1/R^2$

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Melvin E. Conway, @conways_law
Delivered at Mapcamp 2021, October 13, 2021

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Now we're going to focus on the general case of the distribution of a seller's market penetration in a market with many sellers and many buyers.

The example I'll treat first is the market that connects blog and web page creators and readers.

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I first learned about this case from this 2003 paper by Clay Shirky: "Power Laws, Weblogs, and Inequality".

http://extremedemocracy.com/chapters/Chapter%20Three-Shirky.pdf

The market in this case comprises the writers (sellers) and readers (buyers) of blogs (they called them weblogs then).

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Here is an excerpt from Shirky's paper. The names along the horizontal axis are blogs ranked by the number of links elsewhere that point to them, a proxy for popularity.

We are all so used to bell curve distributions that power law distributions can seem odd. The shape of Figure 1, several hundred blogs ranked by number of inbound links, is roughly a power law distribution. Of the 433 listed blogs, the top two sites accounted for fully 5 percent of the inbound links between them. (They were InstaPundit and Andrew Sullivan, unsurprisingly.) The top dozen (less than three percent of the total) accounted for 20 percent of the

Figure 1: 433 weblogs arranged in rank order by number of inbound links[1]
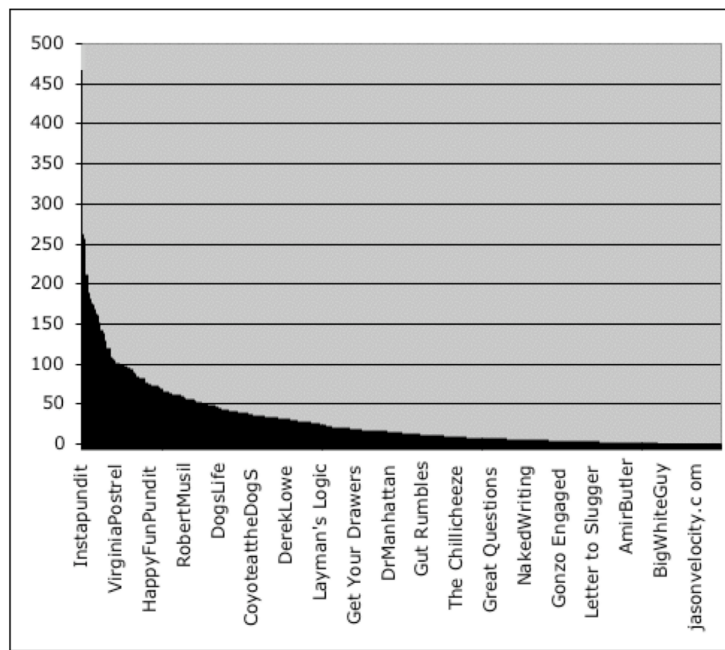
[1] The data is drawn from N.Z Bear's 2002 work on the blogosphere ecosystem. The current version of this project can now be found at http://www.myelin.co.nz/ecosystem/.

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If the readers of all the blogs were isolated and didn't communicate with each other, each reader/blog choice would essentially be a die-toss, and each blog would, on average, have the same number of readers.

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But this is not what happens. In reality, readers communicate with each other, some write reviews, minds are changed, favorites develop, and you end up with a market penetration power-law distribution like that shown above in the Shirky-paper excerpt.

17/46

This skew, or inequity, in popularity can be seen as the consequence of:

Many-to-many communication
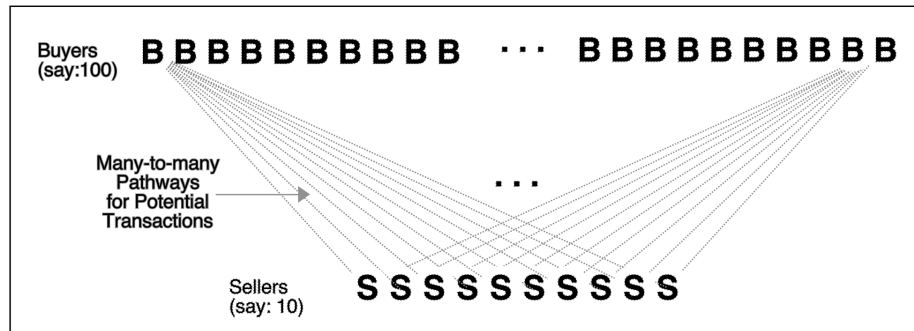In a market that permits
Contagion of buyer preferences.

This is a pattern that you will see in many variations once you start looking for it.

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Let's generalize this market idea. This graphic depicts a market, consisting of (say) 100 buyers, (say) 10 sellers, with all the potential buyer-seller interactions represented by the lines.


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Now let's rank the sellers by market size (i.e., number of buyers) and show each seller's market size as the height of a vertical bar below that seller. This is the market-penetration ranked-order distribution which, under this no-communication assumption, is equally distributed.
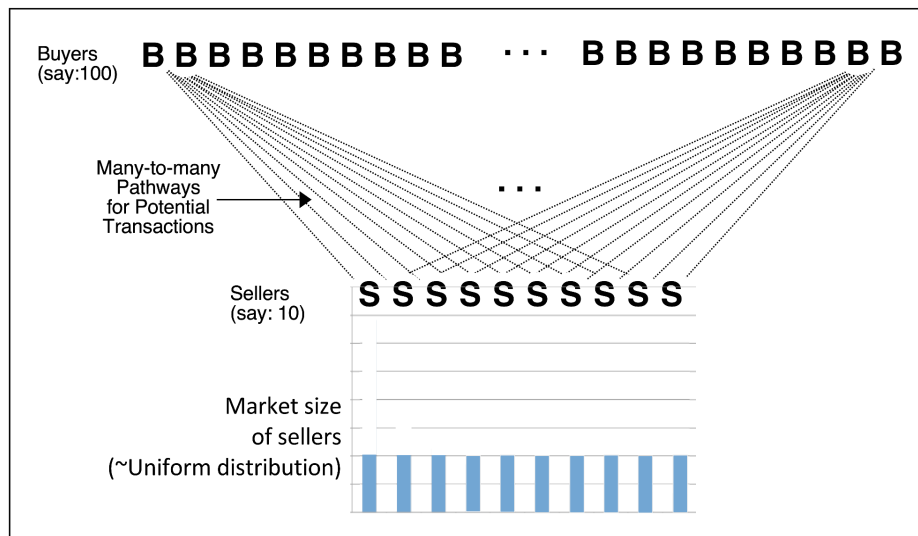

20/46

Now we'll represent free communication among the buyers by adding to the graphic a many-to-many communications network connecting all buyers.
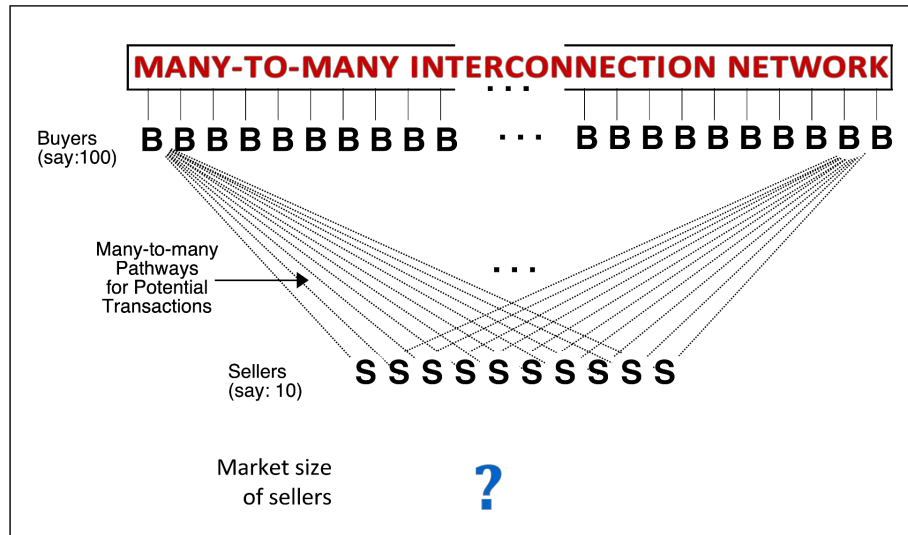
21/46

Assuming buyers communicate their preferences freely and are influenced by others according to some uniform rules, Zipf's Law kicks in and the market-size distribution becomes a power-law ranked-order distribution as shown here.
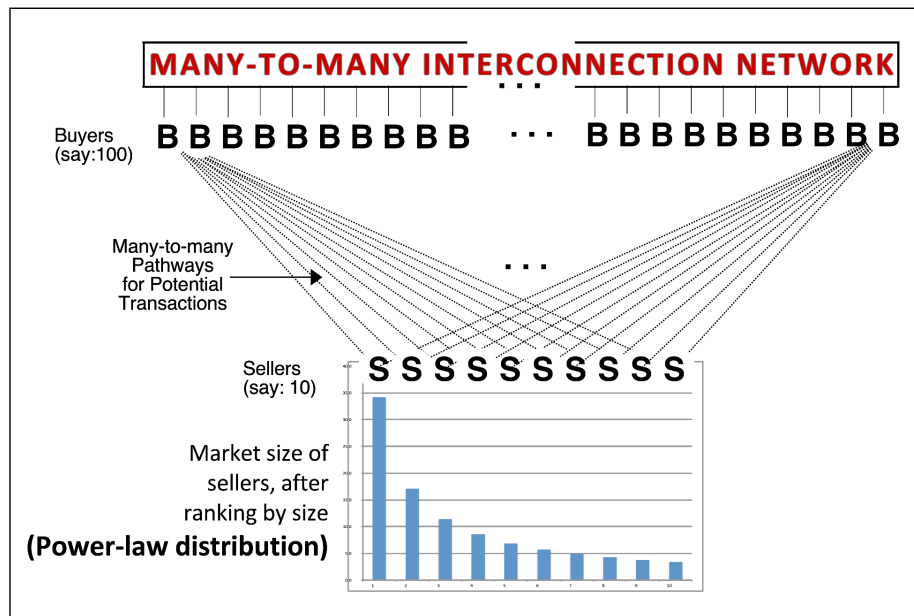
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B. ZIPF'S LAW AT SCALE LEADS TO SYSTEMIC INEQUITY.

In the 1970s, Boston Consulting Group (BCG) observed a principle for stable competitive markets they called "The Rule of Three and Four".

This rule is a consequence of Zipf's Law. Here is their statement.
https://www.bcg.com/publications/1976/business-unit-strategy-growth-rule-three-four
23/46

Here is my bottom-line shortcut summary of the BCG statement:

Company number three in this market might survive, but you don't want to be number three. Indeed, if you are below number three, find yourself another business.
24/46

(In the 1980's Jack Welch, CEO of GE, required that each GE line of business be first or second in its market, or it must be sold. But this one-dimensional optimization strategy was unsustainable, and the 2008 financial crisis permanently crippled GE.
https://twitter.com/conways_law/status/1356300109286404097)
25/46

After BCG's Rule of Three and Four settles out in a market, the market will have at most three viable participants. We can represent this consequence as a "Threshold of Viability" on the market-share distribution.
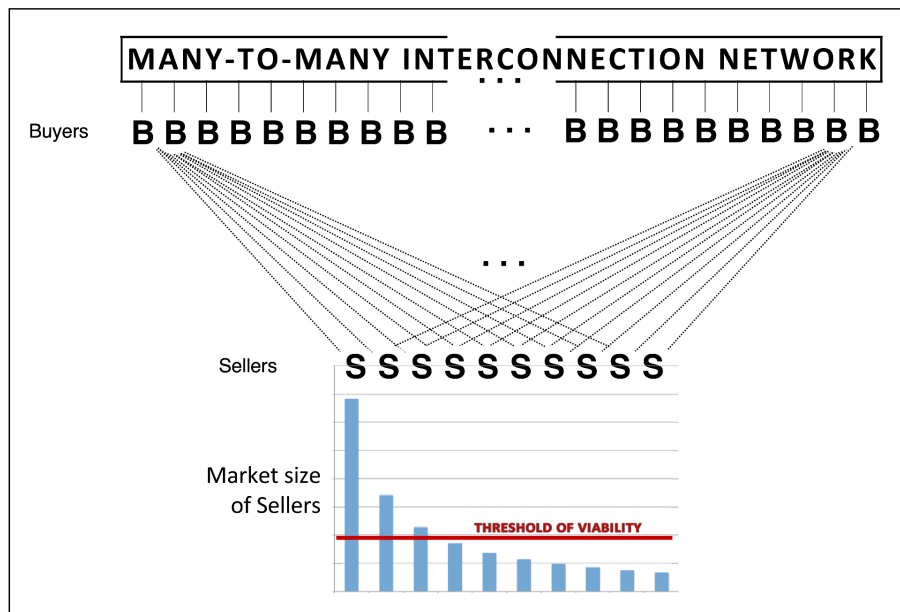
26/46

What happens to the non-viable participants? Often, each sells out to one of the three leaders.

In this graphic, number eight is acquired by number one, Mega Global Enterprises (MGE), and the market becomes more concentrated.
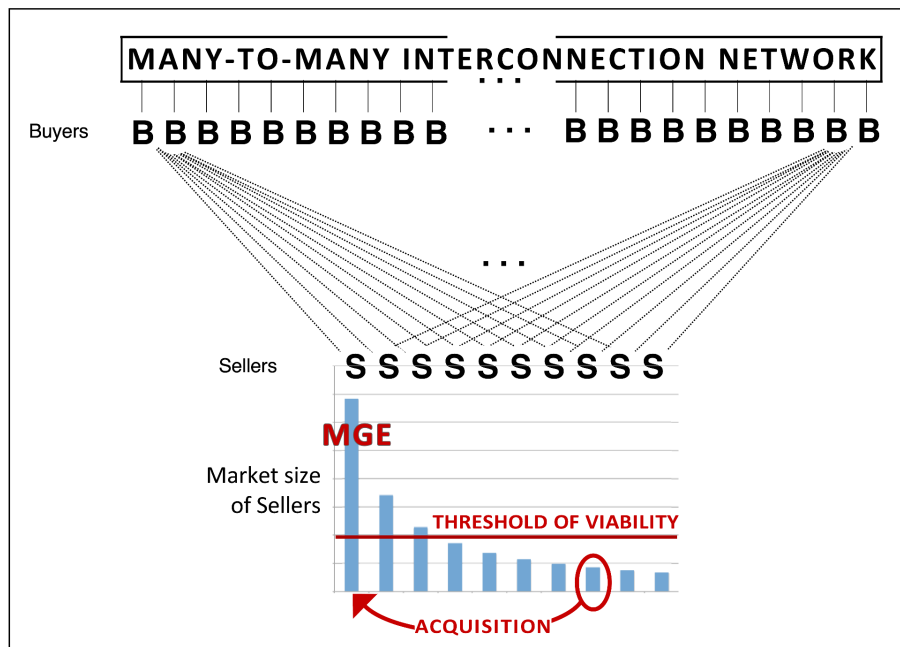
27/46

Maybe the economics of the business permits only two survivors, putting number three below the threshold. Or maybe a few of the also-rans merge and move ahead of number three.

The existence of a threshold changes the character of the game from competition to survival.

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C. DOMINANT PUBLIC-STOCK CORPORATIONS DON'T KNOW HOW TO SHRINK.

If the market participants are public stock corporations, there is a positive feedback loop that makes their market a game of survival for them all, even the dominant businesses.
29/46

Let's go back to the acquisition of number eight by Mega Global Enterprises. What currency does MGE want to use to make that purchase?

Cheap stock. What do I mean by "cheap"?
30/46

To the management of MGE, "cheap" stock is cheap to existing MGE shareholders (that is, spending it will minimally dilute their portfolios) but valuable to the shareholders of the company being acquired. In other words, MGE stock has already appreciated in the stock market.
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So the incentive system for assuring MGE's survival (stay number 1 or 2) drives MGE Management to keep growing its stock price. (Note that the MGE Board of Directors has probably realized this incentive by compensating senior management with stock.)
32/46

How does MGE Management grow its stock price? By growing the business.

Investors are constantly evaluating the relationship between MGE's share price and its business fundamentals, and comparing MGE with other investment opportunities in the equities market.
33/46

MGE might run out of direct competitors to acquire, but it will continue to be compelled to grow its share price. Its Board is incentivizing senior Management with stock, and the equities market will punish the corporation (and Management) if the share value falls.
34/46

This logic follows from multiple concurrent sources.
1. Shareholding corporate insiders are incentivized to grow their personal wealth.
2. Corporate boards almost always signal to Management its duty to grow the share price.
35/46

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3. This signal often follows from wide acceptance of the "Friedman Doctrine": the only duty of the corporation is to enrich its shareholders.
https://www.nytimes.com/1970/09/13/archives/a-friedman-doctrine-the-social-responsibility-of-business-is-to.html
36/46

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4. Many institutional investors, such as pension funds, in fact have a fiduciary duty to grow their clients' money.

These sources of belief add up to a "Grow or Die" imperative driving MGE's behavior.

Here is the logic driving Grow or Die.
37/46

It turns out that MGE has a presence in two different markets: the industrial market in which it sells its products, and the equities market in which it sells its shares.
38/46

MGE's proxies in these two markets are coupled by this positive feedback loop. It is a growth ratchet. Shrinking the corporation would be Management suicide.
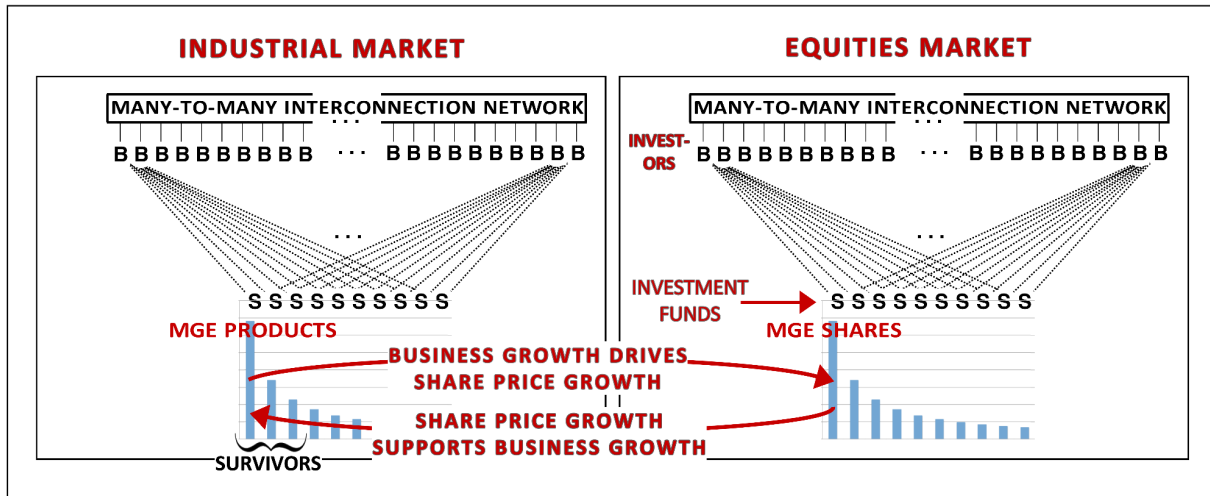
39/46

D. BIG OIL IS IN A BOX.

The Big Oil corporations (e.g., ExxonMobil, BP, Shell, ConocoPhillips, Chevron, Total) are MGE-like, both as a group and individually in their respective markets. They are under major political pressure to replace fossil fuels with renewable energy sources.

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I see this challenge to fundamental business change as similar in character to the challenge posed by the introduction of a disruptive technology. Kodak, Polaroid, and Blockbuster are examples of leading businesses that failed to meet such a challenge.

41/46

This article frames the failures of Kodak, Polaroid, and Blockbuster in terms of failure to innovate.

https://www.investopedia.com/articles/investing/072115/companies-went-bankrupt-innovation-lag.asp

I don't see that for Big Oil, which is technologically sophisticated and has not failed to innovate.

42/46

But Big Oil is captive to its sunk capital which can be written off only at massive pain. Converting the business to renewable energy at scale, in my opinion, would not generate acceptable returns on any feasible time scale that would meet shareholders' expectations.

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Meanwhile, Big Oil is responding cooperatively to political pressure to reduce its carbon footprint, and it is at least keeping both of its markets happy for now.

https://www.nytimes.com/2023/02/07/business/bp-oil-gas-profits.html

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This might be a rope-a-dope strategy, but it is working so far.

https://hotidioms.com/2016/08/09/rope-a-dope/

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In my view, the codependence on so many levels between our society and Big Oil is another way that it is set apart from Kodak, Polaroid, and Blockbuster.

A way out for Big Oil cannot come from within, and I believe it must originate externally from the political process.

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[A pdf of this essay is at

https://melconway.com/Home/pdf/ZipfConsequences.pdf]