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Increasing Returns

Identifying Forms of Increasing Returns and What Drives Them

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Introduction

Those with even a passing familiarity of economics have likely heard of Adam Smith and his famous tome, *The Wealth of Nations*.[1] The pin factory and the invisible hand are the most famous ideas in the book. The story of the pin factory shows how the division of labor can lead to a cost advantage and, ultimately, increasing returns. The invisible hand metaphor suggests that economic participants acting in their own interests will drive the market toward equilibrium, suggesting decreasing returns.[2]

Assessing when and how increasing or decreasing returns are dominant is a key task of economic observers, policy makers, and investors. The concept of increasing returns describes the case when a marginal investment generates an output above the average. Decreasing returns prevails when a marginal investment produces an output below the average.

Decreasing returns is the default condition because it is the natural result of competition. For example, a firm earning a high markup, where the price of the good is above the marginal cost, will entice competitors to enter the market and sell the product at a lower price.

The back and forth between competitors will drive the price toward the marginal cost. George Stigler, an economist and winner of the Nobel Memorial Prize in Economic Sciences, stated flatly, "There is no more important proposition in economic theory than that, under competition, the rate of return on investment tends toward equality in all industries."[3]

Two empirical findings support Stigler's point. The first is the well-documented evidence that businesses with a high return on invested capital (ROIC), a measure of profit divided by invested capital, see their ROICs regress toward the opportunity cost of capital.[4] Although the rate at which ROICs regress varies by industry and company, the broad pattern is a constant.[5]

The second is that markups for businesses in the U.S. were a relatively modest 1.3 at the time Stigler wrote that in 1963. This indicates a price above the marginal cost but also a limited ability to earn an ROIC substantially above the cost of capital. Decreasing returns documents that firms struggle to earn and sustain economic profits above the cost of capital.

The hallmarks of increasing returns for a business are rising ROICs and a high market share. Right around 1980, ROICs and markups started to rise in the U.S. as measured using standard accounting. For example, one measure of return on investment for U.S. companies doubled from 1980 to 2023, and markups rose steadily from roughly 1.2 in 1980 to about 1.5 today.[6]

This picture is not quite right for reasons that are central to this report. Traditional measures of ROIC and markup do not accurately reflect intangible investments, which are not physical but can still create value. Research that properly reflects the impact of intangibles shows that the rise of ROICs and markups is much more muted than what the unadjusted figures suggest.[7]

Increasing returns clearly plays a role in industry formation, market structure, international trade, and economic growth. Informed investors benefit from an understanding of increasing returns as they assess both macro- and microeconomic developments.

This report discusses where increasing returns is relevant. The review is non-technical but seeks to highlight the important ideas. Increasing returns is a deep topic that is the subject of dozens of academic papers and books.[8] One of those books, *Knowledge and the Wealth of Nations* by David Warsh, a journalist, provides the framework for much of this discussion. Further, a number of businesspeople and investors learned about increasing returns through researchers affiliated with the Santa Fe Institute (SFI).[9] SFI, founded in 1984, does basic science across disciplines to search “for order in the complexity of evolving worlds.”

Ideas are an important ingredient in economic growth. As the foundation for economic activity shifts from being based on tangible to intangible assets, understanding the characteristics of intangible assets is becoming more relevant by the day. Some of these characteristics are favorable, including the ability to share ideas and to use them as the building blocks for innovation. Others create challenges, such as the protection of intellectual capital and the risk of obsolescence.

We review five areas of economic analysis where the concept of increasing returns applies. This simple taxonomy belies substantial overlap between the parts. We describe these areas and attempt to show where and why they may be relevant to investors today.

Although Adam Smith pointed out increasing returns two and a half centuries ago, much of economic theory over time has featured perfect competition and decreasing returns. However, Kenneth Arrow, an economist and also a Nobel Prize winner, noted that a review of economic studies over time reveals that, “[the theory of increasing returns] acts like an underground river, springing to the surface only every few decades.”[10] Research over the past 50 years has allowed the river to flow to the surface, and it is time to see what it has to say and what it means.

Forms of Increasing Returns

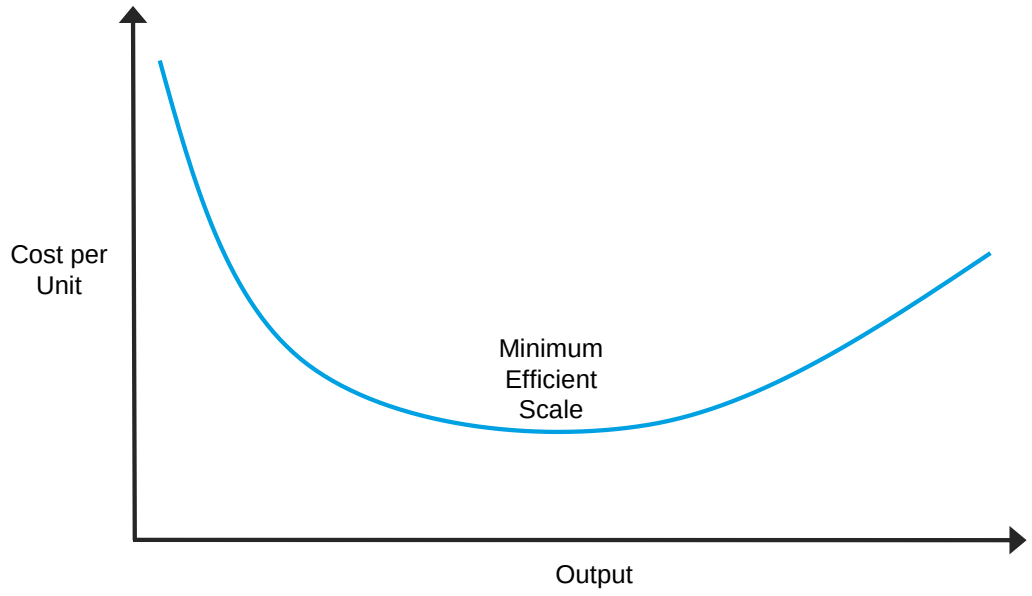
Economies of Scale. The first source of increasing returns is economies of scale, very much what Adam Smith had in mind when he described the pin factory. Economies of scale exist when a company "can perform essential tasks . . . at a lower cost per unit as volume increases."[11]

Smith illustrates the benefits of the specialization of skills as the result of the division of labor. He argues that a single person executing all of the manufacturing steps would struggle to make one pin and "certainly could not make twenty" in a day. But by breaking down the task of making a pin into 18 steps, 10 workers would be able to produce 48,000 pins in a day, a massive increase in output.

Smith knew that the extent of the division of labor is a function of the size of the market. When markets are small, division of labor does not pay off and workers have to do many tasks. Think of a startup. But division of labor does work for large markets because it makes sense to disaggregate activities so that workers are more efficient.

Economists depict economies of scale with a cost curve placed on a chart where the horizontal (X) axis represents output and the vertical (Y) axis is cost per unit (see exhibit 1). The curve starts in the upper left corner and drops, before bottoming and then moving back up. Minimum efficient scale is the level of output a company must achieve to exhaust economies of scale.[12]

Exhibit 1: Average Cost Curve



Source: Counterpoint Global.

The curve moves up again, reflecting higher average cost per unit, as a consequence of diseconomies of scale. The sources of diseconomies of scale include complexity, bureaucracy, and coordination costs.

Note that operating leverage is distinct but related to economies of scale. Operating leverage leads to lower cost per unit as the result of spreading preproduction costs over a larger volume of output. Preproduction costs capture the money a company spends before it can launch a good or service. Instances of preproduction costs include writing the software code for a new operating system or building a factory to manufacture shoes.

Operating leverage is sensitive to the mix between fixed and variable costs. A fixed cost, generally linked to an asset that is not sold or used up in the normal course of business, occurs independent of output. A variable cost, such as commissions based on sales, rises and falls with output. Companies have high operating leverage when a small change in sales leads to a relatively large change in operating profit. For example, the operating leverage for the materials sector is roughly double that of the consumer staples sector.[13]

Economies of scale as a source of increasing returns is based on the idea that one company can gain scale at the expense of its competitors and expand until it becomes a monopoly. Empirically, we see some cases of winner-take-most markets, for example internet search, but more commonly we see market shares that are more dispersed. Ultimately, the success of economies of scale is conditional on the size and growth of the market, the nature of the cost structure of a business, and the ability to fend off the drivers of diseconomies of scale.

International Trade. Paul Krugman, an economist who also won the Nobel Prize, mentioned to a colleague in 1977 that he was working on international trade. The other professor said, "Trade is such a monolithic field. It's a finished structure, with nothing interesting left to do."[14] Krugman is probably better known today as a contributor of opinion columns at *The New York Times*, but his contributions to new trade theory proved that there was still a lot left to do.

In 1817, David Ricardo, a political economist, had come up with the idea of comparative advantage.[15] The concept is somewhat counterintuitive. It shows that if two countries produce two commodities, they are better off trading even if one country has a cost disadvantage in producing both commodities. The key is to focus on comparative advantage: if the country with the higher cost produces the good where its comparative cost gap is lower and the countries trade, both are better off.[16]

Ricardo's theory was and is hugely valuable but fails to address what Krugman calls "similar-similar" trade. Comparative advantage explained well the trade between dissimilar goods and dissimilar countries in the first wave of globalization. Krugman notes that in 1910 the vast majority of British exports were in what the country did well, manufactured goods, and the vast majority of the imports were in what the country lacked, raw materials. By 1990, manufactured goods still dominated exports but were also three-quarters of the imports.

Krugman was then exposed to models of "monopolistic competition," most notably the Dixit-Stiglitz model, that he saw as a "gadget" that provides insight into international trade.[17] Monopolistic competition describes a condition when companies compete against one another but produce goods that are somewhat different. For example, France and Germany might trade automobiles as the comfort of French cars is appealing to some German customers and the performance of German cars is attractive to a subset of French buyers.

Krugman's insight was "countries that were identical in resources and technology would nonetheless specialize in producing different products, giving rise to trade as consumers sought variety."[18] This explains intra-industry specialization and increasing returns.

He then reintroduced comparative advantage, inter-industry specialization, to round out the picture.[19] By doing so, he created a framework that accommodated both competition and increasing returns.[20]

Krugman also contributed to the field of "economic geography." He lays out a very simple model where a company has two markets with fixed demand and one is larger than the other. Shipping product from one market to the other incurs an expense and opening a second facility creates an extra fixed cost.

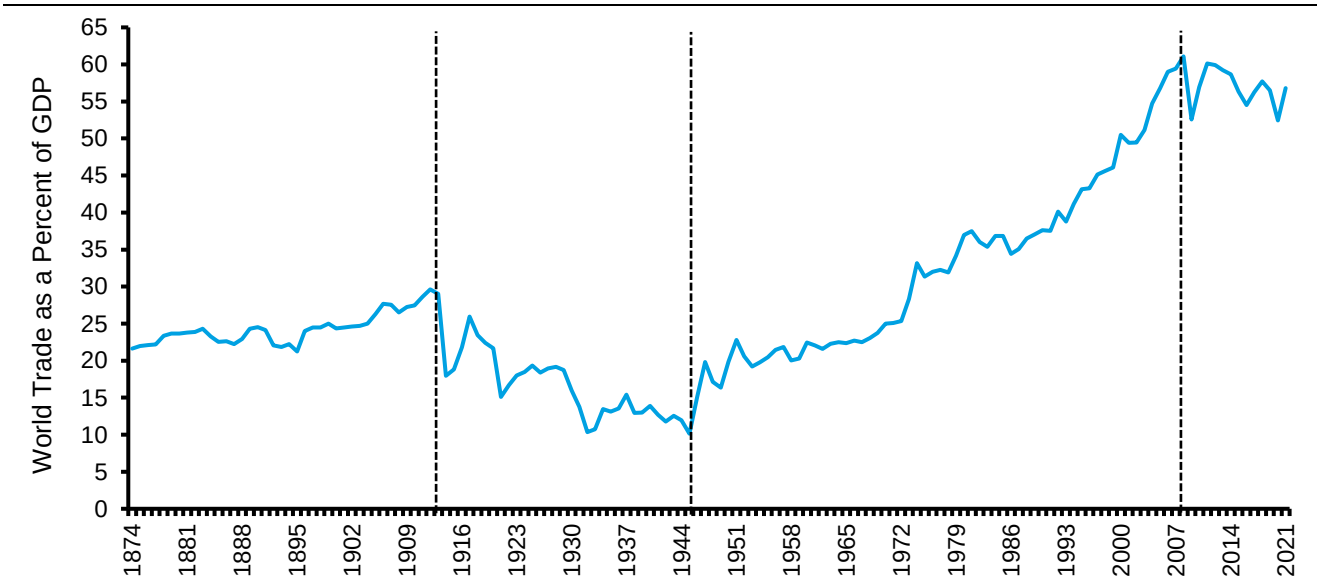
If the company can open only one plant, it will locate it in the larger market. But it will open a second facility if its additional fixed cost is less than the transportation costs.

This basic model leaves out a number of salient considerations related to industry structure and the nature of consumer demand. Alfred Marshall, an economist known for his opus, *Principles of Economics*, offers factors to explain industry concentration including specialized suppliers, a robust market for capable labor, and knowledge sharing.[21] The Dixit-Stiglitz model helped explain the first and Krugman and his contemporaries set out to explain the others.

International trade is an important topic today given current geopolitical dynamics. Over the last 150 years, there have been distinct phases in international trade (see exhibit 2). The late 1800s through the beginning of World War I was a period of steady trade growth driven by industrialization. This was "dissimilar-dissimilar" trade that the comparative advantage model explained well. From World War I to the end of World War II, trade dropped as a reflection of the conflicts and rising protectionism. After World War II, trade again climbed steadily until the global financial crisis of 2007 to 2009.

Since then, we have seen trade plateau in what economists at the International Monetary Fund call "slowbalization," which reflects "a prolonged slowdown in the pace of trade reform, and weakening political support for open trade amid rising geopolitical tensions."[22]

Exhibit 2: Regimes in International Trade, 1874-2021



Source: Douglas A. Irwin (see www.piie.com/research/piie-charts/globalization-retreat-first-time-second-world-war); World Bank; Counterpoint Global.

Semiconductors, among the highest value good traded in the world, are a particularly interesting area to watch. The CHIPS and Science Act of 2022, which provides $280 billion to "support the domestic production of semiconductors" and "authorizes various programs and activities of the federal science agencies" in the U.S., opens an opportunity to shift some semiconductor manufacturing from Asia to the U.S.[23]

The current U.S. administration has set limits on the sale of semiconductor technology to China in an attempt to slow that country's access to leading technology. And relations between China and Taiwan remain tense, of note because most of the foundries that produce high-end chips are in Taiwan.

Learning by Doing. Kenneth Arrow's Nobel Prize was awarded for his work on general equilibrium theory, which is the study of supply, demand, and prices across multiple markets. But his most cited paper is on the topic of learning by doing, which he wrote in 1962.[24]

Economists knew that the inputs of labor and capital did not explain economic output well before Arrow wrote that paper. Another factor, often simply called "technology," was contributing to output. Technology is "the way inputs to the production process are transformed into output."[25] The paper sought to make technology an endogenous part of economic growth and required that workers could learn.[26]

Arrow's non-technical setup was straightforward. He argued that learning comes from experience and that repetition contributes to learning. The more experience you have in doing something, the better you can do it.

One example that economists commonly cite to demonstrate this idea is the ironworks at Horndal, Sweden, a town about 175 kilometers northwest of Stockholm. From 1935 to 1950, the owner decided to keep the facility open but to invest no incremental capital. During that time, output per worker hour grew two percent per year. Arrow chalked up those gains to learning by doing.[27]

Scientists, including a trio affiliated with the Santa Fe Institute, sought to figure out which of six models most accurately explain the drop in the cost of producing one unit of a good. They adjusted all of the figures for inflation. To evaluate the models, they examined the cost and production data for more than 60 technologies.[28]

Moore's Law, which says that cost reductions are a function of time as the result of technological improvement, is the best known of the models. Created in 1965 by Gordon Moore, one of the founders of Intel, the law said the number of transistors on an integrated circuit would double every year.[29] Ten years later, he revised the time to double to two years.[30]

The researchers found that Wright's Law performed the best. T. P. Wright was an engineer and a naval aircraft inspector during World War I. After the war, he joined Curtiss Aeroplane and Motor Company and, knowing that the cost of planes would have to come down sharply to be commercially viable, kept track of industry capacity and labor efficiency.

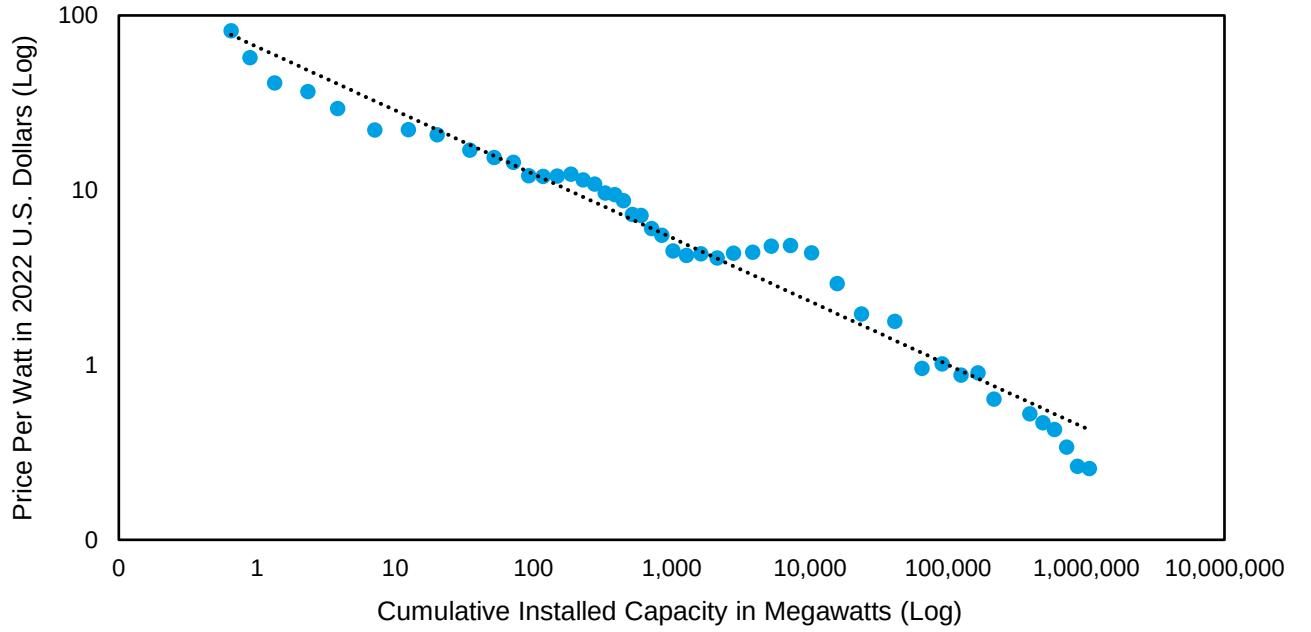
Wright's Law is based on his finding, published in 1936, that the number of hours of labor required to produce an airframe declined as a function of the cumulative number fabricated. The precise formula says the amount of labor hours per unit equals $N^{-1/3}$. Translated into everyday language, this says that the labor hours per unit decline 20 percent for each doubling of cumulative output.[31]

Wright's Law and Moore's Law were both good at explaining cost reductions for the technologies the researchers examined. But note the difference: Moore's Law is about improvement in technology and therefore is a function of time. Wright's Law is based on experience and is therefore a function of cumulative output. Wright's Law is largely about learning by doing.

In practice, it is difficult to discern whether lower costs per unit are the result of technological improvement, economies of scale, or learning by doing.[32] Both economies of scale and learning by doing can support increasing returns, especially if one company gets ahead of its competitors.

Solar panel production is an industry where learning by doing may be an important driver of costs. Exhibit 3 shows the decline in the price of solar photovoltaic technology, or solar panels, as a function of cumulative installed capacity from 1976 to 2022. Note that both axes are on a logarithmic scale. For each doubling of capacity, prices declined by just under 20 percent.[33] This is essentially what Wright's Law predicts.

Exhibit 3: Solar Panels: Installed Electricity Capacity and Price, 1976-2022



Source: Lafond et al., "How Well Do Experience Curves Predict Technological Progress?"; International Renewable Energy Agency; Our World in Data (https://ourworldindata.org/grapher/solar-pv-prices); Counterpoint Global.

Production of lithium-ion batteries for electric vehicles is another example. The learning curve has led to a price decline of 18 percent for every doubling of cumulative output.[34] Tesla, a company that designs and manufactures electric vehicles, has benefitted from lower battery costs and also operates the most productive automobile plant in the U.S.[35] In the cases of batteries and electric vehicle production, cumulative output has moved Tesla down the cost curve faster than its competitors.

Positive Feedback and Network Effects. Negative feedback is associated with decreasing returns. Positive feedback is associated with increasing returns. Positive feedback is a key mechanism in markets where one winner takes all or most of the economic profits.

A thermostat is a good metaphor for negative feedback and corporate results. You set your thermostat to a particular temperature. If the temperature rises too much, the thermostat signals the cooling system to turn on and return the temperature back to the setting. Likewise, if the temperature drops too much the thermostat activates the heating system. The system is designed to maintain the temperature near the level set.

For companies, the set temperature is the cost of capital and the thermometer measures ROIC. If a company's ROIC gets too high, or hot, competitors act like the switch in the thermostat and attempt to enter the market and push the returns lower. If the ROIC gets too low, or cold, there is disinvestment or consolidation that allows returns to improve. This is all consistent with regression toward the mean for ROIC.

But there are cases where positive feedback dominates. One example is competition between multiple formats that are different but serve the same purpose. Classic examples include track gauge (the distance between the rails on a railway track), driving on the left or right side of the street, and Betamax and Video Home System (VHS) videocassettes. In these cases, the formats compete until one reaches a tipping point, beyond which positive feedback takes over and establishes that format as the standard.

For example, in the early 1970s Betamax had a higher market share than VHS, and in the late 1970s they roughly split the market. But by the late 1980s VHS reached a tipping point and Betamax was discontinued. Explanations for VHS's success after the fact include a longer recording time than Betamax, which allowed for share gains that led to economies of scale and ultimately the support of movie studios and rental outlets that preferred to work with a sole standard.[36]

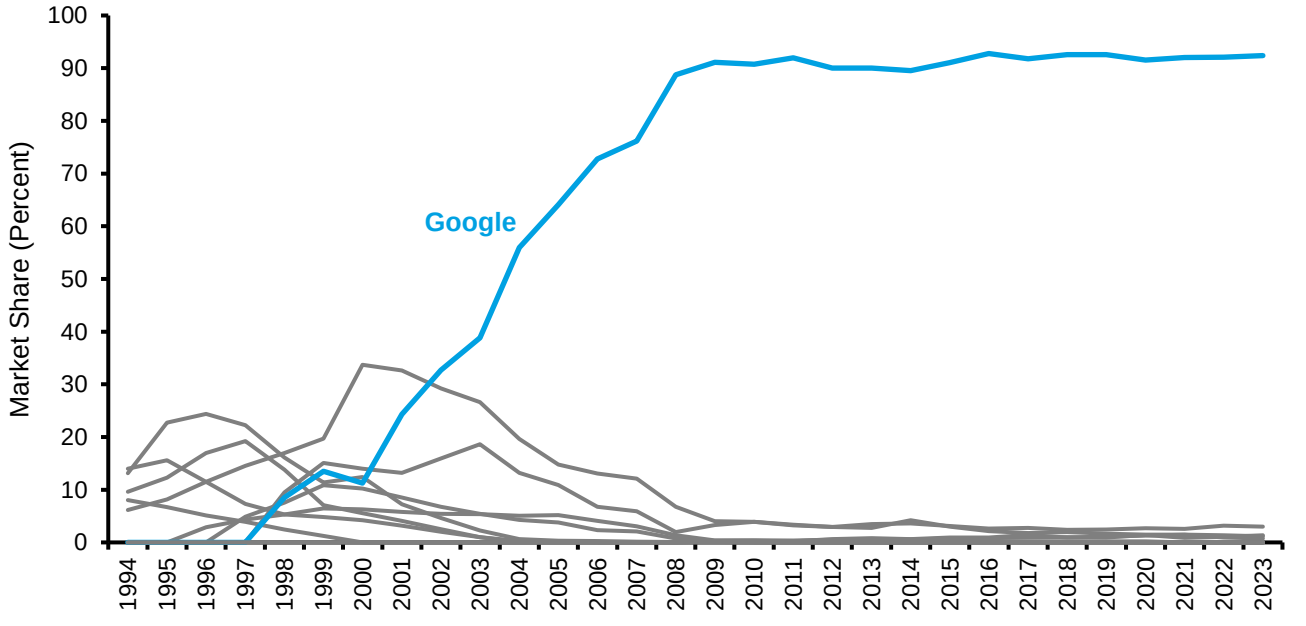
Explaining why one format won is easy after the battle is over. But uncertainty and luck can play enormous roles in shaping the outcome.[37] One famous, albeit disputed, story is about the QWERTY keyboard.[38] Developed in the 1870s and designed to reduce the jamming of the keys of physical typewriters, QWERTY's rights were sold to E. Remington & Sons, an early and successful typewriter manufacturer.

Users then learned to use a QWERTY keyboard, which increased switching costs, propelled demand, and locked in the popularity of the format. In the 1930s, a professor named August Dvorak developed an alternative keyboard that was ergonomically superior and purportedly allowed for faster typing. But the market had already tipped in favor of the QWERTY over the Dvorak.

This pattern of runaway success extends to social systems as well, including who becomes famous, what song is a hit, and which books reach the bestseller list. Robert K. Merton, a professor of sociology, called it the "Matthew Effect" after a verse in the Gospel of Matthew (13:12) that says, essentially, the rich get richer and the poor get poorer.[39]

An indicator of positive feedback is that one competitor has an extremely high market share. Examples include Microsoft's share in operating systems for desktop personal computers and Google's in internet search. But it is crucial to acknowledge that anticipating which technology will win is a challenge early on. Exhibit 4 shows the market share for the internet search industry from 1994-2023. In the late 1990s, the market shares changed significantly, and it was not until the early 2000s that Google's position was established.

Exhibit 4: Market Share for the Internet Search Industry, 1994-2023



Source: Statcounter; www.dailymotion.com/video/x81fzhm; Counterpoint Global.
Note: Includes search engines that were among the top five at any point during this period.

In 1987, Kenneth Arrow and Philip Anderson, a professor of physics and winner of the Nobel Prize in Physics, convened a workshop at the Santa Fe Institute called "Evolutionary Paths of the Global Economy."[40] The idea was that Arrow would invite economists and Anderson would invite researchers in the physical sciences, including physicists.[41] Arrow invited his colleague at Stanford University, W. Brian Arthur, an economist who had done early work on the mechanisms that generate increasing returns.[42] Arthur would go on to be the first director of the economic program at SFI. Lots of the investors who were early to appreciate increasing returns heard about the concept from Arthur at SFI.[43]

In many cases, positive feedback leads to one format winning over others but does not translate into economic profit. The width of track gauge, driving on the left side of the road, or typing on a QWERTY keyboard do not confer competitive advantage to railroads, automobile manufacturers, or producers of keyboards. But there are instances where positive feedback leads to the formation of networks that are extremely valuable.

In *Principles of Economics*, Alfred Marshall, one of history's most influential economists, said costs can go down for two reasons. The first is "internal economies," which are "those dependent on the resources of the individual houses of business." The second is "external economies," which are "dependent on the general development of the industry."[44] These external economies, or "externalities," are costs or benefits that the market does not price.

As with platform battles, positive feedback tends to lead to one network becoming dominant. For example, Facebook, part of Meta Platforms, Inc., is the world's largest social media business today with three billion monthly active users. But Facebook had to beat out rival networks to ascend to its dominant position. These included Friendster and MySpace, sites that launched before Facebook did.

Network effects exist when the value of a good or service increases as more people use the good or service. One way to measure changes in the value of the network is through willingness to pay (WTP), the most a consumer is willing to pay to use a good or service. Once a network becomes dominant, WTP rises because users are locked in and face substantial switching costs if they move to a smaller network. The sum of these costs is a substantial barrier to entry for a fledgling network seeking to topple an incumbent.[45]

There are different types of networks. In a direct network, users connect without an agent in the middle. A telephone network is a classic example. In an indirect network, value comes from the presence of complements, or goods or services that are consumed with other goods or services. The WTP of one good or service goes up if the cost of its complement goes down. Electric vehicles and charging stations are a good case of complementary products. The growth and value of the network depends on the co-evolution of electric vehicles and charging stations.

Platform businesses that match two sides of a market can also have strong network effects. The rideshare industry is a good illustration. More drivers attract more riders, and more riders attract more drivers. If two networks compete and one reaches a tipping point, the other will have a tough time competing profitably.

Companies that benefit from positive feedback and network effects can create a substantial amount of shareholder value because they draw on two forms of increasing returns. The first is classic economies of scale, where demand for additional supply leads to lower costs per unit. But the benefits of economies of scale can be limited as companies grow and factors creep in that lead to diseconomies of scale.

The second is based on network effects, where WTP continues to increase as the product remains in demand. Unlike economies of scale from the supply side, economies of scale from the demand side do not dissipate as long as a network remains healthy. Many of the world's most valuable companies have enjoyed increasing returns through positive feedback and network effects.

Recombination of Ideas. Matt Ridley, a journalist and businessman, is fond of saying that innovation comes from "ideas having sex." By that he means that humans have prospered, especially in the last 250 years, by combining ideas and sharing the successful output with others. Innovation, ideas that create something new or improve on current processes, raise the standard of living.[46]

Ridley's phase is catchy but John Holland had formalized the concept years before with his development of the genetic algorithm. Holland was a professor of engineering, psychology, and computer science at the University of Michigan. He was the first recipient of a Ph.D. in computer science and one of the intellectual founders of the Santa Fe Institute.

A genetic algorithm uses evolutionary processes to solve a problem. The inputs are a population of individuals, in this case computer programs, and a fitness function that determines how well each individual solves the problem. The individuals can be random to start. The next step is to take the individuals with the highest fitness, pair them, and let them have "sex" by recombining their parts and allowing for some rate of mutation.

The pairs generate sufficient progeny to create a population as large as the original one, and the process repeats until the programs achieve sufficient fitness to solve the problem. The method is similar to breeders seeking particular traits in animals.[47]

Labor and capital are the classic inputs into a production function to describe economic output.[48] But economists observed that the rate of growth in output was faster than the rate of growth in inputs and therefore knew that technology is important. Ideas are what improve technology.

Robert Solow, an economist who received the Nobel Prize, wrote a paper in 1956 that featured an equation that showed that the growth of output was a function of classic inputs, labor and capital, plus a constant to reflect accumulated knowledge.[49] The difference between the growth attributable to labor and capital and the actual growth is known as Solow's residual or the more elaborate "total factor productivity." While Solow's model allowed for increasing returns, he worked within the classic framework of perfect competition and treated accumulated knowledge as a public good that could be accessed by all without cost.[50]

In the old theory, economic growth is a function of labor and capital with knowledge as an external, or exogenous, source of growth. In the new theory, economic growth is a function of people, things, and ideas. But the important point is that ideas are an internal, or endogenous, source of growth.[51]

Restating both Ridley and Holland, innovation comes from combining building blocks of ideas. An increase in the number of building blocks and improvements in the ability to manipulate them computationally lead to the potential for faster growth. In other words, increasing returns. We see this, for example, with the superlinear scaling of innovation in cities. Larger cities, where ideas have more opportunity to interact, produce more innovation per capita than do smaller cities.[52]

Paul Romer, an economist, put these pieces together in a formal framework that led to him winning the Nobel Prize. The analysis in his most famous paper is based on three premises. First, technological change, which is a set of instructions for reshaping the physical world, is core to economic growth. Second, actors who respond to market incentives pursue this change intentionally. And third, these instructions are distinct from other goods in that they can be costly to develop but are essentially free to share.

Romer added some critical elements to the growth model that made it more realistic and, as it turns out, more relevant to investors.[53]

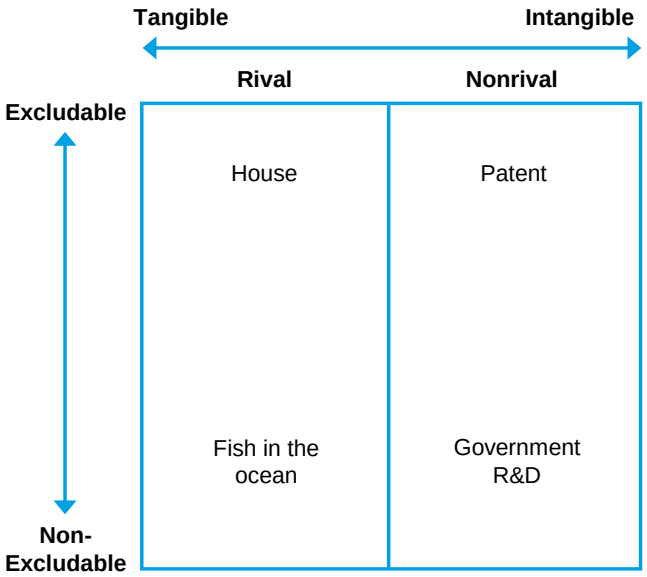
Romer used two known economic concepts to develop his theory. The first is "rivalry." A rival good is one that only one person can use at a time. The clothing you are wearing and the pen in your hand are rival goods. These are tangible assets. A nonrival good is one that many can use at the same time, and include recipes, algorithms, or sets of instructions. The operating system on your smartphone or favorite recipe for chocolate chip cookies are nonrival goods. These are intangible assets. Companies have rival and nonrival assets.

The second concept is "excludability." An excludable good is one that the owner can prevent others from using. Excludability is established through the legal system, including patents and copyrights, as well as technology. Nonexcludable goods are those that anyone can use. Romer recognized that some nonrival goods can be "partially excludable," permitting firms to profit from their intangible investments.

Think of a pharmaceutical company. The recipe for a drug is a nonrival good and the factory that produces the pills is a rival good. The formula for the drug that the pharmaceutical company produces is partially excludable until its patent runs out.

Exhibit 5 summarizes the potential combinations of rivalry and excludability. Understanding these possibilities is important because of the substantial shift in how companies invest. As recently as 1990, tangible investments meaningfully exceeded intangible investments.[54] Tangible assets are generally rival and intangible assets are commonly nonrival. This evolution presents businesses with positives and negatives for value creation.[55]

Exhibit 5: Rivalry and Excludability



Source: Counterpoint Global based on Paul M. Romer, "Endogenous Technological Change," Journal of Political Economy, *Vol. 98, No. 5, Pt. 2, October 1990, S71-S102.*

Romer emphasizes that there are two aspects to driving growth. The first is the discovery of instructions to rearrange the physical world to be more valuable. The second is the implementation of the instructions. Over time, the point of emphasis has shifted to discovery from implementation. A steel factory from 1900 had instructions but the vast majority of the effort was in implementation. A biotechnology company today has implementation but dedicates most of its resources to discovery.[56]

Organizations trying to discover instructions are making intangible investments. When successful, these lead to greater scalability and opportunity for recombination. Scalability addresses upfront fixed costs versus incremental variable costs. Think of a nonrival good such as a new drug. It is common for companies to spend $1 billion or more developing and testing a new drug. But producing the drug tends to be cheap after it has proven to be safe and efficacious.

Innovators can also use successful products as building blocks for future recombination. Some of the world's most valuable companies did not exist 30 years ago because the building blocks, such as the internet and sufficient computing power, were not around and the problems they solved were yet to appear on the horizon. Businesses come and go because of change in the available building blocks and in problems in need of a solution.

But intangible assets have downsides as well. To start, intangible assets are much easier to steal than tangible ones even if a company tries to make an intangible asset excludable through intellectual property rights. For example, a Chinese entrepreneur named Wang Xing recreated Facebook's website, down to adding "A Mark Zuckerberg Production" on each page, and he later cloned Twitter (now called X) and Groupon.[57]

That said, the gap in productivity between the best and worst companies within industries is large. For instance, economists measured the productivity of U.S. manufacturing plants and found that the output at the 90th percentile was nearly double that of those at the 10th percentile. Economists do not fully understand why that difference is so large, but they commonly attribute it to management talent.[58] Organizations do not always identify and implement best practices.

Intangible assets also face the risk of obsolescence. Consider software that has been replaced by a new and improved version, the brand name of a bankrupt business, or a patent on a product that is no longer desired by the market. Further, many tangible assets have salvage value while some intangible assets do not.

James Bessen, Executive Director of the Technology & Policy Research Initiative at Boston University, is an economist who has been studying "superstar" technology companies.[59] These are firms with economic profits that are higher than those of their peers and a profitability gap that is widening. He outlines three things these firms are doing that allow them to sustain a competitive advantage. Romer's framework provides a useful way to assess their actions.

To start, superstar firms substantially outspend their competitors on intangible assets. They are spending big on "ideas": software, training, and research and development (R&D).[60] Bessen documents that spending for proprietary software has grown substantially faster than that for R&D, acquisitions, advertising, and lobbying.[61] U.S. firms spend more than $200 billion per year on proprietary software and the big firms represent the bulk of that outlay. They are investing heavily in nonrival goods.

Bessen then makes the case that proprietary software enables superstar firms to capture classic economies of scale and to offer differentiated products. Think of a company such as Amazon potentially benefitting from scale as a function of its size as well as being able to understand, based on data, what products to sell to whom. This knowledge makes it possible for modern superstar firms to create scale and benefit from complexity in a way that companies simply could not do in the past.

Bessen's last point has to do with excludability. He tells the story of the automatic transmission on an automobile, which General Motors (GM) developed in 1940. While protected by patents, the transmission technology diffused

to the rest of the automobile industry in the span of just over a decade, which included a world war. The ideas that led to GM's transmission ended up as nonrival and nonexcludable goods.

By contrast, Bessen argues, the businesses of leading companies today are based on custom software and the firms lack an incentive to license their technology because they do not want to lose their source of differentiation. They are investing heavily in nonrival and excludable goods, which has allowed them to grow with high ROICs.

Exhibit 6 provides a brief summary of the various forms of increasing returns and includes some of the thinkers who contributed to each, the key idea, and why they are relevant.

Exhibit 6: Forms of Increasing Returns

Form	People	Key Idea	Relevance
Economies of Scale	Adam Smith Alfred Marshall John Stuart Mill	A company can perform essential tasks at a lower cost per unit as volume increases.	One company gains scale at the expense of its competitors and keeps expanding until it becomes a monopoly.
International Trade	David Ricardo Paul Krugman	Firms create many products that are differentiated and achieve economies of scale through trade.	This combines traditional comparative advantage with monopolistic competition to explain increasing returns.
Learning by Doing	Ken Arrow Paul Romer Robert Lucas Jr. T.P. Wright	Cost per unit drops by about 20% for every doubling of cumulative output.	Companies can gain a cost advantage by generating higher cumulative output than their competitors.
Positive Feedback and Network Effects	W. Brian Arthur Paul David Carl Shapiro	Positive feedback can lead to one product dominating others, thus locking in customers. Network effects exist when the value of a good or service increases as more people use the good or service.	Positive feedback leads to outcomes where the winners take all. This results in increasing returns when combined with economies of scale and network effects.
Recombination of Ideas	Paul Romer Robert Solow John Holland	Innovation is the result of recombining ideas to allow inputs of the production process to be transformed into greater output.	The more ideas there are as building blocks for innovation, and the ability to manipulate them computationally, lead to the potential for faster growth and increasing returns. Some ideas can be "partially excludable," allowing for companies to profit from them.

Source: Counterpoint Global.

Conclusion

Over time, the emphasis of economics has been on how returns decrease toward an equilibrium between price and marginal cost. There is a great deal of empirical evidence for decreasing returns. Businesses with high ROICs tend to see their returns revert toward the opportunity cost of capital over time. This is especially relevant for sectors that rely predominantly on tangible assets.

But even Adam Smith, writing in 1776, recognized the potential for increasing returns. Economists faced the challenge of identifying different forms of increasing returns and understanding the mechanisms that drive them. Much of this work has occurred following World War II.

This research is more important than ever as our global economy shifts from a reliance on tangible to intangible assets. Physical things are becoming less important and non-physical instructions on how to rearrange the world profitably are more important.

This report discusses five forms of increasing returns. They tend to overlap and are useful to understand in the context of industry formation, market structure, international trade, and economic growth. All of them have relevance in the investment process. Increasing returns shows up as rising ROICs and high market share.

The importance of most forms of increasing returns is deeply intertwined with the rise of intangible assets. Some of the characteristics of tangible and intangible assets are notably different. Intangible assets can scale faster than tangible ones but are also harder to protect. Intangible assets can lead to a faster rate of innovation but are subject to obsolescence.

This discussion of increasing returns is relevant for a number of key issues that investors are grappling with, including what is happening in global trade, discussions about antitrust policy, the rise of superstar firms, the evolution of industry structure for relatively new industries, and the overall rate of economic growth.

Please see Important Disclosures on pages 23-25

Endnotes

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