UBS Center
for Economics in Society

at the University of Zurich

University of Zurich[UZH]

UBS Center
Public Paper #12

Dominant Firms in the Digital Age

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Economics.
For Society.

No. 12, November 2022

10 years UBS Center

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Jan Eeckhout studies the macroeconomic implications of market power, unemployment, labor market risk, and inequality. He is the author of the book *The Profit Paradox* for which he won the silver medal of the Axiom Business Book Awards. In the book, he shows why a small number of companies exploit an unbridled rise in market power—the ability to set prices higher than they could in a properly functioning competitive marketplace.

Professor Eeckhout's work has been supported by several government grants and has been published in top economic journals, such as the *American Economic Review, Econometrica, the Review of Economic Studies, and the Journal of Political Economy*. His research is regularly featured in the media, including in *The Economist, WSJ, FT, NYT, and Bloomberg*. He has been tenured professor at the UPenn and UCL and has been Louis Simpson Visiting Professor at Princeton. He is fellow of the Econometric Society, EEA, and Academia Europaea.

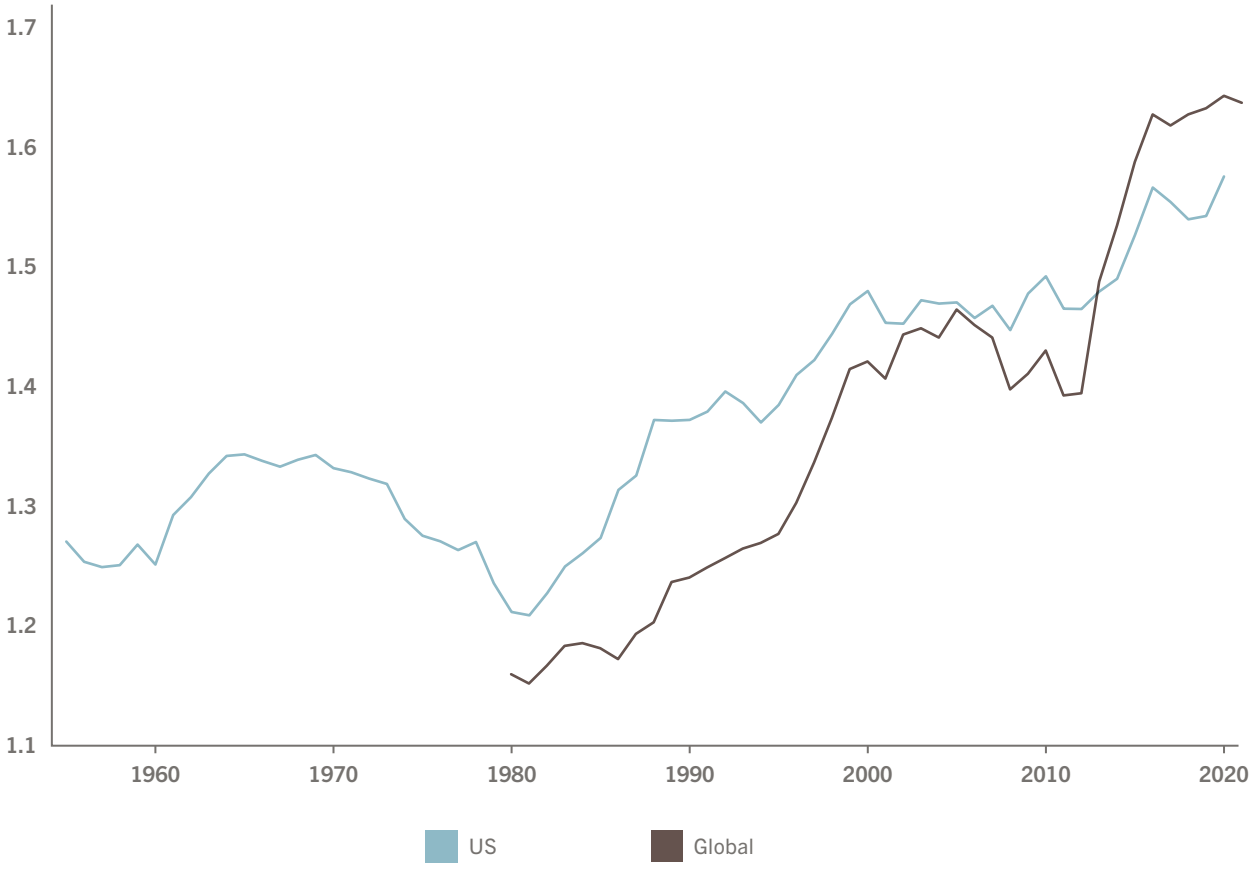
Abstract

Since 1980, the world economy has experienced an increase of dominant firms. Dominant firms face limited competition in their market and exert monopoly power. Why has this happened, and why did it start in 1980? The rise of dominant firms has a direct impact on customers who pay higher prices, but it also has far-reaching implications for the macroeconomy. Widespread market power leads to wage stagnation and a decline in the labor share, it increases wage inequality, it slows down business dynamism, it reduces the number of startup firms and lowers innovation. In this public paper I review the determinants of the rise of dominant firms, I discuss the causes and consequences, and I propose directions for policy solutions.

The main facts about the rise of dominant firms

Different measures indicate that a number of dominant firms increasingly exert more market power. A first measure is the markup or margin, the ratio of the price at which a firm sells its goods and services relative to the cost of production, or marginal cost. Until 1980, the average markup was fairly stable around 1.2. The average firm was selling its goods and services at a price 20% above the direct cost to produce those goods and services. Since 1980, the markup has increased steadily to reach nearly 1.6; firms are selling their goods on average 60% above cost. This is a global phenomenon with similar trends around the world.

Fig. 1 **Average, sales-weighted markup in the US and in the world**



Notes: The figure depicts the revenue-weighted average markup of US publicly traded firms (blue line) and of global publicly traded firms (brown line).

Source: De Loecker & Eeckhout, 2018, and De Loecker, Eeckhout & Unger, 2020

It is misleading to think that markups go up for all firms. Dominance is about a select number of firms. In fact, the median markup, which measures the markup of the firm exactly in the middle of the distribution of markups, has remained remarkably constant. What we see is an extremely sharp rise of the markup of the firms at the top of the distribution (figure 2). Most firms see no rise in market power, and only a few select firms are able to dominate their market and charge prices that are significantly higher than the cost.

Fig. 2a **Percentiles of the average, sales-weighted markup distribution in the US**

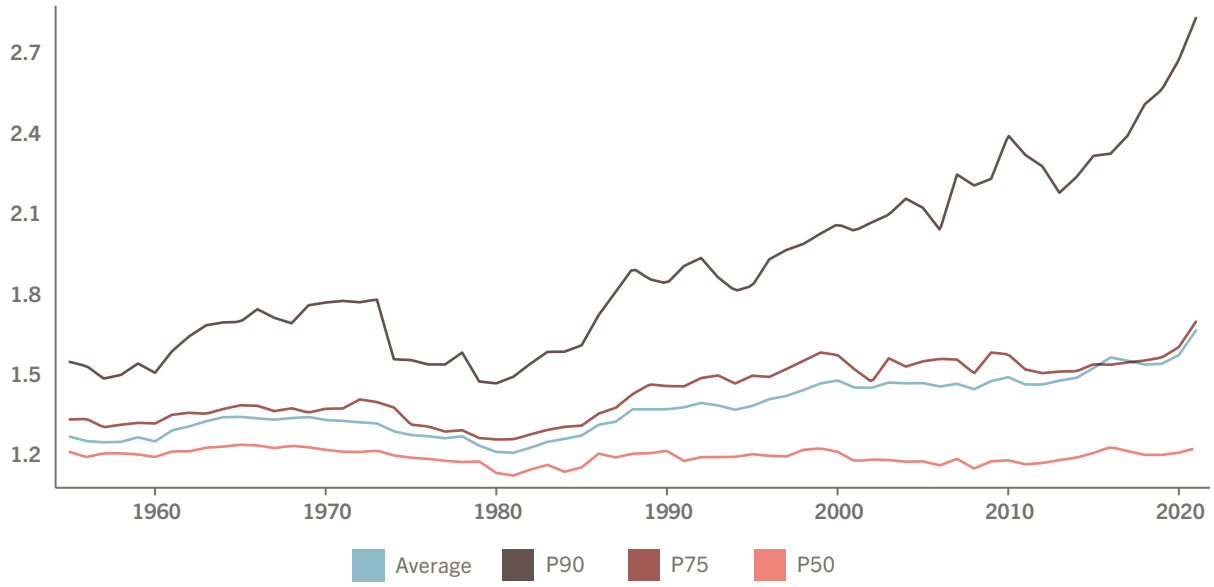
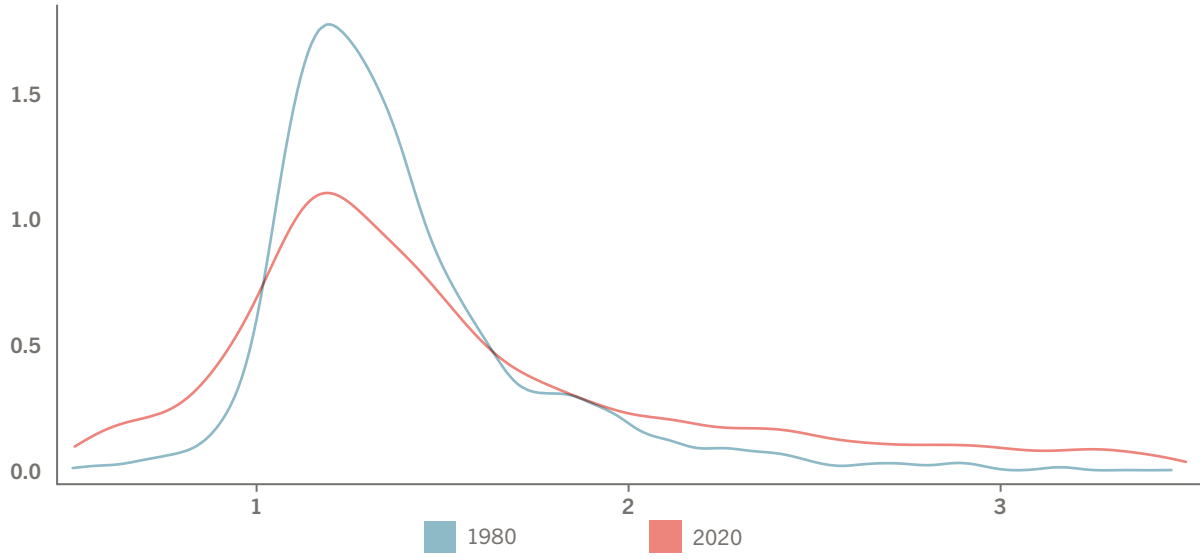


Fig. 2b **Density of markup distribution in the US**

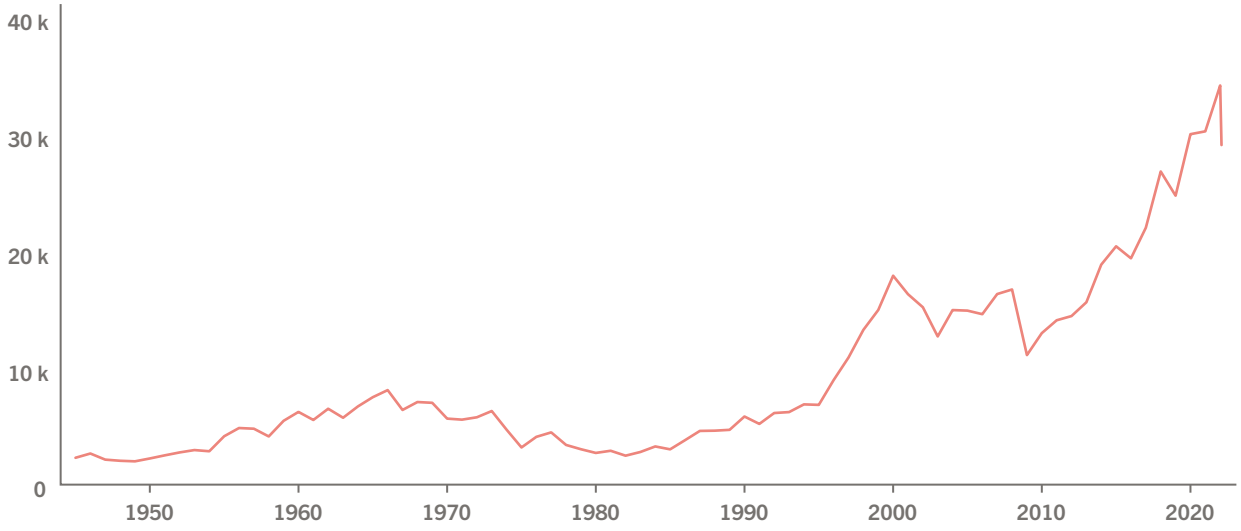


In addition to markups, other measures confirm the same trend between 1980 and today. Profit rates, a second measure, have increased from around 1–2% of sales to 7–8%. A third measure, the market valuation of publicly traded firms as a share of sales, has increased from 0.5 to 1.5. Firms are now considerably more valuable for the same amount of sales because investors expect higher profits. A closely related measure is the direct performance of stock indices. While these are highly selective on the companies that are included, and many other determinants (most notably interest rates) play a role in pinning down the stock market value, it is nonetheless striking how the Dow Jones for example shows a growth rate close to zero between the Second World War and 1980, and an annual growth rate of nearly 7% thereafter (see box and figure 3). A fourth measure, the average Herfindahl-Hirschman Index (HHI), which measures concentration in a market, has increased, indicating that within a given market, one or few firms obtain a larger share of the sales.[1]

Not surprisingly, we also see an increase in the size of the largest firms. While the size of most firms has not changed, there is a continuous increase in the size – whether it is measured by sales or the number of employees in the firm – of a small number of very large firms. This phenomenon of large, dominant firms is also referred to as superstar firms.[2]

The rise of dominant firms is certainly a phenomenon we see in the tech sector with giants like Apple, Alphabet (Google), Meta (Facebook), Microsoft and Amazon. These dominant firms are the most valued companies in the world, with Apple for example reaching a 3 trillion US dollar market capitalization in January 2022 – an indicator of their profitability and the dominance in their market. The technology sector has without a doubt contributed to most of the stock market growth. However, the phenomenon of dominant firms is not exclusive in the technology sector and occurs in all sectors, from tech to textiles, and from beer to pharma. Dominant firms are

Fig. 3 **Dow Jones Index (inflation-adjusted)**



Notes: Dow Jones Industrial index for Jan 1st or first available day in January, each year. Adjusted to 2019 values using CPI

Source: WRDS and Yahoo Finance

The profit paradox

Fig. 4 **News channels announcing Dow hitting 20,000**

Source: Keystone SDA

High stock market valuations are often interpreted as a sign of a healthy economy. News outlets commonly report on record valuations of stock market indices.

But what do high stock market valuations mean for the economy? The stock market value of a firm reflects a number of factors, such as risk, the stock of capital net of debt, the interest rate, etc. Most importantly, a firm's stock market value is predominantly determined by the flow of future profits that the firm is expected to generate. Innovating firms break new ground and gain an edge on their competitors which allows them to generate higher profits. This is great news for the firm, and also for the economy whenever this firm is operating in a competitive market and those profits reflect a return on its investment to innovate. This effectively means that those profits are short-lived and new entrants will soon adopt this new technology or further improve it and wage competition in the market, very much in the spirit of Schumpeter's idea of creative destruction.

Instead, when firms obtain excess profits not as a return for innovation but due to market power and the absence of competition, then a booming stock market is not a sign of a healthy economy. The widespread market power of firms across industries and sectors has a series of negative implications economy-wide, for workers in the labor market, for competing firms that are not dominant, and for young startup firms. The news reports about the Dow reaching new, excessive heights should therefore be a cause of concern, rather than a reason for celebrating the state of the economy.

predominantly a within-market phenomenon, where one or few firms dominate the market at the expense of the other competitors. Now that does not mean that tech does not play a role. Firms that become dominant often heavily invest in digital technology. Many of the dominant firms in traditional sectors have become dominant because they extensively digitize their operations in order to gain an edge over their competitors and thus gain market share. After all, Amazon is a firm in a traditional sector, retail, yet it heavily uses digital technology to gain a dominant position.[3] Below I will turn extensively to the role of the digital technology and the making of dominant firms.

Consequences

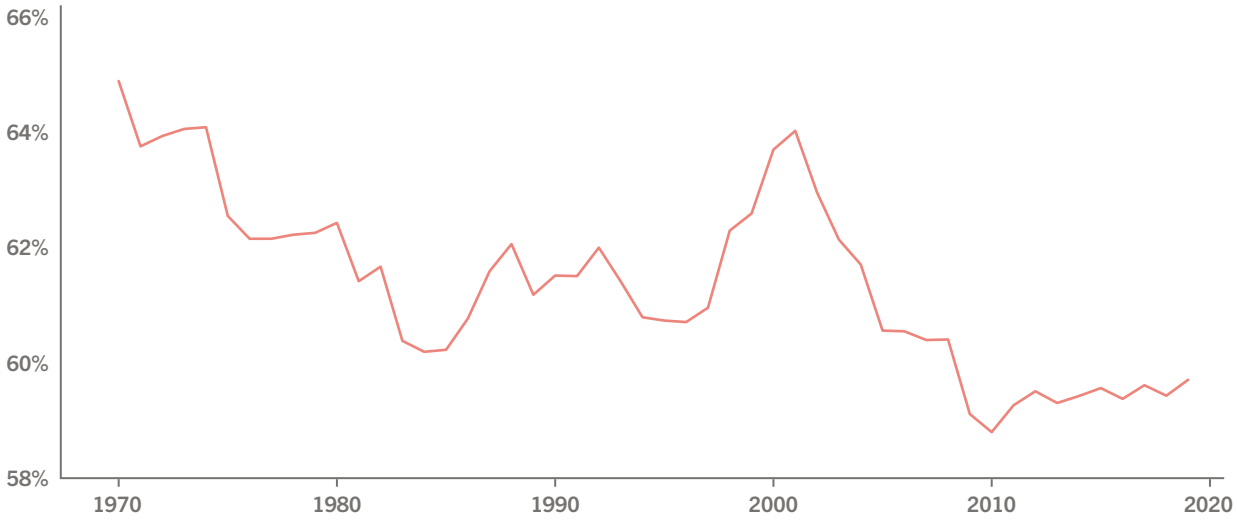
The rise of market power by dominant firms has a direct effect on customers who pay higher prices for goods and services relative to what it costs to produce. This leads to what is called deadweight loss: fewer people buy, thus failing to create value to the customer from gains from trade. If a smartphone that costs 350 euros to produce is sold at 1200 euros, fewer customers will purchase it than if it were sold at 400 euros.

But even more importantly, in addition to this direct effect on customers, there are a number of other macroeconomic implications that result from the rise in market power. Ever since the early 1980s, there are a number of long-term macroeconomic trends that have substantially altered the economy. While those phenomena were initially puzzling to most economists, with the discovery of the trend in the rise of market power, these macroeconomic implications can be explained by the rise of dominant firms.

Declining labor share

First, one of the most striking long-run trends is the decline since 1980 of the labor share. In 1937, Samuel Bowley observed a remarkable regularity. The total amount of expenditure on labor as a share of Gross Domestic Product (GDP) was remarkably stable and equal to two thirds or 66%. This fact received even more notoriety when Nicolas Kaldor established his stylized facts about the economy in 1957, of which the constant labor share was one. However, in recent decades, researchers observed that what was thought to be a universal constant was declining. The labor share dropped to 58% of GDP, a huge decline (see figure 5).

Fig. 5 **The labor share of GDP in the US**



Notes: Share of labor compensation in GDP at current national prices for US

Source: Penn World Tables

Some have attributed this decline to a decline in the productivity of labor at the expense of capital,[4] but there is also an immediate impact of market power. The smoking gun that points towards market power as a driver is the fact that not only the labor share has declined, but also the capital share.[5] That is, the amount of productive capital that firms invest in as a share of GDP has declined. This makes sense since firms use labor and capital as complements, i.e., they use it proportionally, so that a decline in the share of labor necessarily goes hand in hand with a decline in the share of capital. But if both capital and labor decline, where does the remainder of GDP end up? The answer is in the increase in profits. Dominant firms in particular generate more profits which goes at the expense of labor and capital.

The decline in the labor share is tightly linked to two other long-term trends: wage stagnation and the decline in labor force participation. After all, the labor share is the product of the wage workers get and the number of people who work. While worker productivity has grown steadily over the last four decades, wages of most production and service workers have not. In other words, the wage relative to productivity has declined. In addition, fewer people today are in the labor force than there were in 1980. If wages decline relative to productivity, and fewer people work, then wages times the number of workers (the labor share) is bound to decline.

It is important to analyze the mechanism behind the decline in wages relative to productivity and the decline in labor force participation. There are two ways, a direct way and an indirect way. The direct way is often referred to as monopsony power, first analyzed by Joan Robinson (1933). Monopsony power is similar to the effect of monopoly prices on customers, where monopolistic firms charge too high prices which leads to fewer consumers buying. Likewise, dominant firms that exert monopsony power are able to pay lower wages relative to their workers' productivity, realizing that they have wage-setting power and thus hiring too few workers. Think of a large copper mine in a mountain village. Workers have few alternative employers where to look for a job, and as a result of their limited mobility, the firm operating the copper mine is able to hire those workers at lower wages, resulting in fewer workers being willing to work.

Dominant firms generate more profits which goes at the expense of labor and capital.

But there is also an indirect effect of dominant firms on wages that stems from monopoly power in the goods market. When a firm has monopoly power in the output market, it sells at a price that is high relative to cost. As a result, fewer customers will buy the product compared to a situation where prices are lower. If the demand is sufficiently inelastic (customers don't respond much to price hikes), it is nonetheless in the firm's interest to sell fewer units because revenue, price times quantity, is higher. Now if the labor market is competitive and the firm cannot exert any monopsony power, this has no effect on the wage a firm pays. But there is an economy-wide effect (a general equilibrium effect): if monopoly power is widespread in the economy and there are a large number of firms that sell at high prices, then the economy-wide consumption will be lower. And if consumption is lower, so is production. Fewer goods and services need to be produced and as a result, the demand for workers to produce that output is lower. The decline in the demand for labor automatically leads to lower wages. Economy-wide monopoly indirectly leads to lower wages.

Both monopsony power in the labor market, and monopoly power in the goods market lead to a decline in wages. This explains the wage stagnation (despite the steady increase in productivity) that we have seen since the 1980s. The question remains what the contribution is of each to wage stagnation: quantitative analysis shows that the vast majority of wage stagnation is due to the indirect effect of monopoly (75%), with the remainder stemming from the direct effect on wages from monopsony (25%).[6]

In addition to wage stagnation – the decline of wage relative to growing productivity – in the last decades we have experienced a decline in labor force participation. Or alternatively, the inactivity rate, the fraction of workers who stay out of the labor force, has increased. For males, the inactivity rate was 4% in 1980 and now it is 12% (see figure 6). What is even more concerning is that even female inactivity has started to increase.[7] Despite all the progress towards gender equality and the increase in labor force participation since the Second World War, female labor force participation has started to fall in the late 1990s.

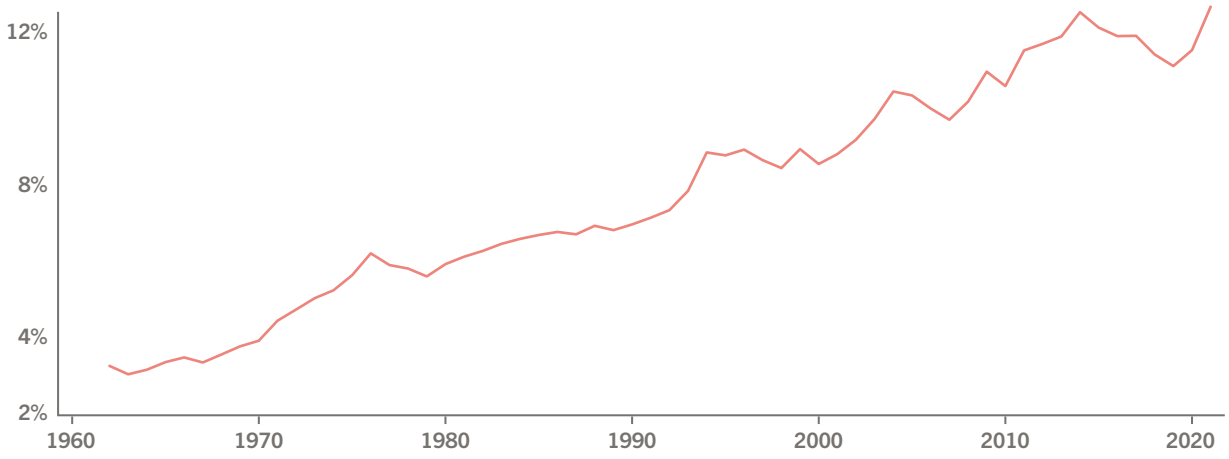
And there is a tight connection with the rise of market power because when wages fall due to the rise of dominant firms, so does labor force participation. When the labor supply is upward sloping, a decline in wages due to the rise in market power of dominant firms automatically leads to a decline in labor force participation. At lower wages, more workers stay out of the labor market, for example because it is cost-effective for them to look after their children or elders rather than pay of care.

Rising wage inequality

A second consequence of the rise in market power is an increase in wage inequality. While wages of production and service workers have fallen relative to productivity, the wages of those in the top percentiles are positively affected by the rise in market power. In particular, the average wage of top managers has started to increase towards the end of the 1970s, around the same time when markups have started to increase (see figure 7).

This positive relation between manager pay and market power of firms holds not only on average but also at the level of the individual firm. While wages of produc-

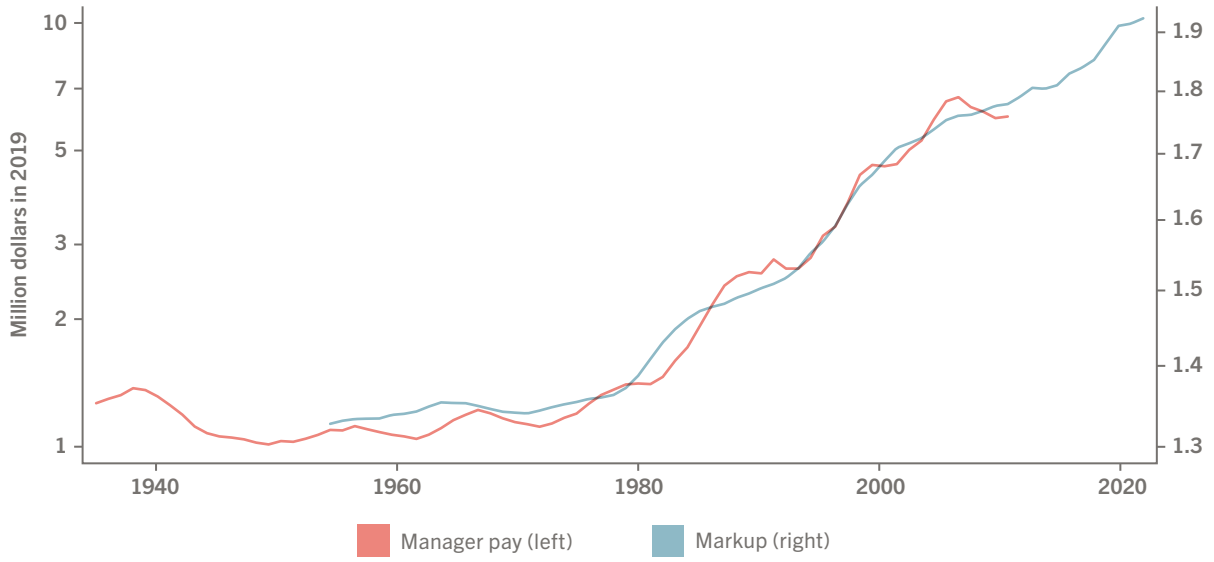
Fig. 6 **Inactivity rate (males)**



Notes: Male persons aged 25 to 54 who are inactive in the US (not working nor unemployed), over males aged 25 to 54 who are inactive, working or unemployed, excluding armed forces

Source: Current Population Survey

Fig. 7 **Wages of top managers and markups**



Source: Frydman 2010 and Bao et al. 2022

tion and service workers are lower when market power is higher – either directly because of monopsony power or indirectly because of the economy-wide effect of lower labor demand from higher output prices – the opposite is true for managers. Managers that work in firms with more market power help contribute to the profits for firms. In a competitive market for managers, firms compete for the most skilled managers who get rewarded for their contribution to the profits of the firm. The input of managers is to make firms more productive. This has a double effect: productivity leads to an increase in the size of the firm; and productivity also increases the profits of the firm relative to its direct competitors. The latter effect of higher productivity from the manager input leads to more market power.

On average, about half of managers' wages stem from their contribution to market power and the other half leads to an increase in the size of the output of the firm.[8] What is most striking however is that there is huge variation in the contribution of market power to manager wages. For the most skilled managers, the majority of their wages is due to creating market power (80%), whereas for the lower ranked managers only a small share is due to market power. The reason is that the top managers are hired by already dominant firms because the better manager consolidates that dominant position even further. In other words, a top manager can increase the profits most in a dominant firm more so than a firm that is large but not dominant in its market. And because all dominant firms compete for the best managers, they bid up the top manager wages.

Of course, wage inequality goes beyond the incomes of the top managers. There has also been a huge increase in the skill premium, the ratio of the average wage of those with a college degree and the average wage of those without a college degree. It has long been established[9] that the rise in the skill premium is predominantly driven by technological change that favors the highest skilled workers much more than the low skilled workers. But there is also a small part of the rise in the skill premium (7%) that is due to market power. The demand by dominant firms for high and

low skilled workers varies by skill which leads to different equilibrium wages as market power changes.[10] In addition, firm dominance affects the variance of wages, especially between firms.[11] About half of the rise in wage inequality between firms is due to market power.

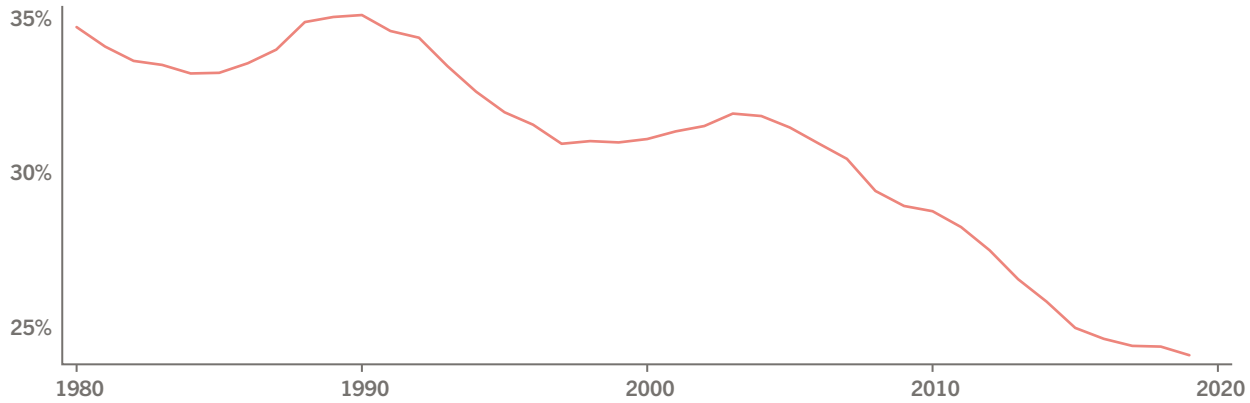
Declining business dynamism

A third major consequence of the rise of dominant firms is the decline in business dynamism.[12] Business dynamism encompasses a wide variety of indicators, all of them related to the dynamism and mobility of workers and firms in the economy. Consider first the job reallocation rate of workers in a firm, which is the fraction of all hires and separations as a share of total employment. Averaged over all firms in the economy, the job reallocation rate was 35% in 1980 (see figure 8). That means that 35% of all jobs at the firm turned over, either as a new hire, or as firing or quitting. By 2021, the job reallocation rate has fallen to 25%. This decline by one-third indicates there is a lot less turnover of workers at the firm. And while at face value it may appear this leads to more job security, what is most worrisome is that there is less upward mobility and promotions, which leads to more misallocation of workers to jobs.

Immediately following from the decline in the job reallocation rate is the decline in the migration rate. Until the 1980s, the fraction of households that moved between residence between states was 3%. By 2020, this had fallen in half to 1.5%.[13] There are many reasons to move from one city to another, but having job opportunities is a prominent one. If workers are less likely to move between firms, they are less likely to move between firms in different locations resulting in falling migration rates.

Possibly the most striking consequence of dominant firms is the decline in startups. We think of the digital age as an epoch of technological innovation driven by startup firms, often by young entrepreneurs who, from their parents' garages, develop new products and services that disrupt existing markets. While a lot of this was going on in the early 1980s, the statistics tell us that today this is no longer the case. When analyzing the startup rate economy-wide and we define startups as young, newly formed firms, we see that the startup rate has fallen from 14% to 8% (see figure 9). That is, initially 14% of all firms were young firms. Today, the fraction of young firms has fallen in half. The flip side of this fact is that there are therefore more old firms that tend to be larger.

Fig. 8 **The job reallocation rate US**



Notes: The sum of all jobs created plus the sum of all jobs destroyed, divided by total employment; 5-year moving average

Source: Business Dynamics Statistics, US Census

Possibly the most striking consequence of dominant firms is the decline in startups.

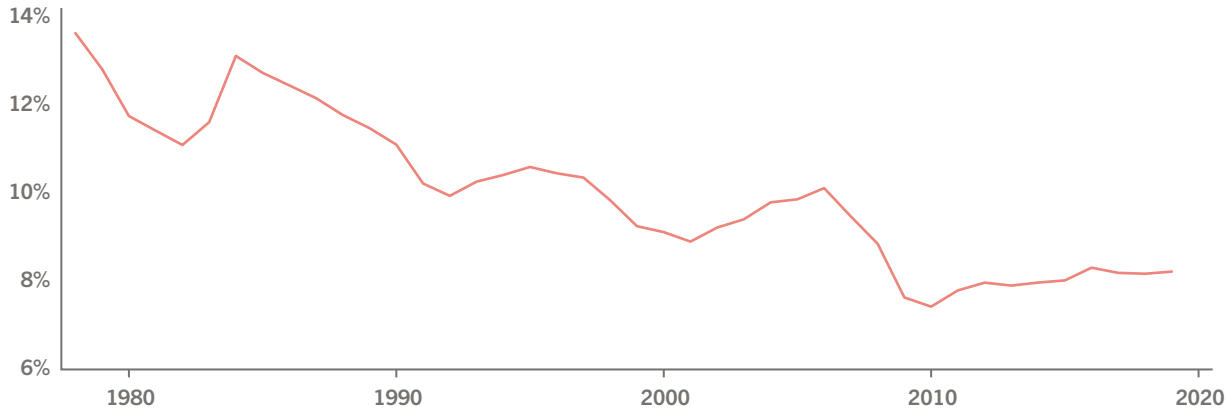
This has profound implications for the economy. Young startup firms are the engines of the economy. They tend to grow faster, they hire more workers, especially young workers, and they innovate more. With fewer startup firms, there is less dynamism in the economy. Of course, some of the innovation that was done before by the young startup firms is now done by the larger, established firms, but those firms proportionately innovate less and are often more concerned with innovation that protects their dominant position.

These facts show that the rise of dominant firms has profound implications on business dynamism in the economy. The economic mechanism underlying this connection between dominance and dynamism is the concept of incomplete passthrough of production costs to prices.

When markets are competitive, variation in costs immediately leads to an equivalent change in prices. For example, when oil prices increase or decrease, gas stations with competitors in the neighborhood will adjust their prices one for one. Instead, when the next station is far away, the gas station will sell to a significant number of customers even if the price is higher than the cost. With fluctuations in costs, the passthrough of costs to prices is incomplete. The higher the degree of market power, the more incomplete the passthrough of costs. Now if the passthrough of costs to prices is incomplete and there is less variation in prices than there is in costs, then there is also less variation in quantities sold. And with less variation in quantities sold, there will be less variation in the workforce. But that is precisely what the job reallocation rate measures. There is thus a direct link, through incomplete passthrough, between dominant firms and business dynamism.

Figure 10 summarizes the processes described above and illustrates how dominant firms create a welfare loss of 8% GDP.

Fig. 9 **Startup rate US**



Notes: Share of firms under 1 year old, over total firms

Source: Business Dynamics Statistics, US Census

Fig. 10 **How dominant firms create welfare loss of 8% of GDP**

Causes

Antitrust

With such a far-reaching impact of market power on the macroeconomy, the question remains why market power has increased so much. And why since 1980? The 1980 mark hints at the role of policy changes, especially in the United States. In 1978, the book by Robert Bork, *The Antitrust Paradox,* had an enormous influence impact on antitrust policy, with a strict prescription to focus exclusively on consumer surplus as a welfare standard. Leaning on Harberger's findings from 1952 that the welfare cost for consumers is quantitatively negligible, Bork argues that Mergers and Acquisitions (M&A) must get the green light whenever there is no impact on consumer surplus. Bork's influence on antitrust policy during the Reagan era is cited as instrumental in the rise of M&A activity since 1980.

In part, the increased market power has also origins in the changing composition of ownership of firms. The common ownership hypothesis posits that even if different firms compete in the market, they may not do so if those firms have a common owner. Azar et al. (2018) show that common ownership is on the rise in the airline industry, and this has implications for how firms set prices. Ownership is often difficult to observe or verify, which makes it easier for firms to exert market power while in an apparent competitive market. For example, car dealers of competing brands in a given location are increasingly owned by the same firm. As a result, when you are shopping for a Ford and walk over to the competition (say Toyota) to see if you can get a better price, you are virtually walking across the same showroom to a different car and both salespersons have instructions from the same owner how to offer you a better deal. Common ownership is observable in large pension funds such as Blackrock and Vanguard, whose participation in different large companies is public information.

Technological change

1980 is also the start of the digital age, the turning point when digital technology starts to have an impact in the economy. While digital technology had been developed much earlier, it is not until the late 1970s that companies such as Apple and Microsoft start to sell hardware and software at a large scale, and households and companies start using personal computers and servers. This inaugurates the transformation to the digital economy.

Technological change is both the hero and the villain of the movie of the economy.

And technological change – digital technology in particular – is both the hero and the villain of the movie of the economy. It is the hero because new technologies generate a vastly improved quality of life and create growth in the economy. Who would have thought in the 1980s that we'd be walking with a device in our hands that displays a map that not only tells us where we are going but also where we currently are on the map, which changes as we move? Today, we perceive this as second nature. Digital technology has given us innovation, growth, longevity and higher standards of living.

But digital technological change is also the villain of the movie. The reason is that digital technology simultaneously creates economies of scale and network effects. A selling site such as eBay or a communications platform such as WhatsApp for example is more efficient and valuable the more users it has. These network effects create economies of scale by which the most efficient outcome is obtained with one firm in the market, which has the lowest cost when the scale is the largest possible. But this extremely efficient outcome goes necessarily hand in hand with a monopoly. However efficient the firm is, in the absence of competition it will set prices above marginal costs to make the highest possible profits. While the new digital technologies make firms more efficient, they also keep competitors out of the market. The resulting high prices lead to loss of consumer surplus.

New digital technologies keep competitors out of the market. The resulting high prices lead to loss of consumer surplus.

Scale economies

Accounting and other data reveal different ways in which technological change leads to scale economies. First, there is a rise in the accounting entry 'Selling, General and Administrative expenses' (SG&A). Those include expenditures on Research and Development (R&D), advertising, manager salaries, etc. and are often interpreted as fixed costs or intangibles.[14] The observed rise in SG&A is a source of economies of scale as the fixed cost of production leads to declining average costs even with moderately decreasing returns in the variable inputs. In addition, there is evidence of increasing returns in the variable inputs. That means that even after accounting for fixed costs to set up a firm, the inputs in production (say labor and capital) produce more output per input as the scale of production increases. In a traditional, constant returns to scale technology such as Cobb-Douglas, the coefficient of the parameters on labor and capital sums up to one. The estimated production function coefficients show an increase from 1 in the 1980s to 1.05 now. In addition to the scale economies that stem from the importance of fixed costs (SG&A), technology today leads to even higher returns to scale.

How firms achieve these scale economies is not by accident or random. Firms make huge upfront investments in order to achieve those scale economies. That is what innovation is to a large extent about. Yes, innovation is to develop new products, but that often means firms invest in order to increase the quality of the product or to produce the same good or service at a lower cost. Innovation is as much about inventing a new Covid vaccine as it is about inventing IKEA's flat-pack furniture that you assemble at home because it makes transportation easier and cheaper.

And the data on market power and the relation with innovation and investment in SG&A shows exactly that. Firms that invest more in SG&A tend to have more market power. That may be partly due to differences in technologies. It takes a much higher fixed cost to build a bridge than to sell sausages. Therefore, there is a bigger wedge between the price and the marginal cost of production on high fixed cost goods, i.e., the markup is higher, because prices need to cover a high fixed cost to avoid losses.

But then, profits should be no different across firms with high and low fixed cost investments. And that is not what we see in the data. Firms with higher fixed costs investments also have higher profit rates, especially those firms with profit rates in

the top percentiles of the profit distribution, which includes the dominant firms. In the last four decades, we witness a steady rise in the profit rate of those firms that have a higher share of SG&A investment.[15]

That was the entire point of Sutton's view (1991, 2001) of market power. Firms innovate and make upfront investments in order to increase their productivity through cheaper production and/or higher quality. But in this process, and accounting for the fact that this upfront investment induces scale economies, firms create monopolies. Ultimately, a monopoly and market power is the only way to make higher-than-normal profits, that is, to make profits higher than what compensates for the risk-free return on capital, the compensation for risk, etc. And this ability to obtain some monopoly power is the right incentive for entrepreneurs to innovate and invest resources in order to discover new technologies. In fact, because information can easily be copied and new technologies will not bestow such a monopoly power on the innovator and hence provide the incentive to invest in the first place, most economies have in place an intellectual property rights system with patents, trademarks and copyrights that explicitly give the innovator a legal protection from copying. This legal safeguard is a right to exploit the innovation exclusively, which effectively means the right to exert a monopoly position without the threat of competition.

But key to this monopoly that derives from intellectual property is that it is temporary. The temporary nature provides sufficient monopoly rents and hence the incentives to innovate. At the same time, competition follows once the patents run out. And while there are many ways to improve on the current patent system – it is a one-fits-all system with very different needs in pharma than in software development, and granting pure monopoly instead of some form of imperfect competition (oligopoly) to incorporate incentives as well as customer benefits is often too extreme – it is clear that some form of regulation is needed to stimulate innovation.

Creative destruction?

While never even mentioning the patent system, in a sense the patent system is what Schumpeter's theory of creative destruction aimed to achieve without regulation.[16] He argued that it takes time to copy or improve an existing innovation, and hence innovators automatically have a temporary edge over competitors until a better vintage of the technology is invented. The improvement over existing technology together with the temporary nature and the threat of competitors to enter the market and find a new technology is at the heart of a healthy, growing economy based on technological progress.

What we have seen in the last decades is indeed the rise of monopoly power by a selection of firms. However, it is not Schumpeterian creative destruction, because the market power is not temporary and is much more long-lasting. This indicates that rather than innovation by challenging firms trying to leapfrog incumbents, we see that past innovators have managed to consolidate their position and maintain their dominance for a long time. Scale economies play a significant role as firms invest in technology in order to gain market power as posited by Sutton, rather than an ongoing race of leapfrogging innovators as in Schumpeter's creative destruction.

The rise of dominant firms that we have seen during the advent of the digital age is built on cost-reducing and efficiency-enhancing innovations that create increasing returns to scale. This implies a winner-takes-all market with a dominant firm achieving a long-lasting monopoly position. And while monopoly is often associated with higher prices, most of these firms achieve this position by doing the opposite, that is lowering prices. They can do this because their innovations and

investments lead to an even larger reduction in costs. And that is why the digital technology is so attractive for customers: technological innovation is the hero. But because costs decline more than prices due to scale economies, technological change is also the villain. The fact that markups decline due to technological change is therefore not so much due to an increase in prices, but rather a decrease in costs. After all, markups (and profit rates) are ratios.

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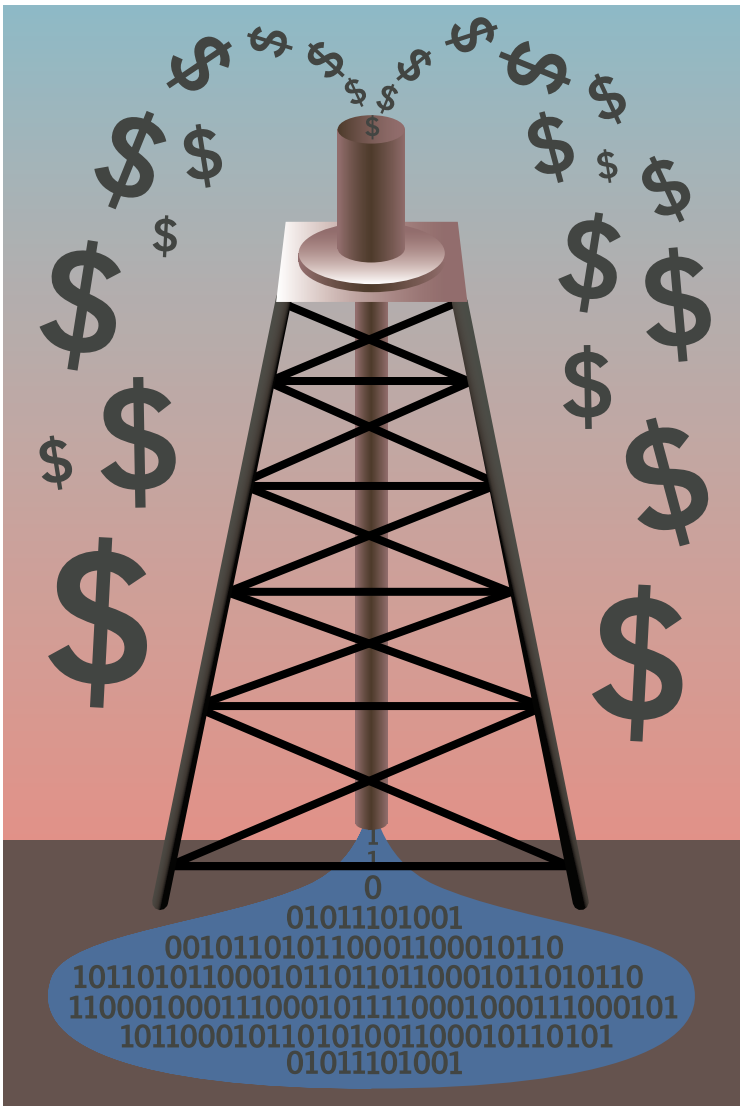
Data

The digital age started to have a substantive impact in the early 1980s. In a simplified and broad-brush description, each decade had its own driver. Initially it was the widespread use of personal computers at home and at work. By the 1990s, the technological transformation was driven by advent of the internet and in the 2000s, mobile communication made its entry. And in the last decade, the extended use of data has fundamentally altered the productivity in the economy, and much more is to be expected from the impact of data in the future. Data increase efficiency. Amongst other things, data reduce uncertainty and better forecast customer preferences, as well as predict costs and opportunities.[17] This efficiency gain leads to productivity growth and therefore higher income and a higher quality of life. Data-driven technological change is the hero of the economy.

Fig. 11 **Data is the new oil**



Notes: This figure illustrates the fact that data is often referred to as the new oil. Like oil, data holds enormous potential for efficiency gains through better forecasting and reduced uncertainty.

Source: Own work

But data also opens up a huge potential for building market power; data as the villain. There are enormous returns to scale from investment in data, and firms use the investment in data to gain a technological edge over their competitors. The more distant the technology is between firms, the more market power the dominant firm can exert. Investment in data allows leading firms such as Ama-

zon to gain such a technological lead fast, making it very hard for followers to catch up, because data-dominated markets tend to have huge returns to scale, often reaching global proportions.

It is no surprise that data is often referred to as the new oil. Like oil, data holds enormous potential to realize efficiency gains from better forecasts and lower uncertainty. But firms may also use data to create a dominant position, just as the Rockefeller's Standard Oil around 1900 created a dominant position from massive investment in oil exploitation. Data-driven firms that operate more efficiently and with better ability to forecast also naturally grow larger.

Like oil, data holds enormous potential to realize efficiency gains from better forecasts and lower uncertainty.

Welfare Impact

Whether it is because of investment in data or traditional economies of scale, market power has an impact on the entire economy. First, we cannot underestimate the positive impact that the digital technology has on the economy.
Amazon can deliver everything, from light bulbs to used books, at lower cost and faster than any other company. This efficiency contributes massively to the welfare in the economy, and the larger the market share of Amazon, the bigger the welfare impact is. Large and dominant firms that are more efficient also have a large positive impact on overall efficiency and hence welfare. The problem is that these highly efficient firms, at the same time, use their dominant position to exert market power. While they lower the cost of what they produce, they do not pass all those efficiency gains on to the customer who ends up paying a lower price than before the new technology was around, but a substantially higher price than the cost. And it is that excessive price-to-cost ratio, the markup, that causes a decline in economic welfare. Compared to a competitive market with lower markups, the efficient but dominant firms price too many customers out of the market. This not only lowers consumer surplus, as we have discussed, this also has welfare implications through wages, labor force participation, business dynamism and startups.

With a positive effect from the increase of efficient production by the dominant firm, and a negative effect from its dominant position and market power, the question remains which of these two effects dominates and what the net outcome is. Several studies estimate the net effect to be negative, and large. Gross Domestic Product could be of the order of 8% higher today if markets were as competitive as they were in 1980.[18]

This cost of market power is enormous, and orders of magnitude larger than other distortions in the economy, most notably, the cost of inflation, which is typically estimated to be around 0.5% of GDP. Market power has a high welfare cost despite the positive effect of the efficient use of technology, by which the innovating and more efficient firm reaches more customers. However, the negative effect from high markups is even larger.

Policy

The enormous welfare cost begs the question what policy options we have. Taxing profits will certainly help redistribute money that is concentrated in the hands of those who own the firms to those whose wages have stagnated. And while it is desirable to redistribute on equity grounds, mere redistribution does not address the inefficiency to the order of 8% of GDP. More importantly, the objective should be to address the inefficiency from market power. This not only increases output in the economy and thus creates higher welfare on average. It also leads to redistribution from profits to labor income. Lowering market power reduces inequality.

First, beyond redistribution, why can taxes on profits not fully solve the market power problem in the first place? Taxes on profits only correct the negative impact of market power to the extent that those taxes affect the decision maker's incentives what and how much to produce.[19] Consider the simplest possible scenario where a manager only chooses the price and/or the quantity of the firm's goods and services. Then a profit tax will reduce the profits of the firm, but it will not affect how much to produce and at which price to sell the goods and services. In other words, while profits are taxed away, before taxes the profits are still the same, and that is because the firm does not adjust how much to produce. The extent of the market power is still the same – customers still pay too high prices and competition is lower than optimal – and as a result, the inefficiency is the same.

Now taxes can have some, albeit limited, impact under certain circumstances, such as manager incentives or on capital investment. For example, profit taxes can affect market power when profits not only depend on how much the firm produces, but on the effort of the manager. A manager will put in less effort when taxes are higher. But then profit taxes have a perverse effect: in order to provide the manager with incentives to work hard, profit taxes should be negative. That is, there should be profit subsidies, not profit taxes.

Profit taxes have a perverse effect: to provide the manager with incentives to work hard, profit taxes should be negative.

With taxes being unable to restore efficiency as a result of market power, authorities necessarily need to resort to antitrust and regulatory policy. Existing legislation that governs antitrust in the United States predominantly stems from the late 19th and early 20th century (though there were laws as early as in Roman times). The Sherman Act from 1890 is still the backbone of US antitrust policy. The law was introduced in an attempt to restrict cooperation and collusion between large companies to fix output and prices, often through trusts. Those existed in railroads due to the high capital requirements which effectively stifled competition in remote parts of the country, which opened the door to price fixing and destroying potential competitors. And in the oil industry, the Standard Oil Company trust controlled several markets in the 1880s. The Sherman Act regulated these trust activi-

ties as well as the prohibition on monopolies. In 1914, the Act was complemented with the Clayton Act, which explicitly prohibited exclusive dealing agreements, and regulated mergers achieved by purchasing stock.

Antitrust legislation in Europe started later, but due to the Great Depression and the Second World War, laws didn't really start to have an impact until the second half of the 20th century. Since then, European antitrust has increasingly come to be the prerogative of the European Union, more so than of the individual nations.

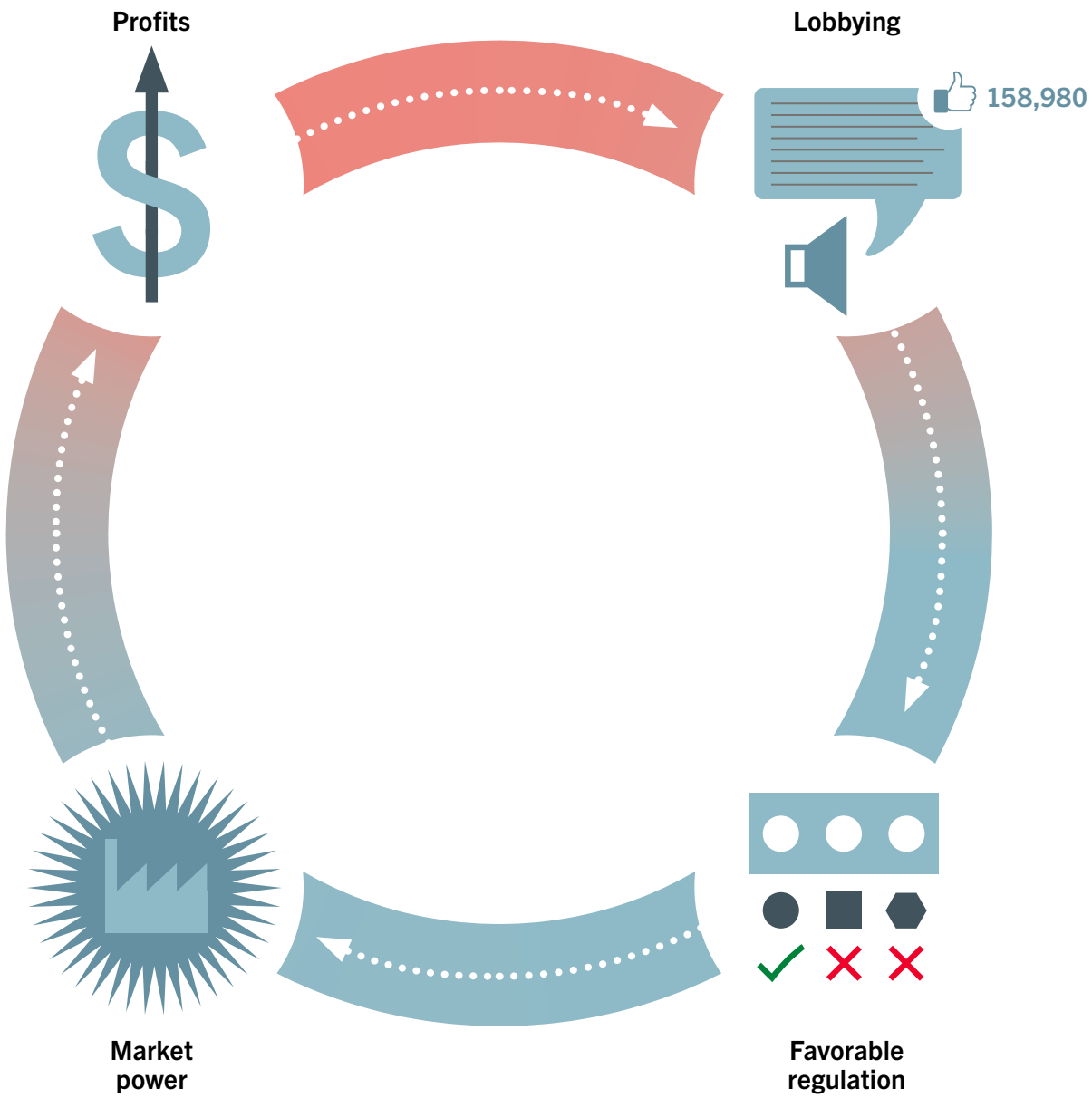
European antitrust has increasingly come to be the prerogative of the European Union, more so than of the individual nations.

And more recently, there is a recognition, both in Europe and in the United States, that the digital technology has brought about new economic conditions that require different forms of intervention. In particular, the role of platforms and network externalities that give the owners the power to act as a gate keeper with the ability to create market power from restricting access by competitors. The European Digital Markets Act and the Digital Services Act from 2022 are a first attempt to regulate market power in the context of digital technology.

And there are many policy interventions that we know work. For example, the notion of interoperability is a powerful tool to increase competition. On digital platforms for example, network externalities lead to scale economies and are thus a natural source of monopoly power. In the presence of such scale economies, it is efficient to have one dominant platform because the larger the size of the platform, the better its performance. If more people use a trading platform, the more likely sellers will find enough buyers willing to bid on their good for sale, and the more likely buyers will find the good they are looking for. But this scale advantage leads to lack of competition and hence an ability for the platform owner to charge an excessive access price. When Apple's online App Store charges a 30% commission for Epic Games to distribute their game Fortnite, it can do so because it has established itself as the dominant platform with a large user base. The 30% commission is substantially above cost. Interoperability regulation would ensure that the access fee set by the regulator is high enough for the platform owner to be compensated for developing a high-quality platform, yet low enough to ensure there is enough entry and competition on the platform.

Interoperability has many applications. It is the regulation that ensures that a hardware producer cannot change the charger plug from product to product thus forcing users to buy an expensive new one each time, or whenever they need to replace an existing plug. And the concept of interoperability was at the heart of the development of the internet where the founding fathers of the world wide web ensured that the accessibility of different services was built in. They ensured that an email message for example could be sent from one provider (say Gmail) to another (say your company email servers). Similarly with the access to web pages that are hosted by different providers. This generates a lot of entry and competition of internet service providers. But this concept of interoperability does not come without regulation. For example, interoperability is not engrained in messaging services. It is impossible to send a message from WhatsApp to Snapchat since messaging services are closed. None of the services has an incentive to open their messaging

Fig. 12 **Vicious circle between market power and political influence**



Notes: The figure shows the reinforcing cycle between market power and political influence. The market power of the dominant firms is reflected in profits, part of which is invested in lobbying. This in turn results in favorable regulations that cement the market power of the dominant firms.

Source: Own work

platform to the messages of their competitors. As a result, compared to the number of service providers for email and the world wide web, the number of messaging services is very small. Because there is no interoperability, each messaging service needs to have sufficient scale to ensure a large enough network. A small messaging service (say your small company) would limit communication only to work-related business, and you would need a service for each social network. Instead, with interoperability, we would be able to send messages across messaging apps. The result now is that the messaging services, even if they are provided for free, can exploit the largest troves of data that their user base supplies, and they can sell the data to advertisers.

But despite the existence of regulatory solutions such as interoperability, often the constraint is the successful enforcement of competition, rather than adequate laws. In principle, the Sherman and Clayton Acts are sufficient to ensure competitive markets. The problem is often the enforcement and interpretation of existing laws. As mentioned before, since the early 1980s, the Bork doctrine has argued for the strict focus on consumer surplus as the criterion for antitrust intervention. At the same time, as I have argued above, we are currently experiencing a rising trend in market power and the influence of dominant firms. And this has consequences much further than just the consumers. Through economy-wide effects on prices and other outcomes, this growing market power increasingly affects workers' wages, labor market mobility, business dynamism and startups, and all this generates a large welfare cost.

Part of the reason why we don't see a bigger impact of antitrust legislation is that firms that have market power try to influence existing and new legislation, either by blocking new laws or by using resources to win court cases under existing laws. Just like those who evade taxes are reluctant to accept more stringent tax compliance initiatives, and are willing to spend some of the resources to stop such initiatives, those who currently have market power are reluctant to get more powerful pro-competitive enforcement and are willing to dedicate resources to stop these initiatives. There is a vicious circle between market power, lobbying, and legislation. Obtaining market power generates profits. Those profits from market power can be used as resources for lobbying to influence the political decision-making process and obtain legislation that is favorable to allow for more market power.

Firms that have market power try to influence existing and new legislation.

In the light of the lobbying by dominant firms to interfere with the attempt to tackle market power and to foster competition, the question remains what can be done. In principle, the judicial system and the antitrust authorities are independent. But the problem is often the lack of resources and the dispersion of authorities that prevents a coordinated response.

Market power is a global problem with multinational firms that have a global reach, and yet, they often face multiple competition authorities in different countries. This opens the door for 'regulatory arbitrage' across authorities. Even within a country, there are competing authorities addressing related issues. In the US, antitrust enforcement is in the hands of the Department of Justice and the Federal Trade Commission, which includes the Bureau of Consumer Protection. But also states can bring antitrust cases, and financial firms are subject to the additional oversight by several financial regulators for antitrust enforcement such as the Securities and Exchange Commission, the Consumer Financial Protection Bureau, etc. This often leads to conflicting prescriptions.

But most importantly, however dedicated these regulators are, the resources are way too little to face the huge challenges of enforcing competitive markets. Even with dedication, expert antitrust officials have no chance against an army of lawyers and experts representing the dominant firms who have a huge amount to gain from stopping antitrust enforcement when the government experts have to select a small number of cases due to a lack of resources and then face the dominant firms who have multiple times the resources to make their case.

To illustrate how little resources society currently spends on guaranteeing pro-competitive markets, consider the comparison with the independent central bank. To control inflation, policymakers have recognized that politicians have an electoral incentive to increase the money supply in the run-up to the elections, which creates a perception of abundant economic times, which then ends in inflation or hyperinflation only months after the elections. To avoid this negative influence of the political process on inflation control, governments in most advanced economies have set up an independent central bank. This is arguably the biggest success story in economic policy.

The goal is to have a pro-competitive policy that reduces market power and creates competitive markets.

The welfare cost of inflation is estimated to be 0.5% of GDP, yet the expenditure on the independent federal reserve system is around 5 billion US dollars. In comparison, the cost of market power is of the order of 8% of GDP, yet the US spends less than 0.5 billion US dollars on antitrust. Magnitudes in Europe are similar. To replicate the inflation control success story with the same expenditure per percentage point GDP gain, the US government should be willing to spend 80 billion US dollars on antitrust, or 160 times as much as current expenditure. Still, 80 billion is only 0.35% of GDP, a lot smaller than the welfare cost of market power. Of course, the dominant firm lobby will work hard to avoid such a massive increase in the antitrust budget.

But with an independent, international competition authority that breaks the vicious circle between the influence of the dominant firms on antitrust enforcement and market power, it is possible to reduce the dominant position of these firms. The ultimate objective is to have a pro-competitive policy that reduces market power and creates competitive markets.

Conclusion

The digital age has fundamentally transformed the global economy. This has led to technological progress and growth, and has ultimately resulted in higher standards of living. But the digital technological transformation has at the same time introduced enormous economies of scale, reaching global proportions, in which the use of data plays a key role. And with these scale economies, market power has grown since 1980. Dominant firms can exert monopoly positions and charge prices that are substantially higher than costs. As a result, they accumulate enormous profits, testament of which are the exorbitant stock market valuations of those dominant firms that are publicly traded.

Widespread market power has macroeconomic implications. In the labor market, wages have grown less than productivity, and labor force participation has fallen. As a result, the labor share has declined. In addition, due to an incomplete passthrough of shocks, business dynamism has fallen significantly. This results in lower labor reallocation and a sharp fall in the number of young, startup firms.

While the digital age has given us growth and higher standards of living, there is also a welfare cost as a result of the dominance of firms with market power compared to an economy with competitive markets. The cost to society is of the order of 8% of GDP.

There are feasible pro-competition policies that can reduce market power and the influence of dominant firms. But the successful implementation requires a lot more resources and an attempt to break the vicious circle between the profits dominant firms generate and their ability to influence pro-competitive policies and their implementation.

Notes

1 See De Loecker et al. (2020), Eeckhout (2021), Guttierez and Philippon (2017), Gruillon et al. (2019).

2 See Autor et al. (2020).

3 See Teulings and Van't Klooster (2021).

4 See Karabarbounis and Neyman (2014).

5 See Barkai (2020).

6 Deb, Eeckhout et al. (2022a).

7 See Eeckhout (2021) and www.TheProfitParadox.com.

8 See Bao et al. (2022).

9 See for example Katz and Murphy (1992) and Krusell et al. (2000).

10 See Deb et al. (2022a).

11 Rising between-firm inequality is the main driver of wage inequality in the last decades, see Bloom et al. (2019).

12 See Decker et al. (2020).

13 See Eeckhout (2021).

14 See De Loecker et al. (2020), De Loecker et al. (2022) and De Ridder (2022).

15 Moreover, firms that achieve those dominant positions tend to remain in those positions for a longer duration. See De Loecker et al. (2020) and Kehrig and Vincent (2021).

16 See Schumpeter (1944).

17 See for example Goldfarb and Tucker, 2019, Bajari et al. (2019) and Eeckhout and Veldkamp (2022).

18 See De Loecker et al. (2022) and Ederer and Pelligrino (2022) for example.

19 See Eeckhout, Fu, Li, and Weng (2022).

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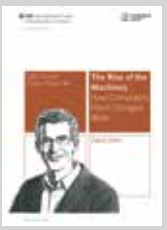

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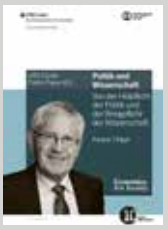

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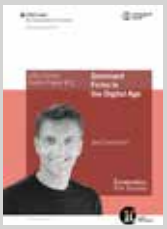

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Imprint
Publisher: UBS Center for Economics in Society, Zurich
Author: Prof. Jan Eeckhout
Concept/Layout: Roman von Arx, Ricco Pachera
Printed by Abächerli Media AG, Switzerland
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