

This chapter investigates whether corporate market power has increased and, if so, what the macroeconomic implications are. The three main takeaways from a broad analysis of cross-country firm-level patterns are that (1) market power has increased moderately across advanced economies, as indicated by firms' price mark-ups over marginal costs rising by close to 8 percent since 2000, but not in emerging market economies; (2) the increase has been fairly widespread across advanced economies and industries, but within them, it has been concentrated among a small fraction of dynamic—more productive and innovative—firms; and (3) although the overall macroeconomic implications have been modest so far, further increases in the market power of these already-powerful firms could weaken investment, deter innovation, reduce labor income shares, and make it more difficult for monetary policy to stabilize output. Even as rising corporate market power seems, so far, more reflective of “winner-takes-most” by more productive and innovative firms than of weaker pro-competition policies, its challenging macroeconomic implications call for reforms that keep future market competition strong.

Introduction

Public debate about rising corporate power is mounting. Heightened interest has unfolded amid the rise of corporate giants, such as in the tech industry, and because of broader, often worrisome macroeconomic trends in advanced economies over the past three decades. As shown in Figure 2.1, these trends include (1) sluggish investment despite falling borrowing costs and rising expected returns from investment, as captured by the ratio of the market value of firms to the book value of their capital stock (so-called Tobin's Q); (2) a growing disconnect between a roughly stable rate of return on productive capital and a falling rate

of return on safer assets, such as the bonds of governments and the healthiest firms; (3) a widening gap between financial and productive wealth; and (4) falling labor income shares and rising income inequality. A fifth trend is the well-documented slowdown in productivity growth (Adler and others 2017).

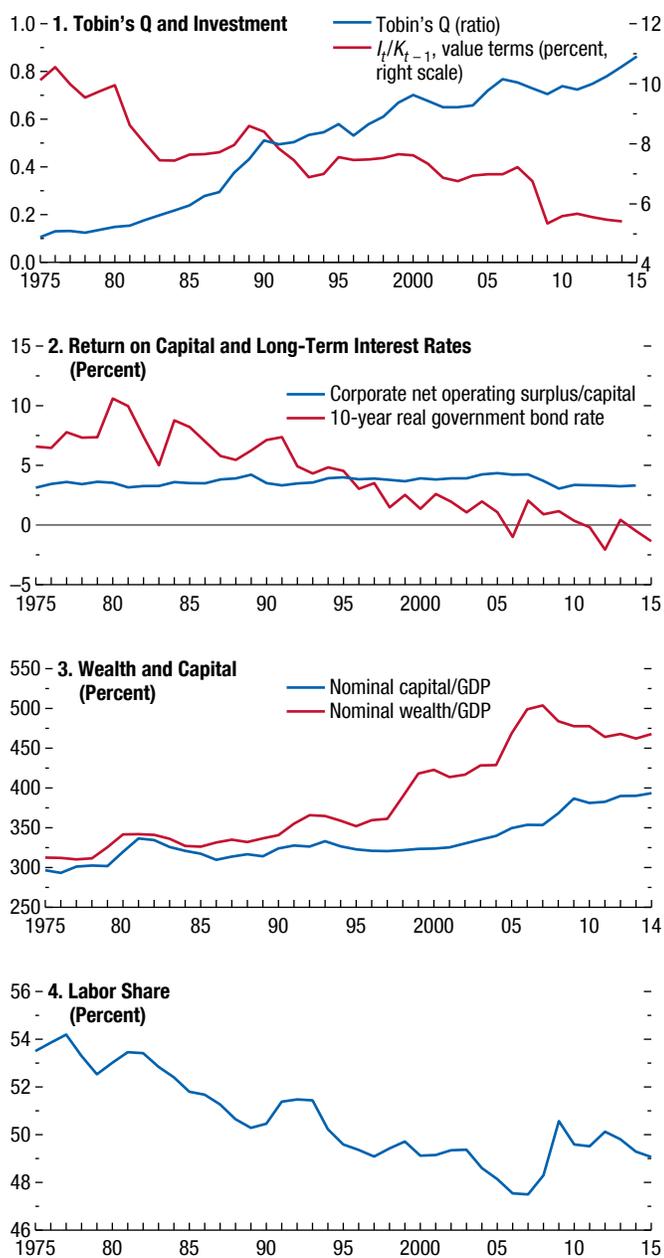
Could rising market power be one factor behind slowing trend growth and growing inequality? Other drivers that may account for one or several of the five macroeconomic trends listed above have been put forward. Examples include a slowing pace of major inventions or long lags before these pay off; protracted weak demand, as featured in Chapter 4 of the April 2015 *World Economic Outlook* (WEO); mismeasured (underreported) intangible capital; falling investment prices (Chapter 3 of the April 2017 WEO); growing demand for safe assets; and weaker worker bargaining power. Unlike these drivers, however, rising corporate market power can, in principle, contribute to all five trends simultaneously (Stiglitz 2015; Caballero, Farhi, and Gourinchas 2017; De Loecker and Eeckhout 2017; Eggertsson, Robbins, and Wold 2018). Increased market power would be expected to lead firms to invest less in physical and other forms of capital than would be optimal (trend 1), which would weaken productivity growth (trend 5) without necessarily reducing returns on capital, even if returns on risk-free assets were to decline for other reasons (trend 2). In parallel, the value of shareholders' assets would grow faster than the sheer value of their productive capital (trend 3), and workers' share of total income would mechanically fall (trend 4).

At the same time, neither the rise of market power itself nor its macroeconomic implications have been firmly established. Broad market concentration is generally not a good gauge of market power; it is hard to measure and can be misleading. Better, more direct measures, such as price markups—the ratio of a good's price to the marginal cost of producing it—are not readily available and, so far, they have been studied mostly for the small subset of listed firms (De Loecker and Eeckhout 2017, 2018; Díez, Leigh, and Tambunlertchai 2018). A full picture of market power trends

The authors of this chapter are Wenjie Chen, Federico Díez (lead), Romain Duval (lead), Callum Jones, and Carolina Villegas-Sánchez, with contributions from Mai Chi Dao, Jiayue Fan, Christopher Johns, and Nan Li, and supported by Luisa Calixto, Rebecca Eyassu, and Ariana Tayebi.

Figure 2.1. Worrysome Macroeconomic Trends

Increased market power could, in principle, be a factor behind several important macroeconomic trends of the past decades.



Sources: Organisation for Economic Co-operation and Development; Penn World Table 9.0; United Nations; World Inequality Database; and IMF staff calculations. Note: Aggregate series are advanced economy medians. Tobin's Q is defined as equity value/net worth (current prices). Investments are cumulated into capital stocks using asset-specific geometric depreciation rates using the perpetual inventory method. See Online Annex Table 2.1.2 for a list of countries used in median calculations.

across the broader economy is needed to gauge the macroeconomic implications for aggregate investment, labor income shares, and the effectiveness of monetary policy, to use these as examples. Even rising economy-wide markups need not imply declining competition if they merely enable firms to recoup the growing fixed costs—or reward them for the higher risks—associated with large investments in intangible assets, such as research and development or information technology systems.

The drivers of any possible rise in market power have also yet to be uncovered. This matters because different drivers could call for very different policy remedies. At one extreme, rising market power could be the outcome of *greater* competition and winner-takes-most dynamics in the digital age. For example, in many industries, the rising importance of economies of scale and scope, network effects, managerial and technical skills, and specific intangible assets—such as patents, proprietary information technology systems, and large consumer databases—may help the most dynamic firms achieve market dominance. Inasmuch as such firms have higher markups and profit shares, any increase in competition that benefits them could result in higher aggregate markups and profit shares (Van Reenen 2018). At the other extreme, rising market power could reflect an increase in anticompetitive product market regulations or weaker antitrust enforcement (Gutiérrez and Philippon 2018).

To explore these issues, this chapter looks at close to 1 million firms covering large swaths of the economy across 27 countries—about two-thirds of which are advanced economies and one-third (mostly central and eastern European) are emerging market economies. The aim is to gauge market power trends over the past two decades, assess their macroeconomic implications, and—more tentatively—shed some preliminary light on their underlying drivers.¹ The chapter tackles the following questions:

- Has corporate market power increased globally? How do trends in market power differ across country income groups, countries, industries, and firms?
- What might be the drivers of rising market power? Can the data reveal the possible roles of changes in the structure of product markets—associated with

¹The countries included in the analysis are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Latvia, the Netherlands, Poland, Portugal, Romania, Russia, the Slovak Republic, Slovenia, Spain, Turkey, the United Kingdom, and the United States.

the rise of the digital economy or other factors—and of a policy-driven weakening of competition?

- What is the impact of market power on growth and income distribution? How does it affect the drivers of growth, such as investment and innovation, as well as labor income shares?
- What are the policy implications? Should measures be taken to strengthen market competition and, if so, which would be effective? Are there also macroeconomic policy implications of rising market power, such as for monetary policy?

In tackling these questions, the chapter reaches the following conclusions:

- There has been a moderate rise in corporate market power across advanced economies. Economy-wide markups increased by close to 8 percent, on average, across firms during the 2000–15 sample period, alongside rising profits and market concentration. By contrast, markups remained broadly stable in emerging markets, possibly reflecting limited country coverage and the fact that market competition was weaker than in advanced economies to start with.
- Markup increases have been fairly broad based across countries and industries—taking place in almost all advanced economies and nearly two-thirds of country-industry pairs. The magnitude of this rise has varied across countries—it is larger in the United States than across the European Union, for example—and industries; it is essentially concentrated in nonmanufacturing industries.
- A key contributor almost everywhere is the increase in markups charged by a small fraction of firms. Most of these firms are rather small, but the larger ones in the group account for the vast majority of the group's total revenue. High-markup firms also perform better than others—their productivity is higher and they are more likely to invest in intangible assets, such as patents and software. In the United States, these firms also gained market share during 2000–15, contributing to the larger increase in aggregate markups compared with other countries—and consistent with a (productivity-enhancing) growth of high-productivity, high-markup firms at the expense of those with low productivity and low markups.
- This tentatively suggests that changes in the structure of product markets have underpinned at least some of the overall rise in market power.

One such change would be the winner-takes-most outcome achieved by the most productive and innovative firms, rooted in part in specific intangible assets (technological, managerial, or other); network effects; and economies of scale. The rather broad-based nature of increasing markups across countries and industries, and the role played by a small fraction of firms in most cases, also hint at such common forces—more than a policy-driven weakening of competition. At the same time, weak pro-competition policies can magnify winner-takes-most dynamics, and firms that have so far achieved market dominance primarily through innovative products and business practices may attempt to entrench their positions by erecting barriers to entry.

- The impact of rising markups on economic growth has been rather modest so far, but it could grow increasingly negative if the market power of high-markup firms—in particular—rises further. Higher markups have been associated with somewhat weaker investment, despite higher profits and Tobin's Q; empirical estimates suggest that because of this, output would be about 1 percent higher today in the average advanced economy if markups had not increased since 2000—ignoring such factors as technological or organizational improvements that may have enabled some firms to raise their markups over time. Through this investment channel, rising market power may have also slightly reduced the natural (real) rate of interest, thereby making the effective lower bound on policy interest rates more binding. Effects on innovation are more ambiguous; the analysis suggests that they may have been marginally positive so far, but would turn increasingly negative if high-markup firms further increase their market power.
- Higher markups may not only reduce firms' own capital and output, but may also spill over to other domestic and foreign firms through supply-chain links. Empirical evidence suggests that higher markups across foreign suppliers have been associated with slightly lower output among emerging market firms that purchase their inputs in less competitive markets.
- There is also evidence that rising market power throughout 2000–15 reduced labor shares of income, by a minimum of 0.2 percentage point—about 10 percent of the overall decline—across

advanced economies. This lower-bound estimate includes only the impact of rising markups *within* firms and ignores the effect of reallocation of resources *between* firms, which is an additional factor in countries where high-markup, low-labor-share firms have gained market share from those with low markups and high labor shares. Also ignored is the possible contribution of the uneven rise in market power across firms to rising wage inequality between firms—which has contributed to the overall rise in wage inequality in some advanced economies—as well as to wealth inequality.

- With mounting risks of adverse growth and income distribution effects from rising corporate market power, policymakers should keep future market competition strong. Helpful reforms would include cutting domestic barriers to entry in nonmanufacturing industries, liberalizing trade and foreign direct investment, adjusting competition policy frameworks to deal with emerging issues as needed, easing obstacles to technological catchup by lagging firms, and shifting the burden of corporate taxation onto economic rent.

The next section examines trends in market power across countries, industries, and firms, and attempts to explain what may lie behind them. The section that follows analyzes the implications for growth and income distribution, focusing on investment, innovation, and labor shares. It also explores whether rising market power affected inflation, interest rates, and the dynamics of output in advanced economies after the 2008–09 global financial crisis. The main takeaways and policy implications are discussed in the conclusion.

The Rise of Corporate Market Power

Measuring market power is challenging. This chapter considers two main alternatives. The first, and most common, is the ability of firms to charge prices that exceed their marginal cost of production. Under this definition, a firm's market power can be measured through its markup, defined as the ratio of price to marginal cost. This is the main measure used throughout the chapter. A second possible definition is the ability of firms to obtain extraordinary profits—so-called economic rents. A frequently used indicator here is an (operational) profitability measure, such as the ratio of operating earnings to sales; this is an empirical measure of the Lerner index, which also

relates closely to a firm's markup.² These have limitations: markups can be estimated from often available firm-level data, but might overestimate market power in the presence of fixed costs, as these need to be recouped through markups if firms are to avoid incurring losses; Lerner indices are easy to compute, but hard to measure accurately and, like all measures of profitability, they can be volatile. As a complement, measures of market concentration are also computed, focusing, in particular, on the share of top firms in the total sales of a particular industry. These should be interpreted with great caution; they require identifying the appropriate market and can be misleading—for example, *stronger* competition may lead to larger, more productive firms gaining market share over their less productive, smaller counterparts, resulting in *higher*, not lower, concentration. For these reasons, markup indicators, rather than market concentration measures, are used in the empirical analysis of this chapter.

How has corporate market power evolved over the past two decades? To answer this question, the chapter uses firm-level data covering 27 countries—16 advanced economies and 11 emerging market economies—since 2000.³ The raw data, which include information on publicly listed and privately held firms, typically cover at least 40 percent of total output reported in official sources in a given country and year. They have been found to be reasonably representative of the full population of firms in most of the countries considered (Kalemli-Özcan and others 2015). The final data set obtained after cleaning the raw data includes more than 900,000 distinct firms. Markups and Lerner indices are computed for each firm—and then aggregated up to industry or country level for parts of the analysis; concentration indices are computed for narrowly defined (four-digit NACE (Nomenclature statistique des activités économiques dans les Communauté européenne)) industries in each country. Building on these three measures, the analysis

²Markups and Lerner indices are closely related in theory; their empirical measures, however, are very different. Following De Loecker and Warzynski (2012), markups are measured as the ratio of a firm's output elasticity of a variable input to the share of that input in total revenue. By contrast, the empirical Lerner measure focuses on overall, not marginal, operational profitability and, as such, it captures the wedge between prices and average—not marginal—costs. As a result, there is no reason to expect both measures to be correlated a priori.

³The definition of advanced economies used in the empirical work of this chapter follows the WEO classification in 2000 (the first year in the data set, which extends to 2015). For details on the data, see Online Annex 2.1. All annexes are available at www.imf.org/en/Publications/WEO.

begins by establishing a series of facts on the recent dynamics of corporate market power across countries, industries, and firms.

Aggregate Market Power Trends

All available indicators point to a moderate increase in aggregate market power since 2000. Across the 27 sample countries, the (firm-revenue-weighted) average markup increased by 6 percent during 2000–15, a modest yet steady increase (Figure 2.2, panel 1).⁴ At the same time, while more volatile than markups, average profitability, as measured by the Lerner index, also increased throughout the sample period (Figure 2.2, panel 2). This accompanying rise in profitability suggests that the increase in markups goes beyond a mere technological change—such as higher fixed costs from larger intangible investments needed for firms to be competitive.⁵ Finally, to a lesser extent, market concentration has also increased (Figure 2.2, panel 3).

While the increase in market power has been fairly broad based, its magnitude—focusing hereafter on markups—has varied across countries and industries. First, the rise is strongly concentrated among advanced economies, whose average markup rose by about 7.7 percent throughout 2000–15, versus only 1.8 percent for the group of emerging market economies—mostly in central and eastern Europe—covered by the data (Figure 2.3).⁶ There is substantial variation, as well, in the rise in markups across advanced economies, with

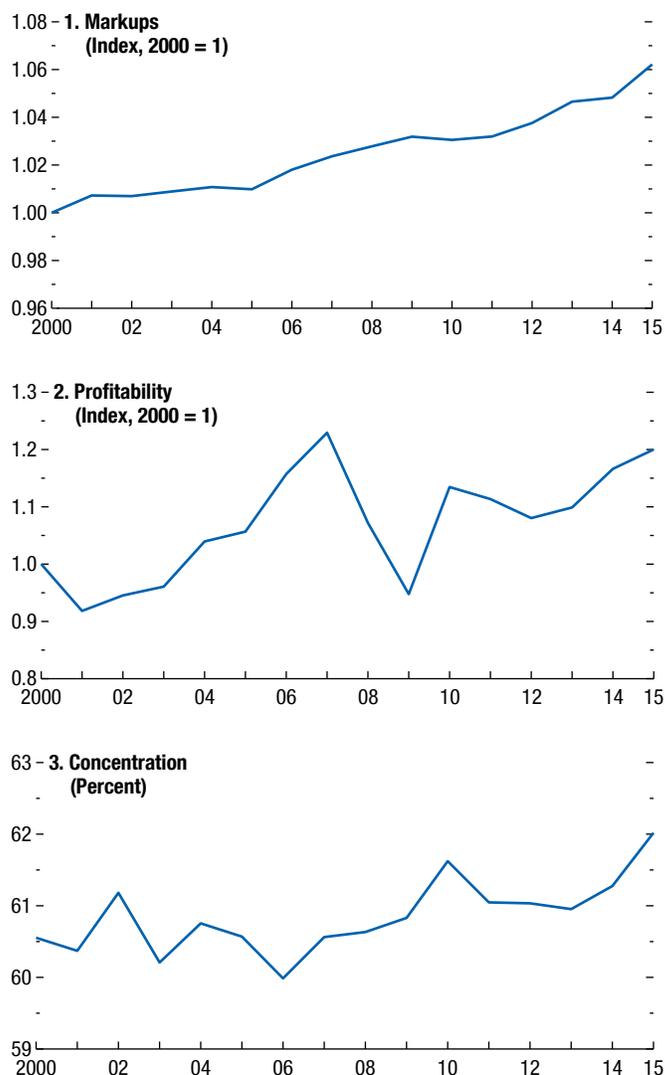
⁴This is a substantially smaller number than the increase found in recent studies that focus only on listed firms (De Loecker and Eeckhout 2017, 2018; Díez, Leigh, and Tambunlertchai 2018). In level terms, the (firm-revenue-weighted) average markup shows an increase from about 1.28—corresponding to a markup of the price over marginal cost of 28 percent—in 2000 to 1.36 in 2015. Qualitatively similar, but quantitatively smaller, increases are obtained when considering cost-weighted average markups. However, given the estimation technique employed, these point estimates are identified only up to a constant and should therefore be seen as illustrative. See De Loecker and Warzynski (2012) for details.

⁵The correlation between changes in markups and profits across firms is statistically significant at the 1 percent confidence level. Additional analysis also finds that the increase in markups remains essentially unchanged after accounting for the role of overhead costs; this further suggests that the rise in markups reflects more than just the need to recoup higher fixed costs.

⁶This comparison refers to the differential *increases* in market power—the focus of this chapter—across country income groups, not to differences in markup *levels* and the level of competition in general. Considering only listed firms, but a broader sample of countries and a longer period, Díez, Leigh, and Tambunlertchai (2018) also find much smaller increases in markups in emerging market than in advanced economies.

Figure 2.2. Evolution of Market Power

All measures point toward a moderate increase in market power over time: higher markups, higher profitability, and, to a lesser extent, higher concentration.

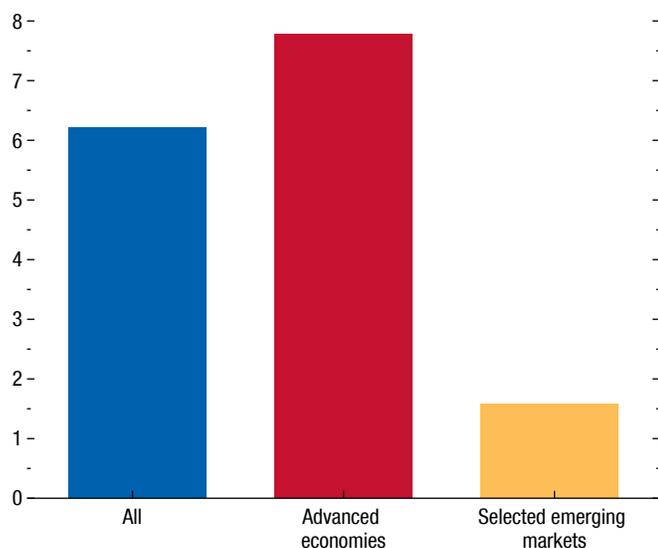


Sources: Orbis; and IMF staff calculations.

Note: Markup calculations are based on the approach of De Loecker and Warzynski (2012) using the Orbis database. Panel 1 plots year fixed effects from regressions of markups that also include country fixed effects to account for entry and exit to/from the sample. Regressions are weighted by firms' operating revenue. The measure of profitability used in the figure is the Lerner index, computed as the weighted average of firms' ratio of earnings before taxes to revenue. Concentration is computed as the ratio of sales of top four to top 20 firms within each country-sector bin. To aggregate, simple averages are taken across sectors within a country, and then the median across countries, to obtain the plotted line. See Online Annex Table 2.1.2 for a list of countries used in the calculations.

Figure 2.3. Markup Increases, by Country Income Group
(Percent change, cumulative 2000–15)

Markup increases are concentrated in advanced economies; markups in the selected emerging markets covered by the analysis have risen only slightly.



Sources: Orbis; and IMF staff calculations.
Note: Figure uses the 2000 *World Economic Outlook* definition for advanced economies. Markups weighted by firms' operating revenue.

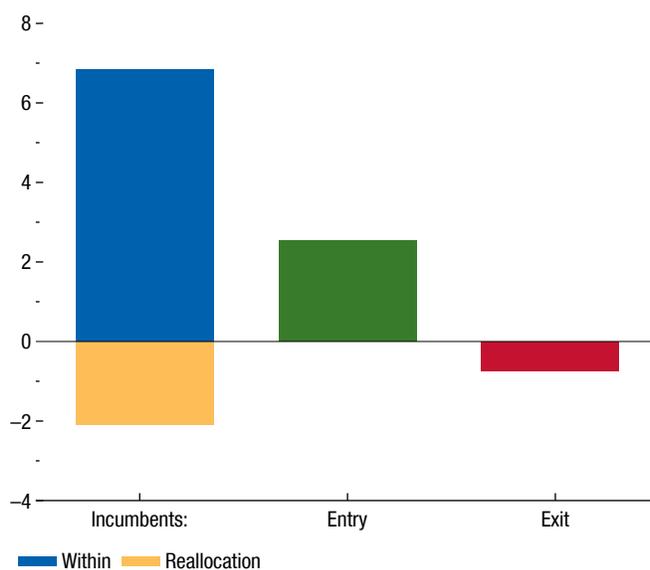
significantly larger increases in the United States (twice as large as in the average advanced economy). Although markup increases have also been rather broad based across industries, trends differ: nearly two-thirds of the country-industry pairs in the sample show markup increases, with the largest among nonmanufacturing industries and in industries that use digital technologies most intensively.⁷ The average markup across manufacturing industries has been mostly flat.

With some exceptions, the rise in aggregate markups reflects mostly higher markups within incumbent firms and, to a lesser extent, the entry of new firms with higher markups, rather than a greater market share of high-markup incumbents. Over the full sample, markup increases within incumbent firms accounted for the full increase in the aggregate markup (the large positive “within” component, shown in blue in Figure 2.4), whereas high-markup incumbents did not increase their relative size (negative “reallocation” com-

⁷Intensity of digital usage is constructed based on Organisation for Economic Co-operation and Development estimates; for details, see Online Annex 2.2 and Calligaris, Criscuolo, and Marcolin (2018), which also finds larger markup increases among digital-intensive firms than among other firms.

Figure 2.4. Decomposition of Markup Increases
(Percent)

Two-thirds of the overall markup increase can be accounted for by incumbent firms (intensive margin) and the remainder by the net entry of new firms (extensive margin). Among incumbents, the rise in markups reflects primarily an increase within firms rather than reallocation of market shares away from low-markup toward high-markup firms.



Sources: Orbis; and IMF staff calculations.
Note: The bars plot the change in overall markups explained by each component, after applying a Melitz-Polanec decomposition to the markup changes between 2000 and 2015. See Online Annex 2.2.C for details on the decomposition.

ponent). One noticeable exception is the United States, for which the reallocation component accounted for about 80 percent of the rise in the aggregate markup.⁸ New firms entering the market with high markups also contributed about one-third of the overall rise in markups across advanced economies (the “entry” component in Figure 2.4).

Rise in Markups across Firms Is Highly Uneven

Markups have increased significantly in only a small fraction of incumbent firms—they are the dominant force behind the higher aggregate markups in most economies. Firms in the top decile of the markup distribution increased their (weighted) average markup

⁸The analysis results from applying a so-called Melitz-Polanec decomposition (see Online Annex 2.2). The large “between” component found for the United States is in line with recent evidence; see Baqaee and Farhi (2017) and De Loecker, Eeckhout, and Unger (2018).

by more than 30 percent, while the remaining nine deciles report a (weighted) average increase of just 2 percent (Figure 2.5, panel 1). This means that any analysis of the drivers and macroeconomic implications of the overall rise in corporate market power must pay particular attention to this small fraction of firms in the top decile of the markup distribution.

These high-markup firms are typically found in every broad economic sector and vary in size. In terms of revenue, the most-represented sectors in the top decile are information and communication, financial and insurance activities, manufacturing, and utilities. After accounting for the fact that some sectors have more firms than others, in general, the likelihood that a firm be in the top decile is above (the cross-sector) average in information and communication, finance and insurance activities, and utilities, while it is below average in construction, manufacturing, and wholesale and retail trade.

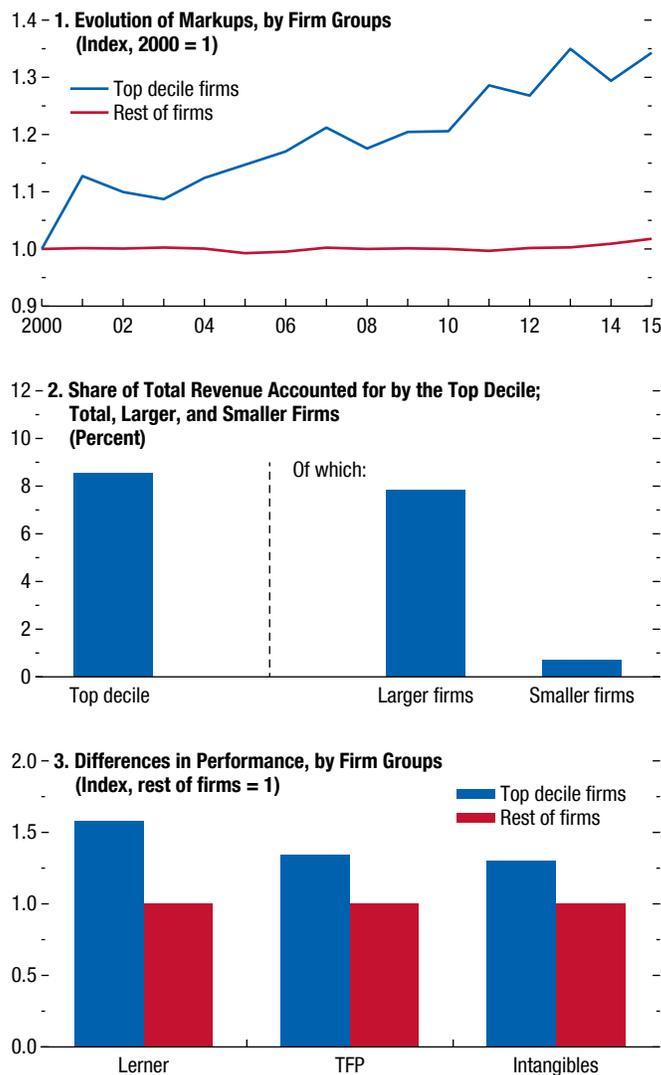
High-markup firms vary in size, but they tend to perform better than others. Most of these firms are rather small—in the bottom half of the size (revenue) distribution—but the larger ones in the group account for the vast majority of the group’s total revenue (Figure 2.5, panel 2).⁹ As regards performance, the top 10 percent of firms in the markup distribution are, on average, about 50 percent more profitable, more than 30 percent more productive, and more than 30 percent more intensive in their use of intangible assets than the other 90 percent (Figure 2.5, panel 3).

To sum up, there has been a moderate rise in corporate market power since 2000 across advanced economies, but not across the emerging markets covered by the analysis. Although increases have varied in magnitude across advanced economies and industries, in most cases, the main driving force was the ability of a small fraction of high-markup firms to strengthen their market power—and also gain market share in some countries, such as the United States. These firms were typically more dynamic than others, tentatively suggesting that changes in the structure of product markets—such as the winner-takes-most dynamics benefiting the most productive and innovative firms, rooted in part in specific intangible assets—are behind at least some of the overall rise in market power.

⁹For further details on the relationship between markups and size, see Díez, Fan, and Villegas-Sánchez (forthcoming).

Figure 2.5. Disconnect between Firms in the Top Decile and the Rest

Markup increases have been largely concentrated in the top 10 percent of the markup distribution; most of these firms are small, but the larger ones account for most of the group’s revenue; firms in the top decile tend to be more profitable, more productive, and make relatively more intensive use of intangibles than other firms.



Sources: Orbis; and IMF staff calculations.
 Note: Firms are sorted by their average markups over the sample period into two groups: top decile and the rest. Panel 1 plots, for each group, year fixed effects from regressions of markups that also include country fixed effects to account for entry and exit to/from the sample. The regressions are weighted by firms’ operating revenue. The bars in panel 2 show the share of total revenue accounted for by firms in the top decile as a whole (left bar); the larger firms within the top decile (10 percent largest firms within top decile, middle bar); smaller firms within the top decile (90 percent smallest firms within top decile, right bar). Each bar in panel 3 plots the average value of the Lerner index/TFP/intangibles ratio for the firms in the top decile of the markup distribution and for the other firms. The values for the rest of the firms were normalized to one. TFP = total factor productivity.

Macroeconomic Implications of Rising Market Power

What are the implications of rising market power for growth and the distribution of income? To assess the former, this section examines the impact of rising markups on key firm- and industry-level drivers of growth, namely innovation (as proxied by individual patents) and physical capital investment. This analysis relies on cross-country firm- and industry-level regressions that include a rich set of fixed effects and account for other potential drivers of innovation and investment. In an attempt to identify the causal effect of rising markups on these outcomes, markups are lagged and instrumental variable strategies are pursued—using as instruments markups in other firms in the same country and industry. A similar approach then explores whether markup increases have contributed to the downward trend in the labor share of income—the share of national income paid in wages, including benefits, to workers—in recent decades. This matters for income distribution, given that capital ownership tends to be concentrated among top incomes (Wolff 2010).

The empirical exploration of the growth impact of markup increases is complemented by the use of a dynamic stochastic general equilibrium model that also sheds light on implications for inflation, interest rates, and monetary policy in the euro area and in the United States. There are other macroeconomic trends of the past two decades that coincide with rising markups. Box 2.1 shows that rising corporate saving across advanced economies is closely linked to greater concentration in corporate sales and assets and to increased markups. Other trends that could reflect in part rising markups, but are not directly explored here, include declining business and labor market dynamism and rising wage inequality, among others.¹⁰

Innovation

Market power has ambiguous effects on firms' decisions to innovate, reflecting two opposing forces.¹¹ On one hand, firms need to expect some degree of market power (and profitability) to invest in innovative products and processes. On the other hand, greater

competition—that is, less market power—incentivizes firms to try to escape their competitors through innovation. A synthetic view of these two forces argues for a hump-shaped relationship: starting from low levels, stronger market power will first increase innovation but, beyond a certain point, additional market power will weaken the desire to innovate.¹²

The empirical analysis explores whether there is a hump-shaped relationship between market power and innovation at both industry and firm levels across the full sample of 27 countries. Innovation is measured by (various alternative indicators of) firms' patenting activity and is linked to market power, measured either by firm-level markups or industry-level average markups and Lerner indices. The analysis consists of a (Poisson) regression in which the number of patents depends on the lagged (logarithm of the) markup and its square, controlling for a rich set of fixed effects and using instrumental variable techniques to address potential reverse causality—that is, innovation may affect markups. Specifically, all firm-level regressions control for firm size, firm fixed effects, and alternatively (four-digit NACE) country-industry-year fixed effects or country-year and industry-year fixed effects. These fixed effects ensure that results are not driven by other, omitted drivers—for example, consumer demand. To address reverse causality concerns, besides lagged markup values, some specifications use, as an instrumental variable, the median markup of all firms (except that of the firm being instrumented) in a given country-industry-year. The industry-level regressions use the lagged (logarithm of the) markup or the Lerner index and country-year and industry-year fixed effects (see Online Annex 2.3A for further details).

There is strong and robust evidence that higher markups increase patents at both industry and firm levels when markup levels are low, but have the opposite effect when markups are high. At the industry level, more than 80 percent of the observations were located before the turning point (the red line in Figure 2.6) over the sample period, implying that, for most country-industry pairs, higher markups led to more innovation.¹³ However, the fraction of observations located beyond the turning point increased from roughly 15 percent in

¹⁰For a more detailed description of these trends and the possible contribution of rising markups, see Davis and others (2007); De Loecker and Eeckhout (2017); Van Reenen (2018); and Autor and others (2017a, 2017b).

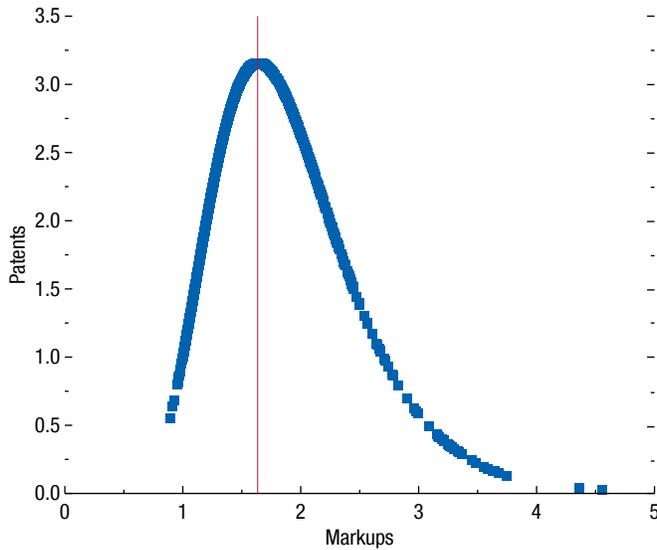
¹¹See, for example, Shapiro (2012) for a review of the literature on competition and innovation.

¹²This hypothesis, which goes back at least to Scherer (1967) and Kamien and Schwartz (1976), was further modeled and tested on British firm data by Aghion and others (2005).

¹³Comparable results are obtained when using, as a measure of market power, the Lerner index rather than the markup, with almost 85 percent of observations located before the turning point.

Figure 2.6. Patents and Markups: A Hump-Shaped Relationship

There is a hump-shaped relationship between markups and patents. Starting from low markup levels, an increase leads to more patents. Beyond the red line, further markup increases lead, instead, to fewer patents.



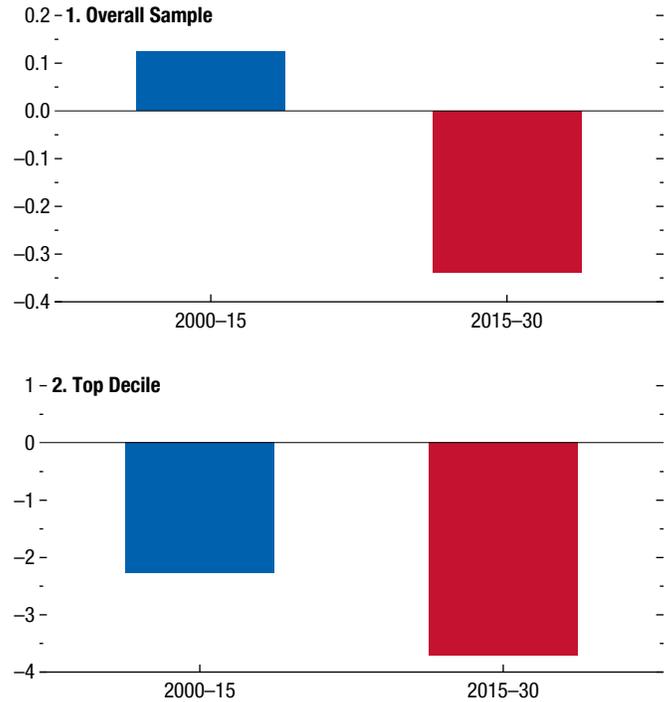
Sources: Orbis; PATSTAT (Worldwide Patent Statistical database); and IMF staff calculations.
 Note: The figure plots the effects of markups on the predicted average number of patents by country-sector. Predicted patents normalized to 1 for markups = 1.

2000 to 21 percent in 2015. A similar pattern emerges at the firm level. Under this approach, the share of firms located beyond the turning point is still small, at about 7.5 percent in 2015, implying that past markup increases may have been associated with higher innovation for most firms. However, that share increased by 50 percent during the sample period.

The analysis implies that, while the overall impact of rising market power on the pace of innovation may have been marginally positive so far, it could become increasingly negative if high-markup firms—in particular—further strengthen their market power in the future. Firms in the top decile of the markup distribution are (on average) already beyond the turning point of the estimated hump-shaped firm-level relationship. This is a potential cause for concern, given that those are the firms whose markups have risen sharply over the past two decades. As an example, if across the sample, markups rose as much during 2015–30 as they did during 2000–15, the predicted patent stock of high-markup firms would be almost 4 percent lower than if markups were stable, and the overall patent

Figure 2.7. Implied Relationship between Higher Markups and Patents
(Percent change in patents)

Past overall increases in markups are estimated to have had a marginally positive effect on patents. However, if markups continue to rise at the same rate, patents are predicted to fall, mostly driven by firms in the top decile of the markup distribution.



Sources: Orbis; PATSTAT (Worldwide Patent Statistical database); and IMF staff calculations.
 Note: The 2000–15 bars show the implied predicted percent change in patents resulting from the markup increase in 2000–15, weighted by operating revenue. The 2015–30 bars show the implied predicted change if markups increase in 2015–30 at the same rate as in 2000–15. Panel 1 makes use of the whole sample; panel 2 uses information only from the top decile of the markup distribution.

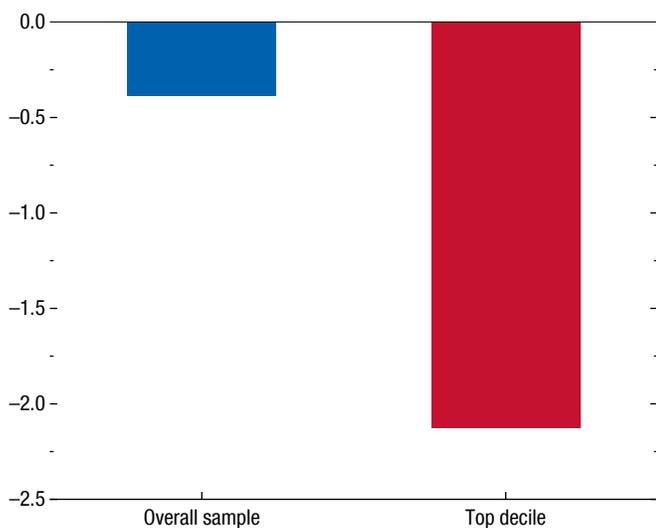
stock would be more than 0.3 percent lower, taking the empirical estimates at face value (Figure 2.7).

Investment

Private fixed investment has declined by about 25 percent, on average, across advanced economies since the global financial crisis, compared with its precrisis trend (Chapter 2 of the October 2018 WEO). This has happened despite a large and persistent fall in borrowing costs, higher rates of corporate profit, and higher expected returns on capital (Tobin’s Q). Although weak economic growth since the crisis has played a role (Chapter 4 of the April 2015 WEO), other possible factors include credit constraints or

Figure 2.8. Markups and Physical Capital Investment
(Percentage point change in investment rate)

For the overall sample, the average increase in firms' markups is associated with a 0.4 percentage point decrease in the physical capital investment rate. For the firms in the top decile of the markup distribution, the (larger) average increase in firms' markups is associated with a decrease in the investment rate of 2 percentage points.



Sources: Orbis; and IMF staff calculations.

Note: Average changes in markups across firms are weighted by operating revenue.

shifts in the composition of investment toward (possibly undermeasured) intangibles, but also increased market power (Gutiérrez and Philippon 2017).¹⁴ As a firm's market power increases, it can—at any given marginal cost—increase its profits by charging a higher price and reducing its output. This, in turn, leads the firm to reduce its demand for capital and, therefore, its investment.¹⁵ Over the long term, inasmuch as the return on capital and labor supply remain unchanged, firms' lower desired output will also translate into a lower capital-to-output ratio. However, only a few studies explore empirically the link between markups and investment, and they focus primarily on the United States and publicly listed firms.¹⁶

¹⁴See more details on the possible drivers of low investment in Gutiérrez and Philippon (2017); Hall (2017); Crouzet and Eberly (2018); and Chapters 4 and 2, respectively, of the April 2015 and October 2018 WEOs.

¹⁵Online Annex 2.3C provides a more detailed discussion of the mechanism through which higher market power reduces investment in the short term and the capital-to-output ratio over the long term.

¹⁶See Gutiérrez and Philippon (2017); De Loecker, Eeckhout, and Unger (2018); Díez, Leigh, and Tambunlertchai (2018); and Eggertsson, Robbins, and Wold (2018).

Empirical analysis finds that rising markups have contributed to some reduction in firms' physical capital investment since the early 2000s. Cross-country firm-level analysis is performed for the same set of countries and firms used in the previous subsection. A firm's net investment rate in tangible assets is explained by its lagged markup, controlling for other firm-level drivers of investment and the rich set of fixed effects considered in the innovation analysis.^{17,18} Similar instrumental variable techniques are also used to address risks of reverse causality and omitted variable bias. The main finding is that a 10 percentage point increase in a firm's markup is associated with a statistically significant 0.6 percentage point decrease in its physical capital investment rate. Figure 2.8 illustrates that, for the overall sample, the average increase in firms' markups since 2000 is associated with a 0.4 percentage point decrease in the investment rate, whereas for the sample of top decile firms, the average increase in markups is associated with a 2 percentage point decrease in the investment rate.

The results imply that if markups had remained stable since 2000, the overall capital stock today would be about 3 percent, and output about 1 percent, above current levels in the average advanced economy. The broad country- and firm-level coverage of the data set used in the analysis makes it possible to gauge the implications of higher markups for *aggregate* investment, capital, and output. Specifically, the path of each firm's net tangible asset stock during 2000–15 is simulated under a (counterfactual) scenario in which the firm's markup is set at its 2000 level—or, for new firms, its initial level—using the estimated impact on investment shown in Figure 2.8. The calculated capital gaps between the actual and counterfactual scenarios can then be aggregated to obtain an aggregate estimate of the capital shortfall for each economy. For the group of advanced economies in the sample, this exercise yields a 3 percent larger physical capital stock in 2015 in the average advanced economy under constant markups; that would have translated into an output gain of about 1 percent, assuming an elasticity of

¹⁷The net investment rate in tangible assets is calculated as the ratio of the change in the stock of tangible assets to value added. For more details, see Online Annex 2.3B.

¹⁸One difference from the innovation analysis is that the relationship between investment and markups is assumed to be monotonic, in line with investment theory. Additional (unreported) analysis could not find robust evidence of a nonlinear (for example, hump-shaped) relationship.

output to capital of about one-third.¹⁹ However, these estimates do not factor in (growth-enhancing) technological or organizational improvements that may have enabled firms to raise their markups in the first place. Furthermore, it reflects only a *within*-firm effect—as a firm’s markup increases, it tends to decrease its own physical investment rate—leaving aside any possible *between*-firm effect stemming from the reallocation of capital between firms with different markup levels. Additional analysis suggests that any such effects, however, have typically been small.²⁰

Higher markups may not only reduce firms’ own capital and output, but may also spill over to other firms through domestic and international supply-chain links. Adverse international spillovers may arise because domestic firms that raise their markups may reduce their demand for foreign inputs (demand channel) or raise the price of the goods they sell as inputs to foreign firms (input channel). These channels are analyzed by regressing a country-industry’s (logarithm of) value added on the weighted average of its foreign buyers’ markups (demand channel) and the weighted average of its foreign suppliers’ markups (input channel), controlling for domestic firm links and a rich set of fixed effects (see Online Annex 2.3E for details). Weights reflect the importance, for each country-industry considered, of each foreign country-industry as a source of demand and as an input provider. The results point to moderate negative international spillovers of higher markups through the input channel. For example, for a hypothetical industry in an emerging market economy that imports 40 percent of its value added, a 10 percentage point markup increase across all its foreign suppliers is found to reduce output by 0.3 percent, all else equal.

The upshot of the analysis is that higher markups have been associated with somewhat lower investment and capital in advanced economies over the past two decades. This has been mostly driven by the small fraction of firms whose markups increased sharply.

¹⁹This magnitude in the predicted loss in physical capital is somewhat below, but close to, that obtained when simulating the macroeconomic model of the next subsection. See also Gutiérrez, Jones, and Philippon (2019) for the US economy.

²⁰See Online Annex 2.3B. In addition, to check whether this decrease in physical investment may have been replaced with increased investment in intangibles, as some suggest (Crouzet and Eberly 2018), the same empirical analysis is rerun with the net intangible asset investment rate as the dependent variable. The estimated relationship between markups and intangible investment is found to be economically insignificant.

Higher markups in advanced economies may have also entailed mild adverse spillovers to emerging markets. Together with the mixed impact of higher markups on innovation—which the previous analysis suggests may be negligible so far, but would turn increasingly negative with increased market power of high-markup firms—these macroeconomic implications of rising market power should be a cause for policy concern.

Economic Slack, Interest Rates, and Inflation

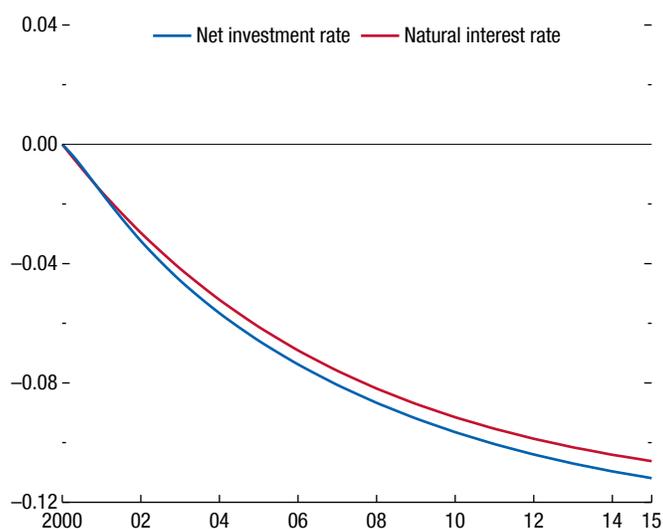
By reducing investment, rising markups can generate economic slack that may offset their immediate inflationary effect and may also imply a trade-off for monetary policy. These issues are explored through an estimated dynamic stochastic general equilibrium model of the euro area and the United States (see Online Annex 2.3C for details). The model is calibrated to match the within-firm component of the observed trend in markups since 2000 in each of the two areas documented in the section titled “The Rise of Corporate Market Power.” Considering only the within-firm rise in markups, rather than the total increase, aligns more closely with the model’s setup and focus on rising market power *within* firms. Rising markups are modeled as a decline in the substitutability between the goods and services produced by different firms (Jones and Philippon 2016; Eggertsson, Robbins, and Wold 2018). In this setup, a sustained, unexpected rise in markups is inflationary as firms raise prices. There is an offsetting contractionary force, however: firms with greater market power face more inelastic demand for their products and cut output and investment to earn higher profits—as confirmed by the empirical analysis. These declines, and the resulting fall in employment, are magnified by the failure of wages and prices to adjust immediately, due to nominal rigidities.

Model simulations suggest that the trend rise in markups may have raised inflation somewhat, produced some slack, and slightly reduced natural interest rates in advanced economies, starting from at least the early 2000s. Under rising markups, inflation is higher and potential output growth is lower, and so the natural interest rate—the interest rate that arises absent wage and price rigidities—is also lower than it would be under stable markups. For the euro area and the United States as a group, the output gap might have been about 0.3 percentage point wider, inflation about 0.2 percentage point higher, and the natural interest rate about 10 basis points lower by 2015 than if

Figure 2.9. Markup Increases, Investment, and the Natural Interest Rate

(Percentage point change; index, 2000 = 0)

The trend rise in markups since 2000 may be associated with a 0.1 percentage point reduction in the net investment rate and a 10 basis point reduction in the annual natural interest rate by 2015.



Source: IMF staff calculations.
Note: Interest rates are annualized.

markups had stayed at their 2000 level—all else equal; that is, abstracting from the impact of the 2008 financial crisis (Figure 2.9). The focus of the model-based analysis on weaker investment is qualitatively—and quantitatively—consistent with the empirical results, which highlight higher markups' harm on investment and their broadly neutral effect on innovation.

Because a trend rise in markups fosters some economic slack and slightly lowers the natural interest rate, it can deepen a recession when other macroeconomic shocks bring the policy interest rate down to its effective lower bound. Following the 2008 financial crisis, this may have either marginally amplified the recession, pushed central banks to rely even more on unconventional monetary policies, or both.

The impact of rising market power on the responsiveness of inflation to economic conditions—the so-called Phillips curve, which has flattened over the past two decades (Chapter 3 of the April 2013 WEO and Chapter 3 of the October 2016 WEO)—is less clear and depends on how firms (re)set prices, among other factors. On one hand, greater market power could weaken firms' incentives to keep prices close to

those of their competitors for fear of losing market share; they might then be more inclined to adjust their prices after a shock, in which case inflation would become *more* responsive to economic conditions. On the other hand, if a firm incurs a cost from changing its price, it will adjust *less* frequently when it has more market power because its demand—and profit margin—is less sensitive to shocks. Model simulations suggest that in either case, the implied change in the responsiveness of inflation to economic conditions has been small, largely because the increase in markups has not been large enough to make a major difference, at least so far (Online Annex 2.3C).

Income Distribution

After remaining largely stable for decades, the share of national income paid to labor has fallen since the 1980s across many advanced economies, by an average of about 2 percentage points (Chapter 3 of the April 2017 WEO). The four most widely studied explanations for this decline are technological change, including the associated decline in the relative price of capital; globalization and offshoring; measurement difficulties associated with the rise of intangible capital or increased depreciation of physical capital; and weaker worker bargaining power.²¹ In particular, Chapter 3 of the April 2017 WEO highlights the role of technology and globalization in reducing labor shares in advanced and emerging market and developing economies. A fifth possible driver, which has gained recent attention, could be increased corporate market power and the associated rise in economic rents accruing to firm owners (Barkai 2017; De Loecker, Eeckhout, and Unger 2018; Eggertsson, Robbins, and Wold 2018).

Empirical analysis finds that rising markups have compressed firms' labor income shares. Similar to the approach taken to explore the effects of higher markups on investment, cross-country firm-level regressions explain the labor share within each firm by its markup—instrumented to address endogeneity concerns (Online Annex 2.3D)—as well as firm-level control variables and a rich set of fixed effects. The results imply that an increase in markups of 10 percentage points is associated with a statistically significant 0.3 percentage point decrease in the labor share,

²¹Regarding the first three explanations, see Chapter 3 of the April 2017 WEO and references therein. Regarding labor market deregulation, worker bargaining power, and labor shares, see Ciminelli, Duval, and Furceri (2018) and its references.

measured as the ratio of the firm's wage bill to value added. Figure 2.10 illustrates that, for the overall sample, the average increase in firms' markups since 2000 is associated with a 0.2 percentage point decrease in the labor share, whereas for the sample of top decile firms, the average increase in markups is associated with a 1 percentage point decrease in the labor share.

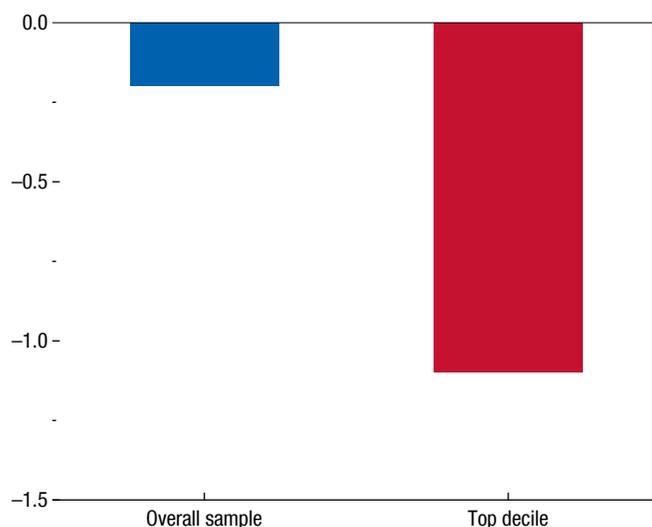
Taken at face value, the empirical estimates imply that rising markups have accounted for at least 10 percent of the trend decline in the labor share in the average advanced economy. Without any markup increases since 2000, the average labor share across the sample of advanced economies might have been at least 0.2 percentage point higher today; this compares with an average fall in the labor share of about 2 percentage points over the past two decades. Because the underlying empirical analysis estimates only the labor share impact of rising markups *within* firms, it is likely to underestimate the overall effect on the aggregate labor share in countries where resource reallocation *between* firms also accounts for some of the rise in markups. In the United States, in particular, high-markup firms have gained market share at the expense of low-markup firms (see “The Rise of Corporate Market Power” section). Given that the former tend to have lower labor shares than the latter, the aggregate labor share falls through a composition effect—even leaving aside any markup increase and its labor share impact *within* those firms.²² Indeed, when considering both the within- and between-firm components of the rise in markups in the empirical analysis—by removing the firm fixed effects from the regression—the estimated impact of markups on the labor share becomes larger. This tentatively suggests that the within-firm contribution may underestimate the overall impact of rising markups on the aggregate labor share (see Online Annex 2.3D for details).

Although analyzing the full income and wealth distribution implications of market power is beyond the scope of this chapter, the uneven rise in markups across firms that is documented here may have been accompanied by greater earnings inequality between

²²Autor and others (2017a, 2017b) and Kehrig and Vincent (2018) find that this contribution of resource reallocation between firms overshadows that of rising markups within firms in accounting for the aggregate fall in the US labor share. Both studies link this large, between-firm component to the growing weight in the economy of high-productivity firms at the expense of those with low productivity—which tend to have lower markups and higher labor shares.

Figure 2.10. Markups and Labor Income Shares
(Percentage point change in labor shares)

For the overall sample, the average increase in firms' markups is associated with a 0.2 percentage point decrease in the labor share. For the firms in the top decile of the markup distribution, the average increase in firms' markups is associated with a decrease in the labor share of 1 percentage point.



Sources: Orbis; and IMF staff calculations.

Note: Average changes in markups across firms are weighted by operating revenue.

workers. Recent evidence shows that earnings inequality between firms—as opposed to within firms—has been the main driver of the overall rise in earnings inequality in recent decades, at least in the United States (Song and others 2019). One factor, among others, might be that only a small fraction of high-pay workers has been able to capture a share of their firms' growing economic rents.

Summary and Policy Implications

Over the past two decades, a generally moderate but broad-based rise in corporate market power has been observed across advanced economies, driven primarily by a small fraction of firms. The analysis in this chapter finds that the macroeconomic implications, including for the worrisome trends documented in Figure 2.1, have been rather modest so far. However, they would become increasingly negative if the market power of high-markup firms, in particular, were to continue to rise in the future—investment would weaken, innovation could slow, labor income shares would fall further, and monetary policymakers might

find it even more difficult to stabilize output in the event of major downturns. Unlike in advanced economies, market power seems to have remained broadly stable in emerging market economies, possibly because of their greater distance to the technological frontier, smaller service sectors—where markup increases have been concentrated globally—and weaker competition to start with.

Several findings in this chapter tentatively suggest that technology-driven changes in the structure of many product markets have underpinned at least some of the rise in market power in advanced economies. First, the rather broad-based nature of the rise in markups across countries and industries, and the role played by a small fraction of firms in most cases, point to common underlying forces, rather than country- or industry-specific drivers related to anti-trust policy or product market regulation.²³ Although markups increased more in the United States than in other countries, this also seems to reflect in part a growth-enhancing reallocation of resources away from low-markup, low-productivity firms toward high-markup, high-productivity counterparts. Second, and on a related note, in most countries and industries, only a small fraction of firms raised their markups, and these were typically the most dynamic—more productive and innovative—firms. This hints at winner-takes-most dynamics, rooted in part in specific intangible assets (technological, managerial, or other), network effects, and economies of scale in driving some of the overall rise in markups. Third, there is little direct evidence that pro-competition policies have weakened across advanced economies so far. On the contrary, tariff and nontariff barriers to trade and behind-the-border barriers have been vastly reduced across advanced economies and emerging market economies alike over the past three decades (see, for example, Koske and others 2015; and Duval and others 2018). These policies strengthened, rather than weakened, product market competition in manufacturing and service industries, although some firms

²³For example, EU countries have undergone major product market deregulation since the early 1990s, and the combination of country-level and EU-level competition law and policy is widely seen as stringent in international comparison (Bergman and others 2010; Alemani and others 2013); yet the analysis above finds that markups and market concentration have increased across the European Union (see also Calligaris, Criscuolo, and Marcolin 2018; Bajgar and others, forthcoming).

may well have done better than others at seizing the opportunities that liberalization offered.

Other factors may have also played some role, however—possibly magnifying the impact of technological changes. Winner-takes-most outcomes and the associated increase in winners' market power may be more likely when competition policy fails to adapt or becomes less stringent, for example, when it comes to merger enforcement or exclusionary conduct by dominant firms.²⁴ Over the broad sample of firms analyzed in this chapter, the evidence shows that mergers and acquisitions have been followed by significantly higher markups (Box 2.2). That said, whether the loss to consumers from such increases has been typically more than offset by gains from cost and price reductions due to economies of scale and scope, or by other efficiency gains, is an open question that warrants investigation. Another related concern, and a lesson from economic history, is that firms that have, so far, achieved market dominance primarily through innovative products and business practices, may attempt to entrench their positions by erecting barriers to entry going forward—for example, potential competitors may find it hard to enter markets where incumbents' success is underpinned by hard-to-reproduce (or hard-to-buy) intangible assets, such as large proprietary consumer databases.²⁵

The possibility of successful firms discouraging the entry and growth of competitors, and the increasingly negative association between rising market power within firms and key macroeconomic outcomes, such as investment or innovation documented in this

²⁴For example, debate is ongoing regarding the extent to which rising market concentration, markups, and profits in the United States might reflect a weakening of antitrust enforcement, notably starting with the revision in 1982 of the 1968 merger guidelines that discouraged increases in concentration only in already highly concentrated markets. Khan (2017) and Kwoka (2017) argue that these changes should be reconsidered, while Peltzman (2014) uncovers a rising concentration trend since then. So, too, do Grullon, Larkin, and Michaely (2018) and Gutiérrez and Philippon (2018), which highlight the implications of this rise in concentration for profits, market power, and the macroeconomy. By contrast, Rossi-Hansberg, Sarte, and Trachter (2018) cautions against the use of concentration data, especially at the national rather than local level. So does Shapiro (2019), which nevertheless identifies some scope for improvement in current US competition policy.

²⁵For example, in a study of US firms, Bessen (2017) finds a significant role of proprietary information technology systems in entrenching market power. At the same time, rising barriers to entry may not *necessarily* lead to higher aggregate markups. This is because they enable less productive, lower-markup firms to survive more easily, which, all else equal, should lead to lower concentration and a possibly unchanged aggregate markup relative to an unchanged-barriers scenario (Edmond, Midrigan, and Xu 2018).

chapter, call for structural reforms to keep product market competition strong in the future. This need for reform applies particularly to nonmanufacturing industries. It is an agenda that remains unfinished in advanced economies, and even more so in emerging market economies, despite major deregulation in past decades. Regardless of the drivers of rising corporate market power, strengthening market contestability by cutting domestic regulatory barriers to entry (such as administrative burdens on start-ups or regulatory protections of incumbents) and further openness to trade and foreign direct investment would make markets more contestable by increasing the threat of entry and, so, help to spur growth (Chapter 3 of the April 2016 WEO; Duval and Furceri 2018). This is even more relevant for emerging markets than for advanced economies, given that emerging markets face larger barriers to domestic and foreign competition.²⁶

Strong competition law and policy are key complements to product market deregulation—just as financial supervision is a key complement to financial liberalization. More research is needed to determine whether competition policies have contributed to rising market power and, if so, the possible remedies. Depending on the jurisdiction, a case might be made for strengthening some aspects of competition law and policy to ensure that they remain supportive of strong market contestability, firm entry, and rivalry—including in two-sided markets, such as digital platforms, which raise new challenges that may require guidelines for competition policy to be redrawn (Tirole 2017). In general, competition authorities should have ample resources to investigate mergers in detail and assess whether they will benefit consumers. Anticompetitive behavior may be deterred more effectively if competition authorities also have the ability to undertake market examinations and—when evidence of anticompetitive behavior is found—enforce strong remedies, including directing firms to divest assets if deemed necessary. An open question is whether authorities should have the power to investigate, and pay greater attention to, issues of potential loss of competition when a large incumbent firm acquires a small—but potentially large in the future—competitor, as has happened regularly in the high-tech sector. Figuring out the counterfactual—whether the small target could become a large com-

²⁶Product market regulations and barriers to trade and foreign direct investment remain comparatively more stringent, and competition policy enforcement weaker, in emerging market economies (Koske and others 2015; WB 2017).

petitor if not acquired—is difficult *ex ante*, calling for caution; the argument for such action will increase according to the size and persistence of the incumbent firm's market power. Finally, competition policy may also need to take a dynamic perspective: the larger and more persistent an industry's profits, the more likely there are barriers to entry, and the greater the need for close examination of the industry.

The concentration of markup increases among a small set of high-productivity firms suggests that easing obstacles to technological catch-up by lagging firms could also strengthen competition. Examples of helpful policies on this front include well-calibrated intellectual property rights that keep on incentivizing groundbreaking innovation without undermining technological diffusion,²⁷ and competition-neutral data governance regimes.

Finally, rising market power may further strengthen the case for corporate taxation reform. A regular corporate income tax system taxes not only the excess returns on capital derived from market power—so-called economic rents—but also normal returns.²⁸ An efficient corporate tax, however, would exempt normal returns and focus on economic rents only. This can be achieved through cash flow taxes, which allow investment to be expensed, or, alternatively, by providing some allowance for corporate equity (a deduction from regular corporate profit taxation equal to the normal return on equity). Innovation, which often generates economic rents, can be encouraged efficiently through incentives, such as research and development tax credits (Chapter 2 of the April 2016 *Fiscal Monitor*). The destination-based version of these taxes—which tax corporate income based on the location of final consumption, rather than the origin of profits—has the further advantage of being able to withstand profit shifting by multinational firms (Auerbach and others 2017). In this way, it also helps level the playing field between large firms—which are typically better equipped to shift profits across jurisdictions—and their smaller, current, or potential competitors.

²⁷For example, this might require that intellectual property rights protect disruptive innovations better than those that are incremental (Acemoglu and Akcigit 2012). Also, patent pools—agreements between different firms to jointly market licenses of a group of individual patents they own regarding a particular technology—should be designed to facilitate, rather than hinder, the use of new technologies and firm entry (see, for example, Lerner and Tirole 2004).

²⁸In the case of monopolies, achieving an efficient output level would also require combining high profit taxes with output subsidies (Paulsen and Adams 1987).

Box 2.1. The Comovement between Industry Concentration and Corporate Saving

The past two decades have witnessed a broad-based increase in corporate saving across major advanced economies (see, for example, Chen, Karabarbounis, and Neiman 2017; Dao and Maggi 2018).¹ This box presents new firm-level evidence that shows that the rise in the corporate saving rate is closely linked to increased concentration in corporate sales and assets—which has occurred alongside rising markups and profitability, as discussed in “The Rise of Corporate Market Power” section in Chapter 2.

Among publicly traded firms, the average saving rate across narrowly defined (four-digit NACE (Nomenclature statistique des activités économiques dans les Communauté européenne)) industries in Group of Seven (G7) countries appears to comove strongly over time with the average share of sales by the largest four firms in an industry, with a correlation coefficient of 0.8 (Figure 2.1.1).² Uncovering the drivers of this comovement could shed light on several issues, including the drivers of current account imbalances, whose dynamics largely reflect the evolution of corporate saving in advanced economies (IMF 2017).

Analysis using data for listed firms in the G7 countries reveals four key findings:

- Most of the increase in aggregate corporate saving reflects higher saving by incumbent firms rather than compositional changes driven by entry of new firms, exit, or market share reallocation among incumbent firms.
- Incumbent firms have been increasing their saving rates more in industries where concentration (or markups) has risen more (Figure 2.1.2), consistent with the time series correlation shown in Figure 2.1.1.³

The authors of this box are Mai Chi Dao and Nan Li, based on Dao and others (forthcoming).

¹The corporate saving rate here refers to total gross saving (undistributed gross profits) as a share of gross value added.

²All the results presented here hold when the average firm markup is used as a measure of market concentration. Firm markups are defined and calculated in the same way as in the rest of the chapter.

³This finding is confirmed in a more detailed panel regression, which is estimated using Worldscope data for 1996–2014:

$$s_{ijct} = \beta_0 + \beta_1 CR4_{jt} + \beta_2 X_{ijct} + \gamma_{ct} + \delta_i + \varepsilon_{ijct}$$

where $s_{ijct} = \frac{\text{Gross savings}}{\text{Gross value added}}$ is the saving rate of firm i in industry j , country c , at time t ; $CR4$ is market concentration, measured as the fraction of total sales (or assets) accrued to the four largest firms in an industry j ; X_{ijct} is a vector of other firm-specific controls, such as age, and γ_{ct} and δ_i are country-year and firm fixed effects, respectively. Coefficient β_1 is found to be positive and statistically significant.

Figure 2.1.1. Comovement between Average Industry Concentration and Corporate Saving in Group of Seven Countries (Percent)



Sources: Thomson Reuters Worldscope; and IMF staff calculations.

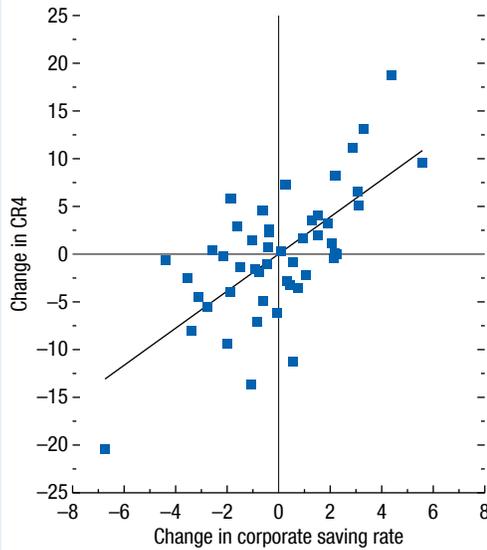
Note: This figure reports the movements of the average firm's saving and average concentration (at four-digit industry level) across countries and industries. The set of countries includes Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. Utility and financial sectors are excluded due to regulation; agriculture and other services are excluded because of poor coverage. CR4 = total market share of the four largest firms in an industry.

- Rising pretax profits (gross operating surplus) as a share of corporate value added are the main source for this increase in corporate saving in concentrating industries. Despite their rising profitability, firms in industries with larger increases in concentration have not significantly raised their dividends or tax payments.⁴
- The within-firm rise in saving has been driven by large firms, with the top 1 percent (by size) showing the largest increases.

⁴Again, this finding is based on a similar regression specification, with profits, dividends, and tax payments (as a share of value added) as the dependent variables.

Box 2.1 (continued)

Figure 2.1.2. Change in Industry Concentration and Change in Saving Rates
(Percentage points)



Sources: Thomson Reuters Worldscope; and IMF staff calculations.

Note: The distributions of concentration and saving rate changes were divided into 50 equally sized bins. Each point in the figure represents the average change in concentration within a bin (CR4 at four-digit industry level, absorbing country-industry fixed effects), plotted against the corresponding (bin) average change in saving rates (conditional on firm fixed effects). CR4 = total market share of the four largest firms in an industry.

The drivers of the relationship between rising concentration (or markups) and increasing corporate saving are not yet fully understood. One possible factor, explored in Dao and others (forthcoming), is the trend decline in global real interest rates (and corporate tax rates) over the past couple of decades. Given that larger firms are less financially constrained and able to leverage more, lower interest rates benefit them disproportionately. As a result, they are better able to exploit opportunities to invest in high-return projects (because, for example, of network effects or increasing returns to scale). When liquidity is constrained and firms must put away investment funds for future projects, larger firms save disproportionately more for these high-return projects.

Box 2.2. Effects of Mergers and Acquisitions on Market Power

Renewed debate about the economic welfare implications of mergers and acquisitions has preoccupied many economists and policymakers in recent years.¹ Mergers and acquisitions can enhance efficiency through economies of scale and scope, thereby reducing production costs and prices or improving product quality. At the same time, however, the consolidation of firms can leave an economy with fewer and larger firms that eventually use reduced competitive pressure to raise prices or offer consumers lower product variety or quality. This box investigates whether acquiring firms' price markups have increased following mergers and acquisitions across the large cross-country sample of firms considered in this chapter. To this end, the extensive firm-level data set on markups is combined with transaction-specific data on mergers and acquisitions.² The main finding from this box is that mergers and acquisitions are followed by markup increases by acquiring firms.³

The total number of worldwide mergers and acquisitions deals has grown steadily since 2000 (Figure 2.2.1). Among these, the value share of horizontal deals—those in which acquirer and target firms are in the same industry—has recovered to its pre-global financial crisis average of about one-third. The pickup in mergers and acquisitions activity raises the question of its economic effects.

Mergers and acquisitions have been generally accompanied by markup increases by acquiring firms. To assess the change in the markup of acquirers against

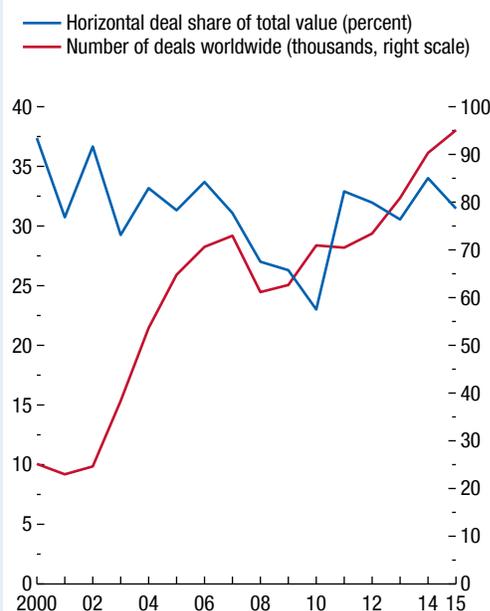
The author of this box is Wenjie Chen.

¹For recent examples regarding the United States, see Peltzman (2014); Khan (2017); Kwoka (2017); Grullon, Larkin, and Michaely (2018); Gutiérrez and Philippon (2018); and Shapiro (2019).

²The mergers and acquisitions data are collected by Zephyr and come from governmental regulatory filings, media reports, and reporting arrangements with investment banks. Therefore, the resulting data set on mergers and acquisitions theoretically includes data for the universe of mergers and acquisitions transactions. One shortcoming is the underreporting of deal values, which are missing for about one-half of reported transactions. Hence, while some descriptive statistics are included using existing deal values—bearing in mind the underreporting issue—the main empirical analysis in this box abstracts from using deal values.

³The analysis builds on, and is consistent with, recent research on firms in the United States. Blonigen and Pierce (2016) finds that mergers and acquisitions in the US manufacturing industry are associated with increases in average markups for the acquired plant; in addition, they find little evidence of increased plant-level productivity.

Figure 2.2.1. Total Number of Deals and Share of Horizontal Deals



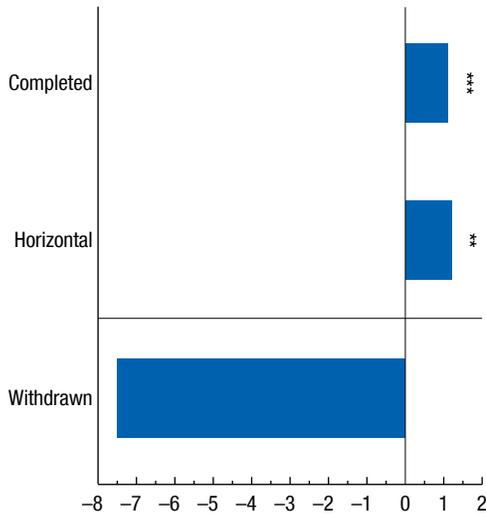
Sources: Zephyr; and IMF staff calculations.

that of nonacquirers, a simple ordinary least squares regression is run that explains the markup by a dummy variable that takes a value of 0 for all firms in 2000 and switches to 1 starting from the year of the mergers and acquisitions. To address the risk that the relationship between mergers and acquisitions and markups may be obscured by confounding factors, the analysis controls for firm and country-industry-year (four-digit NACE (Nomenclature statistique des activités économiques dans les Communauté européenne)) fixed effects, as well as for the firm's size (operating revenue), efficiency (total factor productivity), and profitability (earned income before interest and taxes divided by total assets). Standard errors are clustered at the firm level. The results show a sizable and statistically significant association between mergers and acquisitions and the subsequent change in a firm's markup, on the order of 1.1 percentage points, on average, and 1.2 percentage points for horizontal mergers and acquisitions (Figure 2.2.2, rows 1 and 2).

In a counterfactual exercise that attempts to control for unobserved factors that could drive a firm to seek a merger or acquisition and also increase its markups,

Box 2.2 (continued)

Figure 2.2.2. Impact of Mergers and Acquisitions on Acquirer Firm's Markups, by Deal Type
(Percentage points)



Sources: Orbis; Zephyr; and IMF staff calculations.
 Note: ** and *** denote statistical significance at the 5 and 1 percent confidence levels, respectively.

the same regression estimation is performed using a sample of mergers and acquisitions deals that were announced but then aborted. This set of announced acquirers with ultimately withdrawn deals should share similar characteristics, observed and unobserved, with acquirers in completed deals. The result yields a (statistically insignificant) negative relationship between markups and the (counterfactual) post–mergers and acquisitions period, controlling for the same variables and including the same set of fixed effects as before. The sample size is much smaller for this set of counterfactual mergers and acquisitions, and there could be specific reasons behind the failure of these announced mergers and acquisitions that also negatively affect markup rates. Bearing these caveats in mind, the results suggest that when mergers and acquisitions are not completed, the markups of aspiring acquirers do not increase following the mergers and acquisitions announcement, while they do for firms that succeed in completing the deals.

More detailed analysis is required to establish a causal link between mergers and acquisitions activity and increasing markups, and to assess its impact on productivity and other measures of economic efficiency that can benefit consumers. Ultimately, a comparison of these two effects is needed before implications for welfare and competition policy can be drawn.

References

- Acemoglu, Daron, and Ufuk Akcigit. 2012. "Intellectual Property Rights Policy, Competition and Innovation." *Journal of the European Economic Association* 10 (1): 1–42.
- Akerberg, Daniel, Kevin Caves, and Garth Frazer. 2015. "Identification Properties of Recent Production Function Estimators." *Econometrica* 83 (6): 2411–451.
- Adler, Gustavo, Romain Duval, Davide Furceri, Sinem Kiliç Çelik, Ksenia Koloskova, and Marcos Poplawski-Ribeiro. 2017. "Gone with the Headwinds: Global Productivity." IMF Staff Discussion Note 17/04, International Monetary Fund, Washington, DC.
- Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith, and Peter Howitt. 2005. "Competition and Innovation: An Inverted-U Relationship." *Quarterly Journal of Economics* 120 (2): 701–28.
- Aleman, Enrico, Caroline Klein, Isabell Koske, Cristiana Vitale, and Isabell Wanner. 2013. "New Indicators of Competition Law and Policy in 2013 for OECD and non-OECD Countries." OECD Economics Department Working Paper 1104, Organisation for Economic Co-operation and Development, Paris.
- Auerbach, Alan, Michael Devereux, Michael Keene, and John Vella. 2017. "Destination-Based Cash Flow Taxation." Saïd Business School Research Paper 17/01, Oxford.
- Autor, David, David Dorn, Lawrence F. Katz, Christina Patterson, and John Van Reenen. 2017a. "Concentrating on the Fall of the Labor Share." *American Economic Review* 107 (5): 180–85.
- . 2017b. "The Fall of the Labor Share and the Rise of Superstar Firms." NBER Working Paper 23396, National Bureau of Economic Research, Cambridge, MA.
- Bajgar, Matej, Giuseppe Berlingieri, Sara Calligaris, Chiara Criscuolo, and Jonathan Timmis. Forthcoming. "Industry Concentration in Europe and North America." OECD Science, Technology and Industry Department Working Paper, Organisation for Economic Co-operation and Development, Paris.
- Baqee, David, and Emmanuel Farhi. 2017. "Productivity and Misallocation in General Equilibrium." NBER Working Paper 24007, National Bureau of Economic Research, Cambridge, MA.
- Barkai, Simcha. 2017. "Declining Labor and Capital Shares." Unpublished.
- Bergman, Mats, Malcom Coate, Maria Jakobsson, and Shawn Ulrik. 2010. "Comparing Merger Policies in the European Union and the United States." *Review of Industrial Organization* 36 (4): 305–31.
- Bessen, James. 2017. "Information Technology and Industry Concentration." Boston University School of Law & Economics Paper 17–41, Boston, MA.
- Blonigen, Bruce, and Justin Pierce. 2016. "Evidence for the Effects of Mergers on Market Power and Efficiency." NBER Working Paper 22750, National Bureau of Economic Research, Cambridge, MA.
- Caballero, Ricardo J., Emmanuel Farhi, and Pierre-Olivier Gourinchas. 2017. "Rents, Technical Change, and Risk Premium Accounting for Secular Trends in Interest Rates, Returns on Capital, Earning Yields, and Factor Shares." *American Economic Review* 107 (5): 614–20.
- Calligaris, Sara, Chiara Criscuolo, and Luca Marcolin. 2018. "Markups in the Digital Era." OECD Science, Technology and Industry Working Paper 18/10, Organisation for Economic Co-operation and Development, Paris.
- Calvo, Guillermo. 1983. "Staggered Prices in a Utility-Maximizing Framework." *Journal of Monetary Economics* 12 (3): 383–98.
- Chen, Peter, Loukas Karabarbounis, and Brent Neiman. 2017. "The Global Rise of Corporate Saving." *Journal of Monetary Economics* 89 (C): 1–19.
- Ciminelli, Gabriele, Romain A. Duval, and Davide Furceri. 2018. "Employment Protection Deregulation and Labor Shares in Advanced Economies." IMF Working Paper 18/186, International Monetary Fund, Washington, DC.
- Crouzet, Nicolas, and Janice Eberly. 2018. "Intangibles, Investment, and Efficiency." *American Economic Review, Papers and Proceedings* 108: 426–31.
- Dao, Mai Chi, Isabel Hanisch, Callum Jones, and Nan Li. Forthcoming. "The Granularity of Corporate Saving." IMF Working Paper, International Monetary Fund, Washington, DC.
- Dao, Mai Chi, and Chiara Maggi. 2018. "The Rise in Corporate Saving and Cash Holding in Advanced Economies: Aggregate and Firm Level Trends." IMF Working Paper 18/262, International Monetary Fund, Washington, DC.
- Davis, Steven J., John Haltiwanger, Ron Jarmin, and Javier Miranda. 2007. "Volatility and Dispersion in Business Growth Rates: Publicly Traded versus Privately Held Firms," in *NBER Macroeconomics Annual 2006* (21): 107–80. Cambridge, MA: MIT Press.
- De Loecker, Jan, and Jan Eeckhout. 2017. "The Rise of Market Power and the Macroeconomic Implications." NBER Working Paper 23687, National Bureau of Economic Research, Cambridge, MA.
- . 2018. "Global Market Power." NBER Working Paper 24768, National Bureau of Economic Research, Cambridge, MA.
- , and Gabriel Unger. 2018. "The Rise of Market Power and the Macroeconomic Implications." Unpublished.
- De Loecker, Jan, and Frederic Warzynski. 2012. "Markups and Firm-Level Export Status." *American Economic Review* 102 (6): 2437–471.
- Díez, Federico, Jiayue Fan, and Carolina Villegas-Sánchez. Forthcoming. "Global Declining Competition." IMF Working Paper, International Monetary Fund, Washington, DC.
- Díez, Federico, Daniel Leigh, and Suchanan Tambunlertchai. 2018. "Global Market Power and Its Macroeconomic Impli-

- cations.” IMF Working Paper 18/137, International Monetary Fund, Washington, DC.
- Duval, Romain, and Davide Furceri. 2018. “The Effects of Labor and Product Market Reforms: The Role of Macroeconomic Conditions and Policies.” *IMF Economic Review* 66 (1): 31–69.
- , Bingjie Hu, Joao Jalles, and Huy Nguyen. 2018. “A Narrative Database of Major Labor and Product Market Reforms in Advanced Economies.” IMF Working Paper 18/19, International Monetary Fund, Washington, DC.
- Edmond, Chris, Virgiliu Midrigan, and Daniel Yi Xu. 2018. “How Costly Are Markups?” NBER Working Paper 24800, National Bureau of Economic Research, Cambridge, MA.
- Eggertsson, Gauti B., Jacob A. Robbins, and Ella Getz Wold. 2018. “Kaldor and Piketty’s Facts: The Rise of Monopoly Power in the United States.” NBER Working Paper 24287, National Bureau of Economic Research, Cambridge, MA.
- Gal, Peter. 2013. “Measuring Total Factor Productivity at the Firm Level Using OECD-ORBIS.” OECD Economics Department Working Paper 1049, Organisation for Economic Co-operation and Development, Paris.
- Galí, Jordi. 2008. *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton, NJ: Princeton University Press.
- Gopinath, Gita, Şebnem Kalemli-Özcan, Loukas Karabarbounis, and Carolina Villegas-Sánchez. 2017. “Capital Allocation and Productivity in South Europe.” *Quarterly Journal of Economics* 132 (4): 1915–967.
- Grullon, Gustavo, Yelena Larkin, and Roni Michaely. 2018. “Are US Industries Becoming More Concentrated?” Unpublished.
- Gutiérrez, German, Callum Jones, and Thomas Philippon. 2019. “Entry Costs and the Macroeconomy.” NBER Working Paper 25609, National Bureau of Economic Research, Cambridge, MA.
- Gutiérrez, German, and Thomas Philippon. 2017. “Investment-less Growth: An Empirical Investigation.” Brookings Papers on Economic Activity, Washington, DC.
- . 2018. “How EU Markets Became More Competitive than US Markets: A Study of Institutional Drift.” NBER Working Paper 24700, National Bureau of Economic Research, Cambridge, MA.
- Hall, Robert E. 2017. “The Anatomy of Stagnation in a Modern Economy.” *Economica* 84 (333): 1–15.
- Inklaar, Robert, and Marcel P. Timmer. 2014. “The Relative Price of Services.” *Review of Income and Wealth* 60 (4): 727–46.
- International Monetary Fund (IMF). 2017. *External Sector Report*. Washington, DC.
- Jones, Callum, and Thomas Philippon. 2016. “The Secular Stagnation of Investment?” Unpublished.
- Kalemli-Özcan, Şebnem, Bent Sorensen, Carolina Villegas-Sánchez, Vadym Volosovych, and Sevcan Yesiltas. 2015. “How to Construct Nationally Representative Firm Level Data from the ORBIS Global Database.” NBER Working Paper 21558, National Bureau of Economic Research, Cambridge, MA.
- Kamien, Morton, and Nancy Schwartz. 1976. “On the Degree of Rivalry for Maximum Innovative Activity.” *Quarterly Journal of Economics* 90 (2): 245–60.
- Kehrig, Matthias, and Nicolas Vincent. 2018. “The Micro-Level Anatomy of the Labor Share Decline.” NBER Working Paper 25275, National Bureau of Economic Research, Cambridge, MA.
- Khan, Lina. 2017. “Amazon’s Antitrust Paradox.” *Yale Law Journal* 126 (3): 710–804.
- Koske, Isabell, Isabelle Wanner, Rosamaria Bitetti, and Omar Barbiero. 2015. “The 2013 Update of the OECD’s Database on Product Market Regulation: Policy Insights for OECD and non-OECD Countries.” OECD Economics Department Working Paper 1200, Organisation for Economic Co-operation and Development, Paris.
- Kwoka, John. 2017. “US Antitrust and Competition Policy amid the New Merger Wave.” Washington Center for Equitable Growth, Washington, DC.
- Lerner, Josh, and Jean Tirole. 2004. “Efficient Patent Pools.” *American Economic Review* 94 (3): 691–711.
- Melitz, Marc J., and Sašo Polanec. 2015. “Dynamic Olley-Pakes Productivity Decomposition with Entry and Exit.” *RAND Journal of Economics* 46 (2): 362–75.
- Paulsen, Jim, and Roy Adams. 1987. “Optimal Taxation of a Monopoly.” *National Tax Journal* 40 (1): 121–25.
- Peltzman, Sam. 2014. “Industrial Concentration under the Rule of Reason.” *Journal of Law and Economics*, 57 (S3): 101–20.
- Rossi-Hansberg, Esteban, Pierre-Daniel Sarte, and Nicholas Trachter. 2018. “Diverging Trends in National and Local Concentration.” CEPR Discussion Paper 13174, Center for Economic and Policy Research, Washington, DC.
- Rotemberg, Julio. 1982. “Sticky Prices in the United States.” *Journal of Political Economy* 90 (6): 1187–211.
- Scherer, Fredrick. 1967. “Market Structure and the Employment of Scientists and Engineers.” *American Economic Review* 57 (3): 524–31.
- Shapiro, Carl. 2012. “Competition and Innovation: Did Arrow Hit the Bull’s Eye?” in *The Rate and Direction of Inventive Activity Revisited*, edited by Josh Lerner and Scott Stern. Chicago: University of Chicago Press.
- . 2019. “Antitrust Policy in a Time of Populism.” *International Journal of Industrial Organization*, in press, available online February 27, 2019.
- Song, Jae, David Price, Fatih Guvenen, Nicholas Bloom, and Till Von Wachter. 2019. “Firming Up Inequality.” *Quarterly Journal of Economics* 134 (1): 1–50.
- Stiglitz, Joseph E. 2015. “New Theoretical Perspectives on the Distribution of Income and Wealth among Individuals: Part I—The Wealth Residual.” NBER Working Paper 21189, National Bureau of Economic Research, Cambridge, MA.

Tirole, Jean. 2017. *Economics for the Common Good*, Chapter 14. Princeton, NJ: Princeton University Press.

Van Reenen, John. 2018. "Increasing Differences between Firms: Market Power and the Macroeconomy." CEPR Discussion Paper 1576, Center for Economic and Policy Research, Washington, DC.

Wolff, Edward. 2010. "Recent Trends in Household Wealth in the United States: Rising Debt and the Middle Class Squeeze: An Update to 2007." Levy Economics Institute Working Papers Series 159, Bard College, Annandale-on-Hudson, NY.

World Bank (WB). 2017. *A Step Ahead: Competition Policy for Shared Prosperity and Inclusive Growth*. Washington, DC: World Bank.