Market power and investment in advanced economies: monopolistic and 'segmented' forms of competition

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Abstract

Recent studies have shown rising market power in advanced economies to lead to stagnating business dynamism, innovation and investment. In this article we study the relation between market power and investment at the firm level, using both markups and market shares as measures of market power. Our research shows three important results.

First, higher markups are not generally found in very large "superstar" firms. Secondly, there appears to be a trade-off between markups and market shares such that firms typically sacrifice markups to gain market shares. Third, markups and market shares have opposite effects on investment, while higher market shares are estimated to negatively affect investment behavior, markups generally have a positive effect. Only in niche firms with very high markups do we find the expected negative effect.

In this way, along with the existence of "superstar" firms, the current state of market power in advanced economies should also be described as one of 'segmented competition'

where firms are reducing investment needs by becoming increasingly successful in targeting specific segments of the market on which they charge higher markups.

Keywords: market power, markups, investment behavior, firm-level data

JEL classification codes: L100, L130, E220

1. Introduction

The rise of market power in advanced economies has received much attention in recent years. Different studies have documented strong increases in market concentration rates (Gutierrez and Philippon, 2017; Grullon et al., 2019; Autor et al., 2020), price markups (De Loecker et al., 2020; Diez et al., 2018; Diez et al., 2021) and monopolistic rents (Gutierrez and Philippon, 2016; Brun and Gonzalez, 2017; Eggertsson et al., 2021; Stiglitz, 2017) over the past decades, suggesting that markets have become less competitive and business dynamism more stagnant. The standard narrative in most of these studies is that higher market power increases monopolistic profit rates, reduces investment and damages consumer surplus and labor shares. This narrative has been challenged by evidence presented in other studies, however, that show that the relation between market power and investment behavior could also be positive (Athey and Schmutzler, 2001; Buehler and Schmutzler, 2008; Autor et al., 2020) or, at least, ambiguous (Davis and Orhangazi, 2021).

One of the main limitations in these studies is that they look at macro or meso-level relations between market power and investment aggregates (or at best they model firm-level behavior that is consistent with aggregate trends). Most of them do not empirically study how market power affects investment behavior at the firm-level, and generally assume the underlying firm-level dynamics that would explain aggregate trends. In fact, to the best of our knowledge, only Diez et al. (2018) estimate the effect of market power on investment behavior at the firm-level, and find markups can have a positive effect on investment that only becomes negative at very high markups. In other words, while aggregate measures of market power may offer insight on overall trends in advanced

economies, a more granular look into sector and firm-level dynamics is required to understand how the rise in market power may affect investment overall.

This article takes a step in this direction. We study the relation between market power and investment behavior at the firm-level using data for over 13,000 firms in OECD countries, from 2012 to 2020. Our large dataset and geographical coverage aims at identifying if there is something like a generalized effect of market power on investment in advanced economies, and our recent time window allows us to characterize the current state of competition and market power (as compared to studies that focus on how market power has changed in the past decades). To do so, we consider two different indicators of market power at the firm level, which are typically found in the literature: markups and market shares.

Our research presents three main findings which we consider to be important contributions to the literature. First, market power in advanced economies is not only found in large pseudo-monopolist or superstar firms, as we would typically expect. In fact, when we look at the relation between markups and firm size we find very high markups to be more common in smaller and not larger firms. These smaller, high-markup firms, furthermore, appear to play an important role in the overall rise in markups which the literature has taken as evidence of declining competition. Thus, competition in advanced economies today appears to be characterized not only by the presence of large superstar firms, but also by the emergence of some form of 'segmented competition' by which niche firms manage to exert increasing market power on smaller segments of demand where they exhibit higher markups.

Secondly, markups, on their own, do not seem to be a comprehensive measure of market power. If we were to only consider markups as measures of market power, the concentration of higher markups in smaller firms that we find in our data would imply,

contrary to standard economic intuition, that larger firms tend to have less market power in general. Instead, looking at the relation between markups and market shares reveals an interesting trade-off by which firms with higher market shares tend to charge moderate (not higher) markups and, instead, very high markups are typically found in firms with low market shares which seem to represent niche firms that cannot upscale their activity without lowering markups (Keil, 2017; 2019). In consequence, since markups and market shares are not perfectly related to each other and each reflect important dimensions of market power, both need to be considered to have a full understanding of market power at the firm level.

Finally, in relation to investment, our estimation shows that markups and market shares have opposite effects. While market shares have a negative effect on investment (as expected), our results show that the effect of markups is generally positive and only becomes negative at very high markups (as in Diez et al., 2018). For most firms, it seems that markups reflect growth opportunities or 'post-investment rents' (Aghion et al., 2005) that stimulate investment behavior. A certain degree of market power –linked to higher markups–, therefore, appears to be positive for investment. Interestingly, these 'post-investment rents' (and thus, the positive relation between market power and investment) seem to wear off as firms gain market share (as suggested by Aghion et al., 2005), but also as they manage to target non-generalizable niche markets with lower growth perspectives but higher market power on consumers. A generalization of this form of 'segmented competition' is therefore also likely to have an overall negative effect on aggregate investment levels.

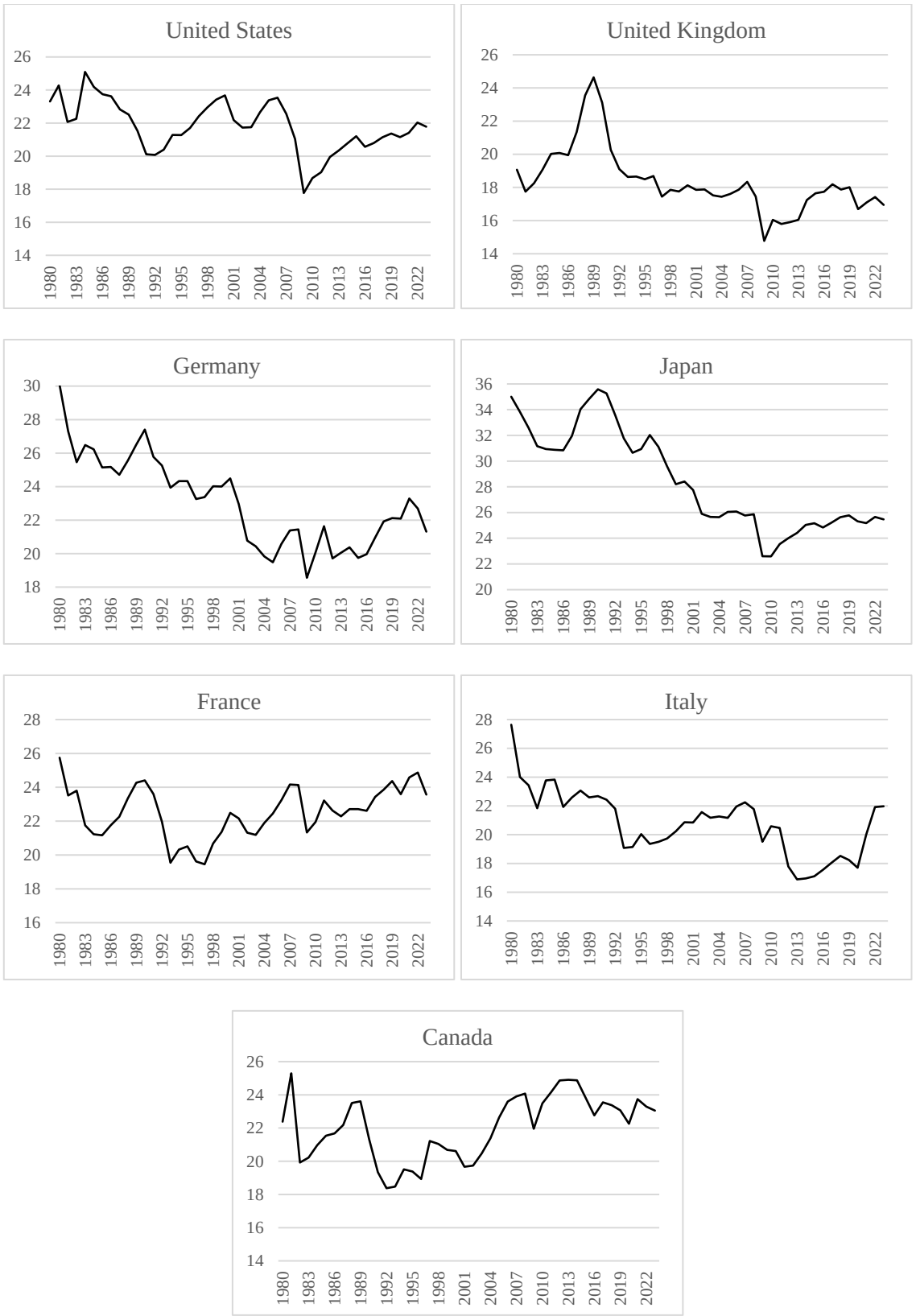
This article is divided into seven sections. The following section reviews the main findings in the literature on the rise of market power and its effects on investment behavior. Section three presents the data used for our analysis and stylized facts in relation

to markups and market shares. Section four presents our theoretical model and quantitative method used to estimate the effect of market power on firm-level investment, and section five presents the results of our estimation. In section six we discuss how these findings relate to those of previous studies, and how they modify our interpretation of the rise of market power in advanced economies, and section seven concludes.

2. Investment and market power

Investment rates in advanced economies have been slowing down over the past decades (Baldwin and Teulings, 2014; Eggertsson et al., 2021; Gordon, 2012; Grullon et al., 2019; Gutierrez and Philippon, 2016; Summers, 2014). In Figure 1, we see that Gross Capital Formation (as a percentage of GDP) has fallen in most of the major advanced economies, typically presenting lower levels in the last decade than those observed in the 80s and 90s.

Figure 1. Investment rates in major advanced economies (% of GDP)



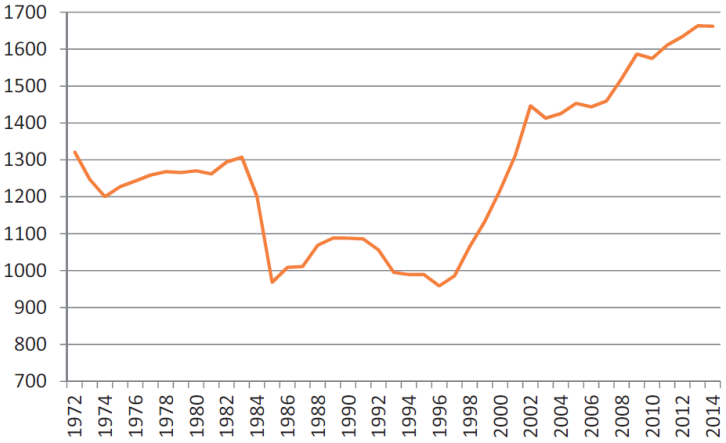
Source: IMF, World Economic Outlook data

While this is a well-established fact, the causes for this slowdown are less clear. Gordon (2012) enumerates a series of structural headwinds, including low productivity-enhancing

innovations in the information technology sector, globalization and off-shoring of production, rising inequality or weak population (and labor-force) growth, that could all have contributed to a secular stagnation of investment and economic growth in advanced economies. Summers (2014) argues that persistently low interest rates, despite monetary stimulus, signal a lack of profitable investment outlets which would also explain the observed slowdown. Other authors, such as Stockhammer (2004), Davis (2018) and Tori and Onaran (2020) argue that an important factor behind weaker investment is the rise of a shareholder-value oriented paradigm of corporate management in the late 1970s that has since redirected corporate resources away from long-term productive investments and towards financial markets. On a similar note, the extraordinary growth of the financial sector has been considered by some authors to have come at the expense of weaker growth for the economy overall (Cecchetti and Kharroubi, 2015).

Another important change that has taken place during these decades is the rise in market power, registered through both the increase in markups and the rise in market concentration rates. Gutierrez and Philippon (2017) find evidence of decreasing competition and higher average price markups, and argue that rising concentration rates can largely account for the investment gap (low investment despite high Q-ratios) observed in the United States during the past decades. Grullon et al. (2019) also find evidence of increasing market concentration rates among listed firms in the United States since the 1980s (as we show in Figure 2) and agree that market power has become an important source of value for listed firms. In fact, Eggertsson et al. (2021) argue that only by the combination of high market power and lower natural interest rates can the observed investment slowdown be explained when cost of funding has been historically low and profit rates historically high.

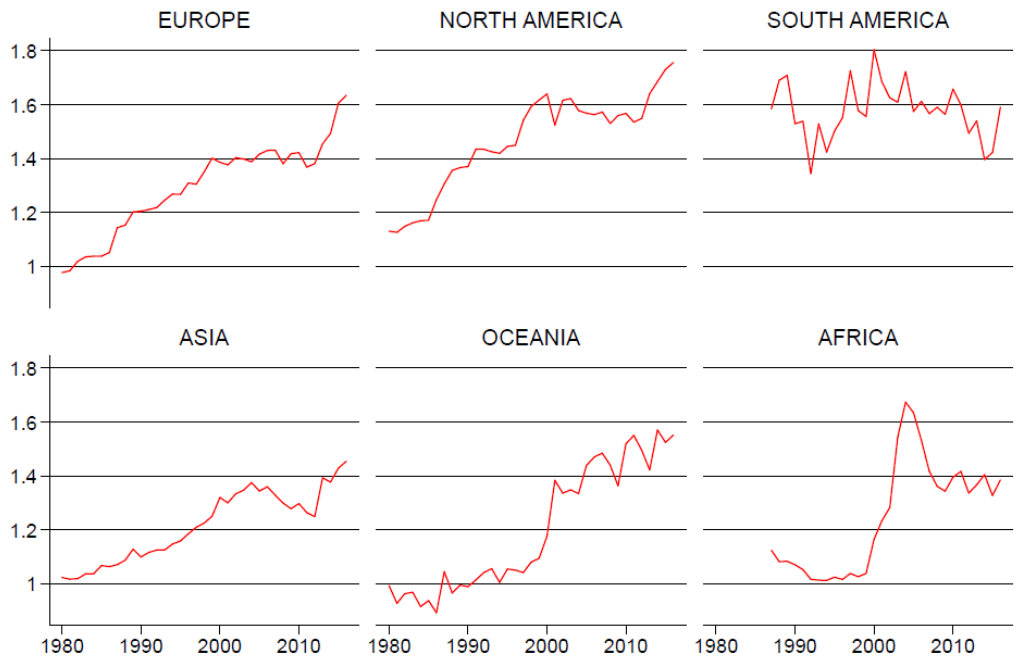
Figure 2: Sales-weighted average Herfindahl-Hirschman Index (United States)



Source: Grullon et al. (2019)

Another set of studies also show evidence of rising market power by looking at the evolution of average price markups (De Loecker et al., 2020; De Loecker and Eeckhout, 2018; Diez et al., 2018; Diez et al., 2021). Following a method for markup estimation developed by De Loecker and Warzynski (2012), these studies find a strong increase in price markups over the past decades in both advanced and emerging economies (Figure 3). Since markups are observed at the firm-level, in contrast to market concentration rates, these studies can also look into the distribution of markups across firms to identify where market power is growing. De Loecker et al. (2020) and Diez et al. (2021) find that the rise in average markups has been mainly driven by high-markup firms growing faster than other firms and by a greater dispersion in the distribution of markups (more firms enjoying increasingly higher markups).

Figure 3. Evolution of average markups by world regions



Source: De Loecker and Eeckhout (2018)

In relation to investment, however, it is not clear what the aggregate effect of this rise in markups has been. While Guiterrez and Philippon (2017) do find a negative relation between rising markups and aggregate investment, Autor et al. (2020) argue that the rise in aggregate markups could, in fact, be consistent with the emergence of more efficient, highly innovative "superstar" firms, which would actually bring investment rates up. If this were the case, the investment slowdown would have to be explained by other factors such as those indicated above.

Diez et al. (2018) estimate a panel-data regression model using firm-level data from listed firms of 74 countries, from 1980 to 2016, and find that higher markups do not have a consistently negative effect on investment. Their study finds a non-monotonic inverted-u shaped relation between markups and investment at the firm-level, similar to the relation between competition and innovation found in Aghion et al. (2005). According to their results, increases in market power initially have a positive effect on investment ('post-investment rents'). As markups reach higher values, however, the effect wears off and

eventually becomes negative, as most of the literature would expect to happen in firms with high market power.

Looking at market power more broadly, that is, taking both markups and market concentration into consideration, Davis and Orhangazi (2021) also find an ambiguous relation between market power and investment. In their study, which focuses on the industry-level relation between market concentration rates, markups, investment behavior and profitability in the United States, the authors find that more concentrated markets (typically considered to be less competitive) actually tend to have higher investment levels than less concentrated markets, and that higher markups are not always found in more concentrated markets. In fact, the authors find cases of high market concentration rates with low markups, low profit rates and average investment rates, and yet other cases in which firms enjoy high markups in low concentration markets (indicating some form of market power that is not related to market concentration) with no clear relation to investment.

In summary, the relation between the rise in market power and the observed investment slowdown in advanced economies is not clear, and the empirical evidence is somewhat inconclusive. Nevertheless, it should be noted that most of these studies are done at the aggregate (macro or meso) level, without looking directly into underlying firm-level dynamics that explain how firms manage to obtain higher levels of market power, and how that affects their competition-related incentives to invest. We believe that studying these dynamics empirically and at the firm-level, can offer important insights for understanding the relation between the rise in market power and the aggregate investment slowdown.

3. Markups and market shares

Data

To study these relations at the firm level we use annual financial data obtained from the ORBIS database for listed firms of 35 OECD countries during the years 2012-2020. Financial statements in ORBIS have been standardized and are comparable across jurisdictions and, while the availability of historical data in ORBIS is lower than in other datasets such as Compustat, its geographical coverage is much larger and has been used for this reason in other studies concerned with multi-country firm-level analyses (Gal, 2013; Gopinath et al., 2017; Diez et al., 2021).

For our study, we focus on non-financial corporations[1] that present consolidated financial statements. Financial data are deflated using the GDP deflator. Additionally, firm-level data typically require some treatment in order to eliminate anomalous or irrelevant observations. Since we are only considering listed firms, we eliminate any observations for years in which the firm was not yet listed or had already been delisted. We also drop observations that represent a large jump in firm assets or sales[2] since these are typically residual observations representing a firm's starting years or last years. Firms with zero or negative profits, sales or capital stock throughout the entire observation window are also eliminated. Finally, we winsorize all of our variables of interest by dropping observations in the top and bottom 1%. As a result, we end up with a panel of over 100,000 observations for 13,000 firms from 2012-2020.

Price markups and investment rates can be calculated directly for each firm-year observation in our sample. We estimate markups as profit margin (sales revenue minus costs of goods sold) relative to costs of goods sold. Though many studies have used the method for estimating markups developed by De Loecker and Warzynski (2012), this

method has recently been called into question (Bond et al., 2021; Doraszelski and Jaumandreu, 2021). Doraszelski and Jaumandreu (2021) argue that the estimation of output elasticities required to calculate these markups are not robust to differences in demand across firms or time, thus leading to biased estimated of price markups. Additionally, the entire estimation procedure relies on cost minimization of a representative production function, which requires the strong assumption of common production technologies across firms within the same market.

While our markup is not an exact measure of price relative to marginal cost, similar measures are commonly used in the literature as approximations given the lack of more detailed information (Aghion et al., 2005; Gutierrez and Philippon, 2017; Grullon et al., 2019; Davis and Orhangazi, 2021). More importantly, as we will show later on, our stylized facts obtained using profit margin relative to costs of goods sold are largely in line with those found in previous studies using the De Loecker and Warzynski method (Diez et al., 2021; De Loecker et al., 2020).

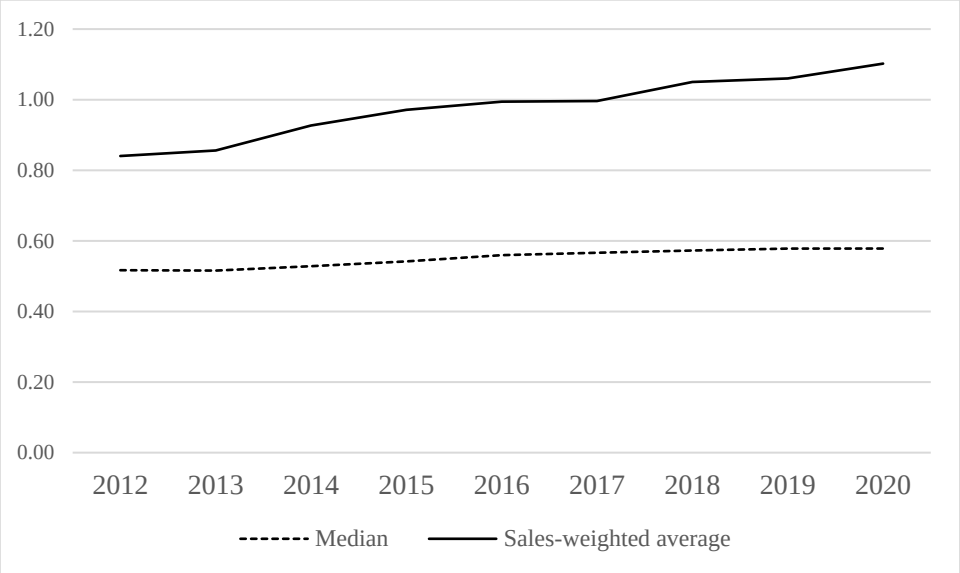
Estimations of market shares present a different set of complications since direct calculation of market shares using firm-level data are typically unreliable in markets where listed firms only represent a small portion of the market (Diez et al., 2018; Grullon et al., 2019; Davis and Orhangazi, 2021). To mitigate this effect we calculate market shares of listed firms by considering sales of both listed and non-listed firms available in ORBIS. However, even after including non-listed firms, many markets still present unreasonably high concentration rates which are likely a result of incomplete data collection and not underlying market structures (see Table A1). To further avoid possible biases introduced by these firms, we calculate pseudo market shares for a given year considering only the largest 20 firms in markets with at least 20 firms[3]. As a result,

however, the number of market share observations is reduced to roughly one third of our initial sample (see Table A2 for summary statistics).

Markups

As we show in Figure 4, both the median markup and the sales-weighted average markup in our sample appear to have risen steadily during in the past decade. Most studies typically consider the sales-weighted average markup, but this measure can be affected by composition effects such as high-markup firms becoming larger or large firms increasing their markups. As we mentioned earlier, De Loecker et al. (2020) find that the rise in the sales-weighted average markup since 1980s is, in fact, mainly driven by high-markup firms becoming larger. While the number of high-markup firms and the average markups of these firms have also increased, the authors find that these changes have contributed less to the overall increase in the sales-weighted average markup since the 1980s than the growth of high-markup firms.

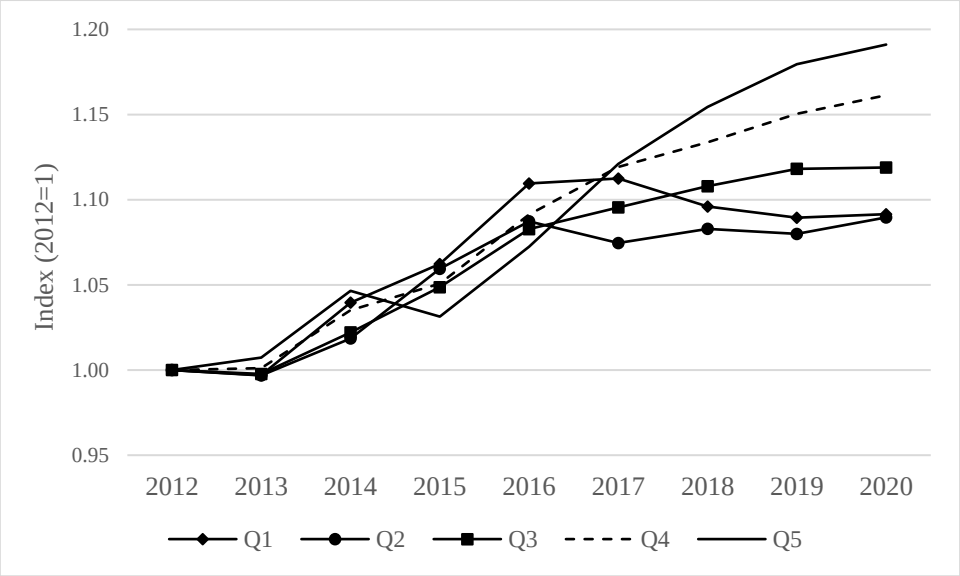
Figure 4. Evolution of average markups



Source: Own elaboration using data from ORBIS

In our case, we are more interested in knowing if the rise in markups can be considered a generalized phenomenon that could have a significant effect on firm-level investment behavior overall, and not just in a specific subsample of firms. For this reason, the rise in the median markup is a more significant observation for us, since it shows that market power has increased for most firms, even if there will likely be heterogeneities in these rising markups.

Figure 5. Evolution of median markups by quintiles



Source: Own elaboration using data from ORBIS

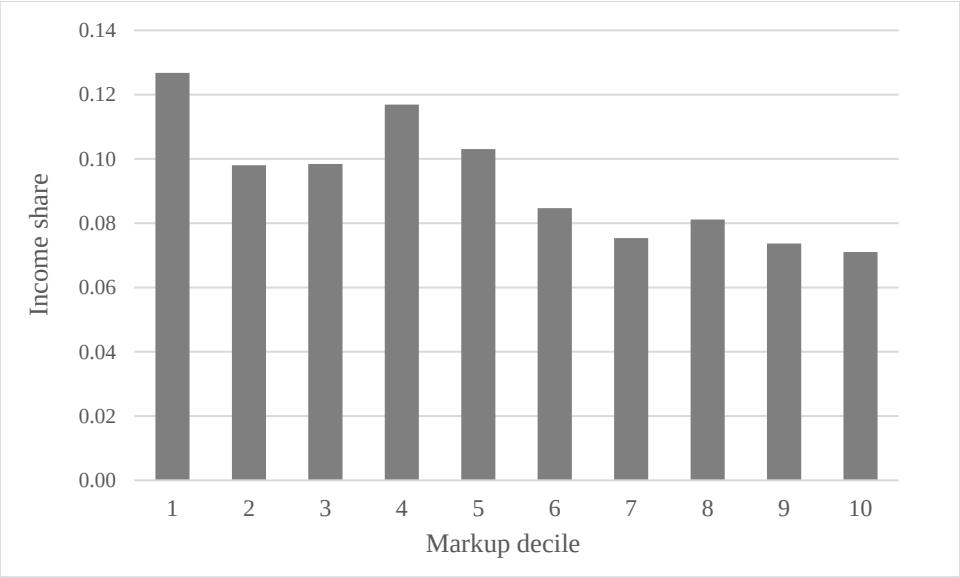
Looking at Figure 5, where we see the evolution of the median markup for each quintile of the markup distribution, we find that this generalized rise in markups appears to have lasted only until 2016. After this year, even though the median still continued to rise, markups in the bottom two quintiles stabilized and markups in the upper quintiles grew at a considerably stronger rate. As of 2020, markups in the top quintile doubled the increase observed in the bottom quintiles. To put this observation in context with previous findings (Diez et al., 2018; De Loecker et al., 2020; Diez et al., 2021), we can see that, even if markups have gone up for most firms, there is also a tendency towards a stronger

polarization of markups by which markups grow faster in segments of the population with already high markups, and low-markup segments fall behind.

Previous studies have typically associated these high markups to pseudo-monopolists, large multinationals or "superstar" firms (Gutierrez and Philippon, 2017; De Loecker et al., 2020; Autor et al., 2020) since they find rising markups to be related to greater market concentration or weaker competition. The standard reasoning is that higher markups can only be enjoyed if firms manage to beat competition and gain higher market shares. In fact, we typically expect firms to turn any competitive advantage they may have into higher market shares first, in order to ease off their survival constraint, and only later would they be able to start raising prices without fear of losing their dominant position. The observed polarization of markups, therefore, would seem to indicate greater market power and larger monopolist rents among market-dominating firms.

However, if we look at the relation between markups and firm size, what we find is quite the opposite. Figure 6 replicates, using our own data, a graph presented in Diez et al. (2021) which shows the share of income (relative to the total sample) of the firms in each decile of the markup distribution. What we find is a generally negative relation between markups and firm size, such that larger firms actually tend to have lower markups than smaller firms.

Figure 6. Income share per markup decile



Source: Own elaboration using data from ORBIS

This observation, however, is not altogether new. Diez et al. (2021) also find a persistently negative relation between size and markups, until deciles 9 and 10, where the income share grows slightly. The increase in firm size in these upper deciles leads the authors to conclude that there is a non-linear u-shape relation between markups and size which would be consistent with the standard notion that larger firms (pseudo-monopolists or "superstar" firms) are the ones enjoying the highest markups, even though these top markup deciles still largely contain relatively smaller firms. If, as we see in Figure 6, firms that have higher markups are generally smaller firms, it would seem that markups (compared across the entire population of firms) reflect something different than market-dominant positions.

One possibility, which is briefly considered in Diez et al. (2021), is that firms with high markups and smaller firm size could represent something similar to niche firms that manage to exert great degrees of market power on a well segmented section of the market. If this is the case, then the generally negative relation between firm size and markups found in Figure 6 would suggest that this form of 'segmented competition' is more generalized than most of the literature acknowledges. Furthermore, if the rise in aggregate

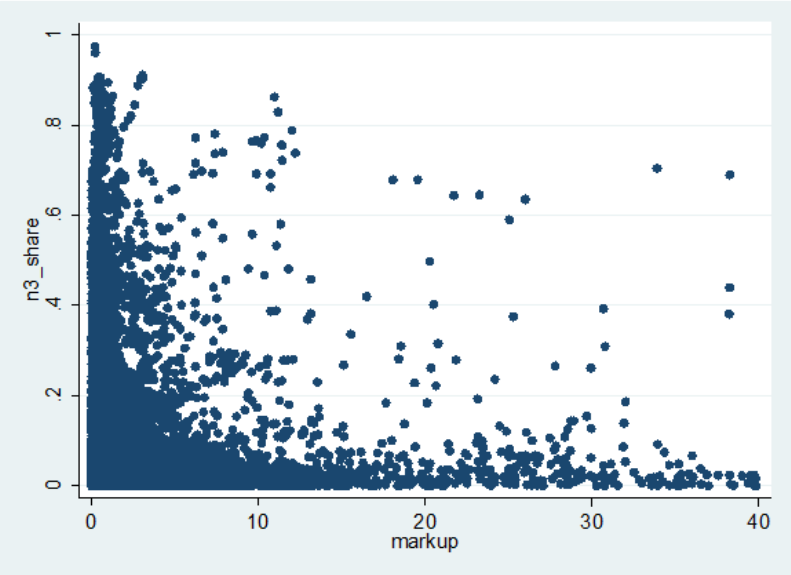
markups over the past decades (which appears to have been driven by high-markup segments) is also related to the emergence of these niche firms, then the current landscape of market power in advanced economies is not just one where market-dominant firms have managed to gain even more control of their markets, but also, and perhaps more importantly, one where smaller firms have found ways to target specific market segments in order to escape competition.

We should bear in mind, however, that the expected relation between markups and firm size laid out above is, *sensu strictu*, a within-market relation. A smaller firm (compared to the entire sample of listed OECD firms) may actually be a market leader in a smaller industry or country, which could also potentially explain its high markup. Similarly, very large firms may be average-sized firms within very large industries facing strong competition, and again, this could also explain their lower markups. Therefore, in order to fully understand the link between these two variables, we need to look at the relation between markups and market shares.

Market shares

Figure 7 shows the relation between markups and market shares. Sa explained above, to obtain more reliable estimates of market shares we calculate the share of total sales among the top 20 firms in each market. This figure reveals an interesting pattern. First of all, we typically find higher markups in firms with low market shares. Only in a few exceptional cases do firms with high market shares manage to enjoy very high markups (these seem to be cases of pseudo-monopolists or “superstar” firms).

Figure 7: Market shares and markups



Source: Own elaboration using data from ORBIS

However, the relation between market share and markups is not a directly negative relation, as we could have inferred from Figure 6. Instead, what we find is that, as firm gain market shares, their markups tend to gravitate towards more moderate values. In other words, there appears to be a certain trade-off by which firms that intend to reach high market shares either need to keep prices in line with competition (Shaikh, 2016; Kiel, 2017; 2019) or face diminishing returns to scale, and where very high markups can generally only be enjoyed by smaller firms that find it difficult to upscale their activity and keep markups high.

This trade-off would be more in line with Shaikh (2016)'s *theory of real competition*, where market leaders act as *regulating capitals*, setting prices to maximize profits in line with their state of *regulating* technology (that which is easily reproducible and generalized) and other market structure conditions. Market leaders will, therefore, determine the *regulating profit rate*, while laggards may (i) struggle to survive under the conditions imposed by these prices (the bottom-left corner of the figure), (ii) have better but not generalizable technologies, or operate in niche market segments, that allow them

to charge higher prices (the bottom-right side of the figure), or (iii) have better and generalizable technologies that make them potential competitors (and move up along the curve shown in the figure).

In any case, this non-linear relation implies that market shares and markups are not necessarily interchangeable measures of market power. Davis and Orhangazi (2021) argue that market concentration rates can be insufficient measures market power if there are high-markup firms in low-concentration markets. Similarly, if market shares or market-dominating positions are also an expression of some form of market power (as most of the literature seems to accept), then market power cannot be fully accounted for by only considering markups. To analyze the effect of market power on investment behavior at the firm-level we should, therefore, take both dimensions into account.

4. Theoretical model and estimation method

In order to see how each of these dimensions of market power affects investment behavior, we estimate a firm-level investment function. The determinants of firm-level investment have been the subject of extensive debate in economic literature (Abel and Blanchard, 1986; Blundell et al., 1992; Brauman and Kopcke, 2001; Carruth *et al*., 2000; Chirinko, 1993; Fazzari and Petersen, 1993; Jorgenson, 1971), and there is a general consensus that profitability, demand and cost of funding are important determinants of investment behavior. In consequence we estimate the following regression model:

$$\frac{I}{K_{it}} = \beta_0 + \beta_1 \frac{I}{K_{i,t-1}} + \beta_2 Q_{i,t-1} + \beta_3 \frac{S}{K_{i,t-1}} + \beta_4 \frac{D}{K_{i,t-1}} + \beta_5 markup_{i,t-1} + \beta_6 market\ share_{i,t-1} + \tau_t + \eta_i + \epsilon_{it}$$

Where *I/K* represents firm *i*'s investment expenditure relative to capital stock (property plant and equipment) at time *t*, *Q* represents the Q-ratio (calculated as stock market capitalization relative to total assets) as a measure of firm profitability, *S/K* represents sales volume relative to capital stock as a measure of demand pull and *D/K* represents the debt to capital ratio as a measure of financial fragility and cost of external funding. To this equation we add two measures of firm-level market power: *markup* represents price markups, defined as profit margin relative to costs of goods sold and *market share* represents share of total sales volume among the largest 20 firms in a given sector and country.

We include a lag of the dependent variable, since investment is better specified as a dynamic process containing an autoregressive component and a set of exogenous variables (Bond and Meghir, 1994; Brauman and Kopcke, 2001; Tori and Onaran; 2020). All other regressors are also lagged since a firm's investment decisions at time t is expected to be made in the previous period or on the basis of information available to the firm at the start of the current period (Abel and Blanchard, 1986; Orhangazi, 2008). Additionally, since we are working with panel data, we include time dummies (τ_t) to control for time fixed effects.

To avoid any potential individual fixed effects (η_i) from biasing our estimated coefficients, we estimate the coefficients in our model using the system-GMM estimator with instrumental variables as in Arellano and Bover (1995) and Blundell and Bond (1998). Sector and country dummies are not included since they are dropped from the first-difference equation and are collinear to individual fixed effects in the level equation. Instead, we use country-sector cluster-robust standard errors[4] to control for cross-sectional correlation and heteroscedasticity in the error term. Finally, observations are also weighted by country-sector so that coefficient estimates do not mainly reflect

empirical relations observed in countries or sectors with more observations (Love, 2003; Cameron and Trivedi, 2010).

In line with previous studies on firm-level investment behavior we expect the Q-ratio to be positively related to investment, since profitability will lead to high returns on investment and facilitate external funding (Blundell et al., 1992; Bond and Meghir, 1994). We also expect the sales-to-capital ratio to be positively related to investment, since sales largely represents the strength of demand for a firm's goods or services and this will typically lead to greater investment through a sales-accelerator mechanism (Brauman and Kopcke, 2001; Orhangazi, 2008; Tori and Onaran, 2020). The debt-to-capital ratio is expected to have a negative effect on investment, since higher indebtedness will signal financial fragility and increase external funding costs (Fazzari and Petersen, 1993; Tori and Onaran; 2020; Nikolaidi, 2014). However, indebtedness could also have a positive effect on investment if firms mainly rely on external funds to finance investment, and the final effect could be ambiguous.

As for our measure of market power (market shares and markups), we expect them both to have a negative effect on investment. While firms with high market shares in oligopolistic settings can, under certain circumstances, maintain high levels of investment to defend their position from potential competitors (Athey and Schmutzler, 2001; Buehler and Schmutzler, 2008), more generally, a higher degree of market power (higher market shares) is expected to reduce incentives to invest since firms face lower competitive pressures. Additionally, in line with most of the literature (De Loecker et al., 2020; Grullon et al., 2019; Gutierrez and Philippon, 2017) we expect higher markups to also reflect lower competition, and therefore, have a negative effect on investment, even if the effect may initially be positive (Diez et al., 2018).

This does not mean that firms with high market power will necessarily have low levels of investment, but rather that their investment levels are expected to be lower than those of firms with less market power, after controlling for the effect of all other regressors. Importantly, since market shares and markups are not directly related (as we saw in section 3), we expect each variable to reflect the effect of different forms of market power on investment behavior (high market shares indicating market-dominant positions, and high markups mainly reflecting niche firms in forms of 'segmented competition'). In addition to the base model containing both markups and market shares, we estimate two additional models to take full advantage of the whole set of observations (since using market shares greatly reduces our estimation sample): one using only markups, and another using markups and squared markups to test for any non-linear effects such as those found in Diez et al. (2018).

5. Estimation results

Table 1 presents the results of our estimation. The p-values of the Hansen test in all three models show no sign of overidentification[5] and the autocorrelation tests also show no sign of autoregressive behavior in the error term. Table 1 shows the results for three different specifications of our model: Column I provides results for the full model using markups and market shares, Column II provides results for the model using only markups, and Column III provides results for the model using markups and squared markups. In order to use more reliable estimates of market shares, the results presented in Column I are based on a restricted sample of the largest 20 firms in each market, whereas the results presented in Columns II and III are based on the full sample of firms.

Beginning with the traditional determinants of firm-level investment, we find the lagged term of investment rate to be positive and significant, as expected, in all three models.

However, while the Q-ratio, the sales-to-capital ratio and the debt-to-capital ratio present the expected signs in most cases, only the coefficient for the Q-ratio seems to be statistically significant. Considering that our sample consists of firms from many different sectors and countries where demand elasticities of investment may vary and where financial fragilities related to costs of funding may appear at different levels of indebtedness, this is not entirely surprising.

Table 1. Estimation results

Variables	I Markups and shares	II Markups only	III Markups squared
I/K_{-1}	0.2032***	0.2289***	0.2262***
	(0.0585)	(0.0391)	(0.0380)
Q_{-1}	3.8690*	5.5805***	5.2002***
	(2.1093)	(1.4103)	(1.3303)
S/K_{-1}	0.0127	0.0878	0.0872
	(0.0803)	(0.0927)	(0.0979)
D/K_{-1}	0.1472	-0.0006	-0.0062
	(0.1202)	(0.0698)	(0.0839)
$Markup_{-1}$	1.1977*	0.1298	1.5905***
	(0.6482)	(0.2384)	(0.5786)
$Market\ share_{-1}$	-0.7321**		
	(0.3057)		
$Square\ Markup_{-1}$			-0.0524***
			(0.0182)
Constant	16.2583***	10.1694***	8.9831***
	(3.6214)	(2.1905)	(2.1595)
Observations	18,111	65,940	65,940
Number of id	3,300	10,496	10,496
Cluster variable	country-sector	country-sector	country-sector
Num. Clusters	147	423	423
Year FE	YES	YES	YES
Num. Instruments	127	107	127
Hansen test	0.380	0.197	0.310
AR1	0.000	0.000	0.000
AR2	0.725	0.200	0.247
Wald Chi-square	1082	2864	2856

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

If we look at Column I, where we estimate the full model using model market shares and markups, we find that both these variable also have a significant effect, indicating that market power plays an important role in firm-level investment. Interestingly, however, only the effect of market share is negative (reducing investment by 0.73 percentage points for every 1-point increase in market share) In contrast, markups are estimated to have a positive effect on investment (increasing investment by 0.12 point per each 10-percentage-point increase in markups), even after controlling for demand pressure (S/K) and profitability (Q).

These results, we believe further highlight the different aspects or dimensions of market power captured by each variable. When firms are able to charge higher markups, this leads to stronger investment levels, possibly because they wish to upscale their activity in order to obtain a stronger position within their market or because their higher markups are the result of efficiency-gains related to innovation. However, as firms reach dominant positions in their market (represented by higher market shares), their level of investment weakens since additional gains from upscaling activity or innovating are likely to become smaller.

The opposite effects of markups and market shares are not contradictory if we consider the relation between these two variables found in section 3. Firms with high market shares tend to have moderate markups, such that the negative effect of market shares on investment is likely to dominate. Similarly, firms with high markups tend to have lower market shares, such that the positive effect of markups on investment is likely to dominate. In the case of firms with low (high) markups and low (high) market shares the dominating effect is ambiguous, but in any case higher markups will generally have a positive effect for similar levels of market shares (indicating higher profitability of

investment), and market shares will generally have a negative effect for similar levels of markups (indicating lower growth opportunities).

While the results in Column I are limited to a smaller subsample of larger markets (since we cannot measure market shares for firms in markets with few observations), we also find a generally positive effect of markups on investment when considering the entire observation sample (Columns II and III). As in Diez et al. (2018), the relation between markups and investment appears to be non-monotonous and inverse-u shaped. When the squared-markup term is omitted (Column II), markups have a positive but not significant effect on investment. However, once the squared-term is included (Column III), we find that markups have a positive and significant effect on investment that becomes negative at high markup levels as a result of the negative effect found in the squared-markup term.

As we mentioned earlier, Diez et al. (2018) explain these results by comparing them to the inverse-u shape relation between competition and innovation found in Aghion et al. (2005). Initially, firms in more competitive markets (lower markups) have strong incentives to invest (innovate) in order to escape competition. By investing/innovating firms become more efficient, leading to higher markups, and creating a positive feedback mechanism between investment and markups. Only as firms reach higher levels of market power do these returns from investment/innovation begin to wear off, eventually leading to lower levels of investment.

The problem with this explanation is that it, again, identifies higher markups with higher market shares. However, this is not consistent with the generally negative relation found between markups and firm size or the fact that market leaders do not typically have high markups (as we saw, in section 3). If high markups represent firms escaping competition, our data seem to suggest that this is done by successful market segmentation rather than by gaining market share. In fact, beating competition to greater market shares apparently

involves a trade-off by which firms lower markups to keep in line with competition rather than charging increasingly higher markups.

Instead, we believe the negative effect found in Column III for very high markups (the squared-markup term) is more likely to be related to the fact that niche firms do not expect high returns from growing their activity and therefore keep investment levels low. If 'post-investment rents' represented by markups wear off as firms gain market share (as suggested by Aghion et al., 2005), this would more generally appear to involve a movement towards the left-hand side of the inverted-u shape, as a result of the apparent trade-off between market shares and markups.

For example, if a small firm with high markups is an innovator, it is likely to gain market share but, in the process, lower its markup as it becomes a regulating capital (Shaikh, 2016). The negative effect of a higher market share (which we see in Column I), together with a decreasing markup, will eventually bring investment levels down. If a small firm with high markups is instead a niche firm, it is likely to continue targeting specific market segments and attempt to raise markups while lowering investment (resulting in the negative effect on the squared-markup term found in Column III).

6. Discussion

Our estimation results largely describe two main scenarios where rising market power can lead to lower investment levels. The first scenario has to do with rising concentration rates. Higher market shares are found to have a negative effect on investment behavior, and therefore, greater concentration rates will likely lead to lower investment levels. This is the scenario most studies on market power and concentration have in mind (Eggertsson et al., 2021; Grullon et al., 2019; Gutierrez and Philippon, 2017). However, contrary to

the standard narrative, we find that these high market shares do not typically lead to higher markups, but entail a trade-off between markups and market shares that seems more in line with dynamics described in Shaikh (2016)'s theory of real competition than by the notion of pseudo-monopolists or "superstar" firms (Autor et al., 2020; Diez et al., 2021).

The second scenario can thus be characterized as one where a larger number of niche firms manage to charge very high markups on well-defined market segments while not aspiring to become industry leaders. Very high markups are also found to have a negative effect on investment behavior, and therefore, in a scenario like this, the rise in high-markup firms would also lower aggregate investment rates.

Interestingly, if the rise in aggregate markups over the past decades has mainly been driven by high-markup segments (as shown in Diez et al., 2021), it would seem that the nature of market power in advanced economies is better described both by a proliferation of niche firms that act as monopolists in their specific market segments together with a growing accumulation of market power and surplus extraction in the hands of large corporate behemoths. We would thus be witnessing the development of a kind of 'segmented competition' with growing market power for firms in more narrowly defined product-markets or niches. Given the developments in information technologies, big-data, advertising techniques, and core-competencies-oriented corporate strategy (which would greatly favor market segmentation strategies), together with the fact that globalization has increased the degree of competition faced by large market-dominant firms, this outcome is not entirely surprising.

In fact, it is possible that both of these scenarios are actually interdependent. Market-segmentation can be a valid survival strategy for market laggards in more concentrated markets where competing for higher market shares via price undercuts is more complicated, or where only market-dominant firms have the financial capacity to carry

out efficiency-improving innovations and will carry out pre-emptive mergers to defend their market shares (Bryce and Dyer, 2007). While both scenarios would entail an overall negative effect on investment behavior, correctly identifying how market power is being exerted is relevant in terms of its effects on other aspects of economic performance (such as productivity growth, innovation, consumer surplus or income distribution) and to accurately design pro-competition policy measures. More importantly, by only looking at the evolution of markups, it is not possible to determine how firms are reacting to changes in market structure and competitive pressures and how these may be driving rises in markups.

7. Conclusions

Higher market power has traditionally been associated to lower incentives for investment. Given that a generalized rise in market power, together with a slowdown in aggregate investment levels are two stylized facts of advanced economies in the past decades, a question that immediately comes to mind is whether the rise in market power can help explain this investment slowdown. While some recent studies have approached this question through macro or sector-level analyses, in this article we look at market power and investment at the firm level to see what the underlying dynamics behind these macro trends may be.

Our study offers three main results. First, we find that high markups are generally found in smaller and not larger firms. While this does not rule out the existence of "superstar" firms or pseudo-monopolists that may enjoy a strong market-dominant position, our data show that higher markups are more common in relatively smaller firms. Interestingly, if the aggregate rise in market power observed in other studies has been driven mainly by these higher markup segments of the population (De Loecker et al., 2020), then the current

state of market power in advanced economies is perhaps better described as one where firms are becoming increasingly successful in targeting specific segments of the market on which they charge higher markups, a sort of 'segmented competition', in addition to the existence of "superstar" or pseudo-monopolist firms. This distinction is relevant in terms of its potential effects on consumer surplus, income distribution, innovation or productivity growth, and particularly in terms of the effectiveness of pro-competition policy measures developed by governments.

Secondly, if we believe that market leaders or market-dominant firms have some form of market power as well, then our data suggest that markups are not fully comprehensive measures of market power. In fact, looking more closely at the relation between markups and market shares, we find some sort of trade-off between these two variables that resonates with the notion of regulating capitals in Shaikh (2016)'s theory of real competition. Our data show that markups of market leaders tend to gravitate towards moderate markups (as they adjust prices to stay competitive or face decreasing returns to scale in their more generalizable technologies), and very high markups are typically found in firms with lower market shares that could be emergent innovators or niche firms that cannot upscale their activity and at the same time retain these high markups. In other words, to accurately measure market power (at the micro and macro level) both dimensions –markups and market share– should be taken into consideration.

Our third main result is that, while higher market shares are estimated to negatively affect investment behavior, higher markups generally have a positive effect. As in Diez et al., (2018), we only find a negative effect on investment in the case of firms with very high markups. The opposite effect of market shares and markups on investment is actually not contradictory if we consider the observed trade-off between these two variables. In fact,

we believe it offers further insight into the dynamics behind the inverted-u shape relation between markups and investment (Aghion et al., 2005; Diez et al., 2018).

For the most part, higher markups stimulate investment behavior and, therefore, appear to reflect 'post-investment rents' (Aghion et al., 2005). In other words, some degree of market power is good for investment. However, as firms gain market share, this generally leads to lower markups (reducing 'post-investment rents') and ultimately weakens investment behavior. The negative effect of very high markups on investment we believe can more generally be explained by niche firms that have high market power (markups) in specific market segments and low incentives for investment given their less generalizable business models.

These results shed some light on the underlying firm-level dynamics between market power and investment that can help us understand the effect of a generalized increase in market power on aggregate investment. At the aggregate level, this effect will ultimately depend on where these rising markups are concentrated. If these rising markups are driven by high-markup firms, as our data and previous studies seem to indicate, then our research suggests that we should expect to find lower aggregate investment rates. This, however, would not come necessarily as a result of greater concentration and the growing presence of "superstar" firms, but could also be the result of the generalization of 'segmented competition' strategies that do not target firm-growth as much as high profit margins.

We should note, however, that our study presents some limitations due to data availability, specifically regarding estimations of market shares across the entire sample of firms. Future studies could help determine if the trade-off between market shares and markups we find in our data is also observed in a broader set of markets or industries, or if, perhaps, there are different competition regimes (as suggested by Davis ad Orhangazi, 2021) that give rise to other interrelations between markups, market shares and investment. While

our study shows a general relation between market power and investment at the firm-level, the existence of different competitive regimes could entail more specific patterns, which could prove to be important in determining how micro-level relations in terms of market power translate into aggregate investment levels.

Appendix

Table A1. Number of market observations by firm count

Market size	Markets	Market-year observations
Full sample	*1,683*	*14,649*
At least 20 firms	*219*	*1,614*
At least 50 firms	*79*	*568*

Table A2. Summary statistics

Variable	Mean	Std. Dev.		Observations
I/K	22.065	overall	22.998	N = 95087
		between	20.935	n = 12910
		within	15.296	T-bar = 7.365
Q	1.144	overall	1.333	N = 90850
		between	1.299	n = 12053
		within	0.697	T-bar = 7.538
S/K	16.266	overall	36.693	N = 100295
		between	37.082	n = 13449
		within	18.953	T-bar = 7.457
D/K	8.299	overall	21.827	N = 101758
		between	21.765	n = 13504
		within	12.748	T-bar = 7.535
Markup	1.418	overall	3.014	N = 93841
		between	3.249	n = 12787
		within	1.446	T-bar = 7.339
Market share	5.749	overall	8.797	N = 27876
		between	8.559	n = 4249
		within	1.958	T-bar = 6.561

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[1] Firms in Financial Services (NAICS code 52) and Real Estate (NAICS code 53) are not considered.

[2] Following Bloom et al. (2004) and Tori and Onaran (2020).

[3] The United States Census Bureau calculates industry-wide HHIs using the top 50 firms in each industry. This criterion, however, would have significantly reduced the number of markets in our sample.

[4] The use of both countries and 2-digit NAICS codes was necessary to ensure a sufficiently large number of clusters following Roodman (2009).

[5] Instruments were limited to two lags for the first-difference equation to avoid instrument proliferation.