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Monetary policy and local industry structure

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Abstract

We study how monetary policy affects local market competition in a union of countries experiencing different economic conditions: the euro area. We find that when monetary conditions tighten (loosen), from the point of view of an individual economy, market concentration increases (declines). This effect is more pronounced when interest rates have been low-for-long, and it is stronger in sectors that are relatively more sensitive to changes in financing conditions. The underlying mechanism is a decline (increase) in short-term debt and investment by smaller and medium-size firms, relative to large firms, following monetary policy tightening (easing).

JEL classification: E2, G1, G12.

Keywords: Eurozone, Monetary Union, Monetary Policy, Low Interest Rates, Competition.

Non-technical summary

While the creation of the euro was widely expected to become a catalyst for further economic integration within Europe, recent evidence suggests that especially after the global financial crisis, incomes, unemployment rates, and current account balances across the euro area have diverged rather than converged. Yet, very little is known about how one-size-fit-all monetary policy affects the industry structure in a currency area where individual countries can experience different economic conditions. This is an important question because competition in product markets crucially affects a number of factors that are both related to welfare and underpin the question of economic convergence versus divergence, such as productivity and wages.

We study how deviations from an "optimal" monetary policy rule, from the point of view of an individual euro area economy, affect industrial competition in local markets. We study eleven euro area economies during the 20 years after the introduction of the euro (1999–2018). For each country and for each point in time, we compute a country-specific Taylor rule derived from local inflation expectations and the local business cycle. The difference between the policy rate set by the ECB and the "optimal" rate implied by a country-specific Taylor rule then constitutes an exogenous measure of the monetary policy stance, from the point of view of the individual country. We then map changes in the monetary policy stance into changes in the local industry structure at the sector level.

Our main finding is that there exists a significant positive correlation between how tight the monetary policy stance is and the HHI. In particular, we find that an increase (decrease) in the difference between the actual policy rate and an "optimal" country-specific policy rate is associated with an increase (decrease) in market concentration, and this effect is sizeable and significant. The effect is stronger the longer the country has experienced low interest rates, suggesting that the strongest anti-competitive effect of policy cuts is realized when exiting a low-for-long interest rate environment.

We also study some of the microeconomic channels responsible for the main effect. We identify one underlying mechanism whereby smaller firms grow relatively faster (more slowly) in response to a reduction (increase) in policy rates, especially when the policy stance is already accommodative. Digging further, we find that smaller firms reduce (increase) their investment and debt when monetary policy tightens (loosens).

The totality of the facts we document suggests that in the euro area, low interest rates benefit smaller firms at the expense of larger ones. This is plausibly because the euro-area is a bank-based economy where monetary policy is largely transmitted via bank balance sheets, and because of the importance of bank credit for small firms. At the same time, our results also suggest that the competitive advantage that small firms derive from a low-interest-rate environment can be undone when the monetary policy stance reverses.

1 Introduction

The academic consensus is that similar to the US economy for the first 100-150 years of its history, the economy of the euro area does not fit the criteria for an optimum currency area (Lane, 2021).[1] While the creation of the euro itself was widely expected to become a catalyst for further economic integration within Europe, the evidence suggests that especially after the global financial crisis, incomes, unemployment rates, and current account balances across the euro area have diverged rather than converged (e.g. Corrado et al. (2005), Ramajo et al. (2008), Estrada et al. (2013), Mody (2018)). Yet, very little is known about how one-size-fit-all monetary policy affects the industry structure in a currency area where individual countries typically experience different economic conditions. This is an important question because competition in product markets crucially affects a number of factors that are both related to welfare and underpin the question of economic convergence versus divergence, such as productivity and wages (e.g., Nickell (1996), Fabrizio et al. (2007), and Caggese (2019)).

We go to the heart of this question by studying how deviations from an optimal monetary policy rule, from the point of view of an individual euro area economy, affect industrial competition in local markets. We study eleven euro area economies during the 20 years after the introduction of the euro (1999–2018). For each country and for each point in time, we compute a country-specific Taylor rule derived from local inflation expectations and the local business cycle. The difference between the policy rate set by the European Central Bank (ECB) and the "optimal" rate implied by a country-specific Taylor rule then constitutes an exogenous measure of the monetary policy stance, from the point of view of the individual country. This is broadly consistent with how the literature has estimated "optimal" country-specific or region-specific monetary policy objects, such as Taylor rules and Phillips curves (e.g., Nechio (2011), Drometer et al. (2018), Gilchrist et al. (2018), and Ilzetzki et al. (2020)). We then map changes in the monetary policy stance into changes in the local industry structure at the sector level. We proxy for market competition by the Herfindahl-Hirschman Index (HHI). The HHI is the sum of the squared shares (e.g., in output, assets, or employment) of individual firms, and

[1] This argument was made long before the euro was introduced in 1999 (e.g., DeGrauwe (1992), Eichengreen (1991), Feldstein (1997), Wiplosz (1997)), and it remains true despite deepening integration in product and labor markets and in fiscal policy (e.g., Blanchard et al. (2016), DeGrauwe (2018)

so higher values are associated with dominance by one individual firm, implying lower competition.

Our main finding is that there exists a significant positive correlation between how tight the monetary policy stance is and the HHI. In particular, we find that an increase in the difference between the actual policy rate and an "optimal" country-specific policy rate is associated with a decline in competition, and this effect is sizeable and significant. The effect is stronger the longer the country has experienced low interest rates, suggesting that the strongest anti-competitive effect of policy cuts is realized when exiting a low-for-long interest rate environment.

The main result of the paper is robust to a number of potential confounding factors. First and foremost is the issue of endogeneity. A significant correlation between the monetary policy stance and market competition can obtain in the data for example because less competitive economies are farther from an optimal Taylor rule. Alternatively, a third, unobservable factor (e.g., risk-taking) can be driving both competition and monetary policy. To tackle this criticism, we establish our main result at the sector level, showing that the relation between the monetary policy stance and competition is stronger in sectors that are more sensitive to external finance. We therefore employ an analytical method pioneered by Rajan & Zingales (1998) and allowing the researcher to trace out the sector-specific response of various economic variables to a shock that is common to all firms in a market. The idea is that when the cost of external finance changes, firms in sectors that are technologically dependent on external finance should respond more forcefully than otherwise similar firms in sectors that generate enough revenue to cover their financing needs.

By studying the evolution of sector-specific measures of industrial concentration over time, we are able to employ an empirical framework where we can hold a number of unobservable background forces constant. Among these are sectors-specific trends related for example to shocks to global demand or technology adoption; country-specific trends related for example to regulatory reform or shocks to risk aversion; and heterogeneity at the country-sector related for example to fixed differences in technology or substitutability tween capital and labor. Furthermore, we can control directly for the effect of the country-specific business cycle on industry concentration.

Second, monetary policy can be endogenous to economic development, which may introduce reverse causality bias in the estimation of the effect of policy shocks on industrial concentration even if one distinguishes the effect across sectors. This is because financially dependent sectors could be relatively large in an economy that the ECB places a large weight on when making decisions about the policy rate. We tackle this concern by constructing country-specific measure of the monetary policy stance. We calculate this object as the difference between the actual policy rate and the "optimal" one implied by a local Taylor rule. In this way, we are able to construct country-specific exogenous proxies for the monetary policy stance. This allows us to net out the independent effect on industrial concentration of both the global and the local business cycle.

Third, changes in the Central Banks's monetary policy stance can be correlated with unobservable changes in the global environment that affect industry concentration differently in sectors more and less sensitive to changes in funding conditions. For example, demand for goods produced or services delivered by sectors more sensitive to changes in external funding costs may shift in a way favoring small firms precisely at the time when monetary policy is becoming more accommodative. This would result in a decline in industrial concentration without any direct contribution of monetary policy itself. At the same time, the econometrician will erroneously attribute the decline in sector-level HHI to changes in the monetary policy stance. To address this concern, we run our empirical tests on a sample of European countries whose currency is neither the euro, nor is it pegged to the euro. Ex-ante, these countries should not be affected by changes in the ECB's stance. The data confirm that this is indeed the case, which strengthens further the notion that we are documenting a genuine statistical relation between monetary policy and market competition.

Fourth, we show that the main result of the paper is robust to a large number of alternative empirical choices. To begin with, it obtains regardless of whether we derive the HHI measure from firms' sales or from firms' employment. The correlation between changes in the monetary policy stance and industry structure is also robust to estimating country-specific Taylor rules based on different empirical proxies for the policy rate. Furthermore, the main effect is qualitatively similar independent of the source of the underlying micro data, as well as of whether we calculate the sector-specific proxies for sensitivity to monetary policy shocks based on use of external finance or on the sector's global share of small firms.

Finally, we study the microeconomic channels responsible for the main effect. We identify one underlying mechanism whereby smaller firms grow relatively faster (more slowly) in response to a reduction (increase) in policy rates, especially when the policy stance is already accommodative. Digging further, we find that smaller firms reduce (increase) their investment and debt when monetary policy tightens (loosens). The totality of the facts we document suggests that in the euro area, low interest rates benefit smaller firms at the expense of larger ones. This is plausibly because the euro-area is a bank-based economy where monetary policy is largely transmitted via bank balance sheets, and because of the importance of bank credit for small firms (e.g., (Berger & Udell, 1998)). At the same time, our results also suggest that the competitive advantage that small firms derive from a low-rate environment can be swiftly undone when the monetary policy stance reverses.

Our paper informs the current debate on the evolution of industrial competition. For the United States, recently a number of studies have concluded that market power is on the rise. For example, Gutiérrez & Philippon (2018) analyze the HHI of market concentration as a measure of market power, and document a recent increase in concentration. This conclusion is corroborated by considering a number of trends, such as a rise in firm markups based on a variety of approaches and a decline in a variety of measure of economic dynamism. Some authors (e.g., De Loecker et al. (2020)) have concluded that such trends have an explanatory role in outcomes such as the decline productivity, the rise in inequality and fall in the labour share of income. However, some have argued that market concentration and rising markups are a natural side effect of the rise of global technology giants (and their increased global reach) and that such developments are beneficial for growth, as they could spur investment and innovation. Hartman-Glaser et al. (2019), Autor et al. (2020), and Kehrig & Vincent (2017) focus on the role of large firms. Hartman-Glaser et al. (2019) document that the firm-level capital share has decreased on average, even though the aggregate capital share for U.S. firms has increased. They explain the divergence with the fact that large firms now produce a larger output share even if the labor compensation has not increased proportionately. Autor et al. (2020) show the growing importance of large firms that dominate the market. They show that this leads to higher concentration and decreases the labor share, as also shown by Kehrig & Vincent (2017).

At the same time, while there is already a well developed debate about the evolution of industrial competition in the US, far less is known about the degree and evolution of market power and competitive intensity in Europe. Nevertheless, recent evidence tentatively points to a broad-based decline in concentration in Europe. Gutiérrez & Philippon (2018) document a persistent decline in the HHI of market concentration in a sample of European countries between 1997 and 2007. Cavalleri et al. (2019) find that, in contrast to the situation in the US, market power metrics have been relatively stable over recent years and – in terms of the markup specifically – marginally trending down since the late 1990s, driven largely by the manufacturing sector.

Our work also contributes to a growing body of research on the impact of both conventional (e.g., Gertler & Gilchrist (1994); Jimenez et al. (2012)) and unconventional monetary policy (e.g., Acharya et al. (2018); Eser & Schwaab (2016); Giannone et al. (2012); Gilchrist & Zakrajsek (2013); Gilchrist et al. (2015); Heider et al. (2019); Ferrando et al. (2019)) on both nominal and real economic variables. Since the financial crisis in 2008-09, Central Banks around the world have been busy employing a range of tools to revive economic activity and to bring inflation closer to policy targets. One of the main tools in this arsenal has been keeping the policy rate low, and committing to do so for a prolonged amount of time. There has been some analysis of the ability of such policies to maintain inflation close to target (see, e.g., Gertler & Karadi (2015), Jarocinski & Karadi (2019), and Swanson (2021)). More relevant to our work, some authors have also conceptualized and documented international spillovers associated with monetary policy shocks (e.g., Fratzscher et al. (2016), Popov (2016), Morais et al. (2019) Quadrini (2020)). At the same time, this literature has typically analysed the cross-border transmission of monetary policy from more to less developed economic areas. In contrast, we analyse the cross-border implications of common monetary policy within a currency area.

There has been comparatively little examination of the real effect of monetary policy, for instance, on well-defined characteristics in product markets, such as industrial competition. A major exception is a recent paper by Liu et al. (2022) which finds that by benefiting incumbents more than entrants, low interest rates have contributed to increasing industrial concentration in US markets. We show that the opposite is true in the euro area, likely because monetary policy in Europe is primarily transmitted to the real economy through banks. As small and medium-sized enterprises are more bank-dependent than large firms (Berger & Udell, 1998), they benefit more from changes in the level and composition of the bank credit supply, allowing them to grow relatively faster than large firms.

The aforementioned paper by Liu et al. (2022) is by far closest to ours, and it highlight a strategic force that reduces aggregate investment and productivity growth at very low interest rates. In their model, when firms engage in strategic behavior, market leaders have a stronger investment response to lower interest rates relative to followers, and this stronger investment response leads to more market concentration and eventually lower productivity growth. Their evidence thus strongly supports the notion that by benefiting incumbents more than entrants, low interest rates are one of the sources of increasing industrial concentration in US markets. In contrast, we show that in the euro area, low interest rates have supported market competition, and we provide evidence consistent with bank credit benefiting small firms in a low-interest-rate environment.

The paper proceeds as follows. In Section 2, we describe the data used in the analysis. In Section 3, we introduce the empirical strategy. Section 4 presents and discusses the headline empirical results alongside a batter of robustness tests. In Section 5, we investigate some of the underlying mechanisms. Section 6 concludes.

2 Data and methodology

Our identification strategy exploits the fact that the euro area is not an optimal currency area in the sense that macroeconomic environments and business cycles are heterogeneous across member states. This allows us to calculate such simplified interest rate benchmarks at the country-level that typically deviate from the one-size-fits-all short-term interest rate set by the ECB for the euro area as a whole. We can then investigate the impact of changes in how tight or accommodative monetary policy is from the point of view of individual countries on sector-level industry structure in the country in question.

2.1 Sector-level data

The data for the main sector-level analysis come from the publicly available data (upon request) from the 6th vintage of the Competitiveness Research Network (CompNet) database, which is sourced from national institutes and central banks. The CompNet database is built up from firm-level productivity data and provides entire distributions for a set of variables aggregated at the two-digit NACE Rev.

2 industry level. The 6th vintage covers a period from 1998-2018 for fifteen European countries, nine of which lie inside the Euro area[2]. For the purpose of our analysis, CompNet provides average Herfindahl-Hirschman indices (HHI) of firms' market shares in sales, at the country-sector level.

In addition, in order to compute growth rates and concentration measures for robustness, we use the commercial Bureau van Dijk's (BvD) Amadeus database for European firms, which is a subset of the BvD Orbis dataset for global firms. This rich database comprises detailed balance sheet information, employment statistics and industrial sector affiliation for SMEs and large firms, reported with annual frequency. Despite some noteworthy shortcomings[3], BvD's Amadeus is still the best publicly available dataset for comparing firm data over time across Europe (Kalemli-Özcan et al., 2019).

Crucially, for our purpose, it provides firm reporting of sales, number of employees, and total assets, which we use to calculate aggregate growth rates at the two-digit NACE Rev. 1.1 level of industry hierarchy for all nineteen euro area countries[4], covering and the period from the introduction of the euro in 1999 until 2018.

In the analysis we consider unconsolidated firm statements across the full range of industries and winsorize industry observations on growth rates at +100% and -100%. We include countries from the year in which they enter the euro area. Following Kalemli-Özcan et al. (2019), we drop observations with negative values of total assets, number of employees or sales.

With respect to concentration measures, however, BvD Amadeus can only partially be used to construct industry's HHI's due to increasing sample size over time for most economies covered. Here, we restrict the analysis of market concentration at the unconsolidated firm level to periods with a coverage of more than 75% of the aggregate economy based on gross output[5].

[2]Belgium, Spain, Finland, France, Italy, Latvia, Netherlands, Portugal, Slovenia. We include Bulgaria and Denmark in the empirical analysis of euro zone countries because of the Danish crown's peg to the euro since 1999.

[3]such as increasing sample size over time and non-uniform national reporting requirements across countries

[4]That is, Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. We also include Bulgaria and Denmark in the empirical analysis because their currencies have been pegged to the euro since 1999.

[5]That leaves us with HHI's based on Amadeus BvD for the following countries (and time periods): Austria (2012-2017), Belgium (2012-2017), Estonia (2000-2017), France (2008-2017), Latvia (2004-2017), Luxembourg (2011-2017), Portugal (2005-2017), Slovakia (2003-2017), Slovenia (2002-2017), Spain (2008-2017).

We also use firm-level data on sales, investment, and employment from Amadeus to calculate changes in investment and employment patterns at the country-sector level in response to monetary policy shocks. Because of changing coverage over time, in all cases we calculate changes over time for the same set of firms. In particular, in order to calculate sales growth in sector s in country c between year t and year $t-1$, we isolate the subset of firms in sector s in country c that are present (and have non-missing information) in both years, then calculate aggregate sales by summing up across all firms in sector s in country c for both years, and then calculate the percentage change in aggregate sales between year t and year $t-1$. In that way, we make sure that our results are not driven by a mechanical increase or decrease in the number of firms covered by Amadeus.

Finally, in order to break down the country-specific monetary policy stance proxies to the sectoral level, we rely on a external financial dependence ratio as in Rajan & Zingales (1998), recomputed at the two-digit NACE Rev. 1.1 level using data from Compustat. It is defined as the industry median fraction of capital expenditures financed external funds for mature Computstat companies over the period 1990-1999. As a robustness check, we also use the industry-level ratio of small firms which we calculate ourselves using the BvD Amadeus database for euro area countries (including Bulgaria) exhibiting a coverage of more than 85% of the aggregate economy based on gross output. In this exercise, we are left with the following countries (and time periods): Austria (2014-2017), Belgium (2014-2017), Bulgaria (2011-2017), Estonia (2011-2017), France (2014-2017), Latvia (2014-2017), Luxembourg (2014-2017), Portugal (2011-2017), Slovakia (2011-2017), Slovenia (2011-2017), and Spain (2014-2017). Small (medium and large) firms are defined as firms with i) total balance sheet size of less (more) than 10 million euros; ii) less (more) than 50 employees; and iii) sales of less (more) than 10 million euros. The latter serve as an alternative measures of the external financial dependence ratio since empirically speaking, small firms tend to be more reliant on external finance than large firms (Gertler & Gilchrist, 1994).

2.2 Country-level data: Monetary policy

In order to compute deviations from country-specific Taylor rules, we collect macroeconomic time series from 1999-2018 from various databases.

First, monthly country-level Harmonised Index of Consumer Price (HICP) inflation rate forecasts are obtained primarily from Consensus Economics survey data, and from the European Commission's AMECO database for countries not covered in the Consensus Economics[6]. Simple averages are computed in order to retrieve annual series.

Second, we use quarterly proprietary data on euro area economies' real time output gap vintages primarily from the ECB's internal forecasting and policy modelling unit, and quarterly/semiannual real time output gap vintages from Eurostat for countries not covered by the ECB's database[7]. Both apply the non-parametric Hodrick & Prescott (1997) filtering method. Annual averages are computed.[8]

Third, the ECB's main refinancing operations (MRO) rate[9] and country-level GDP growth rates are also retrieved from the ECB's Statistical Data Warehouse. The MRO is collapsed to its mean value at yearly frequency, GDP growth rates are collected accordingly. We report summary statistics on the main variables of interest in Table 1.

The final panel contains 9 core EA countries (plus Denmark and Bulgaria) and 28 sectors for the CompNet dependent variable estimations, and at minimum 12 EA countries (plus Denmark and Bulgaria) and 38 sectors for the Orbis-based dependent variable estimations.

2.3 The country-specific Taylor rule

The Taylor rule is a popular monetary policy benchmark developed by Taylor (1993). At a high level, it postulates that the desirable nominal interest rate is a function of inflation and deviation of GDP from the target (output gap). In the U.S., the original Taylor rule describes fairly well the monetary policy during the Great Moderation period (i.e., from the mid-1980s until the Global Financial Crisis in 2008-09). Although Taylor's focus was on the U.S., his rule has been generalized to other countries

[6]Consensus Economics does not provide HICP inflation rates for Cyprus, Luxembourgh, Malta and Bulgaria.

[7]This applies to euro area countries Cyprus, Greece, Ireland, Luxembourg, Malta, Slovenia, and to non-euro-area countries Bulgaria and Denmark, the Czech Republic, Hungary, Sweden.

[8]In addition, we collect annual real time output gap vintages for Croatia from the World Economic Outlook (WEO) database as it is not covered in Eurostat.

[9]The interest rate banks pay for borrowing money from the ECB for one week. It is set every six weeks and provides the majority of short-term liquidity to the EA banking system. It is most analogous to the Fed Funds rate. See https://www.ecb.europa.eu/explainers/tell-me/html/mro.en.html, retrieved on Oct 15 2020.

and to the ECB's policy in particular.

Even though the original Taylor rule does not appear to be a good description of the interest rate policy in the euro area (Lee & Crowley, 2010), especially after the Global Financial Crisis,[10] several modified versions of the rule have been proposed that appear to track euro nominal rates very well.(Ilzetzki et al., 2020). For example, Gorter et al. (2008) points out that Taylor rules are a fairly good description of the interest rate policy in the euro area when using expectations for inflation and output growth as forecasts are of a better forward-looking nature in general and better capture ECB behaviour in particular(Svensson, 2003).[11] However, there appears to be relatively little guidance or reflection on what exact indicators should be employed in varying Taylor rule specifications for different regions.

Despite this criticism, a range of empirical and anecdotal evidence suggests that this comparatively simple instrument is indeed used by central banks around the world today in evaluating and guiding interest rate setting (Ilzetzki et al., 2020; Gilchrist et al., 2018). The Taylor rule implied policy rate of each EA country is thus computed as follows:

$$i_{c,t} = \pi^{\star}_{EA} + r^{\star}_{EA} + 1.5(\pi_{c,t} - \pi^{\star}_{EA}) + 0.5(y_{c,t} - \Psi_{c,t}), \tag{1}$$

Here, $i_{c,t}$ is the implied short-term nominal interest rate of country c in year t. $\pi_{c,t}$ is the country-level inflation forecast (one year ahead[12]) at time t. $r^{\star}_{EA}$ is the long-run "neutral" interest rate for the euro area as a whole (assumed constant at 2%). $\pi^{\star}_{EA}$ is the ECB's target inflation rate of close to, but below, 2%[13] (assumed at 2%). Finally, $[(y_{c,t} - \Psi_{c,t})]$ denotes a time-varying country-specific output gap (Woodford, 2001; Drometer et al., 2018). Variants that incorporate unconventional monetary policy such as quantitative easing are not explored here.

As a next step, $i_{c,t}$ is deducted from the ECB's policy rate in order to retrieve a proxy variable of

[10] The Taylor interest rate rule has also been less accurate in positively describing Fed's actions in the decade that followed the GFC, and it has faced criticism as a predictor of the future policies (Bernanke, 2015).

[11] The ECB targets a single mandate of price stability over the medium-term and communicates that its reaction function is forward looking, following from the lag of monetary policy decision-making.

[12] or HICP-1YA

[13] In July 2021, the ECB's inflation target was revised to 2% over the medium term with a symmetric aversion to below-target and above-target deviations.

implied country-specific deviations from the euro-area-wide monetary policy stance:

$$MP_{c,t} = i_t - i_{c,t}, \tag{2}$$

where i_t indicates the policy rate set for the euro area. We use the ECB's Marginal Refinancing Operation (MRO) rate.[14] A positive (negative) deviation from the policy rate, as measured by the $MP_{c,t}$ variable, suggests a tight (accommodating) monetary policy stance in any given country c at time t.

Figure 1 plots our estimates based on the above framework, for the 19 euro area members and Denmark. In light blue, we plot the country-specific Taylor-rule-implied policy rate over time. In dark blue, we plot the policy rate by the ECB.

The figure reveals three regularities. First, for the first decade of the euro and until the Global Financial Crisis (GFC), the ECB policy rate closely tracks the "optimal" one from the point of view of "core" countries such as Austria, Belgium, Finland, France, Germany, and the Netherlands. It also closely tracks the "optimal" policy rate vis-a-vis Portugal. At the same time, it is less well correlated with the "optimal" policy rate from the point of view of peripheral countries like Greece, Ireland, Italy, and Spain, as well as the central and eastern European countries that joined the euro area later.

Second, for most of the post-GFC period, the ECB policy rate is below the "optimal" one from the point of view of most individual countries, with the exception of Greece. This is consistent with the idea that the low-for-long policy enacted by the ECB in the wake of the dual financial and sovereign debt crisis has been associated with a broadly accommodative monetary policy.

Third, the deviation of the ECB policy rate from the country-specific "optimal" one varies a lot across euro area member states. For example, in 2016, the ECB policy rate was at the level of the "optimal" one in Italy, but 400 basis points above the "optimal" one in Belgium,

[14] We perform robustness checks using alternative specifications sometimes found in the literature that include the EONIA interbank overnight lending reference rate for the euro short-term interest rate as well as headline or core inflation rates (see Table 7) and show that the results remain qualitatively unchanged.

3 Empirical strategy

3.1 Empirical model

Our main econometric model focuses on the relationship between country-sector-level measures of concentration and country-specific proxies for the monetary policy stance and change therein, accounting for the sensitivity of sectors to monetary policy shocks. Our main specification takes the following form:

$$\begin{aligned} HHI_{c,s,t} &= \beta_1 Stance_{c,t-1} \times \Delta MP_{c,t-1} \times ExtDep_s \\ &+\beta_2 Stance_{c,t-1} \times ExtDep_s + \beta_3 \Delta MP_{c,t-1} \times ExtDep_s \\ &+\beta_4 \Delta GDP_{c,t-1} \times ExtDep_s + \gamma_{c,s} + \mu_{c,t} + \phi_{s,t} + \varepsilon_{c,s,t}, \end{aligned} \quad (3)$$

In equation 3, $HHI_{c,s,t}$ is the Herfindahl-Hirschman Index for sector s in country c in year t. The HHI is the squared sum of each firm's market share, and so it moves between 0 (perfect competition) and 1 (perfect concentration). We use the HHI based on firm's market share (i.e. sales), and in robustness tests complement it with an HHI based on employment.

The variable $Stance_{c,t}$ measures the number of quarters during which monetary policy set by the ECB has been accommodative from the point of view of an individual country. As described in the previous section, we start by defining the variable $MP_{c,t}$, for each country-quarter, as the difference between the policy rate implied by a country-specific Taylor rule and the actual policy rate. The larger this difference, the more accommodative monetary policy is with respect to a particular country. By means of an example, suppose that the ECB policy rate is at 100 basis points. Furthermore, suppose the optimal policy rate implied by the output gap and inflation expectations in the Netherlands and in Spain is 150 basis points and 50 basis points, respectively. Then, $MP_{c,t}$ will take a value of -0.5 for the Netherlands, indicating an easy monetary policy stance, and a value of 0.5 in Spain, indicating a tight monetary policy stance.

From here, we develop the two main objects of analysis. First, $Stance_{c,t}$ is the count for quarters during which $MP_{c,t} < 0$ uninterruptedly. This variable therefore captures the duration component of the "low-for-long" aspect of monetary policy, from the point of view of an individual country. Second,

$\Delta MP_{c,t}$ denotes the change in $MP_{c,t}$, In practice, it measures the year-on-year change in the monetary policy stance, from the point of view of an individual country. While the same change in the stance can take place at high or low policy rates, the interaction of the two tells us whether monetary policy is becoming more (less) accommodative in a more (less) accommodative environment.

The third object of analysis is $ExtDep_s$, and it measures a particular sector's dependence on external finance. This proxy is calculated in the following way. First, we download data on each Compustat firm that reported balance sheet information during the decade before the introduction of the euro (1990–1999). Then, we define a firm's dependence on external finance as capital expenditures minus cash flow from operations divided by capital expenditures. Finally, we take the median value of that proxy for each individual 2-digit sector. The idea behind this approach is based on the argument by Rajan & Zingales (1998) that for technological reasons, some sectors rely more on external finance then others in their day-to-day operations. Such sectors are thus more sensitive to changes in the policy rate, to the extent that the latter is transmitted to the economy via the cost of external finance. The argument is that while how much external financing small firms use can be distorted by credit constraints, the extent to which large mature (and thus unconstrained) firms rely on external funding reflects their demand for external finance. Therefore, difference across sectors in such use reflects technological differences in financing needs across sectors.

We also include an interaction of year-on-year GDP growth with $ExtDep_s$. This accounts for the possibility that the business cycle follows a similar trend as the deviation from a country-specific Taylor rule, that this trend affects market concentration in a material way, and that this effect is stronger in sectors that are more dependent on external finance for technological reasons.

We also include interactions of country, sector, and year dummies, which allows us to hold constant a number of unobservable background forces. $\gamma_{c,s}$ is a matrix of country-sector dummy interactions. These control for any unobservable factors that are mostly fixed over time (e.g., technology differences between Construction in Germany and Construction in Spain). The term $\mu_{c,t}$ is an interaction of country and quarter year, which absorbs any time-varying varying variation in business conditions that is common to all sectors in a country. The term $\phi_{s,t}$ is an interaction of 2-digit NACE sectors and year dummies, which absorbs any time-varying shocks to demand or technology that are common to a sector across all countries. Finally, $\varepsilon_{f,t}$ is the idiosyncratic error term.

We do not include the variables $Stance_{c,t}$ and $\Delta MP_{c,t}$ on their own, because the independent effect of these is absorbed by the interaction of country and quarter year $\mu_{c,t}$. Analogously, we do not include the variable $ExtDep_s$ on its own because its direct effect on investment is absorbed by the country-sector and sector-year dummy interactions.

The coefficients of interest are β_1, β_2, and β_3. The latter two capture whether a more (less) accommodative stance, and changes therein, affect industry concentration, more so for sectors relatively more dependent on external finance. β_1 measures whether changes in the monetary policy stance affect the industry structure, more so in financially dependent sectors, as well as when the policy rate is already low from the point of view of the individual economy. To account for the possibility that monetary policy shocks may affect the industry structure both in the short-run and in the medium-run, we estimate models with contemporaneous shocks, as well as models with lagged shocks.

Finally, all models are estimated using Ordinary Least Squares. We cluster the standard errors at the country level, to account for potential correlation among sectors within the unit where the shock takes place.

4 Empirical results

4.1 Headline result

In Table 2, we present the main results of the paper whereby we take equation 3 to the data. We report two verions of equation 3, one with one lag (column (1)) and one with two lags (column (2)). In addition to the main variables of interest, we also include country dummies interacted with time dummies, country dummies interacted with sector dummies, and sector dummies interacted with time dummies. Finally, we also include an interaction of GDP growth with external financial dependence. The structure of the regression equation allows us to control for the impact of changes in real economic activity on industrial concentration, in sectors with different extent of reliance on external finance. It also allows us to hold constant background forces related to country and sector trends, as well as to factors that are fixed over time for an individual sector in an individual country.

The point estimate on the triple interaction suggests that in sectors more dependent on external finance, an increase (reduction) in the policy rate in period $t-1$ is associated with higher (lower) industrial concentration in period t, the longer monetary policy has been accommodative. This effect is observed regardless of whether we controls for a second lag or not. While the second lag does not play a role, the 1-year effect becomes even stronger when the second lag is controlled for (column (2)).

The numerical effect is substantial. Take the specification with two lags reported in column (2). The point estimate is 0.154, and the standard deviation of external financial dependence is 0.49 (Table 2). This suggests that if the policy rate was increased by 25 basis points in a country where monetary policy has been accommodative for 4 quarters, the HHI in a sector at the 75th percentile of external financial dependence would increasee by 0.15 more, relative to a sector at the 25th percentile of external financial dependence ($0.154 \times 0.25 \times 4 \times 0.98$).

We also find that higher GDP growth is associated with lower concentration in financially dependent sectors. This observation is consistent with models which predict an increase in new business creation when the return to economic activity is higher (e.g., Aghion & Howitt (1992)).

We also note that the main result is attained when controlling for country × time, country × sector, and sector × time dummies. Thereby, we make sure that our estimates are not biased by omitted factors that are common to all sectors in a country over time, as well as to country-specific and sector-specific trends. This allows us to isolate the impact on industrial concentration in an individual sector and an individual country at a particular point in time.

4.2 Robustness

4.2.1 Robust sensitivity to changes in the monetary policy stance

In equation 3, identification is based on the idea that the same monetary policy shock has a different effect in different sectors within the same country, depending on each sector's natural sensitivity to changes in financing conditions. The main proxy we use is one that captures a sector's long-term dependence on external finance. This is based on the insight in Rajan & Zingales (1998) that due to technological differences in factors such as project size, opacity, and gestation periods, some sectors generate more internal funds than others, and are thus less in need of external finance. To the extent that monetary policy works through changes in the level and composition of external funding available to economic agents, it makes conceptual sense to use this variable as a proxy for sensitivity to monetary policy shocks, too.

While widely accepted in the literature, we recognize that this is only one possible proxy for dependence on external funding (and thus sensitivity to monetary policy shocks). Another factor well-established in the literature is the size of firms. Because small firms are more opaque and their projects more risky, small firms are more bank-dependent (Berger & Udell, 1998). Because monetary policy largely propagates to the real economy through the bank lending channel, small firms are also more sensitive to monetary policy shocks (Gertler & Gilchrist, 1994). There is already robust evidence that sectors which are comprised predominantly of small firms respond more in terms of growth to changes in financing conditions (Beck et al., 2008). For these reasons, we conjecture that the share of small firms in a sector can be a valid proxy for sensitivity to changes in the monetary policy stance.

In Table 3, we re-run equation 3 after replacing the proxy for external financial dependence with a measure of the share of small firms in the sector in the full sample over the sample period. We define the share of "small firms" based on three separate factors: employment (share of firms with less than 50 employees; column (1)); sales (share of firms with less than 10 mln. euro; column (2)); and total assets (share of firms with less than 10 mln. euro; column (3)). These numbers are broadly in line with accepted classifications of what type of firms constitute Small and Medium Enterprises (SMEs), as opposed to large firms.

The evidence presented in Table 3 unequivocally suggests that in sectors with a larger share of small firms, an increase (reduction) in the policy rate in period $t-1$ is associated with higher (lower) industrial concentration in period t, especially if monetary policy has been accommodating for long. The effect is significant at the 1-percent statistical level regardless of how we define "small" firms. We conclude that the results presented in Table 2 are not driven by one particular definition of the sector-specific sensitivity to financial conditions, and by extension to monetary policy shocks.

4.2.2 Robust proxy for accommodative monetary policy

We have so far examined two margins of monetary policy. The first one, $Stance_{c,t}$, measures the duration of easy monetary policy in quarters, for an individual country. The second one, $\Delta MP_{c,s,t}$, measures the absolute change in the monetary policy stance, regardless of whether monetary policy is easy or tight. By looking at changes in the monetary policy stance when the stance itself has been "low for long," out analysis is conceptually close to studies in the literature that have looked at the impact of "low for long" interest rates on bank lending and risk taking (e.g., Jimenez et al. (2012) and Jimenez et al. (2014)).

We now estimate a version of equation 3 where we replace the variable $Stance_{c,t}$ with the variable $MP_{c,t}$:

$$\begin{aligned} HHI_{c,s,t} &= \beta_1 MP_{c,t-1} \times \Delta MP_{c,t-1} \times ExtDep_s \\ &+\beta_2 MP_{c,t-1} \times ExtDep_s + \beta_3 \Delta MP_{c,t-1} \times ExtDep_s \\ &+\gamma_{c,s} + \mu_{c,t} + \phi_{s,t} + \varepsilon_{c,s,t}, \end{aligned} \tag{4}$$

In this fashion, we are looking at the current stance, rather than at the duration of easy monetary policy. In other words, we are departing from the analysis of changes in monetary policy in a low-for-long-interest-rate environment, and instead perform an analysis of how changes in the stance affect industrial concentration based purely on the current stance. The coefficient β_1 is now interpreted as the change in industrial concentration in sector s in country c at time t for a change in the monetary policy stance, depending on the current stance and on the sector's technological dependence on external finance.

The evidence presented in Table 4 suggests that when the monetary policy stance is accommodative ($MP_{c,t} < 0$), and monetary policy becomes less (more) accommodative, industrial concentration increases (declines), more so in more financially dependent sectors. This effect is marginally insignificant in a specification with one lag only (column (1)), but it is significant at the 5-percent statistical level in a specification with two lags only (column (2)). Moreover, and similar to Table 2, it obtains when controlling for a matrix of country, sector, and time fixed effects, as well as for the business cycle.

The data thus strongly support the notion that a decline in the policy rate reduces market concentration in a low-interest environment, independent of whether the monetary policy stance has been accommodative for long or not. At the same time, the effect is larger when the stance is currently accommodative.

4.2.3 Robust proxies for industrial concentration

The main dependent variables used in the tests so far is a country-sector-specific Herfindahl-Hirschmann Index derived from individual firms' sales. We now proceed to test for whether our main result is robust to calculating the measure of concentration using different data sources and different measures of firm size.

In Table 5, we calculate an HHI in the same fashion as in the previous tables, but we derive the underlying data from Orbis and not from CompNet. The disadvantage of doing so is that Orbis does not include the universe of firms, and depending on country-specific reporting requirements may overcount or undercount small firms. The advantage is that Orbis allows us to calculate the HHI from the underlying micro data, rather than rely on an aggregate statistics.

The estimates reported strongly confirm the main result of the paper: when the monetary policy stance is already accommodative, increasing (reducing) interest rates is associated with an increase (decline) in industrial concentration, more so in sectors dependent on external finance. In both cases (with one lag (column (1)) and with two lags (column (2)), the point estimates on the triple interaction variable of interest is significant at the 1-percent statistical level.

Next, we once again use Orbis, which has information on firm-level employment, and calculate the HHI based on employment rather than on sales. The results of this modification of equation 3 are reported in Table 6. Unfortunately, the coverage in Orbis is much poorer in terms of employment than in terms of sales, and so this test is less reliable than the main one. Nevertheless, we continue finding that when monetary policy is accommodative, increasing (reducing) interest rates is associated with an increase (decline) in industrial concentration, more so in sectors dependent on external finance and when monetary policy has been easy for longer. In the case when we only use one lag, this effect is also statistically significant at the 5-percent statistical level.

4.2.4 Robust proxies for the country-specific monetary policy stance

One final empirical choice that we have made and that can be questioned is related to the empirical proxies we use to calculate country-specific Taylor rules. Recall our definition of the country-specific deviation from optimal monetary policy:

$$MP_{c,t} = i_t - i_{c,t}, \tag{5}$$

Empirically, we proxy i_t with the ECB's MRO rate. This is a standard choice based on the notion that the MRO rate is most analogous to the US Federal Reserve's funds rate (Scotti (2011)). At the same time, it is possible that our results are sensitive to the choice of a particular benchmark rate. An alternatives is the Euro OverNight Index Average (EONIA). Prior to 1st October 2019, EONIA was computed as a weighted average of overnight unsecured lending transactions in the EU and EFTA interbank market. The EONIA rate is therefore a crucial piece of information about interbank market conditions that the ECB takes into consideration when it sets the policy rate.

Second, in the calculation of i_t, the country-specific data-implied optimal policy rate, we use the HICP-1YA to proxy for the inflation forecast. Alternatives to this empirical choice include the benchmark inflation rate, as well as the core HICP. All of these are potential valid empirical choices that our main results may be sensitive to.

We test for this possibility in Table 7. By and large, the evidence suggests that the statistical correlation between country-specific monetary policy and industrial structure is not sensitive either to the data series used to proxy for the euro area-wide policy rate (column (1)), or to the data series used to proxy for the inflation forecast (columns (2) and (3)).

The totality of the robustness tests reported in Tables 3-7 thereby gives us confidence that the main result of the paper – namely, that tightening/loosening of the monetary policy stance leads to an increase/decline in sector-level concentration, especially in sectors sensitive to external financing conditions – is not an artefact of a particular way of calculating the monetary policy stance and changes thereof, sector-level sensitivity to movements in the interest rate, or the industrial structure.

4.3 Placebo test

Another potential criticism with our approach is that changes in the ECB's monetary policy is correlated with unobservable changes in the global environment that affect industry concentration differently in sectors more and less sensitive to changes in funding conditions. For example, demand for goods produced or services delivered by sectors more sensitive to changes in external funding costs may shift in a way favoring small firms precisely at the time when monetary policy is becoming more accommodative. This would result in a decline in industrial concentration without any direct contribution of monetary policy itself. At the same time, the econometrician will erroneously attribute the decline in sector-level HHI to changes in the monetary policy stance.

To address this concern, we run our empirical tests on a sample of European countries whose currency is neither the euro, nor is it pegged to the euro. Ex-ante, these countries should not be affected by changes in the ECB's stance. Therefore, if we observe that sector-level HHI in these countries moves in sync with changes in ECB's policy rate, we will conclude that also changes in sector-level concentration in the euro area are likely unrelated to the monetary policy stance. We also require that this sample has satisfactory coverage in Compnet and in Orbis. In all, we end up with four countries: Croatia, Czech Republic, Hungary, and Sweden.

The estimates from equation 3 as applied to this alternative sample are reported in Table 8. The data fail to reject the hypothesis that changes in the monetary policy stance are unrelated to changes in industrial concentration, both within one and within two years. We therefore conclude that the headline result presented in Table 2 and confirmed in Tables 3-7 is consistent with a direct link in the euro area between the monetary policy stance and changes thereof, on the one hand, and the extent of industrial competition, on the other hand.

5 Mechanisms

We now turn to the microeconomic mechanisms underpinning our main result. To fix ideas, for a given change in the monetary policy stance, the change in the HHI may be driven by large firms, or by small firms, or by both. For example, if the HHI is declining when monetary policy is becoming more accommodating, it could be because small firms are now borrowing more and growing relatively faster, or because large firms are growing relatively more slowly (or even declining), or by a combination of the two. Distinguishing between the two cases would speak directly to the policy implications of the main empirical regularity we document in our paper.

5.1 Sales growth by firm size

In Table 9, we go to the heart of this question. We start by evaluating a variant of equation 3 where instead of the HHI, the dependent variable is the year-on-year change in sales growth by different categories of firms within the sector. This is the first natural outcome variable to look at because throughout our analysis, we calculate the country-sector HHI based on firms' market share in sales. We look at four size bins: micro firms (those with less than 2 mln. euro worth of total assets); small firms (those with between 2 mln. euro and 10 mln. euro worth of total assets); medium firms (those with between 10 mln. euro and 43 mln. euro worth of total assets); and large firms (those with more than 43 mln. euro worth of total assets).

We calculate country-sector sales from firm-level data in Orbis. In practice, we sum aggregate sales over all firms in a country-sector in two consecutive years, and then we calculate sales growth as the percentage change year-on-year. To make sure that our results are not driven by compositional effects whereby the number of firms in the dataset changes year-on-year because of improving coverage, we base the year-on-year changes in sales on firm sub-samples which keep only firms that are observed in both consecutive years.[15]

The evidence presented in Table 9 suggests that the main result of the paper is a combination of two effects. First, when monetary policy is accommodative, increasing (reducing) interest rates is associated with lower (higher) sales growth for small firms (column (2)). This effect is significant at the 1-percent statistical level. Conversely, when monetary policy is accommodative, increasing (reducing) interest rates further is associated with higher (lower) sales growth for medium firms (column (3)).

[15] E.g., to calculate sales growth for a country-sector between 2010 and 2011, we keep only firms that are present in both years and have non-missing data, then aggregate sales for each year across all firms, and then calculate the percentage change in aggregate sales between 2010 and 2011. The same procedure is applied to all years in the sample.

In both cases, the point estimate is significant at the 1-percent statistical level.

5.2 Investment growth by firm size

In Table 10, we complement these results with evidence on firms' investment decisions in response to changes in the monetary policy stance. Here, we estimate a variant of equation 3 where the dependent variable is country-sector investment growth. Once again, we use firm-level data from Orbis. As in the case of sales, we aggregate total assets over all firms in a country-sector in two consecutive years, and then we calculate growth in total assets as the percentage change year-on-year. As before, we base the year-on-year changes in total assets on sub-samples of firms which that are observed in both consecutive years.

The point estimates reported in Table 10 strongly suggest that changes in sales growth are mirrored by changes in investment. In particular, micro and small firms reduce (increase) investment in response to monetary tightening (easing), especially in sectors sensitive to external finance and if interest rates have been low-for-long (columns (1) and (2)). In contrast, firms with between 10 and 43 million euro in assets increase investment as interest rates tighten from low levels (column (3)). The evidence thus strongly suggests that movements in the HHI are driven by opposing yet complementary action for two different classes of firms.

5.3 Debt growth by firm size

Finally, we look at the evolution of debt by firm size bin. Orbis contains data on short-term and long-term debt. As before, we calculate changes in both types of debt based on repeating samples of firms year-on-year. Accounting for short-term and long-term debt individually is important because theory has suggested that the maturity of debt, in addition to its level, is a critical determinant of firm investment (e.g., Myers (1977), Diamond & He (2014)).

The estimates form these tests are reported in Tables 11 and 12. The evidence suggests that small firms reduce (increase) their short-term debt in response to monetary tightening (easing), especially in sectors sensitive to external finance and if interest rates have been low-for-long (Table 11, column

(2)). In contrast, firms with more than 43 million euro in assets increase short-term debt (Table 11, column (4)). At the same time, small firms increase (reduce) their long-term debt in response to monetary tightening (easing), especially in sectors sensitive to external finance and if interest rates have been low-for-long (Table 12, column (2)).

The opposite reaction of short-term and long-term debt to changes in the monetary policy stance, for small firms, supports the notion that the liability structure responds to the cost of external finance. The fact that small firms decrease short-term debt when monetary policy tightens, and that this decrease is mirrored by a decline in investment and sales, is consistent with theories where short-term debt imposes lower debt overhang than long-term debt (e.g., Diamond & He (2014)).

5.4 Interpretation

The evidence presented in Tables 9 -12 runs contrary to the main insight in Liu et al. (2022). This paper argues that by creating funding advantage to incumbent firms, accomodative monetary policy allows them to grow relatively faster, keeping entrants out of the market. As a result, monetary easing is reflected in higher industrial concentration, especially when the accommodative stance persists for long. In contrast, we find that accommodative monetary policy is associated with lower HHI due to higher relative growth by small firms, and that an increase in the policy rate increases industrial concentration, especially in a low-for-long environment.

Our estimates, and in particular the evidence in Tables 11 and 12, suggest that in the case of the euro area, the mechanism at play is not the same. Liu et al. (2022) argue that when market funding conditions improve, large are better placed than small firms to reap these funding-cost benefits thanks to capital markets. At the same time, in an economic area where monetary policy mainly affects funding conditions mostly through the bank lending channels (as is the case in our euro-area sample), small firms may be more likely to benefit from more accommodative monetary policy (Gertler & Gilchrist (1994)). In contrast, monetary tightening leads them to reduce borrowing, and as result they invest less and grow at a lower rate. This fact is then reflected in a higher sector-level HHI.

6 Conclusion

In recent years, two empirical regularities have independently captured the interest of both financial and macro economists. First, since the early-to-mid 2000s, advanced economies experienced an extraordinary decline in both short- and long-term interest rates, from levels of around 4-6% to close to or even below zero. While there are a number of structural reasons behind low interest rates, such as the demographic transition and the integration of China in global financial markets[16], more recent falls have been largely associated with Central Banks' attempts to stimulate the economy in the wake of financial crises. Second, over the same period, industrial concentration has gradually increased in the US (Covarrubias et al., 2020), but not in Europe (Gutiérrez & Philippon, 2018).

Can these two empirical facts be not only reconciled, but even related? Since the Global Financial Crisis, Central Banks around the world have engaged in forceful efforts to revive economic activity and to bring inflation closer to policy targets. One of the main strategies in the arsenal of tools employed has been keeping the policy rate low for long. While there has been some analysis of the ability of such policies to maintain inflation close to target, e.g., by anchoring inflation expectations (see Gertler & Karadi (2015), Jarocinski & Karadi (2019), and Swanson (2021)), there has been no systematic examination of their impact on the industrial structure of the economy. A major exception is a recent paper by Liu et al. (2022) which argues that in the presence of strategic behavior, market leaders have a stronger investment response to lower interest rates relative to followers, which leads to higher market concentration over time.

In this paper, we take this question to the euro area experience since the introduction of the euro in 1999. For each euro area country and each point in time, we calculate an optimal Taylor rule derived from local inflation expectations and the local business cycle. The difference between the policy rate by the ECB and the optimal country-specific Taylor rule then constitutes an exogenous measure of the monetary policy stance, from the point of view of the individual country. We then study 11 euro area economies during the 20 years after the introduction of the euro (1999–2018).

Our main finding that when a country is in a low-interest environment, and the monetary policy stance becomes more accommodative, industrial competition increases, especially in sectors dependent

[16] See Bean et al. (2015).

on external finance and thus more sensitive to monetary policy shocks. This result is not driven by a particular choice of empirical proxies and it does not obtain in placebo tests based on similar European countries that however do not use the euro. At the same time, the effect is symmetric: in a low-for-long environment, a tightening of the monetary policy stance leads to an increase in industrial concentration.

Our findings stand in stark contrast to the US experience documented in Liu et al. (2022). We hypothesize that this is largely because the bank lending channel–i.e., the transmission of monetary policy to the real economy chiefly through adjustments in the volume and composition of bank credit– is more prominent in Europe than in the US. In confirmation of this conjecture, we show that the underlying mechanism is one whereby smaller firms increase their levels of debt and invest and grow relatively faster in response to a further monetary policy easing when the policy stance is already accommodative. Conversely, in a low-for-long environment, a tightening of the monetary policy stance leads to a relative reduction in debt and investment for small firms, inc comparison with large firms.

Our results strongly suggests that in a bank-dependent economic area, low interest rates benefit relatively more smaller firms that are notoriously dependent on bank lending for their operations. They also serve as a cautious reminder that tightening the monetary policy stance after a protracted period of low interest rates can have real economic effects through the channel of reduced market competition.

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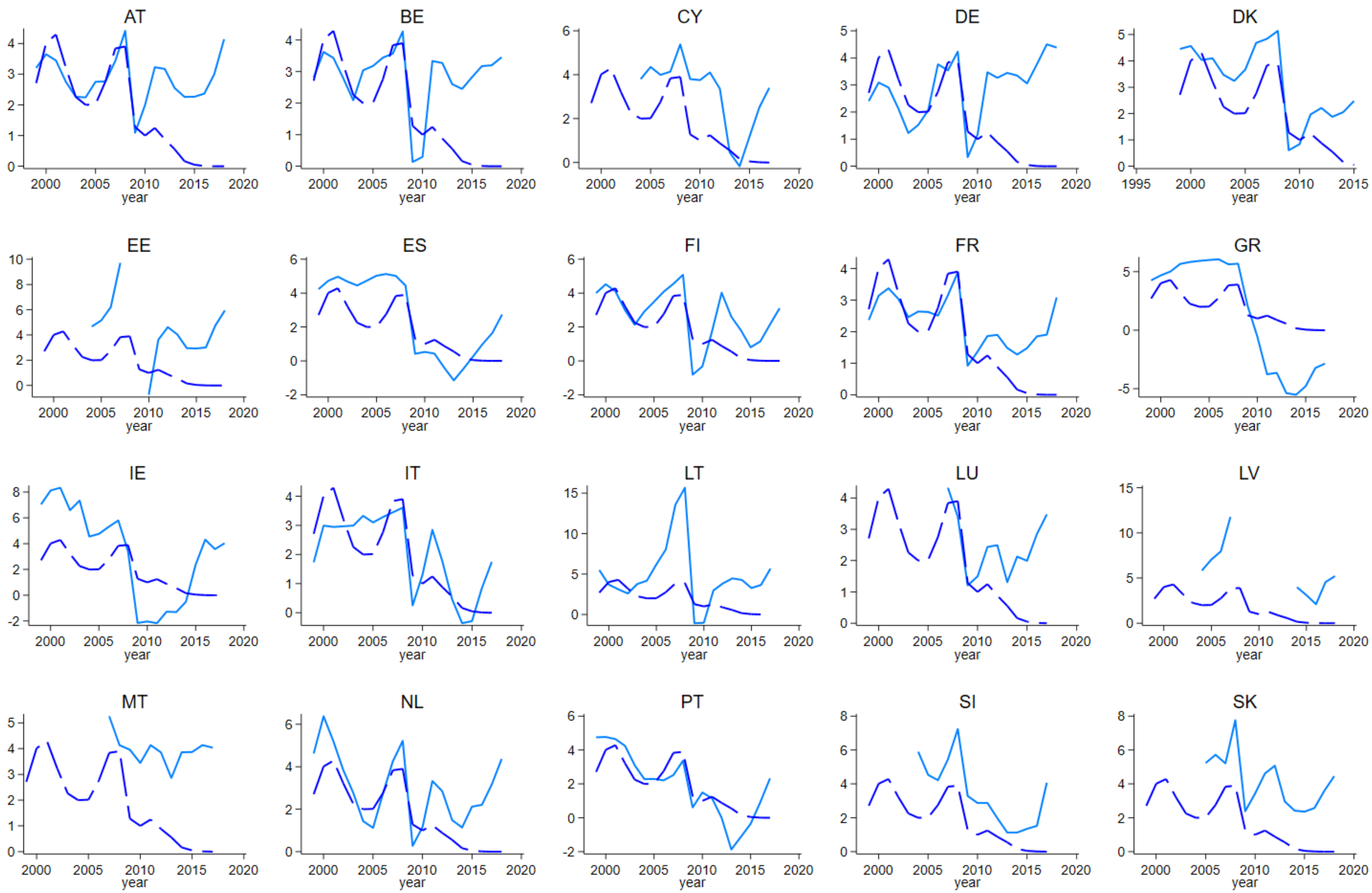
Figure 1: Country-specific Taylor-rule implied vs. nominal ECB interest rates



Notes: The darker (dashed) line displays the EA-wide short-term interest rate as set and provided by the ECB. The lighter (solid) line is the country-specific, Taylor-rule implied interest rate based on our own calculations (all calculations based on our sample).

Table 1: Summary statistics

Variable	Median	Mean	Std. Dev.	Min	Max
HHI CompNet	12.32	63.56	141.70	.02	999.82
HHI Orbis	103.35	197.24	233.80	0	999.60
GDP growth	2.45	2.48	4.11	-15.12	23.59
MRO	2.00	1.89	1.44	0	4.29
MP	-1.22	-1.26	1.98	-7.94	5.93
stance	16.00	19.27	17.36	0	80.00
$ExtDep_s$	0.26	.40	.49	-.12	2.86
rsfNoE50	0.93	.90	.09	.62	.99
rsfTA10	0.96	.93	.07	.67	1.00
rsfSale10	0.95	.93	.08	.66	1.00
Sales gr. micro firms	8.65	11.28	19.66	-100.00	100.00
Sales gr. small firms	6.67	9.05	18.62	-100.00	99.02
Sales gr. medium firms	12.07	6.43	16.20	-99.63	99.61
Sales gr. large firms	12.18	5.92	18.14	-100.00	98.30
Investment gr. micro firms	3.87	4.91	12.23	-93.32	97.49
Investment gr. small firms	2.45	3.13	9.89	-62.49	96.31
Investment gr. medium firms	1.74	2.46	10.44	-67.03	93.96
Investment gr. large firms	1.47	3.03	15.01	-98.17	99.10
Short-term debt gr. micro firms	4.56	4.42	21.13	-100.00	99.50
Short-term debt gr. small firms	3.05	2.68	21.44	-100.00	99.28
Short-term debt gr. medium firms	3.13	3.13	23.30	-100.00	99.42
Short-term debt gr. large firms	3.42	2.69	27.48	-100.00	99.89
Long-term debt gr. micro firms	4.06	5.40	21.98	-100.00	100.00
Long-term debt gr. small firms	1.74	2.28	22.16	-100.00	100.00
Long-term debt gr. medium firms	.34	1.12	24.87	-100.00	99.90
Long-term debt gr. large firms	.32	1.12	29.05	-100.00	99.63

Notes: This table presents summary statistics for the variables used in the empirical tests. All statistics are based on annual frequency. '*HHI CompNet*' is the Hirschman-Herfindahl index of firms' market shares at industry level as provided by CompNet. '*HHI Orbis*' is the Hirschman-Herfindahl index of firms' market shares at industry level as provided by BvD Amadeus database and based on own calculations. '*GDP growth*' is the annual percentage change in GDP per country. The '*stance*' variable captures the length of the accommodative monetary policy stance (measured in quarters). '*MRO*' is the marginal refinancing operations rate set by the ECB. '*MP*' is defined as the country-specific deviation of the monetary policy rule from the MRO. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. '*Sales gr. micro firms*' denotes the change in aggregate sales at industry-level of firms with total assets (TA) of <2 mil. euro at time t. '*Investment gr. small firms*' denotes the change in aggregate TA at industry-level of firms with TA of 2-10 mil. euro at time t. '*Short-term debt gr. medium firms*' denotes the change in aggregate 'current liabilities' at industry-level of firms with TA of 10-43 mil. euro at time t. '*Long-term debt gr. large firms*' denotes the change in aggregate 'non-current liabilities' at industry-level of firms with TA >43 mil. euro at time t.

Table 2: Monetary Policy & Industry Structure: Headline Result

	(1) HHI	(2) HHI
$stance_{\text{c,t-1}} * \Delta MP_{\text{c,t-1}} * ExtDep_{\text{s}}$	0.119**	0.154**
	(0.053)	(0.074)
$stance_{\text{c,t-1}} * ExtDep_{\text{s}}$	0.295	0.172
	(0.167)	(0.198)
$\Delta MP_{\text{c,t-1}} * ExtDep_{\text{s}}$	-4.268	-5.767
	(3.055)	(3.535)
$stance_{\text{c,t-2}} * \Delta MP_{\text{c,t-2}} * ExtDep_{\text{s}}$		-0.016
		(0.087)
$stance_{\text{c,t-2}} * ExtDep_{\text{s}}$		0.195
		(0.237)
$\Delta MP_{\text{c,t-2}} * ExtDep_{\text{s}}$		2.680
		(4.049)
$GDPgrowth_{\text{c,t-1}} * ExtDep_{\text{s}}$	-1.581*	-1.675**
	(0.813)	(0.683)
Country*Time FE	Yes	Yes
Country*Sector FE	Yes	Yes
Sector*Time FE	Yes	Yes
N	2846	2739
$adj.R^2$	0.921	0.925

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 3: Monetary Policy & Industry Structure: Alternative Proxies for Financial Sensitivity

$ExtDep_s$ proxy	(1) HHI rsf (<50 empl)	(2) HHI rsf (<10mio sales)	(3) HHI rsf (<10mio TA)
$stance_{c,t\text{-}1}*\Delta MP_{c,t\text{-}1}*ExtDep_s$	1.119***	1.463**	1.880***
	(0.272)	(0.581)	(0.510)
$stance_{c,t\text{-}1}*ExtDep_s$	-1.029	-0.802	-0.528
	(2.904)	(3.415)	(4.397)
$\Delta MP_{c,t\text{-}1}*ExtDep_s$	-84.020	-108.900	-153.300*
	(48.120)	(62.860)	(69.480)
$stance_{c,t\text{-}2}*\Delta MP_{c,t\text{-}2}*ExtDep_s$	-1.160	-1.681	-2.335
	(0.989)	(1.248)	(1.301)
$stance_{c,t\text{-}2}*ExtDep_s$	-1.006	-0.676	-0.922
	(1.612)	(2.243)	(2.920)
$\Delta MP_{c,t\text{-}2}*ExtDep_s$	66.710	84.090	118.000
	(49.040)	(64.240)	(71.140)
$GDPgrowth_{c,t\text{-}1}*ExtDep_s$	-11.640	-21.840	-22.790
	(9.264)	(12.620)	(12.720)
Country*Time FE	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes
N	2740	2740	2740
$adj.R^2$	0.928	0.928	0.929

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. External financial dependence proxies are the industry share of small firms with i) <20 employees, ii) <10 mio sales and iii) <10mio in total assets. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 4: Monetary Policy & Industry Structure: Alternative Proxy for Monetary Stance

	(1) HHI	(2) HHI
$MP_{c,t-1} * \Delta MP_{c,t-1} * ExtDep_{s}$	-0.584	-0.916**
	(0.384)	(0.457)
$MP_{c,t-1} * ExtDep_{s}$	-5.140	-9.160*
	(3.887)	(4.448)
$ExtDep_{s} * \Delta MP_{c,t-1}$	0.427	0.168
	(3.948)	(3.928)
$MP_{c,t-2} * \Delta MP_{c,t-2} * ExtDep_{s}$		-0.888
		(0.643)
$ExtDep_{s} * \Delta MP_{c,t-2}$		6.937*
		(3.275)
$GDPgrowth_{c,t-1} * ExtDep_{s}$	-0.914	-1.207
	(0.643)	(0.669)
Country*Time FE	Yes	Yes
Country*Sector FE	Yes	Yes
Sector*Time FE	Yes	Yes
N	2846	2739
$adj.R^2$	0.922	0.930

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 5: Monetary Policy & Industry Structure: Alternative HHI 1

	(1) HHI sales	(2) HHI sales
$stance_{\text{c,t-1}}*\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	0.172***	0.344***
	(0.048)	(0.133)
$stance_{\text{c,t-1}}*ExtDep_{\text{s}}$	0.405***	0.243
	(0.115)	(0.228)
$\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	2.841	-4.182
	(2.466)	(5.271)
$stance_{\text{c,t-2}}*\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$		0.205***
		(0.0611)
$stance_{\text{c,t-2}}*ExtDep_{\text{s}}$		0.198**
		(0.0746)
$\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$		-4.320
		(4.744)
$GDPgrowth_{\text{c,t-1}}*ExtDep_{\text{s}}$	3.076**	3.353*
	(1.293)	(1.761)
Country*Time FE	Yes	Yes
Country*Sector FE	Yes	Yes
Sector*Time FE	Yes	Yes
N	2996	2737
$adj.R^2$	0.839	0.838

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares from BvD's Orbis database. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 6: Monetary Policy & Industry Structure: Alternative HHI 2

	(1) HHI employment	(2) HHI employment
$stance_{\text{c,t-1}}*\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	0.109**	0.009
	(0.052)	(0.084)
$stance_{\text{c,t-1}}*ExtDep_{\text{s}}$	-0.012	-0.108
	(0.234)	(0.212)
$\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	-4.020	0.050
	(3.177)	(3.759)
$stance_{\text{c,t-2}}*\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$		-0.070
		(0.075)
$stance_{\text{c,t-2}}*ExtDep_{\text{s}}$		0.176
		(0.121)
$\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$		-0.309
		(3.585)
$GDPgrowth_{\text{c,t-1}}*ExtDep_{\text{s}}$	-1.891	-1.079
	(1.033)	(1.224)
Country*Time FE	Yes	Yes
Country*Sector FE	Yes	Yes
Sector*Time FE	Yes	Yes
N	2972	2715
$adj.R^2$	0.821	0.812

Note: The dependent variable is the Hirschman-Herfindahl index of firms' number of employees from BvD's Orbis database. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 7: Monetary Policy & Industry Structure: Alternative Taylor Rules

	(1) HHI alternative TR: EONIA	(2) HHI alternative TR: HICP	(3) HHI alternative TR: core HICP
$stance_{\text{c,t-1}}*\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	0.244**	0.258***	0.178**
	(0.110)	(0.039)	(0.077)
$stance_{\text{c,t-1}}*ExtDep_{\text{s}}$	0.069	0.878***	0.172
	(0.151)	(0.220)	(0.138)
$\Delta MP_{\text{c,t-1}}*ExtDep_{\text{s}}$	-8.318*	-6.321***	-3.612
	(4.214)	(1.804)	(1.934)
$stance_{\text{c,t-2}}*\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$	0.031	-0.023	0.060
	(0.086)	(0.075)	(0.038)
$stance_{\text{c,t-2}}*ExtDep_{\text{s}}$	0.325	0.146	0.217
	(0.237)	(0.344)	(0.197)
$\Delta MP_{\text{c,t-2}}*ExtDep_{\text{s}}$	1.721	1.071	-0.641
	(4.220)	(2.429)	(1.331)
$GDPgrowth_{\text{c,t-1}}*ExtDep_{\text{s}}$	-2.030**	-0.504	-0.432
	(0.775)	(1.096)	(0.933)
Country*Time FE	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes
N	2368	2725	2291
$adj.R^2$	0.930	0.933	0.928

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares. The variable '$stance$' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Results in column (1) are based on a TR specification that employs EONIA as a benchmark policy rate (rather than the MRO rate). Results in column (2) are based on a TR specification that employs headline HICP as a benchmark inflation rate (rather than HICP-1YA). Results in column (3) are based on a TR specification that employs core HICP as a benchmark inflation rate. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 8: Monetary Policy & Industry Structure: Placebo Sample

	(1) HHI	(2) HHI
$stance_{c,t\text{-}1} * \Delta MP_{c,t\text{-}1} * ExtDep_s$	0.029	-1.225
	(0.128)	(1.157)
$stance_{c,t\text{-}1} * ExtDep_s$	-1.785	3.181
	(0.912)	(2.177)
$\Delta MP_{c,t\text{-}1} * ExtDep_s$	-10.560	11.260
	(12.05)	(6.179)
$stance_{c,t\text{-}2} * \Delta MP_{c,t\text{-}2} * \mathrm{ExtDep}_s$		-0.312
		(0.894)
$stance_{c,t\text{-}2} * \mathrm{ExtDep}_s$		-5.712
		(5.820)
$\Delta MP_{c,t\text{-}2} * ExtDep_s$		-1.540
		(2.052)
$GDPgrowth_{c,t\text{-}1} * ExtDep_s$	-2.263	-2.869
	(2.139)	(5.636)
Country*Time FE	Yes	Yes
Country*Sector FE	Yes	Yes
Sector*Time FE	Yes	Yes
N	694	627
$adj.R^2$	0.915	0.929

Note: The dependent variable is the Hirschman-Herfindahl index of firms' market shares. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed ex- ternal funds for mature Compustat companies. Countries included are Croatia, Czech Republic, Hungary and Sweden. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote sta- tistical significance at the 1%, 5% and 10% level, respectively.

Table 9: Monetary Policy & Industry Structure: Sales Growth by Firm Size

	(1) sales growth micro firms (<2m TA)	(2) sales growth small firms (2-10m TA)	(3) sales growth medium firms (10-43m TA)	(4) sales growth large firms (>43m TA)
$stance_{c,t-1}*\Delta MP_{c,t-1}*ExtDep_s$	0.004	-0.037***	0.073***	0.044
	(0.004)	(0.006)	(0.026)	(0.041)
$stance_{c,t-1}*ExtDep_s$	0.029	0.013	0.007	-0.008
	(0.023)	(0.019)	(0.043)	(0.074)
$\Delta MP_{c,t-1}*ExtDep_s$	-1.184***	1.963**	-0.124	-0.747
	(0.245)	(0.709)	(0.597)	(0.984)
$stance_{c,t-2}*\Delta MP_{c,t-2}*ExtDep_s$	-0.016	0.007	0.069**	0.056
	(0.025)	(0.020)	(0.023)	(0.041)
$stance_{c,t-2}*ExtDep_s$	-0.030	-0.036	0.024	0.045
	(0.037)	(0.023)	(0.028)	(0.057)
$\Delta MP_{c,t-2}*ExtDep_s$	1.432**	1.023*	0.177	0.388
	(0.629)	(0.509)	(0.899)	(1.242)
$GDPgrowth_{c,t-1}*ExtDep_s$	-0.396	0.579**	0.108	0.873**
	(0.267)	(0.188)	(0.205)	(0.298)
Country*Time FE	Yes	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes	Yes
N	5118	5287	5231	4819
$adj.R^2$	0.548	0.502	0.278	0.200

Note: The dependent variable denotes the change in aggregate sales at industry-level for various firm-size classes at time t. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 10: Monetary Policy & Industry Structure: Investment by Firm Size

	(1) investment micro firms (<2m TA)	(2) investment small firms (2-10m TA)	(3) investment medium firms (10-43m TA)	(4) investment large firms (>43m TA)
$stance_{c,t\text{-}1}*\Delta MP_{c,t\text{-}1}*ExtDep_s$	-0.021**	-0.027***	0.024***	-0.008
	(0.008)	(0.008)	(0.008)	(0.011)
$stance_{c,t\text{-}1}*ExtDep_s$	-0.029	0.023	-0.024	0.077***
	(0.042)	(0.026)	(0.028)	(0.024)
$\Delta MP_{c,t\text{-}1}*ExtDep_s$	0.450	1.050***	0.122	-0.535
	(0.325)	(0.285)	(0.717)	(0.572)
$stance_{c,t\text{-}2}*\Delta MP_{c,t\text{-}2}*ExtDep_s$	-0.006	-0.028***	-0.00471	-0.003
	(0.009)	(0.007)	(0.010)	(0.010)
$stance_{c,t\text{-}2}*ExtDep_s$	0.039	-0.031	0.015	-0.028
	(0.042)	(0.026)	(0.020)	(0.027)
$\Delta MP_{c,t\text{-}2}*ExtDep_s$	0.636	-0.108	0.316	0.748**
	(0.573)	(0.234)	(0.338)	(0.340)
$GDPgrowth_{c,t\text{-}1}*ExtDep_s$	0.069	-0.013	0.184	-0.119
	(0.082)	(0.351)	(0.232)	(0.119)
Country*Time FE	Yes	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes	Yes
N	6373	6381	6748	6364
$adj.R^2$	0.215	0.193	0.149	0.143

Note: The dependent variable denotes the change in aggregate total assets at industry-level for various firm-size classes at time t. The variable '$stance$' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 11: Monetary Policy & Industry Structure: Short-Term Debt Growth by Firm Size

	(1) ST debt growth micro firms (<2m TA)	(2) ST debt growth small firms (2-10m TA)	(3) ST debt growth medium firms (10-43m TA)	(4) ST debt growth large firms (>43m TA)
$stance_{c,t\text{-}1}*\Delta MP_{c,t\text{-}1}*ExtDep_s$	0.012	-0.072***	-0.011	0.035*
	(0.013)	(0.019)	(0.020)	(0.018)
$stance_{c,t\text{-}1}*ExtDep_s$	-0.070**	0.059	0.041	0.060
	(0.027)	(0.062)	(0.053)	(0.048)
$\Delta MP_{c,t\text{-}1}*ExtDep_s$	0.426	1.604*	0.353	-3.024***
	(0.785)	(0.849)	(0.939)	(0.789)
$stance_{c,t\text{-}2}*\Delta MP_{c,t\text{-}2}*ExtDep_s$	0.0205	0.005	-0.064**	-0.027
	(0.030)	(0.018)	(0.029)	(0.031)
$stance_{c,t\text{-}2}*ExtDep_s$	0.051	-0.023	-0.012	-0.075
	(0.055)	(0.046)	(0.071)	(0.057)
$\Delta MP_{c,t\text{-}2}*ExtDep_s$	-0.239	-0.728	2.831***	1.909**
	(1.176)	(0.754)	(0.586)	(0.753)
$GDPgrowth_{c,t\text{-}1}*ExtDep_s$	-0.117	0.187	0.119	-1.013***
	(0.239)	(0.282)	(0.452)	(0.153)
Country*Time FE	Yes	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes	Yes
N	5917	5915	5961	5631
$adj.R^2$	0.319	0.270	0.267	0.188

Note: The dependent variable denotes the change in aggregate Current Liabilities at industry-level for various firm-size classes at time t. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 12: Monetary Policy & Industry Structure: Long-term Debt Growth by Firm Size

	(1) LT debt growth micro firms (<2m TA)	(2) LT debt growth small firms (2-10m TA)	(3) LT debt growth medium firms (10-43m TA)	(4) LT debt growth large firms (>43m TA)
$stance_{c,t-1}*\Delta MP_{c,t-1}*ExtDep_s$	-0.020	0.047**	0.068	0.027
	(0.022)	(0.018)	(0.041)	(0.023)
$stance_{c,t-1}*ExtDep_s$	0.024	0.042	-0.049	0.035
	(0.052)	(0.037)	(0.044)	(0.077)
$\Delta MP_{c,t-1}*ExtDep_s$	1.335	-0.886	-1.622	-0.371
	(0.833)	(0.619)	(1.023)	(1.207)
$stance_{c,t-2}*\Delta MP_{c,t-2}*ExtDep_s$	0.022	0.040	-0.014	-0.004
	(0.0192)	(0.034)	(0.031)	(0.043)
$stance_{c,t-2}*ExtDep_s$	0.158**	-0.034	0.053	0.052
	(0.060)	(0.044)	(0.050)	(0.100)
$\Delta MP_{c,t-2}*ExtDep_s$	0.879**	0.213	-1.214	-1.743**
	(0.392)	(1.411)	(1.398)	(0.826)
$GDPgrowth_{c,t-1}*ExtDep_s$	-0.280	-0.0625	-0.813	-0.152
	(0.509)	(0.280)	(0.576)	(0.425)
Country*Time FE	Yes	Yes	Yes	Yes
Country*Sector FE	Yes	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes	Yes
N	5754	5809	5806	5511
$adj.R^2$	0.243	0.180	0.135	0.085

Note: The dependent variable denotes the change in aggregate Non-Current Liabilities at industry-level for various firm-size classes at time t. The variable '*stance*' captures the length of the accommodative monetary policy stance. 'ΔMP' is defined as change in the deviation from the monetary policy rule. '$ExtDep_s$' is the industry median fraction of capital expenditures financed external funds for mature Compustat companies. Regressions include fixed effects as specified, standard errors clustered at the country level appear in parentheses. The ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

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