

The Impact of Loose Monetary Policy on the Competitiveness of Czech Firms

Dopad uvolněné monetární politiky na konkurenceschopnost českých firem

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Abstract

The aim of this paper is to examine whether the policy of low interest rates and exchange rate commitment of the Czech National Bank affected the competitiveness of non-financial firms in the Czech Republic in the sectors of agriculture, construction and manufacturing. Panel techniques are employed to investigate the impact of monetary policy on selected indicators of firms' competitiveness, measured by financial performance in this study. Size and sectoral characteristics are reflected when analysing the impact of monetary policy. The empirical evidence is based on firm-level data from the Amadeus database for the period between 2006 and 2015. Evaluating monetary policy effects on the whole sample, our empirical evidence suggested that the competitiveness of Czech firms measured by indicators of financial performance increases. The results vary among profitability ratios, but the highest influence was investigated for the ROE ratio. We found that monetary policy affected firm-specific characteristics, and firm-specific variables in interaction with monetary policy affected competitiveness of firms. FX interventions were also a significant factor in competitiveness in all cases.

Keywords

competitiveness, financial performance, foreign exchange rate interventions, low interest rates, monetary policy

JEL Codes

E52; G32

Abstrakt

Cílem tohoto příspěvku je zjistit, zda monetární politika nízkých úrokových sazeb a devizové intervence České národní banky ovlivnily konkurenceschopnost nefinančních podniků v České republice, které působí v rámci sektoru zemědělství, stavebnictví a zpracovatelského průmyslu. S využitím metod panelové regrese zkoumáme dopad monetární politiky na vybrané ukazatele konkurenceschopnosti společností, které jsou měřeny prostřednictvím finanční výkonnosti. Dopad měnové politiky je rovněž zkoumán prostřednictvím velikosti a odvětvové příslušnosti analyzovaných společností. Výzkum vychází z firemně specifických dat dostupných v databázi Amadeus v rámci sledovaného období let 2006 až 2015. Výsledky analýzy ukázaly, že konkurenceschopnost podniků měřená prostřednictvím finančních ukazatelů byla monetární politikou ovlivněna. Výsledky se liší pro jednotlivé ukazatele, ale nejvýznamnější dopad měly pro ukazatel ROE. Dále bylo zjištěno, že měnová politika působí rovněž v interakci s firemně specifickými

ukazateli a vzájemně působí na konkurenceschopnost firem. Intervence České národní banky se pak ukázaly jako významné ve všech analyzovaných případech.

Klíčová slova

konkurenceschopnost, finanční výkonnost, devizové intervence, nízké úrokové sazby, monetární politika

Introduction

Both the global financial and sovereign debt crises caused a low level of economic growth and low inflation in many countries of the European Union (EU), and the Czech Republic was no exception. To prevent deflation and to stimulate the economies, the European central bank (ECB) began to lower the key interest rates in 2009, e.g. the interest rate on deposit facilities reached 0.00% in June 2012 and negative values in June 2014. The Czech National Bank (CNB) started to lower the discount rate as early as in August 2008. The developments in the CNB's and ECB's discount rates since 2005 are provided in Appendix 1. Due to the lower rates, the demand for loans should increase and should be reflected in aggregate demand and prices consequently. The CNB also decided to use the exchange rate as an additional monetary policy instrument and in November 2013 started to use foreign exchange interventions to weaken the CZK.

The aim of this study is to examine whether the policy of low interest rates and exchange rate commitment of the CNB affected the competitiveness of Czech firms in the sectors of agriculture, construction and manufacturing. When assessing the impact of monetary policy on competitiveness, the literature is focused primarily on competitiveness at the national level. Porter (1998) states that it is not the nations, but firms that compete. Therefore, we decided to evaluate competitiveness at firm level. Following the existing literature (e.g. see Deperru and Cerrato, 2005; Bobillo et al., 2006; Liargovas and Skandalis, 2010; Pervan and Višić, 2012, among others) and based on the nature of our dataset, we adopted selected indicators of financial performance as measures of firm competitiveness.

One can find a broad literature that is devoted to monetary policy and its impact on international competitiveness at the national level, or when focusing on corporate sector there is also rich evidence on the impact of monetary policy on indicators of banks' financial performance, but to our knowledge, there is very limited literature that deals with competitiveness and monetary policy issues at firm level.

Following Gertler and Gilchrist (1993), Bernanke and Gertler (1995), de Haan et al. (2006) and Aliyev et al. (2015) among others, the balance sheet channel is used when evaluating competitiveness, since we have data at the firm level. This channel is used because firm specifics from balance sheets and income statements are used and according to the literature, these statements are affected by monetary policy settings, e.g. see Bernanke and Gertler (1995).

We intend to reveal the answers to the following research questions that are set to be answered in line with the defined aim of the paper: Is the competitiveness of Czech firms

affected by the monetary policy of very low interest rates? Do changes in the monetary policy rate interact with firm-specific variables included in the model? Do FX (foreign exchange) interventions affect competitiveness? Are there differences among individual sectors when evaluating the impact of monetary policy? Does the impact differ for small and large firms? The answers can be beneficial when assessing the impact of the CNB's monetary policy with respect to the balance sheet channel in an environment of very low interest rates.

We contribute to the empirical evidence in several ways. First, we try to reveal the impact of monetary policy on the competitiveness of Czech firms, where competitiveness is measured by financial performance. Second, the impact of monetary policy is compared in the sectors of agriculture, construction and manufacturing. Third, size characteristics are considered when assessing the impact of changes in monetary policy rate. Fourth, the effects of monetary loosening are addressed.

The paper proceeds as follows. Section 1 provides information on firm competitiveness definitions and measurements. The relation between monetary policy and competitiveness is introduced in Section 2. The used dataset is characterised in Section 3 and the econometric methodology explained in Section 4. The results and discussion are presented in Section 5 and the final section summarises the main findings and concludes the paper.

1 Firm competitiveness in the literature

When focusing on competitiveness in the literature, one can find different approaches to perceptions and definitions of competitiveness. Competitiveness can also be studied at different levels, e.g. for products, firms, industries, regions, nations or integration blocks. It is evident that competitiveness is a multidimensional concept. Therefore, it is very hard to provide a unique definition of competitiveness, even though it is a very frequently used term. A majority of studies agreed with the fact that there is no explicit statement of what exactly competitiveness is. Vlachvei and Nota (2016) provide one of the most universal definitions of competitiveness. It can be viewed as "a complex and fuzzy concept that incorporates a multitude of aspects". A well-arranged theoretical background to competitiveness can be found e.g. in Siudek and Zawajska (2014) or Jambor and Babu (2016).

In this study, we do not intend to provide a detailed review of different competitiveness perspectives on different levels, since it is focused on the effects of monetary policy on firms' competitiveness. The provided review is focused on the current state of knowledge concerning competitiveness at the firm level. However, as stated by Porter (1990), one should be also aware of the fact that the competitiveness of a nation is dependent on the capacity of its industry to upgrade and innovate.

The following text is divided into two sub-sections for better continuity and arrangement. Definitions of competitiveness at firm level are provided in Section 2.1, and methods of competitiveness measurement at firm level in Section 2.2.

1.1 Definitions of competitiveness at firm level

This section provides selected definitions of competitiveness at firm level that can be found in the literature. We believe that firm level competitiveness is crucial for regional, national and consequently international competitiveness. Figure 1 presents our view on competitiveness that is in line with Porter (1990).

Figure 1: Competitiveness at different levels



Source: Authors' construction.

Understanding the provided definitions is a prerequisite for understanding the choice of indicators that can be used for measuring firm competitiveness. Buckeley et al. (1988) view the competitiveness of a firm as its ability to produce and sell products and services of good quality with lower costs than its competitors. They also state that competitiveness is expressed by a firm's long-run profit performance, its ability to provide superior returns to the owners and its ability to compensate the employees. Lall (2001) claims that the competitiveness of a firm can be viewed as its ability to do better in profitability, market shares or sales.

According to Depperu and Cerrato (2005), competitiveness can be viewed from two perspectives, as a driver or as an outcome, and can be treated as both an independent and dependent variable. They also note that competitiveness should be understood as a multidimensional construct. Chikan (2008) defines firm competitiveness as "a capacity of a firm to sustainably fulfil its double purpose: meeting customer requirements at profit". Chao-Hung and Li-Chang (2010) perceive the competitiveness of a firm as its economic position against its rivals in the global market without trade boundaries. Liargovas and Skandalis (2010) perceive firm competitiveness as "multi-faceted in nature as a number of variables should be jointly adopted to measure it". Domazet (2012) claims that the

interpretation of competitiveness at the micro-economic level is straightforward: he proposes that it is “based on the capacity of firms to compete, to grow, and to be profitable”. Jambor and Babu (2016) state that competitiveness at micro-level is focused on firm performance and resources.

Several frameworks have been developed for competitiveness, for example, Buckley et al. (1988) propose a framework that covers competitiveness performance, competitiveness potential and management processes, while Bartlett and Ghosdal (1989) and Hamel and Prahalad (1989), among others, view competitiveness as based on the competency approach and stress the role of internal factors that are specific to the firm. Ajitabh and Momaya (2004) propose an Asset-Processes-Performance (APP) framework that provides a comprehensive view of the sources of competitiveness.

1.2 Measurement of competitiveness at firm level

One can find different measures of competitiveness at firm level in the literature. The measures used depend primarily on the nature and availability of data. Yap (2004) proposes that measures of competitive performance at firm level are straightforward compared to competitiveness measures at the national level.

Basically, measures of firm competitiveness can be divided into two groups. The first includes indicators measuring the financial performance of firms since, as proposed by Liargovas and Skandalis (2010), good financial performance can be connected with increasing competitiveness. Depperu and Cerrato (2005) also claim that profitability is considered as the most significant measure of the competitive success of a firm in general. Indicators of financial performance are used for example in the following studies: Goddard et al. (2005), Pervan and Višić (2012) and Lalinsky (2013) use return on assets (ROA); Bobillo et al. (2006) net profit margin and sales; Liargovas and Skandalis (2010) adopt ROA, return on equity (ROE) and return on sales (ROS); Akben-Selcuk (2016) proxies financial performance by ROA and gross margin. Jambor and Babu (2016) also suggest that firm competitiveness can be measured in a simple way using traditional financial indicators such as ROA, ROE, and earnings before interest, taxes, and depreciation and amortisation (EBITDA) or profitability growth.

The second group of indicators for measuring firm competitiveness is focused on non-financial performance, which includes indicators like the market share of the firm or the overall satisfaction of customers. For example, Ajitabh and Momaya (2004) state that the competitiveness of a firm can be expressed by its share in the competitive market, Lalinsky (2013) employs labour productivity, export performance and market share, and Voulgaris et al. (2013) use market share and market share growth.

It should be emphasised that specifying the determinants of firm competitiveness depends on the point of view through which we understand competitiveness. One variable can be used as an indicator of competitiveness and can be treated as a dependent variable, but the same variable can be used as an independent variable if another measure of

competitiveness is chosen. Typically, the measures of profitability, ROA or ROE and market share are used as examples.

When addressing the factors that affect firm competitiveness, the results of most published studies confirm that firm-specific characteristics affect competitiveness (e.g. see Goddard et al., 2005; Liargovas and Skandalis, 2010; Sauka, 2014; Akben-Selcuk, 2016). A detailed summary of the determinants of financial performance is presented in a meta-analysis compiled by Capon et al. (1990) who review 320 studies from 1921 to 1987. However, some studies also examine the impact of macroeconomic factors, e.g. Andrén et al. (2002), Schmitz et al. (2012) and Gulatiet al. (2013). In the literature, other factors that can affect the competitiveness of firms are also studied, e.g. the role of the innovative capabilities of firms, information technologies, quality of products, research and development activities, marketing strategies, design and management, etc.

2 Monetary policy and firm competitiveness

As stated by Siudek and Zawojcka (2014), the macroeconomic environment provides general conditions that create opportunities for higher corporate competitiveness. Even though a central bank focuses primarily on price stability, its actions affect the overall economy. Transmission mechanisms allow changes in monetary policy settings to lead to the desired changes in inflation. In this study, we are not interested in changes in inflation, which come at the end of the mechanism, but we are focused on the relation between changes in the settings of monetary policy and the competitiveness of firms.

The following sections explain briefly the principles of two instruments that have been recently used by the CNB: changes in key interest rates and FX interventions.

2.1 Changes in key interest rates

To stimulate the economy, the central bank can lower its key interest rates. The changes in discount rates can be transmitted into the economy through different transmission channels. The logic behind this is that with lower rates, the demand for loans should increase and consequently they should be reflected in aggregate demand and price development. Appendix 2 demonstrates how the transmission mechanism works according to the ECB.

Since firm-level data are used in our empirical research and because we adopted the indicators of financial performance as proxies of firm competitiveness, the so-called balance sheet channel is used in order to evaluate competitiveness in response to monetary policy. As stated for example by Gertler and Gilchrist (1993), Bernanke and Gertler (1995), de Haan et al. (2006) and Aliyev et al. (2015), the balance sheet channel is viewed as part of the money or credit channel and it can also be described as the broad credit view or broad credit channel. The importance of the balance sheet channel is also

emphasised by Bernanke and Gertler (1995), who explain the likely impact of changes in monetary policy on borrowers' balance sheets and income statements.

The literature dealing with the balance sheet channel is focused mainly on the effects of monetary policy on the financing of firms (e.g. see Gertler and Gilchrist, 1994; Mizen and Yalcin, 2002; Bougheas et al., 2006; de Haan and Sterken, 2006; Aliyev et al., 2015; Zulkhibri, 2015; Karpavičius and Yu, 2017). The impact on firm investments is analysed in Ogawa (2000), Nagahata and Sekine (2005), Angelopoulou and Gibson (2009) and Masuda (2015) for example.

We believe that the financial performance of firms as a measure of competitiveness can be also affected by monetary policy. Lower rates allow firms to finance investments or other activities that can consequently influence their competitiveness. Lower rates can also support household spending. Households choose from the majority of products on the market where firms compete and then the profitability of firms can increase as a consequence of their spending.

When evaluating the impact of lower interest rates, one should also consider that net exports can be affected as well. As Miskin (1995) proposes, the exchange rate channel of monetary policy also involves interest rate effects. The process behind this is as follows. When domestic real interest rates decrease, domestic deposits in CZK become less attractive relative to deposits denominated in foreign currencies, which leads to a decrease in the value of CZK deposits relative to other currency deposits and to a depreciation of the CZK. The depreciation makes domestic goods cheaper than foreign goods, which should support exports, leading to an increase in net exports and in aggregate output.

2.2 FX interventions

However, when interest rates are very low and close to zero, the central bank should look for other instruments that can release monetary conditions, as did the CNB. It lowered interest rates to technical zero (0.05%) at the end of 2012. To maintain price stability and stimulate the economy, it started to use exchange rate intervention as an additional monetary policy instrument in November 2013. The CNB (2017b) suggests that for a small open economy such as the Czech Republic, FX interventions are a more effective instrument for easing monetary conditions.

The principle of interventions can be summarised as follows. A weak exchange rate of the CZK increases import prices and as a consequence domestic price levels. Domestic economic activity should also be supported in that way that households demand domestic goods and services because of higher import prices and support domestic producers. Exports are also boosted since the weaker CZK makes Czech production cheaper abroad, which should support the profitability of firms and also their investment enthusiasm. For more information on FX intervention as a monetary policy instrument, see Hüfner (2012), who provides evidence for inflation targeting countries.

3 Data

The firm-specific characteristics are obtained from the Amadeus database, indicators of economic sentiment from the European Commission and monetary policy indicators from the ARAD database (Czech National Bank, 2017a). The choice of variables is described below. Data are of annual frequency. The observed period starts in 2006 and ends in 2015. Competitiveness is observed for firms in the sectors of agriculture, construction and manufacturing.

The original dataset included 141,350 firms, however there are many outliers in the sample that are inconsistent with the existing range of data points, therefore all firm-specific variables were winsorised on the 1% and 99% levels to remove outliers from the dataset. The final set including all sectors contains from 7,997 to 8,567 firms depending on the dependent variable used. The concrete numbers are shown in the tables with the results in Section 6. The literature from the Section 2.2 is followed when choosing dependent variables (e.g. see Goddard et al., 2005; Bobillo et al., 2006; Liargovas and Skandalis, 2010; Pervan and Višić, 2012; Lalinsky, 2013; Akben-Selcuk, 2016; Jambor and Babu, 2016). Based on the nature of our dataset and on the assumption that we view competitiveness from the perspective of financial performance, we adopted the following indicators as dependent variables:

$$ROA = \frac{EBIT}{total\ assets} \quad (1)$$

$$ROE = \frac{EBIT}{equity} \quad (2)$$

$$ROS = \frac{EBIT}{sales} \quad (3)$$

$$profit\ margin = \frac{EBIT}{sales} \quad (4)$$

The set of explanatory variables is presented in Table 1. As an indicator of monetary policy, we use the three-month inter-bank money market interest rate PRIBOR, since the short-term interest rate can be associated with the monetary policy rate, as in, for example, Angeloni et al. (2003), de Haan and Sterken (2006) and Aliyev et al. (2015). The negative sign of coefficient is expected, as we expect a lower rate to be associated with more credit that can be used for financing firms' operations and activities, which can lead to increased profitability.

Table 1: Set of explanatory variables

Variable	Definition	Expected sign
MP_{t-1}	Monetary policy indicator	-
$SENT_{t-1}$	Economic sentiment	+/-
AGE_t	Number of years the firm exists	+/-
$CASH_t$	Cash and cash equivalents	+/-
$DEBT_t$	Total debt outstanding	+/-
$DEPR_t$	Depreciation	-
$EMPL_t$	Costs of employees	-
INT_t	Interest expenses paid	-
$INTAN_t$	Intangible fixed assets	+/-
$SIZE_t$	Size of firm measured by the balance sheet total	+
$SOLV_t$	Solvency ratio	+
TAN_t	Tangible fixed assets	-
$WCAP_t$	Working capital	+

Source: Authors' construction based on literature survey.

To catch the impact of the business cycle and expectations, economic sentiment is included based on data from the Directorate General for Economic and Financial Affairs of the European Commission (EUROSTAT, 2017). The impact on the selected measure of profitability and hence competitiveness can be ambiguous. If there are optimistic expectations about future economic development, the increased demand for products should imply higher profits. However, firms can also use more credit to finance their activities, especially during times when interest rates are low. If they buy assets, it does not affect the used ratios of financial performance significantly. Even though the indicator of economic sentiment seems to be optimistic, the economic agents can behave differently to what was expected, especially in an economy with deflationary pressures, and profitability does not increase.

Besides macroeconomic variables, firm-specific characteristics are included in the model. The majority of studies on competitiveness deal with these specifics; for example, McGahan (1999) proposes that firms' characteristics and actions can explain 36% of the variance in profitability. The selected variables are divided by total assets instead of age, solvency ratio, liquidity ratio and size.

Age represents the number of years of a firm's existence. Its impact on competitiveness measured by financial performance can be both positive and negative, as older firms are more experienced and profit from reputation effects, as proposed in Liargovas and Skandalis (2010), or, as stated by Voulgaris et al. (2013), younger firms use modern management procedures and behave more aggressively to gain higher market share and profit. Agiomirgiannakis et al. (2006) also claim that the effect is uncertain.

The variables cash and cash equivalents and working capital are used as measures of liquidity. As is proposed in Ehiedu (2014) among many others, liquidity is one of the major indicators of financial performance. To expand a firm's operations, it should have liquidity at an adequate level (Voulgaris and Lemonakis, 2014). To a certain level, liquidity affects the profitability of a firm in a positive way. However, excess liquidity can have a negative effect. Deloof (2003) states that an important driver of profitability is effective working capital management.

The ratio of debt outstanding to total assets is also included in our model. Capon et al. (2010) show in their meta-analysis that this is an important determinant of financial performance and indicate a negative relationship between debt and financial performance.

Even though many authors in the literature survey do not include costs in their analyses, we decided to include depreciation, cost of employees and interest expenses into our estimations because we believe that these are related significantly to financial performance. Negative signs of the coefficients are anticipated, as costs lower profitability.

Intangible fixed assets are used as a measure of innovations or can be understood as a proxy for research and development expenses because they can indicate future growth opportunities, as mentioned by Volgaris and Lemonakis (2014). They propose a positive relationship, but Akben-Selcuk (2016) evidences a negative relationship.

The ratio of tangible fixed assets to total assets is included in the research as an indicator of capital intensiveness. Capon et al. (1990) report a negative impact, since higher investment in tangible fixed assets is related to lower performance.

The importance of size has been shown in the literature, therefore, it is also taken into account in our work. The logarithm of total assets is used as a proxy of size. Most of the literature shows a positive relationship between size and financial performance, for example Goddard et al. (2005) or Liargovas and Skandalis (2010).

The solvency ratio is adopted as a measure of solvency. Solvency points to financial stability, that can be connected to financial performance and competitiveness. We believe solvency is positively associated with the financial performance of firms.

Dummy variables for size are employed to reveal whether the size of a company matters when assessing financial performance. Dummy d_{small} and dummy d_{large} are defined on the basis of the balance sheet total, see OECD (2013). To catch the impact of FX interventions, dummy variable d_{inter} is added into the model.

The results of the descriptive statistics are demonstrated in Table 2. The probabilities of Jarque-Bera test statistics are not reported here since they are zero in all cases, and therefore the normality is rejected.

Table 2: Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	J.-B.stat.
MP	1.9471	1.5400	4.1100	0.3800	1.2692	2377
SENT	-0.0063	-0.0047	0.1454	-0.2215	0.1127	2254
AGE	2.4878	2.6391	4.1589	0.0000	0.6328	15759
CASH	0.0677	0.0341	1.0352	-0.5094	0.0967	244415
DEBT	0.2412	0.2078	5.1285	-0.4082	0.1738	879388
DEPR	0.0536	0.0464	0.5586	-0.0566	0.0390	271506
EMPC	0.2892	0.2224	4.4603	-0.0350	0.2549	783917
INT	0.0136	0.0106	0.2230	-0.0401	0.0116	289735
INTA	0.0031	0.0000	0.8626	-0.4810	0.0152	6.46E+08
TNG	0.4376	0.4494	1.5852	-0.3698	0.2244	473
WCAP	0.2051	0.1997	1.0430	-1.3132	0.1873	4017
SIZE	10.8871	11.0545	13.9695	5.0999	1.3923	1253
SOLV	38.2303	38.8120	98.3250	-99.1420	26.5971	5563

Source: Authors' calculations.

The correlations are presented in Appendix 3. No strong correlations are found between the independent variables.

4 Econometric methodology

Since we are aware of a possible endogeneity problem as indicated in the literature, we first considered the use of the panel GMM model as proposed in Arellano and Bond (1991), because in commonly applied fixed effect and random effect models, lags of the level-dependent variables might be found to be correlated with the error terms and the models can become inconsistent. The result of the Sargan test (or over-identifying restriction test) revealed that the proposed instruments are invalid and the specification of the model was rejected: for more information, see e. g. Verbeek (2008).

Therefore, the relationship between the ratios and independent variables is estimated using a standard panel regression model with fixed effects. The Hausman test (Hausman, 1978) is focused on testing the differences between random and fixed effects. Andreß et al. (2013) suggest that if two estimators are consistent with the set of preconditions, their estimates should not differ significantly. The standard error of difference between fixed effects and random effect $s\hat{\sigma}(\hat{\beta}_{FE}-\hat{\beta}_{RE})$ estimates is calculated consequently:

$$\hat{\sigma}(\hat{\beta}_{FE}-\hat{\beta}_{RE}) = \sqrt{\hat{\sigma}_{\hat{\beta}_{FE}}^2 - \hat{\sigma}_{\hat{\beta}_{RE}}^2} \quad (5)$$

In the case of large datasets, Andreß et al. (2013) recommend using Wald statistics that can be set in the following way:

$$X_3^2 = \left(\frac{(\hat{\beta}_{FE} - \hat{\beta}_{RE}) - 0}{\hat{\sigma}_{(\hat{\beta}_{FE} - \hat{\beta}_{RE})}} \right)^2 \quad (6)$$

where test statistic t has distributions like χ^2 with one degree of freedom. The fixed effects model is used since the Hausman test rejects the null hypothesis of no systematic difference between coefficients for both the random and fixed effect models. The fixed effect model was also confirmed by a Wald test. Appendix 4 provides the results of the Hausman and Wald tests. The employed panel fixed effect model has the following form:

$$Y_{it} = \alpha_1 + \alpha_2 MP_{t-1} + \alpha_3 \Delta SENT_t + \alpha_4 X_{it} + \alpha_5 d_small_{it} + \alpha_6 d_large_{it} + \alpha_7 d_int_{it} + e_{it} \quad (7)$$

where α_1 is an intercept, $\alpha_2 \dots \alpha_7$ are coefficients to be estimated, Y_{it} is a financial performance indicator adopted as a measure of firm competitiveness i in year t , MP_{t-1} is the indicator of monetary policy in year $t-1$, $\Delta SENT_t$ controls for expectations and cyclical effects, X_{it} is the vector of non-stochastic firm-specific explanatory variables that explain the financial performance of firm i in year t , d_small_{it} represents the dummy variable for small firms and d_large_{it} for large firms at time t , d_int_{it} is the dummy variable for the period of FX interventions, D_sect_{it} and e_{it} are the error terms.

Consequently, the interaction terms between firm-specific variables and the monetary policy indicator MP_{t-1} are added to the regression to reflex the heterogeneity of responses to monetary policy changes as for example in Aliyev et al. (2015) or Kapuściński (2016). The model can be expressed as follows:

$$Y_{it} = \alpha_1 + \alpha_2 MP_{t-1} + \alpha_3 \Delta SENT_t + \alpha_4 X_{it} MP_{t-1} + \alpha_5 d_small_{it} + \alpha_6 d_large_{it} + \alpha_7 d_int_{it} + e_{it} \quad (8)$$

where $X_{it} MP_{t-1}$ symbolises the interaction term between firm-specific variable and monetary policy indicator. Wooldridge (2002) is followed when identifying the effects of monetary policy. One has to be very careful when interpreting the interaction term coefficients to overcome incorrect conclusions.

5 Results and discussion

Before we focus on the monetary policy effects, the impact of the control variables is discussed. The response of profitability ratios to firm-specific characteristics is evaluated in Table 3. We find most of these variables statistically significant for ratios ROA, ROE and profit margin. The results for ratio ROS might be considered as weak: the low effect of firm-specific variables on ROS might be also seen in Liargovas et al. (2010) or Majumdar (1997), who used ROS as one of the financial and non-financial drivers of firm performance. We assume that the profitability measured by ROS is more affected by factors such as advertising, distribution, marketing or tax policy, which need another kind of data.

A negative sign of coefficient is revealed for age of the firms. Voulgaris and Lemonakis (2014) expect a positive sign, as older firms have learned from experience and might benefit from the reputation effect. On the other hand, other studies suggest a negative impact on firms' financial performance due to so-called "inertia effects" leading firms to become inflexible and have difficulties in fitting the rapidly changing business environment in which they operate (Barron et al., 1994; Loderer and Waelchli, 2010). As firms get older, their returns on assets and profit margins deteriorate, Voulgaris et al. (2013) suggest. The negative sign for age might also indicate that younger firms might be more aggressive and use modern methods to achieve higher rates of return. Large firms might be also subject to agency problems, resulting in a negative relationship between size and financial performance (Pervan and Višić, 2012; Loderer and Waelchli, 2010; Cooley and Quadrini, 2001).

Table 3: Panel estimation results for financial performance ratios

	ROA	ROE	ROS	MARGIN
C	-17.3655 ^a (-5.7105)	-12.2692 ^a (-0.8336)	6.8335 (0.237095)	-23.5817 ^a (-9.0081)
MP	-0.2954 ^a (-5.1364)	-0.8322 ^a (-3.1508)	0.8304 (1.5177)	-0.0861 (-1.7441)
SENT	-2.1387 ^a (-4.0887)	2.3863 (0.9949)	-4.0716 (-0.8126)	-2.2087 ^a (-4.9205)
AGE	-2.4984 ^a (-7.3601)	-12.7752 ^a (-7.8014)	-3.1085 (-0.954)	-1.0374 ^a (-3.5397)
CASH	18.2762 ^a (15.0065)	48.4214 ^a (8.4229)	-24.8072 ^b (-2.1177)	10.3233 ^a (9.9133)
DEBT	-6.1594 ^a (-9.6976)	-26.6676 ^a (-8.5625)	-7.2514 (-1.1849)	-3.3932 ^a (-6.2035)
DEPR	-35.8168 ^a (-12.7659)	-126.8878 ^a (-9.1738)	28.9555 (1.0826)	-25.9644 ^a (-10.7629)
EMPC	-8.6806 ^a (-11.4738)	-23.3310 ^a (-5.9228)	-6.1577 (-0.8233)	-3.1815 ^a (-4.9253)
INT	-31.0713 ^a (-3.2601)	-97.3127 ^a (-1.9868)	-313.155 ^a (-3.4254)	-37.6333 ^a (-4.5786)
INTA	-14.0636 ^a (-1.9625)	-14.8570 (-0.4088)	40.5094 (0.6005)	-14.2755 ^b (-2.3304)
TNG	-4.7433 ^a (-5.6483)	-12.6104 ^a (-3.1731)	-5.5782 (-0.6802)	-3.6748 ^a (-5.0871)
WCAP	9.5685 ^a (13.1393)	22.9035 ^a (6.4748)	0.9869 (0.1407)	5.7939 ^a (9.2702)
SIZE	2.1599 ^a (7.9472)	5.1020 ^a (3.9138)	3.5427 (1.3484)	2.4302 ^a (10.3895)
SOLV	0.2346 ^a (36.7394)	0.4272 ^a (12.2830)	-0.0573 (-0.9079)	0.1478 ^a (26.9139)

	ROA	ROE	ROS	MARGIN
MARGIN	-	-	0.2636 ^a (3.3792)	-
D_SMALL	0.0914 (0.3186)	0.0846 (0.0658)	3.1846 (1.1471)	-0.3017 (-1.2244)
D_LARGE	-5.3965 (-1.1671)	-19.8316 (-0.8281)	0.3521 (0.0072)	-8.0092 ^c (-1.8101)
D_INT	1.2736 ^a (7.8873)	2.7178 ^a (3.6627)	-1.1006 (-0.7133)	1.0044 ^a (7.2420)
Adj. R sq.	0.5445	0.3719	0.1028	0.5183
F-stat.	4.8210	2.9065	1.3636	4.4403
No. of obs.	27,438	25,802	27,247	27,398
No. of firms	8,567	7,997	8,552	8,553

Source: Authors' calculations.

Note: a, b and c indicate 1%, 5% and 10% levels of significance. The values of the t-statistics are provided in parentheses.

The positive effect of cash and cash equivalents is consistent with our expectation that a higher share of cash and cash equivalent supports firms' operation (Goddard et al., 2005) and supports firms to benefit from long-term investment opportunities. In our analysis, cash and cash equivalents most strongly affect ROE.

Leverage is negative and statistically significant for all profitability ratios except ROS. High reliance on debt has a negative impact on profitability ratios, as for, for example, Voulgaris and Lemonakis (2014). This finding is in line with Agiomirgiannakis et al. (2006), as leverage affects profitability negatively because of the higher interest cost. Low levels of debt increase the return on equity, but large amounts of debt increase company risk, with adverse effects on profitability.

Depreciation, costs of employees and interest expenses are negatively related to financial performance in three out of four ratios. The negative effect is expected, since these variables directly influence firms' profitability. The strongest effect is on ROE. Intangible assets might be viewed as a proxy for research and development costs according to Voulgaris and Lemonakis (2014). The sign might be expected to be positive or negative and the final effect depends on whether these costs lead to higher productivity or not (Kafourous, 2005). Contrary to our expectation, the sign of coefficient for intangible assets like the proxy for R&D expenses is negative for ROA, ROE and gross profit margin. This finding suggests that an increase in productivity might be offset by these expenditures, leading to a decrease in ROA, ROE and gross profit margin.

Investments in fixed assets negatively affect profitability ratios. This ratio is proxy for capitalisation and shows the capital intensity of the firm. The negative sign is consistent with the findings of Voulgaris et al. (2013) and Liargovas and Skandalis (2010).

The impact of size on firm's profitability is a subject of investigation, e.g. see Pervan and Višić (2012). If firms gain advantage from economies of scale as they expand, a positive effect of size on profitability is expected.

Working capital is used as a measure of liquidity, as it is relevant to the success of a firm as suggested by Deloof (2003). Studies on the impact of liquidity are ambiguous, e.g. Knauer and Wöhrmann (2003). A positive effect is expected according to Benito and Vlieghe (2000). Nevertheless, studies suggest that profitability and liquidity are complementary up to a certain point: after a certain point in liquidity, further investment in current assets might be deteriorative, as stated by Pervan and Višić (2012). In our study, working capital is found to be an important factor of firms' profitability.

We expected the solvency ratio to have a positive impact on profitability. The power of this ratio is weak compare with other firm-specific determinants. This finding might be explained by the thesis of Diakoulaki et al. (1992) that solvency is more closely related to the probability of business failure than profitability.

We use gross profit margin as independent variable to measure its significance for profitability measured by ROS. We find the expected positive effect of this variable. From the set of firm-specific determinants, the profit margin almost the only measure that influences the ROS indicator.

A negative and statistically significant sign is estimated when dealing with the impact of the economic sentiment index on financial performance ratios. One proposal explaining this result might be the construction of this index. Hüfner and Schröder (2002) suggest that this European Commission version of the Economic Sentiment Indicator does not exhibit a lead but rather seems to coincide or even lag economic activity, and this might be the reason why we find a negative sign.

The effect of monetary policy changes in interest rate on the profitability of firms is statistically significant for three out of four profitability ratios. An increase in loose monetary policy positively affects the indicators of financial performance. However, the influence of this variable is low compare with the above analysed firm-specific variables. The role of monetary policy is strongest for the ROE ratio. We realise that changes in interest rates also affect other firm-specific characteristics, and therefore regressions with interactions between monetary policy and firm-specific factors are employed; for the results see Table 5 (discussed below).

Dummy variables are also included in our estimation, see Table 4. The dummy for the period of FX interventions affects the indicators of firms' financial performance positively and significantly. When assessing the effect of small and large firms, we have not found any significant impact on the ratios of financial performance, as the impact of the dummy variables is not statistically significant.

When assessing the impact in individual sectors, our results are in line with previous analyses of the impact of firm-specific determinants on profitability. However, if we focus on macroeconomic variables, we can find differences among sectors. Loose monetary

policy affects sectors differently. We find that low interest rates increase the profitability of the manufacturing and construction sectors; on the other hand, it affects agriculture in the opposite way. We also find the period of CNB FX interventions statistically significant and positive for the profitability of all sectors. The detailed results of the regression estimates for the sectors are provided in Appendices 5–8.

Table 4 summarises the results for interactions between monetary policy and firm-specific determinants, showing the main effects of monetary policy in interaction with firm-specific determinants on the indicators of financial performance. The effects were calculated based on the panel estimation results provided in detail in Appendix 9. Wooldridge (2002) is followed when calculating the coefficients of interaction terms.

Monetary policy affects the majority of firm-specific determinants. The effect is strongest for ROE compared with ROA and margin. Loose monetary policy affects the debt structure of firms, which might be seen in the statistically significant results for variable debt in the ROA and margin ratio. A period of low interest rates also decreases the level of interest expenses, which is reflected in the higher profitability of all ratios. The effect of monetary policy on the size of a firm is the most apparent for the ROE ratio. We might conclude that the impact and its power of monetary policy on firm-specific variables vary among ratios and measures. The strongest influence is registered for the ROE ratio.

Table 4: Panel estimation results for financial performance ratios

Variable	ROA	ROE	MARGIN
CASH*MP	-3.1898	-11.1901	-2.7998
DEBT*MP	-3.4223	-11.1988	-3.0339
DEPR*MP	-3.0053	-10.9582	-2.5969
EMPC*MP	-3.2189	-11.6830	-2.7967
INT*MP	-2.7887	-10.4868	-2.5004
INTA*MP	-3.1830	-11.3599	-2.8021
TNG*MP	-2.6464	-9.6205	-2.3848
WC*MP	-2.9998	-10.7938	-2.6671
SIZE*MP	-0.7592	-4.2304	-0.8253
SOLV*MP	-3.7896	-11.9459	-2.9776

Source: Authors' calculations.

Note: Statistically significant values are in bold.

Conclusions

The aim of this paper was to examine whether the CNB's policy of low interest rates and exchange rate commitment affected the competitiveness of Czech firms in the sectors of agriculture, construction and manufacturing.

Five research questions were set, the answers to which can be helpful when evaluating the impact of the CNB's monetary policy. We found that firm-specific determinants affecting the profitability of Czech firms had different power among variables and sectors. We found that profitability increased with size and decreased with age; on the other hand there are no significant differences in competitiveness between large and small firms.

When evaluating the effects of monetary policy on the whole sample, our empirical evidence suggested that the competitiveness of Czech firms as measured by indicators of financial performance (ROA, ROE, profit margin) increases. ROS does not seem to be a good measure of financial performance; therefore, we focused our estimations primarily on ROA, ROE and profit margin. The results varied for individual ratios, but the highest influence was investigated for the ROE ratio. Including interaction terms in our regression, we found that monetary policy also affected firm-specific characteristics that were included in our model, and then these firm-specific variables in interaction with monetary policy affected the competitiveness of firms. We also added dummy variables for FX interventions to our model and found them significant in all cases. Focusing on the effect of monetary policy in different sectors, we indicated the significance of FX interventions, but the impact of the monetary policy key rate differed. We also intended to reveal whether it matters whether the firm is small or large; however, our results did not confirm our expectations.

The study brought out empirical evidence on the competitiveness of Czech firms, also considering the effects of monetary policy. The findings can have practical implications, especially for policy-makers. The results deepen our understanding of the effects that monetary policy triggers on a firm-specific level. Our results suggested that loose monetary policy as well as FX interventions are significant tools for stimulating economic performance. The paper provides rewarding information on the implications of monetary policy for Czech firms' competitiveness as measured by indicators of financial performance.

Our research also has some limitations that can be addressed in future research, since firm competitiveness is a very complex issue. Other indicators can be employed as measures of competitiveness, and competitiveness can be understood from other perspectives than financial performance. To this point, we would like to mention that it depends on the nature of the data that are available for measuring competitiveness, and that the indicator of competitiveness can be treated as a factor that drives competitiveness from different points of view. To understand monetary policy effects in individual sectors in detail, more comprehensive research should be employed which considers sectoral characteristics.

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References

- AGIOMIRGIANNAKIS, G., F. VOULGARIS and T. PAPADOGONAS** (2006). Financial Factors Affecting Profitability and Employment Growth: The Case of Greek Manufacturing. *Int. J. Financial Services Management*, 1(2/3), pp. 235-245.
- AJITABH, A. and K. MOMAYA** (2004). Competitiveness of Firms: Review of Theory, Frameworks and Models. *Singapore Management Review*, 26(1), 45-60.
- AKBEN-SELÇUK, E.** (2016). Does Firm Age Affect Profitability? Evidence from Turkey. *International Journal of Economic Sciences*, 5(3), pp. 1-9.
- ALIYEV, R., D. HÁJKOVÁ AND I. KUBICOVÁ** (2015). The Impact of Monetary Policy on Financing of Czech Firms. *Czech Journal of Economics and Finance*, 65(6), pp. 455-476.
- ANDRÉN, N., AND L. OXELHEIM** (2002). Exchange-Rate and Interest-Rate Driven Competitive Advantages in the EMU. *Working Paper 576*. The Research Institute of Industrial Economics, Stockholm.
- ANDREß, H., K. GOLSCH AND A. W. SCHMIDT** (2013). *Applied Panel Data Analysis for Econometric and Social Surveys*. Berlin Heidelberg: Springer-Verlag.
- ANGELOPOULOU, E. and H. D. GIBSON** (2009). The Balance Sheet Channel of Monetary Policy Transmission: Evidence from the United Kingdom. *Economica*, 76(304), pp. 675-703.
- ARELLANO, M. AND S. BOND** (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, 58(2), pp. 277-297.
- BARRON, D. N.** (1994). Time to growth and a time to die: Growth and mortality of credit unions in New York. *American Journal of Sociology*, 100(2), pp. 381-421.
- BARTLETT, A. and S. GHOSDAL** (1989). *Managing across Borders*. Boston: Harvard Business School Press.
- BENITO, A and G. W. VLIEGHE** (2000). Stylised facts on UK corporate financial health: evidence from micro-data. *Financial Stability Review*, 8, pp. 83-93.
- BERNANKE, B. S. and M. GERTLER** (1995). The Credit Channel of Monetary Policy Transmission. *The Journal of Economic Perspectives*, 9(4), pp. 27-48.
- BOBILLO, A. M., J. A. RODRIGUEZ and F. T. GAITE** (2006). Innovation Investment, Competitiveness, and Performance in Industrial Firms. *Thunderbird International Business Review*, 48(6), pp. 867-890.
- BOBBA, F., W. LANGER and J. W. POUS** (1971). *Bericht über die Wettbewerbsfähigkeit der Europäischen Gemeinschaft*, Brussels.
- BOUGHEAS, S., P. MIZEN and C. YALCIN** (2006). Access to External Finance: Theory and Evidence on the Impact of Monetary Policy and Firm-specific Characteristics. *The Journal of Banking & Finance*, 30(1), pp. 199-227.

- BUCKLEY, P. J., C. L. PASS and K. PRESCOTT** (1988). Measures of International Competitiveness: A Critical Survey. *Journal of Marketing Management*, 4(2), 175–200.
- CAPON, N., J. U. FARLEY and S. HOENIG** (1990). Determinants of Financial Performance: A Meta-Analysis. *Management Science*, 36(10), pp. 1143-1159.
- CHAO-HUNG, W. and H. LI-CHANG** (2010). The Influence of Dynamic Capability on Performance in the High Technology Industry: The Moderating Roles of Governance and Competitive Posture. *African Journal of Business Management*, 4(5), 562–577.
- CHIKAN, A.** (2008). National and Firm Competitiveness: A General Research Model. *Competitiveness Review*, 18(1/2), pp. 20-28.
- COOLEY, T. F. and V. QUADRINI** (2001). Financial Markets and Firm Dynamics. *American Economic Review*, 91(5), pp. 1286-1310.
- CZECH NATIONAL BANK** (2017a). ARAD Data Series System. Available at: http://www.cnb.cz/docs/ARADY/HTML/index_en.htm [Access: August 15, 2017].
- CZECH NATIONAL BANK** (2017b). *The Exchange Rate as a Monetary Policy Instrument*. Available at: https://www.cnb.cz/en/faq/the_exchange_rate_as_monetary_policy_instrument.html [Access: August 10, 2017].
- DELOOF, M.** (2003). Does Working Capital Management Affect Profitability of Belgian Firms? *Journal of Business Finance and Accounting*, 30, pp. 573-588.
- DEPPERU, D. and D. CERRATO** (2005). *Analyzing International Competitiveness at the Firm Level: Concepts and Measures*. Available at: http://dipartimenti.unicatt.it/dises-wp_azzurra_05_32.pdf [Access: June 12, 2017].
- DIAKOULAKI G., G. MAVROSTAS and L. PAPAYANNAKIS** (1992). A multicriteria approach for evaluating the performance of industrial firms. *Omega*, 20(4), pp. 467-474.
- DOMATZ, T.** (2012). Regional Cooperation Striving for Competitiveness and Finance. *Ekonomika Preduzeća*, 60(5-6), pp. 290-300.
- EHIEDU, V. C.** (2014). The Impact of Liquidity on Profitability of Some Selected Companies: The Financial Statement Analysis (FSA) Approach. *Research Journal of Finance and Accounting*, 5(5), pp. 81-90.
- EUROPEAN CENTRAL BANK** (2017). *Transmission Mechanism of Monetary Policy*. Available at: <https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html>.
- EUROPEAN COMMISSION** (2017). Economic Sentiment Indicator. Available at: https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys/download-business-and-consumer-survey-data/time-series_en [Access: August 15, 2017].
- EUROSTAT** (2017). *Economic Sentiment Indicator*. Available at: <http://ec.europa.eu/eurostat/web/products-datasets/-/teibs010> [Access: August 15, 2017].
- GERTLER, M. and S. GILCHRIST** (1993). The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence. *The Scandinavian Journal of Economics*, 95(1), pp. 43-64.
- GERTLER, M., and S. GILCHRIST** (1994). Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms. *Quarterly Journal of Economics*, 109(2), pp. 309-340.

- GODDARD, J., M. TAVAKOLI and J. O. S. WILSON** (2005). Determinants of Profitability in European Manufacturing and Services: Evidence from a Dynamic Panel Model. *Applied Financial Economics*, 15(18), pp. 1269-1282.
- GULATI, A. B. S., J. KNIF and J. KOLARI** (2013). Exchange Rate Shocks and Firm Competitiveness in a Small, Export-Oriented Economy: The Case of Finland. *Multinational Finance Journal*, 17(1/2), pp. 1-47.
- HAAN, DE L. and E. STERKEN** (2006). The Impact of Monetary Policy on the Financing Behaviour of Firms in the Euro Area and the UK. *The European Journal of Finance*, 12(5), pp. 401-240.
- HAMEL, G., and C. K. PRAHALAD** (1989). *Strategic Intent*. Harvard Business Press.
- HAUSMAN, J. A.** (1978). Specification Tests in Econometrics. *Econometrica*, 46(6), pp. 1251-1271.
- HÜFNER, F.** (2012). *Foreign Exchange Intervention as a Monetary Policy Instrument: Evidence for Inflation Targeting Countries*. Springer Science & Business Media.
- JAMBOR, A. and S. BABU** (2016). *Competitiveness of Global Agriculture*. Springer International Publishing.
- KAFOUROS, M. I.** (2005). R&D and productivity growth: Evidence from the UK. *Economics of Innovation and New Technology*, 14(6), pp. 479-497.
- KARPAVIČIUS, S. and F. YU** (2017). The Impact of Interest Rates on Firms' Financing Policies. *Journal of Corporate Finance*, 45, pp. 262-293.
- KNAUER, T. and A. WÖHRMANN** (2013). Working capital management and firm profitability. *Journal of Management Control*, 24(1), pp. 77-87.
- LALINSKY, T.** (2013). Firm Competitiveness Determinants: Results of a Panel data Analysis. *NBS Working paper*.
- LALL, S.** (2001). *Competitiveness, Technology and Skills*. Cheltenham: Edward Elgar Publishing.
- LIARGOVAS, P. and K. SKANDALIS** (2010). Factors Affecting Firms Competitiveness: The Case of Greece. *Global Business and Management Journal*, 2(2-3), pp. 184-197.
- LODERER, C., and U. WAELCHLI** (2010). Firm age and performance. *MPRA Paper No. 26450*, Munich Personal RePEc Archive, Munich.
- MASUDA, K.** (2015). Fixed Investment, Liquidity Constraint, and Monetary Policy: Evidence from Japanese Manufacturing Firm Panel Data. *Japan and the World Economy*, 33, pp. 11-19.
- MAJUMDAR, S. K.** (1997). The Impact of Size and Age on Firm-Level Performance. *Review of Industrial Organization*, 12(2), pp.231-241.
- MCGAHAN, A. M.** (1999). Competition, Strategy, and Business Performance. *California Management Review*, 41(3), pp. 268-274.
- MISHKIN, F. S.** (1995). Symposium on the Monetary Transmission Mechanism. *The Journal of Economic Perspectives*, 9(4), pp.3-10.
- MIZEN, P. and C. YALCIN** (2002). Corporate Finance When Monetary Policy Tightens. *Working paper, no. 03-18*. University of Nottingham.

- NAGAHATA, T. and T. SEKINE** (2005). Firm Investment, Monetary Transmission and Balance-Sheet Problems in Japan: An Investigation Using Micro Data. *Japan and the World Economy*, 17, pp. 345-369.
- OGAWA, K.** (2000). Monetary Policy, Credit, and Real Activity: Evidence from the Balance Sheet of Japanese Firms. *Journal of the Japanese and International Economies*, 14, pp. 385-407.
- ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT** (2013). *Financing SMEs and Entrepreneurs 2013: An OECD Scoreboard*. OECD Publishing.
- PERVAN, M. and J. VIŠIĆ** (2012). Influence of Firm Size on its Business Success. *Croatian Operational Research Review*, 3, pp. 213-223.
- PORTER, M.** (1990). *The Competitive Advantage of Nations*. New York: Free Press.
- PORTER, M.** (1998). *The Competitive Advantage of Nations*. Macmillan Business.
- SAUKA, A.** (2014). Measuring the Competitiveness in Latvian Companies. *Baltic Journal of Economics*, 14(1-2), pp. 140-158.
- SCHMITZ, M., M. DE CLERCQ, M. FIDORA, B. LAURO and C. PINHEIRO** (2012). Revisiting the Effective Exchange Rates of the Euro. *ECB Occasional Paper 134*. European Central Bank, Frankfurt.
- SCHRÖDER, M. and F. HÜFNER** (2002). Forecasting Economic Activity in Germany – How Useful are Sentiment Indicators? *ZEW Discussion Paper No. 02-56*, Mannheim.
- SIUDEK, T. and A. ZAWOJSKA** (2014). Competitiveness in the Economic Concepts, Theories and Empirical Research. *Acta Scientiarum Polonorum. Oeconomia*, 13(1), pp. 91-108.
- VERBEEK, M.** (2008). *A Guide to Modern Econometrics*. United Kingdom: John Wiley & Sons.
- VLACHVEI, A. and O. NOTA** (2016). Firm Competitiveness: Theories, Evidence and Measurement. In Vlachvei, A., Notta, O., Karantininis, K. and Tsounis, N. (Eds.). *Factors Affecting Firm Competitiveness and Performance in the Modern Business World*. IGI Global.
- VOULGARIS, F. and C. LEMONAKIS** (2014). Competitiveness and Profitability: The Case of Chemicals, Pharmaceuticals and Plastics. *Journal of Economic Asymmetries*, 11, pp. 46-57.
- VOULGARIS, F., T. PAPADOGONAS and C. LEMONAKIS** (2013). Drivers of Competitiveness in the Manufacturing Industry: The Case of Technology Sectors in Greece. *Journal of Economics and Development Studies*, 1(3), pp. 32-40.
- WOOLDRIDGE, J. M.** (2002). *Introductory Econometrics: A Modern Approach*. U.S.: Cengage South-Western.
- YAP, J. T.** (2004). A Note on the Competitiveness Debate. *Discussion paper series no. 2004-39*. Philippine Institute for Development Studies.
- ZULKHIBRI, M.** (2015). Interest Burden and External Finance Choices in Emerging Markets: Firm-level Data Evidence from Malaysia. *International Economics*, 141, pp. 15-33.

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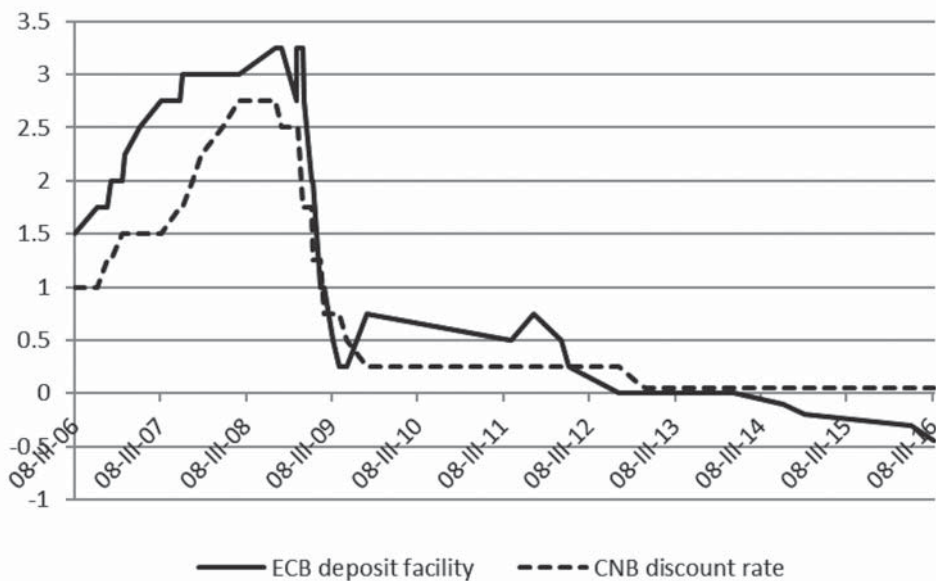
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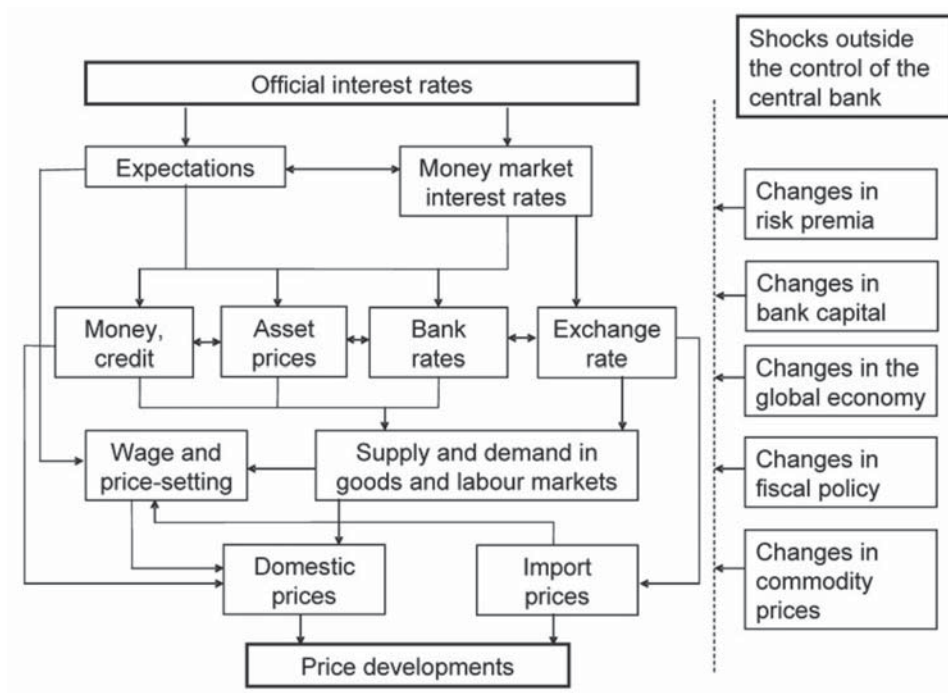
Appendices

Appendix 1: The development in the CNB's and ECB's discount rates (2005-2016)



Source: Authors' construction based on data from CNB and ECB.

Appendix 2: Monetary policy transmission mechanism



Source: ECB (2017).

Appendix 3: Correlation matrix

	MP	SENT	AGE	CASH	DEBT	DEPR	EMPC	INT	INTA	TNG	WCAP	SIZE	SOLV
MP	1												
SENT	0.4671	1											
AGE	0.1855	0.1082	1										
CASH	-0.007	-0.015	-0.1237	1									
DEBT	0.0005	-0.0137	-0.1441	-0.0826	1								
DEPR	0.0223	0.0367	0.0153	0.0309	0.1279	1							
EMPC	-0.0502	-0.0578	-0.0795	0.1319	0.0229	0.1301	1						
INT	-0.0339	-0.0176	-0.2127	-0.0163	0.4772	0.1916	0.1352	1					
INTA	-0.0049	-0.0068	-0.0152	-0.0128	0.0265	0.0382	0.0373	0.0229	1				
TNG	0.0476	0.0593	0.1666	-0.3023	0.1659	0.2894	-0.1929	0.0887	-0.0651	1			
WCAP	-0.019	-0.0252	0.0878	-0.1392	-0.0819	-0.1231	0.0454	-0.1254	0.0136	-0.4151	1		
SIZE	0.0162	0.0321	0.3221	-0.2769	-0.1758	-0.1458	-0.3693	-0.3525	-0.0207	0.1941	0.0958	1	
SOLV	0.0121	0.0228	0.3067	0.0596	-0.4835	0.0054	-0.1774	-0.4941	-0.0195	0.1545	0.2511	0.3694	1

Source: Authors' calculations.

Appendix 4: Hausman test and Wald test results

Hausman test				
		Chi-Sq.St.	Chi-Sq.d.f.	Prob.
ROA		314.1937	19	0.0000
ROE		505.8662	19	0.0000
ROS		14.1366	19	0.7757
Margin		68532834.00077	19	0.0000
Wald test				
		Value	df	Prob.
ROA	F-stat	6.0151	(3,2737)	0.0004
	Ch-Square	18.0455	3	0.0004
ROE	F-stat	2.5543	(3,27374)	0.0535
	Ch-Square	7.6630	3	0.0535
ROS	F-stat	2.3086	(3,27387)	0.0743
	Ch-Square	6.9259	3	0,0743
MARGIN	F-stat	3.9204	(2,2739)	0.0198
	Ch-Square	7.8409	2	0.0198

Source: Authors' calculations.

Appendix 5: Panel estimation results for ROA

	Sector A	Sector C	Sector F
C	-11.8893 ^b (-1.7574)	-23.5116 ^a (-5.6533)	-16.3179 (-1.9217)
MP	0.3085 ^a (3.5938)	-0.4346 ^a (-5.4929)	-0.8386 ^a (-4.3801)
SENT	-4.8955 ^a (-6.2396)	0.259 (0.3602)	-2.2884 (-1.3224)
AGE	-1.1224 (-1.6017)	-2.1559 ^a (-4.7711)	-4.8935 ^a (-4.8909)
CASH	25.1816 ^a (9.3897)	21.5191 ^a (12.2954)	14.35 ^a (4.9537)
DEBT	0.4189 (0.4259)	-8.1377 ^a (-9.1983)	-11.9347 ^a (-5.0799)
DEPR	-61.7786 ^a (-11.7821)	-45.8431 ^a (-11.3845)	-26.2442 ^a (-3.1751)
EMPC	-12.5954 ^a (-3.6433)	-8.8678 ^a (-8.9501)	-23.0689 ^b (-11.164)
INT	-33.8212 ^c (-1.7165)	-34.3182 ^a (-2.6235)	51.0369 (1.8508)
INTA	-36.1748 ^b (-2.4106)	-1.4641 (-0.1749)	16.6498 ^a (0.6883)
TNG	-2.7864 ^c (-1.6711)	-2.3975 ^b (-2.0464)	-5.6513 ^a (-2.2203)
WCAP	11.5726 ^a (8.0303)	10.9839 ^a (10.4989)	6.313 ^a (3.5753)
SIZE	1.3482 ^b (2.3554)	2.351 ^a (6.4639)	2.6129 ^a (3.3244)
SOLV	0.1566 ^a (13.3335)	0.2463 ^a (26.781)	0.3461 ^a (17.9213)
D_SMALL	-0.3505 (-0.7783)	0.0465 (0.1265)	1.7149 (1.355)
D_LARGE	13.2755 ^a (2.7636)	-13.7413 ^b (-1.733)	-34.9229 ^a (-2.7942)
D_INTER	0.764 ^a (3.1274)	1.1713 ^a (5.2479)	1.5926 ^a (2.9462)
Adj. R sq.	0.5270	0.5639	0.5097
F-stat.	5.7331	5.2788	3.4841
No. of obs.	5,679	14,503	4,303
No. of firms	1,319	4,365	1,783

Source: Authors' calculations.

Note: a, b and c mean 1, 5 and 10% level of significance. Values of t-statistics are provided in parentheses. A is a sector of agriculture, C manufacturing and F construction.

Appendix 6: Panel estimation results for ROE

	Sector A	Sector C	Sector F
C	3.1575 (0.1029)	-28.7226 (-1.4012)	-50.4541 (-1.2561)
MP	0.4536 (1.2235)	-1.3348 ^a (-3.5398)	-2.1568 ^b (-2.5116)
SENT	-3.6207 (-1.0686)	10.8235 ^a (3.1602)	-4.8376 (-0.6326)
AGE	-3.008 (-0.9646)	-10.8998 ^a (-4.7961)	-20.0422 ^a (-4.2944)
CASH	77.9473 ^a (6.5027)	50.9215 ^a (6.0204)	52.5579 ^a (4.0251)
DEBT	-19.7352 ^a (-4.4564)	-29.6626 ^a (-6.5891)	-59.2186 ^a (-5.4218)
DEPR	-200.349 ^a (-8.5883)	-164.83 ^a (-7.9779)	-119.945 ^a (-3.0107)
EMPC	-38.9387 ^b (-2.533)	-32.3945 ^a (-6.1719)	-43.1814 ^a (-4.1077)
INT	-46.5278 (-0.5213)	-29.6921 (-0.4384)	-9.6879 (-0.0678)
INTA	-49.9653 (-0.765)	-10.1431 (-0.2222)	66.4717 (0.6282)
TNG	16.7283 (2.255)	-12.1269 ^c (-2.1007)	-7.4471 (-0.6578)
WCAP	33.4579 ^a (5.1104)	28.4434 ^a (5.4597)	24.2833 ^a (2.9588)
SIZE	1.0414 (0.4045)	5.4508 ^a (3.0605)	10.1815 ^a (2.7475)
SOLV	0.085 (1.4334)	0.54 ^a (10.4276)	0.4096 ^a (3.8622)
D_SMALL	-1.1632 (-0.6049)	0.1494 (0.0875)	4.4913 (0.8222)
D_LARGE	29.1039 (0.934)	-27.9254 (-0.7632)	-37.9841 (-0.7128)
D_INTER	0.9579 (0.9004)	2.1674 ^b (2.0335)	7.2893 ^a (3.0251)
Adj. R sq.	0.3691	0.352	0.6285
F-stat.	3.5050	2.7968	2.3346
No. of obs.	5,534	13,718	3,964
No. of firms	1,275	4,130	1,648

Source: Authors' calculations.

Note: a, b and c mean 1, 5 and 10% level of significance. Values of t-statistics are provided in parentheses. A is a sector of agriculture, C manufacturing and F construction.

Appendix 7: Panel estimation results for ROS

	Sector A	Sector C	Sector F*
C	-27.8192 (-0.3933)	-9.2696 (-0.2254)	-
MP	0.4632 (0.5173)	0.3151 (0.407)	-
SENT	-15.2824 ^c (-1.8527)	2.3239 (0.3306)	-
AGE	-0.7906 (-0.1077)	-7.7342 ^c (-1.7312)	-
CASH	-23.3178 (-0.8293)	-31.7215 ^c (-1.8507)	-
DEBT	-12.1306 (-1.1854)	-4.8815 (-0.5629)	-
DEPR	21.2499 (0.3753)	39.4937 (0.9951)	-
EMPC	-39.32 (-1.0847)	-5.8287 (-0.5993)	-
INT	-0.4476 (-0.0022)	-314.409 ^b (-2.4543)	-
INTA	-2.8727 (-0.0184)	94.7139 (1.1641)	-
TNG	-14.4672 (-0.8313)	-9.1442 (-0.7919)	-
WCAP	-9.2468 (-0.6118)	-7.9566 (-0.7718)	-
SIZE	4.4654 (0.747)	4.302 (1.1997)	-
SOLV	-0.118 (-0.9511)	0.0269 (0.2916)	-
MARGIN	0.0875 (0.7085)	0.412 ^a 3.2615	-
D_SMALL	-0.9448 (-0.2012)	6.1348 ^b (1.7094)	-
D_LARGE	-7.2627 (-0.1458)	15.431 (0.2004)	-
D_INTER	0.1589 (0.0623)	1.0685 (0.4882)	-
Adj. R sq.	0.1235	0.067	-
F-stat.	1.5960	1.2368	-
No. of obs.	5,638	14,374	-
No. of firms	1,315	4,353	-

Source: Authors' calculations.

Note: a, b and c mean 1, 5 and 10% level of significance. Values of t-statistics are provided in parentheses. A is a sector of agriculture, C manufacturing and F construction.

*Note 2: Lack of observations for the Sector F does not allowed panel regression computation for the ratio ROS.

Appendix 8: Panel estimation results for profit margin

	Sector A	Sector C	Sector F
C	-21.5923 ^b (-2.4954)	-26.0394 ^a (-8.0993)	0.5501 (0.3196)
MP	0.4872 ^a (4.4476)	-0.2931 ^a (-4.8292)	-0.572 ^a (-4.8594)
SENT	-8.1216 ^a (-8.1013)	0.3385 (0.6137)	-0.9741 (-0.8349)
AGE	-0.3989 (-0.4433)	-0.6389 ^c (-1.828)	-1.0814 ^a (-5.911)
CASH	29.3961 ^a (8.5912)	10.9143 ^a (8.1452)	3.4379 ^a (3.2068)
DEBT	0.5665 (0.4523)	-5.7442 ^a (-8.4459)	1.3961 (1.6191)
DEPR	-70.6261 ^a (-10.315)	-28.4373 ^a (-9.1659)	-10.6824 ^a (-3.466)
EMPC	-28.9723 ^a (-6.5444)	-4.0001 ^a (-5.2982)	-2.4538 ^a (-5.0109)
INT	-42.3199 ^c (-1.6744)	-36.1207 ^a (-3.5956)	-16.4373 (-1.397)
INTA	-36.6009 ^c (-1.9114)	0.8800 (0.1371)	-10.3818 (-0.7656)
TNG	-2.9074 (-1.3624)	-2.5598 ^a (-2.8349)	0.4389 (2.4811)
WCAP	15.7785 ^a (8.5729)	6.1599 ^a (7.6525)	-1.8706 ^b (-2.5636)
SIZE	2.2386 ^a (3.0601)	2.4428 ^a (8.7151)	0.1066 ^a (0.162)
SOLV	0.1572 ^a (10.4739)	0.1495 ^a (21.0769)	0.295 ^a (2.6148)
D_SMALL	-0.6788 (-1.1813)	-0.0476 (-0.1689)	-1.0437 (-1.2977)
D_LARGE	8.0721 (1.3171)	-28.9581 ^a (-4.7673)	-13.5544 ^c (-1.8258)
D_INTER	1.3591 ^a (4.3567)	0.625 ^a (3.6413)	0.9017 ^a (2.9237)
Adj. R sq.	0.5355	0.556	0.1699
F-stat.	5.8470	5.6187	49.5557
No. of obs.	5,672	14,489	4,299
No. of firms	1,315	4,362	1,781

Source: Authors' calculations.

Note: a, b and c mean 1, 5 and 10% level of significance. Values of t-statistics are provided in parentheses. A is a sector of agriculture, C manufacturing and F construction.

Appendix 9: Panel estimations with interactions

	ROA	ROE	MARGIN
C	-12.0058 ^a (-3.7008)	- 8.4454 (0.5415)	-18.3817 ^a (-6.5755)
MP	-3.1830 ^a (-5.8187)	- 11.3600 ^a (-4.3292)	-2.8021 ^a (-5.9548)
SENT	-2.3439 ^a (-4.4788)	2.2928 (0.9518)	-2.3589 ^a (-5.2434)
AGE	-2.8135 ^a (-8.2218)	-12.7443 ^a (-7.6963)	-1.0956 ^a (-3.7024)
CASH	18.8205 ^a (10.8588)	38.9985 ^a (4.7838)	10.2781 ^a (6.9086)
CASH*MP	-0.1998 (-0.3162)	4.9807 (1.6675)	0.0670 (0.1234)
DEBT	-4.5442 ^a (-5.0935)	-29.04178 ^a (-6.5731)	-1.9770 ^a (-2.5713)
DEBT*MP	-1.1515 ^a (-2.8823)	0.7755 (0.3904)	-1.1155 ^a (-3.2411)
DEPR	-44.6283 ^a (-11.2518)	-146.549 ^a (7.5932)	-35.7996 ^a (-10.4667)
DEPR*MP	3.8304 ^a (2.7077)	8.6579 (1.2621)	4.4222 ^a (3.6485)
EMPC	-8.6910 ^a (-9.9782)	-33.513 ^a (-7.233)	-3.5015 ^a (-4.7008)
EMPC*MP	-0.1086 (-0.1614)	-1.4530 (1.3476)	0.0243 (0.1272)
INT	-86.9571 ^a (-6.2991)	-213.6092 ^a (-3.0973)	-81.1056 ^a (-6.7954)
INT*MP	37.2032 ^a (6.3311)	82.3688 ^a (2.7773)	28.4629 ^a (5.6144)
INTA	-2.9945 (-0.3116)	4.0763 (0.0805)	-4.1713 (-0.5064)
INTA*MP	-6.4854 ^c (-1.6712)	-8.36345 (0.4440)	-5.4018 ^c (-1.6473)
TNG	-6.8375 ^a (-6.4999)	-19.6232 ^a (-3.9136)	-5.1339 ^a (-5.6447)
TNG*MP	1.1941 ^a (3.7741)	3.8704 ^a (2.5272)	0.9287 ^a (3.3954)
WC	7.6950 ^a (7.6058)	17.40370 ^a (3.5583)	4.5072 ^a (5.1688)
WC*MP	0.91740 ^a (2.6577)	2.8346 ^c (1.6742)	0.6760 ^b (2.2780)
SIZE	0.2193 ^a (5.0397)	3.7696 ^a (2.7453)	2.1027 ^a (8.4882)

SIZE*MP	0.2193 ^a (5.0397)	0.6449 ^a (3.1580)	0.1788 ^a (4.7738)
SOLV	0.2681 ^a (31.2008)	0.4614 ^a (10.3251)	0.1560 ^a (21.0752)
SOLV*MP	-0.01563 ^a (-5.5044)	-0.0151 (-1.0319)	-0.0045 ^b (-1.8485)
D_SMALL	0.0879 (0.3074)	0.1560 (0.1245)	-0.2886 (-1.1737)
D_LARGE	-5.0198 (-1.0897)	-17.6945 (-0.7393)	-7.7644 ^c (-1.7587)
D_INTER	1.3938 ^a (8.6073)	2.7743 ^a (3.7063)	1.0484 ^a (7.5264)
Adj. R sq.	0.5481	0.3731	0.5206
F-stat.	4.8737	2.9137	4.4687
No. of obs.	27,438	25,802	27,398
No. of firms	8,567	7,997	8,553

Source: Authors' calculations.

Note: a, b and c mean 1, 5 and 10% level of significance. Values of t-statistics are provided in parentheses. A is a sector of agriculture, C manufacturing and F construction.