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Ekonomické studie a analýzy

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VĚDECKÉ STATĚ

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Economic Studies and Analyses
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EDITORIAL

COMMENT OF THE GOVERNOR OF THE CZECH NATIONAL BANK / KOMENTÁŘ GUVERNÉRA ČESKÉ NÁRODNÍ BANKY

SCIENTIFIC ARTICLES / VĚDECKÉ STATĚ

NEWS FROM THE SCIENTIFIC LIFE OF THE UNIVERSITY / ZPRÁVY Z VĚDECKÉHO ŽIVOTA ŠKOLY

Editorial
Editorial

MOJMÍR HELÍSEK

Dear readers,

This year's first issue of the scientific journal ACTA VŠFS is associated with the Professor František Vencovský Prize contest, which is announced by the Rector of the University of Finance and Administration on a biennial basis. This contest aims at supporting young economists (up to 35 years of age) in economics and finance research. In addition, the contest commemorates the work of an outstanding Czech economist, Professor František Vencovský (1923-2006), whose scientific work focused on monetary and fiscal policies and on the history of the Czech economic doctrine.

The sixth year of this contest took place in 2017, with thematic focus on *Competition of enterprises in the context of fiscal and monetary policies*. Upon evaluation, the nomination committee selected three winning papers from all the papers entered in the competition; all three papers are published in this issue of ACTA VŠFS. The first place was shared by two author couples, namely Martin Hodula and Lukáš Pfeifer on one hand and Veronika Kajurová and Dagmar Linnertová on the other hand. The third place went to Lenka Říhová. Their papers were subject to a review procedure, which involved experts from the University of Finance and Administration as well as external evaluators.

In the first article entitled *The Impact of Credit Boom and Economic Policies on Labour Productivity: A Sectoral Analysis*, Martin Hodula and Lukáš Pfeifer analyse the impact of credit boom and of expansive monetary and fiscal policy on labour productivity and labour reallocation in the Czech Republic. They come to the conclusion that credit boom results in a labour reallocation effect towards less productive sectors. Expansive monetary policy supports the catching-up effect of the Czech economy; at the same time, however, it can support credit activity and, thus, indirectly generate the labour reallocation effect. These findings feed into a discussion, which aims at finding reasons for the lengthy economic recovery process following the last crisis.

In the second article entitled *The Impact of Loose Monetary Policy on the Competitiveness of Czech Firms*, Veronika Kajurová and Dagmar Linnertová examine whether the low-interest-rate monetary policy and the foreign exchange interventions of the Czech National Bank affected the competitiveness of non-financial enterprises in the Czech Republic. The results of their analysis showed that the competitiveness of enterprises, measured by means of financial indicators, was affected by the monetary policy. The interventions carried out by the Czech National Bank turned out to be significant in all analysed cases.

The third article written by Lenka Říhová and entitled *Tax Competitiveness of Tourism Enterprises in an International Context* focuses on analysing the most important types of taxes in tourism levied in the Czech Republic, Slovakia and Austria and on their impact on

the international competitiveness of enterprises. In her article, the author concludes that economic operators in the beverage service business face a high share of labour costs, which can be passed on to tourists through higher prices. At the end, she determines the relative tax competitiveness of the Czech Republic as a tourist destination for 2017.

The winning papers were presented at a conference that took place at the Czech National Bank Congress Centre in November 2017. The conference was held under the auspices of the Czech National Bank Governor, Mr. Jiří Rusnok, who gave an opening speech. Its content is also published in the current issue of ACTA VŠFS under the title *The Czech Economy is on an Even Keel Following the Crisis*.

For more information about the contest and the conference, please visit the websites:

- www.vsfs.cz/cena
- www.vsfs.cz/konference

We are currently preparing the seventh year of the contest, the results of which will, once again, be brought to you in the ACTA VŠFS journal.

Prof. Ing. Mojmír Helísek, CSc.
Expert coordinator of the contest
University of Finance and Administration

Vážení čtenáři,

první letošní číslo vědeckého časopisu ACTA VŠFS je spojeno se soutěží o Cenu profesora Františka Vencovského, kterou ve dvouletých intervalech vyhlašuje rektorka Vysoké školy finanční a správní. Cílem této soutěže je podpořit mladé ekonomy (ve věku do 35 let) ve výzkumu v oblasti ekonomie a financí. Touto soutěží také připomínáme dílo významného českého ekonoma profesora Františka Vencovského (1923-2006), jehož vědecké práce se soustředily na monetární a fiskální politiku a na dějiny českého ekonomického učení.

V roce 2017 proběhl šestý ročník této soutěže, s tematickým zaměřením *Konkurenceschopnost podniků v souvislosti s fiskální a monetární politikou*. Z přihlášených soutěžních prací vyhodnotil nominační výbor soutěže jako vítězné tři práce, které jsou publikovány v tomto čísle časopisu ACTA VŠFS. O první místo se dělily dvě autorské dvojice, jednak Martin Hodula a Lukáš Pfeifer, a dále pak Veronika Kajurová a Dagmar Linnertová. Třetí místo získala Lenka Říhová. Jejich práce prošly recenzním řízením, na němž se podíleli odborníci z Vysoké školy finanční a správní i hodnotitelé externí.

Martin Hodula a Lukáš Pfeifer v prvním článku s názvem *Dopad úvěrového boomu a hospodářských politik na produktivitu práce: odvětvová analýza* zkoumají dopady úvěrového boomu, měnové a fiskální expanze na produktivitu a přerozdělování práce v České republice. Docházejí k závěrům, že úvěrový boom způsobuje efekt přerozdělování

práce směrem k méně produktivním odvětvím. Měnová expanze podporuje efekt dohánění české ekonomiky, zároveň ale může podpořit úvěrovou aktivitu a nepřímo tak způsobit efekt přerozdělování práce. Tato zjištění přispívají k diskuzi, která se snaží zdůvodnit zdlouhavý proces ozdravování ekonomiky po poslední krizi.

Veronika Kajurová a Dagmar Linnertová ve druhém článku *Dopad uvolněné monetární politiky na konkurenceschopnost českých firem* zkoumají, zda monetární politika nízkých úrokových sazeb a devizové intervence České národní banky ovlivnily konkurenceschopnost nefinančních podniků v České republice. Výsledky analýzy ukázaly, že konkurenceschopnost podniků měřená prostřednictvím finančních ukazatelů byla monetární politikou ovlivněna. Intervence České národní banky se pak ukázaly jako významné ve všech analyzovaných případech.

Lenka Říhová se ve třetím článku *Daňová konkurenceschopnost podniků cestovního ruchu v mezinárodním kontextu* zaměřuje na analýzu nejdůležitějších typů daní v oblasti cestovního ruchu v České republice, Slovensku a Rakousku a na jejich vliv na mezinárodní konkurenceschopnost podniků. Článek dochází k závěru, že subjekty podnikající v pohostinství čelí vysokému podílu nákladů na pracovní sílu, které mohou být přeneseny na turisty prostřednictvím vyšších cen. V závěru zjišťuje relativní daňovou konkurenceschopnost České republiky jako turistické destinace pro rok 2017.

Prezentace vítězných prací proběhla na konferenci v Kongresovém centru České národní banky v listopadu 2017. Konference se uskutečnila pod záštitou guvernéra České národní banky Jiřího Rusnoka, který v jejím úvodu přednesl příspěvek, jehož obsah je pod titulkem *Vývoj české ekonomiky v postkrizovém období je stabilní* také publikován v nynějším čísle ACTA VŠFS.

Bližší informace o soutěži a o konferenci naleznete na www stránkách:

- www.vsfs.cz/cena
- www.vsfs.cz/konference

V současnosti probíhá příprava sedmého ročníku soutěže, o jehož výsledcích vás budeme opět informovat v časopise ACTA VŠFS.

prof. Ing. Mojmír Helísek, CSc.
odborný garant soutěže
Vysoká škola finanční a správní

The Czech Economy is on an Even Keel Following the Crisis[1]

Vývoj české ekonomiky v postkrizovém období je stabilní

JIŘÍ RUSNOK

In my opinion, company competitiveness is of fundamental importance for fiscal and monetary policy and is relevant to practical macroeconomics and other fields. I will address this topic with some comments on current economic developments both in the Czech Republic and in the European Union.

1 Unevenness in the EU

We are experiencing relatively good times in the context of the age. The European Union has outperformed its original growth estimates in each quarter. An entire range of economic indicators, including significant challenges such as unemployment rates in Western Europe, have improved significantly, although the pattern has of course not been even across all countries. Public debt measured as a percentage of GDP is also falling, albeit very slowly and, once again, rather unevenly.

On the other hand, inflation has remained very low in most of the original core member states of the European Union. The European monetary authority certainly sees things in this light and has continued its very relaxed monetary policy. We are, of course, aware of the unevenness, but this is not a surprising phenomenon for quarterly results. The important thing is that the original core of the EU as a whole currently ranks among the most dynamic economies in the world.

The unevenness has unfortunately also manifested itself to a significant extent in the fact that desirable general and long-term convergence has yet to emerge. We are still seeing the effects of the crisis in terms of divergence of key economies in the Eurozone. It would seem that this will not be overcome soon, even though the general recovery has led to some reduction in the growth of the differences.

1 *This text has been adapted from a speech given at a conference on Company Competitiveness in the Contexts of Fiscal and Monetary Policy, which took place on 16 November 2017 in association with the University of Finance and Administration and the Czech National Bank and was combined with the announcement of the results of the 6th year of the competition for the Professor František Vencovský Prize.*

2 Inflation in the Eurozone is heading towards the target set by the OECD

Inflation is also rather uneven. In most countries, however, if we measure it using the weights of the economies in the Eurozone, it would seem that inflation is starting to approach what the OECD considers to be its inflation target, i.e. somewhere in the area of two per cent.

We are seeing perhaps a blip, perhaps an extreme in the Baltic States, but this only applies to the latest figures, so we need to wait and see how things pan out. It is clear that setting monetary policy in such a context is rather like trying to square the circle. It is undoubtedly almost impossible to address such differing situations by setting basic monetary policy parameters, be they interest rates or other, quantitative-easing-related instruments, for example.

3 Unhealthy levels of debt

I consider it more important to build some degree of resistance into economies for future years. Any such criteria necessarily include a reasonable debt burden on economies. The financial crisis has led to a significant worsening of this situation. Deficit-to-GDP ratios rose during the crisis, which was understandable. They are slowly starting to fall now, but the total rate of indebtedness has risen substantially to a level I consider unhealthy. I believe this will pose a significant problem for many economies when volatility occurs again in the future.

This is one of the factors which I feel also limits the ability of the European monetary authority to set monetary policy and its parameters more flexibly. There is a palpable fear that interest rates will rise too quickly and give rise to dramatic increases in debt servicing costs for indebted countries and negatively affect the financial sector and financial stability. During the crisis, deficits increased substantially in all countries by many percentage points of GDP. We are now experiencing efforts to gradually eliminate them during the good times, and we can see this occurring with varying degrees of success.

4 The positive situation in the Czech Republic

Apart from an overheating labour market, I see no significant imbalances in the Czech Republic. This, however, is a situation which has arisen gradually and was to be expected. Our economic cycle is at the peak of its growth phase. We are sure that there is still room for this positive growth to be maintained for several years to come.

There are, without doubt, various risks. For us, they are mostly external. The Czech Republic is a leader in the area of employment, and in some ways we are constantly surprised that

it continues to be possible for employment to increase further. We are almost at the point of asking ourselves where the resources for this are coming from, but they continue to come. This is a great challenge going forward.

We have also seen a substantial turnaround in the area of public finances in the post-crisis period. I personally think that the Czech Republic has long been in a position where it could be held up as an example in this regard. We are sometimes afraid to admit how good we really are, but we are currently among the leaders in Europe. If all the European challenges to a stable macroeconomic environment – which undoubtedly include the fiscal situation – were considered, the Czech Republic would have to be given as a prime example of success.

I firmly believe we will be able to return the public debt level to around 30 per cent of GDP within the next two years. I regard this as very good, very sensible. It will give the government room to manoeuvre in the future if the economy is confronted with external demand shocks, which can, of course, be expected.

5 Constant trends over the next two years

Inflation has also developed differently in the Czech Republic. Our cycle is somewhat ahead. Inflation in the Eurozone is more or less stable and has even headed slightly backwards at some moments, whereas here we can definitely maintain it near or slightly above our target. This is a fundamental factor that is currently allowing us to gradually neutralise and normalise our monetary conditions.

As you know, we embarked on this path after leaving the exchange rate commitment in April 2017 and also with the two increases in policy rates that we undertook in 2017. There are good preconditions for us to be able maintain this course. There will undoubtedly be much debate about the speed at which this should take place. However, I consider this to be secondary to some extent. The main thing is that we can return to a more or less normal state of affairs in, let's hope, the coming one or two years. This is currently generally considered to mean a state where the natural real interest rate is in the area of one per cent. Given two per cent inflation, this means the rate should theoretically be somewhere around three per cent.

We will see how other factors such as the external environment develop; they are significant for our decision-making. However, the Czech economy is currently being driven by its own internal dynamics, associated with growth in domestic consumption and a solid recovery in investment and with no dramatic constraints on the fiscal side. Thanks to this, I am of the opinion that the current situation should persist for the next year, year and a half, even two years.

Jiří Rusnok
Governor of the Czech National Bank

The Impact of Credit Booms and Economic Policy on Labour Productivity: A Sectoral Analysis[1]

Dopad úvěrového boomu a hospodářských politik na produktivitu práce: odvětvová analýza

MARTIN HODULA
LUKÁŠ PFEIFER

Abstract

Recent empirical evidence suggests that during economic booms, factors of production (especially labour) may shift into less productive and more pro-cyclical sectors of the economy, which can subsequently deepen and prolong economic slump. In this paper, we explore the effects of credit booms, monetary and fiscal policy expansions on labour productivity and labour reallocation in the Czech Republic. We model the effects jointly, as they are not mutually exclusive. To this purpose, we build a large dataset of hundreds of economic variables and estimate a FAVAR model of the Czech economy. We produce several findings: (i) a credit boom causes labour reallocation towards less productive sectors; (ii) the effects are amplified by a subsequent crisis period; (iii) monetary expansion supports the catch-up effect of the Czech economy but at the same time may boost credit activity and indirectly cause misallocations; and (iv) the most pro-cyclical sectors in terms of labour productivity in the Czech economy are Mining and quarrying, Construction and Manufacturing. These findings contribute to the debate illustrating the prolonged decline in the economy and can be further used as an information base for the better targeting of preventive and stabilising economic policy measures in the future.

Keywords

credit boom, Czech Republic, FAVAR, fiscal policy, labour productivity, labour reallocation, monetary policy

JEL Codes

E24, E52, E62, G38

Abstrakt

Nedávné studie naznačují, že v průběhu ekonomické konjunktury dochází k migraci výrobních faktorů (především práce) do méně produktivních a více pro-cyklických ekonomických odvětví. Tento jev může následně prodloužit a prohloubit hospodářský propad. V tomto příspěvku se zabýváme dopady úvěrového boomu, měnové a fiskální expanze na produktivitu a přerozdělování práce v České republice. Tyto efekty modelujeme společně, protože se vzájemně nevylučují. Za tímto účelem jsme sestavili velký dataset obsahující stovky ekonomických proměnných a odhadli FAVAR model pro

1 *The views and opinions expressed are those of the authors and do not represent the views of their institutions.*

Českou republiku. Nabízíme tato zjištění: (i) úvěrový boom způsobuje efekt přerozdělování práce směrem k méně produktivním odvětvím; (ii) tento efekt je dále prohlouben během následného krizového období; (iii) měnová expanze podporuje efekt dohánění České ekonomiky, zároveň ale může podpořit úvěrovou aktivitu a nepřímo tak způsobit efekt přerozdělování práce; a (iv) mezi nejvíce pro-cyklická odvětví v České republice, pokud jde o produktivitu práce, patří těžba a dobývání, zpracovatelský průmysl a stavebnictví. Tato zjištění přispívají k diskuzi, která se snaží zdůvodnit zdlouhavý proces ozdravování ekonomiky po poslední krizi a mohou být v budoucnu využita jako informační základna pro lepší zaměření preventivních a stabilizačních opatření hospodářských politik.

Klíčová slova
Česká republika, FAVAR, fiskální politika, měnová politika, produktivita práce, přerozdělování práce, úvěrový boom

Introduction

Research articles from the Bank of International Settlements (BIS) on financial cycles published since 2000[2] have been gradually converted into the so-called f*inancial cycle drag hypothesis*. Borio (2017) describes its form and its distinction from the s*ecular stagnation hypothesis* which became significant especially after the outbreak of the Great Recession. The *secular stagnation hypothesis*[3] explains the slow growth in a post-crisis period by insufficient demand. The *financial cycle drag hypothesis* sees the reasons to be rather on the supply side and argues that the slow growth is associated with the previous boom of a financial cycle. The expansion of the financial cycle in fact leads to an accumulation of imbalances,[4] and contraction is then connected with the elimination of the imbalances that have arisen, lengthy recession and long-term low labour productivity growth. While the *secular stagnation hypothesis* asserts that during the pre-crisis boom the economy is operating at its potential and with full employment, the *financial cycle drag hypothesis* claims that the pre-crisis boom pushes the economy over its potential and reduces labour productivity.[5] Ceccheti and Kharroubi (2015) state that a credit boom itself may lead to reduced productivity of the economy due to the misallocation of resources. Borio et al. (2015) demonstrate the negative impact of a credit boom on labour productivity on a sample of 20 developed countries over the last 40 years. According to their results, the credit boom leads to labour reallocation into sectors with a lower labour productivity growth, particularly into construction, and the decline in labour

2 *See e.g. Crockett (2000), Borio and Lowe (2002), Drehmann et al. (2012), Borio (2014).*

3 *See e.g. Summers (2014, 2016), Krugman (2014) or Eggertsson and Mehrotra (2014).*

4 *Compared to a business cycle, the duration of a financial cycle is significantly longer (Drehmann et al., 2012).*

5 *The impact of a cycle on productivity has evolved over time. Barnichon (2010), Gali and Rens (2014) and Yépez (2017) show, using US data, that while labour productivity had been rather pro-cyclical to the mid-1980s, subsequently it was rather counter-cyclical. Gilchrist and Zakrajšek (2012) demonstrate that since that time, the influence of financial variables on real economy variables has grown. Adalet McGowan et al. (2017) attribute the decline of labour productivity in this period to the existence of so-called zombie firms; therefore, to an insufficient rehabilitation recession process.*

productivity is significantly deeper if a crisis follows.[6] This is caused not only by the problems of the financial system during the financial cycle contraction but also due to the necessity of eliminating the misallocations of resources which occurred during the boom in the economy.

The final fundamental difference between the two mentioned hypotheses is their view on the concept of a natural interest rate. According to the proponents of the *secular stagnation hypothesis*, the natural interest rate is declining and may be even negative for some time to ensure full employment and the potential output of the economy being reached. Supporters of the *financial cycle drag hypothesis* claim that the natural interest rate is, given the aforementioned imbalances, significantly higher and always positive.[7] The difference between a key and natural interest rate is in fact essential from the point of view of the Austrian business cycle theory, which in simplistic terms states that this difference suppresses the information function of the cost of money. In the event a key interest rate is set lower than its natural level, massive errors occur in investment decision-making which then should lead to a decline in productivity. Gopinath et al. (2015) look at the issue of increasing misallocation of resources due to too-low interest rates in the countries of the southern wing of Europe after entering the euro area. Similarly, Dias et al. (2014) demonstrate an increase in misallocation of resources during the inflow of capital in 1996–2007, using the example of Portugal in the period before and after the introduction of the euro (entry in 1999). According to the Austrian business cycle theory, the information function of money can be suppressed not only by too-low interest rates but also by any kind of state intervention.

In this paper, we investigate the empirical link between economic policies, credit booms and labour productivity growth. We stress the importance of modelling jointly the credit boom together with the effects of monetary and fiscal policy measures, as they also may significantly influence the demand for credit and risk appetite of economic agents. To this purpose, we create a large dataset containing hundreds of economic variables and estimate a FAVAR model of the Czech economy. Central questions we aim to answer are: (i) "does labour move into less productive sectors during the credit boom period?", which is directly linked to the *financial cycle drag hypothesis* and Austrian business cycle theory and their notions about malinvestment during periods of economic boom; (ii) "does a financial crisis amplify the effect of labour reallocations?" and (iii) "do economic policies have any impact on labour productivity?" To get the whole picture, we focus on labour reallocations across economic sectors, which may be further used as an information base for the better targeting of preventive and stabilising economic policy measures in the future.

Our paper is organised as follows: Section 1 shows the decomposition procedure of labour productivity growth to uncover hidden misallocations and describe our raw data. Section 2 presents a FAVAR model of the Czech economy to measure the effects of economic policies and credit booms on labour productivity growth. Section 3 presents and further discusses our results and Section 4 concludes.

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6 Similarly, Jorda et al. (2013) state that recessions associated with a financial crisis are significantly deeper and longer.

7 The predominant view on the natural interest rate is rather that of proponents of the secular stagnation hypothesis (Bernanke, 2015).

1 Breaking down labour productivity growth into unique components[8]

We follow Borio et al. (2015) and use a simple decomposition of the aggregate labour productivity growth for the Czech Republic. The decomposition relies on information from various economic sectors and measures whether labour is reallocated towards high or low productivity sectors. The decomposition of the aggregate labour productivity growth (y/l) can be written as follows:[9]

$$1+\frac{\Delta(y/l)}{y/l}=\underbrace{\left[1+\frac{\Delta(l_S/l)}{l_S/l}\right]\cdot\left[1+\frac{\Delta(y_S/l_S)}{y_S/l_S}\cdot\alpha_S\right]}_{common\ component}+\underbrace{\mathrm{cov}\left(\frac{\Delta(l_S/l)}{l_S/l};\left(1+\frac{\Delta(y_S/l_S)}{y_S/l_S}\right)\cdot\alpha_S\right)}_{allocation\ component} \quad (1)$$

where y denotes aggregate output, l denotes aggregate employment and $\alpha_S = y_S/\bar{y}$ is the ratio of sector s output to average output across sectors. The first right-sided term in the equation is the *common component* (com) of real labour productivity growth. It is a product of the non-weighted average growth rate in employment shares per economic sector and size-weighted average growth rate of productivity across economic sectors. In other words, the common component describes the pure unweighted average of productivity growth across all industries in the economy. If, for example, we think of a hypothetical economy in which both the average employment and productivity growth are equal to zero, the common component will be of zero value as well. The second right-sided term in expression (1) is the *allocation component* $(alloc)$. As is apparent, it represents the covariance across economic sectors between the growth rate in employment shares per economic sector and size-weighted average growth rate of productivity across economic sectors. It measures the impact of labour reallocation across industries.

1.1 Sectoral data

We rely mainly on two sources of sectoral-level data: the Czech Statistical Office (CSO) and the Czech National Bank (CNB). These two databases provide information on value added and employment per sector following the SNA/ISIC rev.2 classification at the 1-digit level (a detailed description is available in the Appendix). We consider eight sectors: *Agriculture, forestry and fishing; Mining and quarrying; Manufacturing; Construction; Trade and private services; Financial and insurance activities; Public services* and *Other activities*. To be able to estimate the decomposition of the aggregate labour productivity growth as described in (1), we require the information on total value added and employment for each data point. While data on the sectoral level are available from 1996 onwards, we report our estimates starting in 2001 (in 2002 after transforming the data) due to the limitations of a large dataset that we use for the macroeconomic model estimation in the rest of the paper.

8 *We are grateful to Enisse Kharroubi for sharing his piece of code to work out the decomposition.*

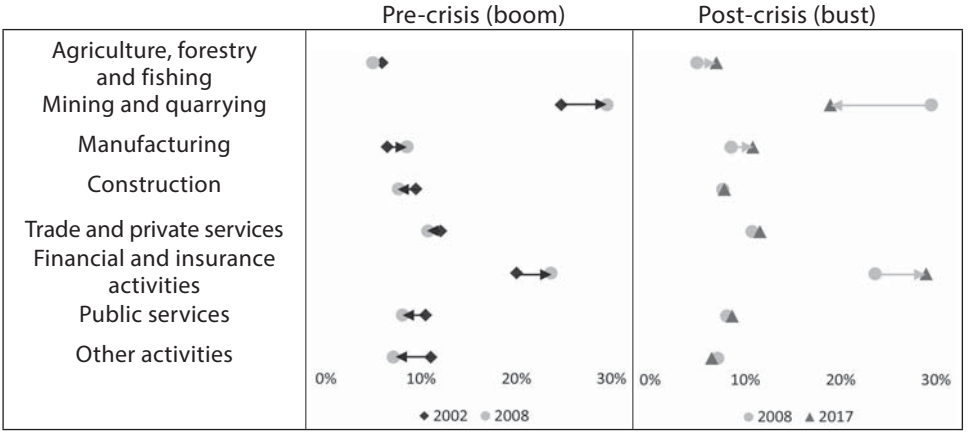
9 *Note that this is purely an identity. For the full decomposition procedure, please consult Borio et al. (2015, pp. 30-31 in the Appendix).*

Figure 1 shows the labour productivity calculated as (y/l) in annualised growth rates for three specific data points: 2002, 2008 and 2017. A few patterns emerge immediately.

Figure 1 shows that *Mining and quarrying* is not only one of the most productive sectors of the Czech economy but it is also the most pro-cyclical sector, as the growth of labour productivity during the economic boom period (+5 pp) was more than compensated by a post-crisis downturn (–11 pp). The highest increase in labour productivity during the period under review was recorded for the *Financial and insurance activities* sector, where productivity increased during both the boom (+4 pp) and the bust period (+5 pp). This is not surprising, as the Czech banking sector recorded low losses during the crisis and remained relatively stable through the entire time.

Labour productivity in the *Manufacturing* sector, which is of great importance to the Czech economy (it holds more than 27% of the total real value added by the end of 2016), is steadily increasing even though primary *Manufacturing* attracts a considerable amount of business cycle effects.[10] However, the *Manufacturing* sector in the Czech Republic is still much less productive in comparison to other countries, due to its structure which is characterised by rather lower added value. With regard to the *Construction* and *Trade and private services* sectors, labour productivity slightly declined during the economic boom. Overall, this confirms the general view of the market overheating in the pre-crisis period.

Figure 1: Labour Productivity Growth Across Economic Sectors in the Czech Republic



Source: Authors' calculations using CSO data.

Following the above-specified decomposition (1) and accounting for changes over time, say between year t and year $t+n$, we write:

$$\frac{y_{t+n}/l_{t+n}}{y_t/l_t} = (com)_{t,t+n} + (alloc)_{t,t+n} \tag{2}$$

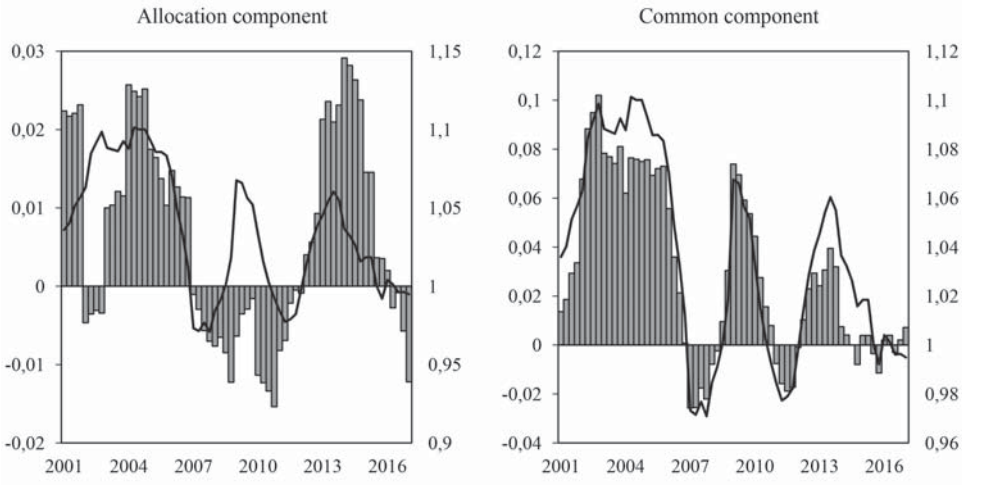
10 Note that we do not distinguish between intensive and excessive growth. Volek and Novotná (2015) have studied the importance of extensive and intensive sources of economic growth in individual sectors of the Czech economy. They confirm that the extensive factor is of negative value for all sectors of the economy (meaning that the total factor productivity rises faster than the gross value added).

which shows that the aggregate labour productivity growth is a sum of the common and allocation component. To compute various growth measures, Borio et al. (2015) suggest using rolling windows of either three or five years. The motivation for this window size is that reallocations take some time, especially between different economic sectors. We experimented with both windows, and since they yield comparatively identical results, we report the three-year wide window in the main text to avoid unnecessary loss of observations.

Figure 2 plots the common and allocation component together with the aggregate labour productivity (solid line, right-sided y-axis) evolution over the period 2001 to 2017. The common component describes the average growth rate of productivity across economic sectors but fails to capture any possible misallocations. Those are captured by the allocation component, which started to decline during the economic expansion period and remained negative until 2011, when economic recovery began. This is economically appealing and offers a new way of looking at the observed slow recovery after the crisis. The decomposition is thus useful, as it allows us to uncover possible misallocation hiding behind the aggregate labour productivity indicator.

From the first quarter of 2016, the allocation component slides into negative values again, which may point to a minor overheating of the Czech economy. This, if not addressed, may cause a new round of misallocations on the labour market.

Figure 2: Common and Allocation Components in the Czech Republic



Source: Authors' calculations using CSO sectoral-level data.

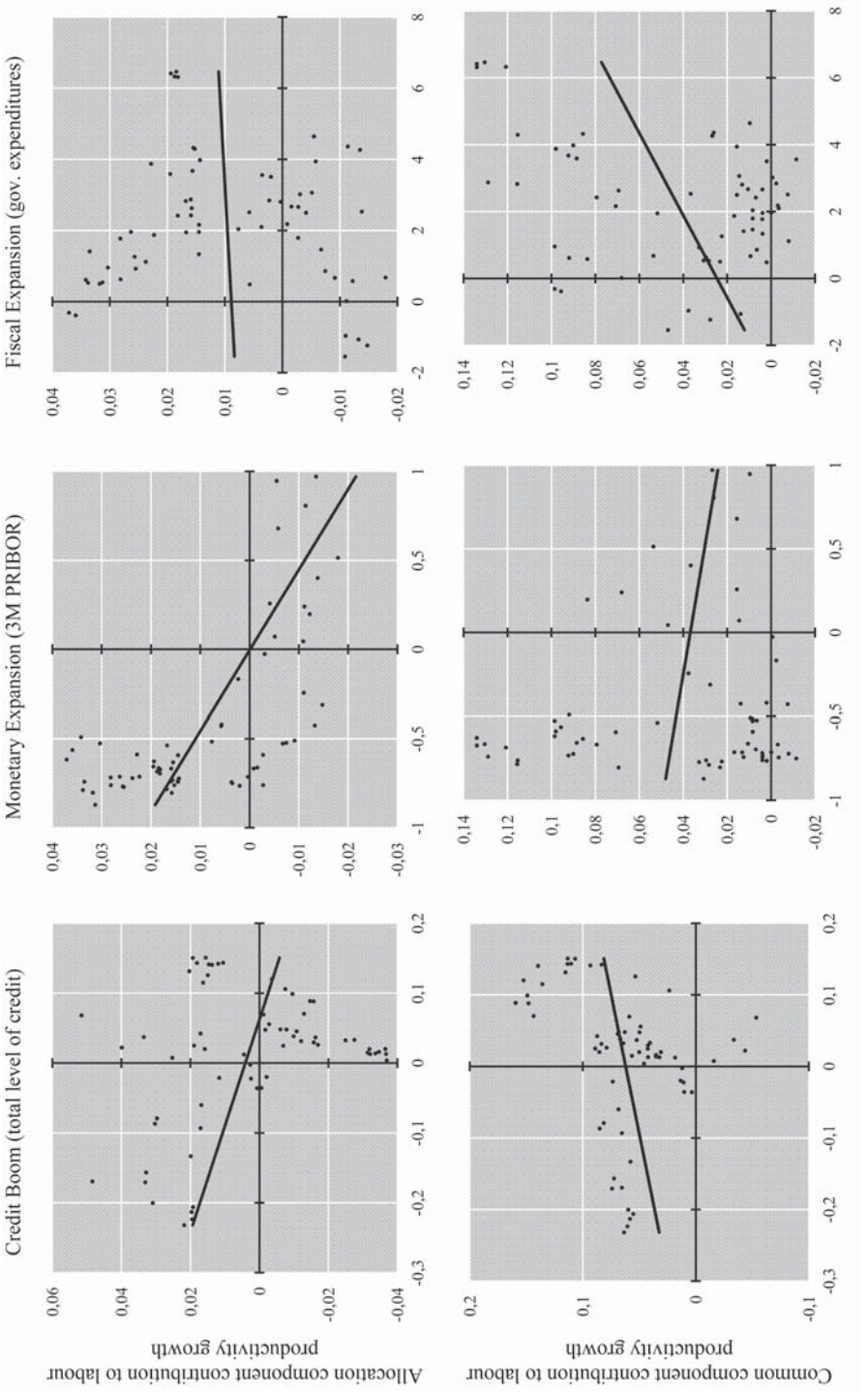
Notes: The aggregate labour productivity can be computed by simply summing the two components and adding one hundred. The data are reported in base units, not in basis points, for the sake of comparability.

1.2 A first look at the drivers of the common and allocation components

Using simple bivariate tests, we take a first look at the relationship between economic policies, credit booms and labour productivity growth. **Figure 3** plots the two labour productivity growth components against the growth in the total level of credit, three-month inter-bank rate and total government expenditures – these are our benchmark measures of credit, monetary and fiscal policy expansion. We use a three-year window for this exercise.

First, we trace a negative and statistically significant relationship between credit growth and the allocation component. By contrast, we find a positive relationship with the common component. This indicates that credit booms may cause labour misallocations and that their impact works though the allocation component. Second, similar effects are found with monetary expansion. This is expected, as monetary expansion increases the demand for credit and, if the interest rates are kept low for long enough, decreases the risk aversion of economic agents (Borio and Zhu, 2012). Third, we find a much weaker relationship between fiscal expansion and the allocation component. The relationship with the common component seems positive and statistically significant. Nevertheless, these results need to be tested if they are to survive increasingly demanding statistical tests.

Figure 3: Cross-check of Productivity Growth Components Against Credit, Monetary and Fiscal Policy Expansion



Source: Authors' calculations using CSO and CNB data.
Notes: the data are reported using three-year window growth rates. The solid line represents a simple trend line.

2 Empirical methodology

The major interest of the study is to determine the impact of credit booms and expansionary economic policies on labour productivity growth. Our goal is to uncover potential misallocations. Such analysis requires a substantial number of variables to be incorporated into the model and analysed in detail. However, the information sets utilised by, for example, the widely used VAR or single equation models are rather small to retain the degrees of freedom. This may lead to a situation in which the information set of the econometrician could be smaller than the information set of the economic agents. If this is the case, the relatively small number of variables in a small model may not be sufficient to properly identify shocks, which increases the risk of a biased estimate (see Alessi et al., 2011 for a detailed review).[11] Forni and Gambetti (2010) demonstrate that non-fundamentals can account for the well-known VAR price puzzle and the delayed overshooting puzzle.

To get around this fact, we use a factor-augmented VAR (FAVAR) model introduced in Bernanke et al. (2005). In contrast to simple VAR models, the FAVAR model includes unobserved low-dimensional factors in the autoregression, reducing the information bias. The FAVAR model uses the advantages of a data-rich environment while remaining tractable in terms of the number of parameters to be estimated. We specify an $M \times 1$ vector of macroeconomic time series Y_t and a $K \times 1$ vector of unobserved factors F_t. We assume that the joint dynamics of F_t', Y_t' is given by the following equation:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \varepsilon_t, \tag{3}$$

where $\Phi(L)$ is a lag polynomial and ε_t is an error term with a zero mean and a covariance matrix Q. Equation (3) is a standard VAR model that can be interpreted as a reduced form of a linear rational-expectations model with both observed and unobserved variables. The unobserved variables make the model impossible to estimate. Therefore, we assume that additional informational time series X_t are linked to the unobservable factors F_t and the observable factors Y_t by:

$$X_t' = \Lambda^f F_t' + \Lambda^y Y_t' + e_t', \tag{4}$$

where Λ^f and Λ^y are matrices of factor loadings and e_t' is a serially uncorrelated error term with a zero mean (innovation shock). Equation (4) captures the idea that both vectors Y_t and F_t are pervasive forces that might drive the common dynamics of X_t. This static representation of the dynamic factor model allows us to estimate the factors by principal components. Specifically, we use a two-step principal components approach, which is a nonparametric way of estimating the space spanned by the common components $C_t' = (F_t', Y_t')$ in (2). As the static factors incorporate information from a large number of

11 The standard VAR or single equation models usually take on 6 to 8 variables. If these variables are not sufficient to properly identify structural shocks, they cannot be viewed as fundamental, i.e. they cannot be recovered from the past and present values of the model variables. For example, when trying to identify a monetary policy shock in a VAR model, the shock may actually not be truly exogenous, as it may also capture instances when the central bank endogenously reacts to changing inflation expectations.

economic variables, the information set of the structural factor model is far greater than that of a standard VAR. Thus, it becomes less likely that the information set of economic agents will be superior to the information set we use.

2.1 Big data

Our vector X_t for factor extraction consists of a balanced panel of 175 quarterly time series representing the Czech economy and the rest of the world. They are drawn mainly from the Czech National Bank, Czech Statistical Office and ECB databases. The data span the 2001Q1 – 2017Q1 period (65 observations). Generally, it is not necessary to perform any ex ante categorisation of data, but we can benefit from stacking data into sub-groups in accordance with the different classes of economic variables for the sake of the clarity of our computational process. The data sub-groups and corresponding number of variables are shown in **Table 1** below.

Table 1: Sub-groups in the Dataset

Data Sub-groups	Slow/Fast-moving	Number of Variables
External environment	S	21
Real economy	S	40
Labour market	S	22
Government	S	12
Prices and price expectations	S	21
Interest rates and credits	F	39
Financial sector	F	14
Exchange rates	F	6

Note: The Appendix explains which time series form these sub-groups. Sub-groups highlighted in bold contain variables used as the sources of an identified shock. Those variables are never included in the dataset from which we extract the factors.

As is apparent from **Table 1**, the set of variables can be divided into eight logical blocks: (i) real economy variables (gross domestic product, construction production index, retail sales), (ii) labour market (employment, hours worked, wages), (iii) fiscal variables (government debt and deficit, interest payments), (iv) prices (consumer price index, industrial producer price index, house prices), (v) credit and interest rates, (vi) financial sector variables (regulatory variables, market indexes, financial cycle indicators, asset prices), (vii) exchange rates and (viii) open economy variables (real economy and financial sector development in Germany and in the Eurozone). Note that prior to the estimation, the data were transformed to assure the stationarity of the time series using natural logarithms and first differences. A more detailed description of the data is available in the Appendix.

2.2 Identification and interpretation of the factors

To estimate the FAVAR model given by Equation (3), the unobserved factors F_t need to be estimated first. Hence all factor models require an initial step prior to the estimation to determine the optimal number of factors used. Bai and Ng (2002) provide a criterion to determine the number of factors present in the macroeconomic data vector X_t. However, as shown by Tuzcuoglu and Hacioglu (2016), different time spans might offer different numbers of factors. In addition, the Bai and Ng (2002) criterion does not solve the issue of how many factors we should include in the VAR model itself.

Stock and Watson (2005) use seven factors to analyse the US economy; similarly, Bernanke et al. (2005) propose the usage of three and five factors respectively to check for the model robustness under a varying number of factors. The Bai and Ng (2002) criterion suggests using four factors, but when the test was run on a shorter sample (data until 2012Q3), the suggested number of factors changed to three. This change probably did not occur due to the sudden appearance of a new meaningful factor, but rather due to nonlinearities in the actual data. We have used various specifications with the same impulse response analysis results (we tested three to seven factors), but the model with only three latent factors showed higher explanatory power and its results are reported in the main text. In **Table 2**, we simply check the correlations of every single variable with the estimated factors. Visual inspection helps us to determine the actual interpretation of these factors. The first factor loads on real economic variables, coupled with prices. The positive correlations accumulated in the second factor correspond at most to credit and financial sector-related variables. The third factor explains external development, which is of great importance to Czech economy. The remaining fourth and fifth factors are mostly insignificant in terms of correlations, which only justifies estimating the FAVAR model with just three latent factors.

Table 2: Correlation Between Data and Estimated Factors

Data Sub-groups	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Real economy	**0.464**	0.148	-0.191	-0.070	-0.015
Labour market	0.289	0.151	0.110	-0.096	0.072
Government	0.233	-0.546	-0.108	-0.016	0.031
Prices and price expectations	**0.415**	-0.102	0.087	0.083	0.199
Interest rates and credits	-0.107	**0.313**	0.197	0.063	-0.054
Financial sector	0.006	**0.240**	0.188	0.108	-0.069
Exchange rates	-0.153	-0.031	-0.015	-0.014	0.025
External environment	0.128	0.136	**0.413**	0.210	-0.004
Factor 1	1				
Factor 2	0.068	1			
Factor 3	0.006	-0.061	1		
Factor 4	0.031	0.057	-0.056	1	
Factor 5	0.023	-0.013	-0.011	0.002	1

Note: Table shows average correlations between sub-groups of variables with five estimated factors.

The dynamics of each variable used in our sample is a linear combination of all factors, implying that the response of any underlying variable in vector X_t to shock in the transition equation (3) can be calculated using the estimated factor loadings and equation (4). Note that the factors themselves have to be uncorrelated with one another.

2.3 Identification scheme and innovations

We identify policy innovations using recursive ordering, placing unobserved factors before observed factors. The main assumption is that unobserved factors do not respond to policy innovations within one quarter. To this purpose, we divide our panel of variables into two groups: slow and fast-moving variables (as in Stock and Watson, 2002). Blocks describing the external environment, real economy, labour market, fiscal variables and prices are classed as slow-moving (in the order as in **Table 1**). A slow-moving variable is one that is largely predetermined in the current period and is assumed not to respond instantaneously to the specified shocks. Fast-moving variables are assumed to be highly sensitive to contemporaneous economic news or shocks (interest rates, credits, financial sector and exchange rates). We consider three types of shock hitting (unexpectedly) the economy: monetary and fiscal policy expansion and credit boom. In the case of a fiscal expansion, all fiscal variables are classed as fast-moving, as in Lagana and Sgro (2011). Note that the variables from which we extract the innovations are always ordered last in the covariance matrix (and treated as a factor on their own). This means that we assume each of the given innovations to affect our latent factors with a lag of one quarter.

The choice of variables from which we extract policy innovations deserve some explanation. The main policy tool of the CNB is a two-week repo rate. However, because the repo rate does not change continuously, but only as an outcome of CNB Bank Board meetings, we use the inter-bank rate (PRIBOR 3M) to proxy for the CNB's key monetary policy rate in a similar way to what is done in CNB's forecasting system. We identify an *expansionary monetary policy shock* as a decrease of the PRIBOR 3M rate. To check the robustness of our results with respect to the zero-lower bound issue and CNB's exchange rate commitment, which started in November 2013, we also estimate the model with data ending in 2012Q3.[12] Note that during this robustness exercise, we discard 20 observations, which lowers the model's explanatory power.

The main fiscal policy variables are government revenues from taxes and total government expenditures. We identify an *expansionary fiscal policy shock* as an increase in total government expenditures. As a part of our robustness exercise, we simulate a decrease in government revenues from taxes and report these results as well. It should be noted that we use a special treatment for these two variables. Building on Dungey and Fry (2009, p. 32), we use the natural logarithm form smoothed through the application of a moving average filter of the current and two lags of observations. The motivation for filtering in this manner lies in the apparent lumpiness of taxation and government expenditure. The

12 For more details on the exchange rate commitment (entry and exit), please consult the CNB website: https://www.cnb.cz/en/monetary_policy/exit_exchange_rate_commit/index.html

original data has relatively high variance in quarterly terms, which is not seasonally related but rather policy-related.

Finally, we consider the impact of a credit boom. We draw the information about *credit boom shock* from the total credit time series and the shock is identified as an increase in the absolute level of credit. We also construct a financial crisis dummy (that takes the value of one during 2008Q4-2010Q1 and zero elsewhere) to capture the financial and subsequent economic crisis structural break. The crisis dummy is included on its own and interacting with credit innovation. By including the dummy on its own, we avoid the confusion of spuriously attributing credit boom effects that belong to the crisis. By linking the dummy to the credit boom, we are able to differentiate between the states of the economy – one in which the credit boom is followed by a crisis event and other where the economy does not experience a crisis. To be able to distinguish between these two states is important, as financial crises generally undermine the ability of the economic system to correct past misallocations.

We present the effects of the identified innovations using impulse response functions (IRFs) over a time window of four years (16 quarters). The responses were normalised to entail a 1 percentage point increase in the 3M PRIBOR, government expenditures and total credit respectively. To account for any uncertainty in the factor estimation, we also calculate accurate confidence intervals as in Kilian (1998). The baseline model specification is based on Schwarz information criteria and employs the lags of explanatory variables and the factors respectively. To check for the robustness of our results, we also try estimating the FAVAR model with different lag numbers (up to four to avoid loss of observations), which yield comparatively identical results.

3 Results

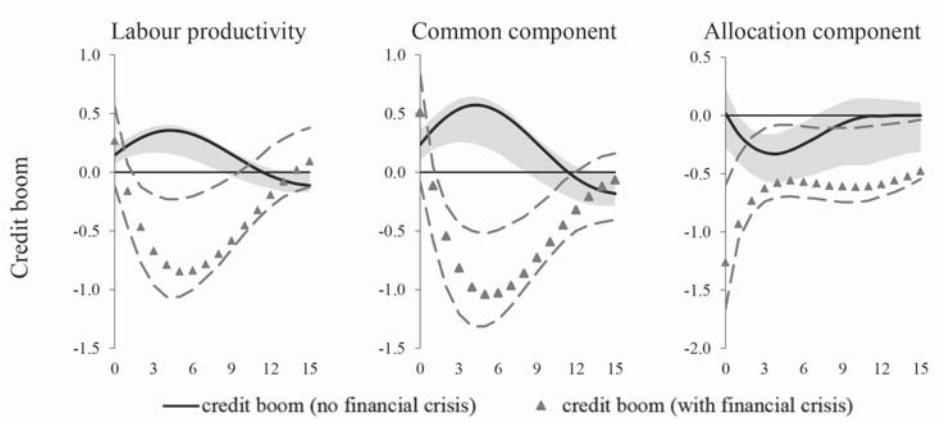
Our results largely coincide with Borio et al. (2015) regarding the impact of credit activity on labour productivity components (**Figure 4**, first row). So, following a credit boom and discarding the period of financial and economic crisis (2008Q4-2010Q1), the labour productivity increases (+0.5 pp), driven entirely by the common component. However, after introducing the structural break in the form of a financial crisis, we report the negative impact of a credit boom on labour productivity (–1 pp). In the context of our study, we are mostly interested in the downward sloping evolution path of the allocation component, both during the boom (–0.3 pp) and more vividly during the bust (–1.3 pp). This evidence shows that a credit boom causes misallocation of labour towards less productive economic sectors and that the impact is even more profound after incorporating a financial crisis period. The overall impact of increased credit activity on labour productivity may be positive during the boom period, due to the so-called catch-up effect, but this relationship always changes to negative during a bust.

Next, we look at the effects of changes in monetary policy setting on labour reallocation (**Figure 4**, second row). Unexpected monetary expansion leads to the growth of the common component (+0.4 pp) with a significant lag (2 years). This result is robust with

respect to the fact that CNB hit the zero-lower bound floor in November 2012 and entered into an exchange rate commitment in November 2013. These events did not alter our estimates in a significant manner. Overall, monetary expansion directly supports the catch-up effect of the Czech economy, because it lowers interest costs and increases real economic activity. Indirectly, however, it may increase credit activity in the economy, which is supported by the negative impact of decreased interest rates on the allocation component (–0.7 pp on average). This suggests that during monetary expansion, labour shifts towards less productive sectors.

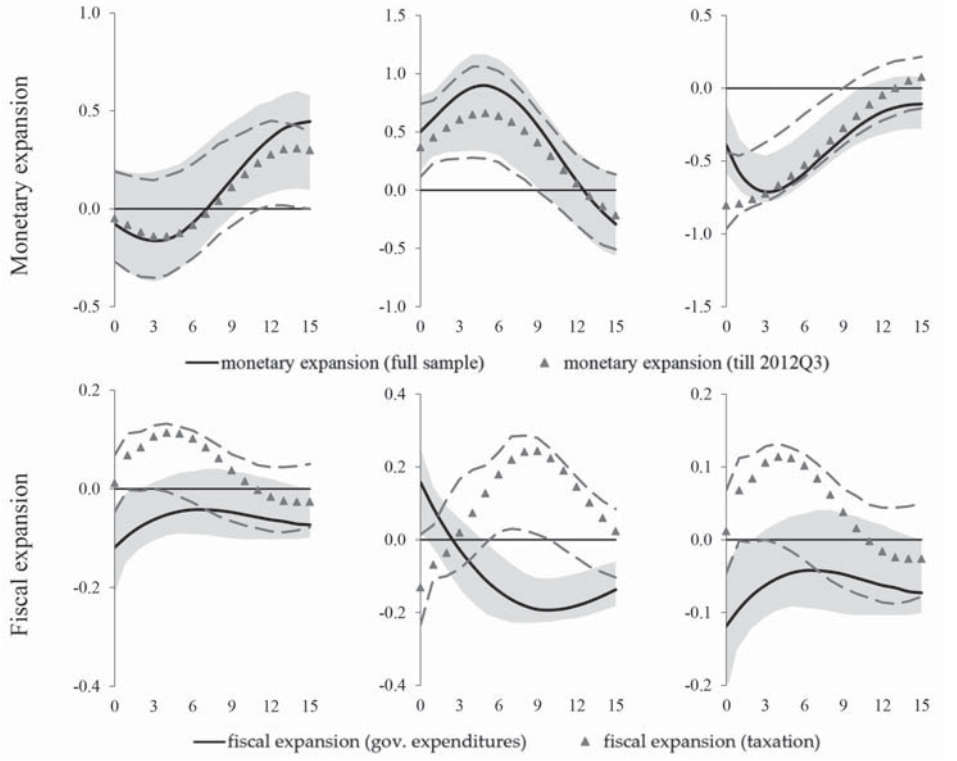
Last, we find the effect of fiscal expansion on labour productivity to be rather small in size compared to the previous shocks (**Figure 4**, third row). However, our results are hugely dependent on the way in which we model the fiscal policy shock (government expenditures vs. revenues from taxes). For instance, we find that increasing government expenditures has mostly adverse effects on both the common and allocation components. This result speaks in favour of a crowding-out effect during which the increasing government expenditures lower production value, reduce investments and thus lower productivity as well.[13] On the other hand, we find mostly positive albeit lagged effects of decreasing government revenues from taxes on the common and allocation components. This is quite intuitive, as decreasing the tax burden is in general expected to have a positive effect on productivity across economic sectors.[14] The responses to the different government shocks highlight the importance of exactly determining the fiscal policy action that is undertaken, because different spending components have different effects on labour market variables.

Figure 4: Impulse Responses of Labour Productivity to Financial and Economic Shocks – Component Breakdown



13 *Ambrisko et al. (2015) confirm the existence of a crowding-out effect in the case of an increase in government invectives in the Czech Republic.*

14 *Vartia (2008) confirms the positive effects of lowering corporate and top personal income taxes on productivity.*



Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables' response in percentages; the x-axis is in quarters after the shock.

3.1 Credit boom

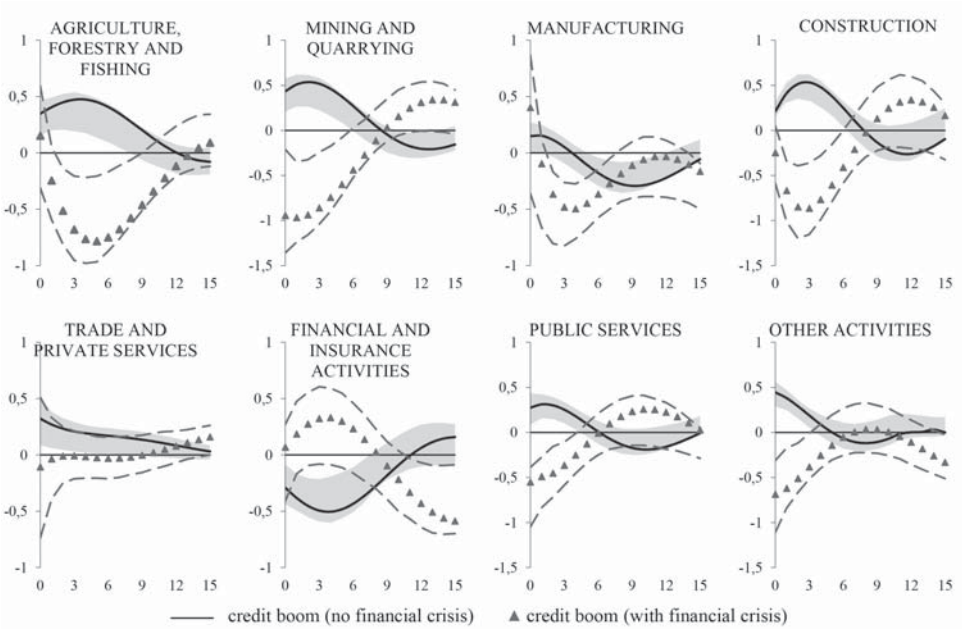
Further, we examine the propagation of the above-specified shocks within economic sectors. Note that we study the effects of shocks on the aggregate labour productivity, which is mainly described by the common component (**see Section 1.1**). This exercise should help us to identify the sectors which are the most sensitive to changes in credit activity and economic policies.

We find that a credit boom, apart from the crisis period, generally increases labour productivity across economic sectors (**Figure 5**). However, as shown in the previous section, this growth is mostly driven by the common component. This idea is supported by the fact that if we account for the crisis period and measure the impact of increased credit in terms of total value, the impact is largely negative. Above-average productivity growth during the credit boom was recorded by the *Mining and quarrying* and *Construction* sectors, due to increased real value added and decreased total employment (see **Figure 1C** in the Appendix). This is quite intuitive, as these sectors are largely dependent on credit accessibility. It comes as no surprise, however, that these sectors, along with the

Manufacturing sector, recorded the largest drop in real value added during the crisis period, and could be considered as the most pro-cyclical sectors. Our results thus suggest that the credit cycle impacts mostly sectors that are at the beginning of the production process (as coined by the Austrian school of economics).

Next, we take a closer look at the impact of credit activity on total employment (denominator in labour productivity fraction) in individual economic sectors. During this exercise, we aim to identify the sectors in which reallocations may have happened. The results are summarised in **Figure 1C** in the Appendix. The impact of credit activity on employment in individual sectors indicates that the labour reallocates towards the *Manufacturing* industry. For example, Borio et al. (2015) consider *Manufacturing* to be a relatively more productive sector in a sample of developed countries. In the Czech Republic, however, due to its specific structure, *Manufacturing* is still rather a less productive sector, despite the long-term growth in labour productivity in this sector. Credit activity also has a positive impact on employment in the productive *Financial and insurance activities*. On the other hand, the impact on employment in *Trade and private services* and *Mining and quarrying* is negative. After including the crisis period, credit expansion has an impact mainly on employment growth in *Agriculture, forestry and fishing*.

Figure 5: Impulse Responses of Labour Productivity to Credit Boom – Sector and Crisis Breakdown



Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables' response in percentages; the x-axis is in quarters after the shock.

3.2 Monetary expansion

Monetary policy may significantly influence the demand for credit (Frait and Malovana, 2017) and it is loudly transmitted into the real economy (Borys et al., 2009). An accommodative monetary policy may stand at the very beginning of a credit boom.

The impact of monetary expansion on labour productivity varies significantly across economic sectors (**Figure 6**). This may be driven, for example, by the sectors' credit dependence (interest sensitiveness) or factor intensity (labour vs. capital intensive). Still, positive effects prevail except for the *Agriculture, forestry and fishing, Financial and insurance activities* and *Other activities* sectors. The *Agriculture, forestry and fishing* sector's response is somewhat erratic and ambiguous, as it is largely weather-driven and is also dependent on subsidies from the government. In addition, monetary expansion increases the demand for credit (see **Figure 1B**, in the Appendix) and thus demand for the services of financial and insurance companies. As is evident from the responses of real value added and total employment, the decrease in productivity is employment-driven, as its growth exceeds that for real value added (**Figure 2C**, in the Appendix).

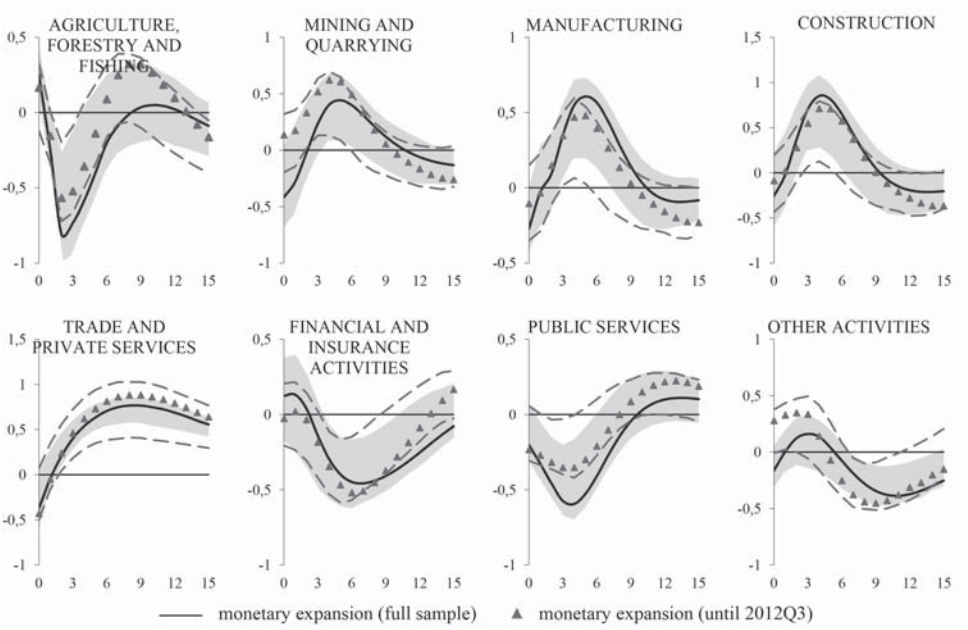
In general, lower interest rates increase firms' demand for credit and allow them to raise output and productivity. Monetary expansion thus supports the catch-up effect, especially in the *Construction, Manufacturing* and *Trade and private services* sectors, where production grows the most. This is not surprising, and this finding is rather common in the literature.[15] The significant impact of monetary expansion is also evident in the growth of credit activity in all sectors of the industry, excluding *Financial and insurance activities* and *Public services* (**Figure 1B**, in the Appendix).

The impact of monetary policy settings on employment in individual sectors (**Figure 1C**, in the Appendix) suggests that labour shifts away from *Other activities* to *Public services* and the *Manufacturing* industry. This agrees with our results obtained by simulating the credit boom in the previous section. Monetary policy also has a negative impact on the real value added of *Public services*, which may be due to the negative influence of monetary expansion on the amount of loans to this sector and by the fact that it is more dependent on government-rather than market-related decisions (see **Figure 1B**, in the Appendix).

Importantly, these documented empirical links highlight three leading sectors of the Czech economy that can both drag and prolong economic downturns as well as sustain economic expansion. These sectors are *Construction, Manufacturing* and *Trade and private services*. From a policy point of view, policy-makers should pay close attention to the development of credit and productivity in these sectors, especially during monetary contraction.

15 For example, see Bouakez et al. (2009) for a model-based study or Pellényi (2012) for Hungarian evidence.

Figure 6: Impulse Responses of Labour Productivity to Monetary Policy Expansion – Sector Breakdown



Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables response in percentages; the x-axis is in quarters after the shock.

3.3 Fiscal expansion

Increasing government expenditures generally leads to a decrease in total labour productivity. During the first quarter after the shock, the productivity slightly increases in the *Agriculture, forestry and fishing, Manufacturing* and *Construction* sectors, only to fall one year later. This hump-like pattern in these sectors may be consistent with the presence of a crowding-out effect. The initial increase would be driven by the increased government spending while the decrease is caused by crowded-out private demand.

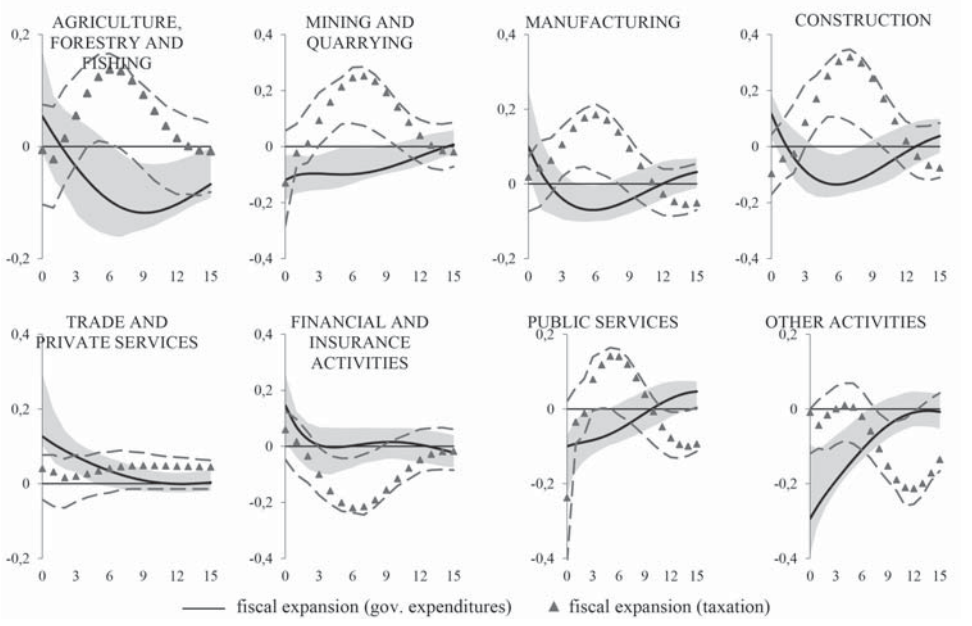
While looking at the response of total employment in individual sectors to the government spending shock, we can track down the direction of public spending. Growth in public spending has led to the highest increase in employment in the *Trade and private services* and *Public services sector*. This is because government spending is often directed to the *Public services* sector where the number of employees is growing (**Figure 3C**, in the Appendix). In addition, mandatory expenditure increases, which has a positive impact on consumption and employment in the *Trade and private services* sector.

In general, the responses to a government shock to taxation follow a hump-like pattern. A decreased tax burden for firms can make them expand employment (increase in the

demand for labour), if the adjustment cost of labour is small and shocks are perceived to be permanent. This will also depend on the extent of price rigidities.

It should also be noted that the responses to government revenue shock rather than shock to government spending resembles a shock to credit activity during the boom period. The reason is that government revenue growth is associated with the expansion of the economic and financial cycle. The highest increase in productivity is therefore evident in the tax revenue shock in the *Construction* and *Mining and quarrying* sectors, i.e. in sectors at the start of the production process. Still, we find almost zero correlation between the GDP and revenues from the taxes time series, which should render the above-mentioned risk of confusion moot.

Figure 7: Impulse Responses of Labour Productivity to Fiscal Policy Expansion – Sector Breakdown



Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables' response in percentages; the x-axis is in quarters after the shock.

4 Conclusions

In the paper, we examine the empirical link between economic policies, credit booms and labour productivity growth using data from the Czech economy. We use a simple decomposition procedure to break down the labour productivity into two main components: the common and the allocation component. The common component is linked to actual productivity development but fails to capture any possible misallocations of labour – those are captured by the allocation component. Visual analysis and simple

bivariate tests suggest that misallocations did occur in the Czech economy and that they were fed by the credit boom prior to the crisis. To verify these results against more demanding statistical tests, we build a large FAVAR model of the Czech economy. The FAVAR model helps us to ensure that the estimated impulse responses are invariant to extensions of the information set – a deficiency that often plagues impulse response results.

Our empirical results generally coincide with those in Borio et al. (2015) regarding the impact of credit activity on individual labour productivity components. During a credit boom, credit activity contributes to labour productivity growth through the common component, but at the same time, the credit boom causes misallocation of labour towards less productive economic sectors, and thus the total labour productivity decreases due to the impact of the allocation component. The negative impact of reallocations that occur during a boom significantly increases during a crisis period, when both the common component and the allocation component contribute to the decline in labour productivity. Based on our analysis of sectoral-level data, we find that, following a credit boom, labour reallocates mainly towards the *Manufacturing* sector. However, *Manufacturing* remains among the less productive sectors (in EU-wide comparison), due to its focus on goods with lower value added. Remaining at the sectoral level, we also identify the most pro-cyclical sectors in terms of labour productivity in the Czech economy: *Mining and quarrying, Construction* and *Manufacturing*. This information may be of some value to policy-makers, who should carefully consider the effects of their measures, not only for the whole economy, but at the sectoral level as well.

Bearing in mind our results obtained from the credit boom shock, we also stress the importance of the effects of monetary and fiscal policy on labour reallocation. Again, we also perform the analysis on a sectoral level.

Monetary expansion leads to the growth of the common component and causes a drop in the allocation component. In another word, it supports the catch-up effect of the Czech economy (this was found to be true particularly for the *Construction, Manufacturing* and *Trade and private services* sectors). However, if we keep the monetary policy accommodative for long enough, it feeds the credit boom, which causes the misallocations. The impact of monetary policy on labour productivity may thus be indirect through the support of credit activity. Monetary expansion leads a the growth in credit activity in all sectors of the industry, excluding *Financial and insurance activities* and *Public services*. These results are robust with respect to the fact that CNB hit the zero-lower bound floor in November 2012 and entered into an exchange rate commitment in November 2013. In the sectoral-level analysis, we find that, apart from *Construction* and *Manufacturing*, the *Trade and private services* sector may also be important to the economy, as demand for their products depends more on consumers' borrowing.

Fiscal expansion does not appear to dampen productivity growth, if accommodated through a decrease in taxation. Such a result is economically appealing, as loosening the tax burden is generally expected to have a positive effect on factor productivity. In the case of a government spending shock, we find evidence supporting the crowding-out effect, which also lowers labour productivity, albeit mildly. In general, the effects of

fiscal policy measures on labour productivity were found to be small in size and mostly concentrated around *Trade and private services* and *Public services*.

Overall, the answer to all of our questions presented in the Introduction of this paper is a resounding yes. Our results show that credit booms dampen labour productivity growth and this effect works through labour misallocation. In addition, we show that mainly monetary policy should carefully weigh the effects of its measures, even on the sectoral level, as it may support credit activity in less productive sectors and indirectly labour misallocation. Therefore, it is possible to support the recommendations of the proponents of the *financial cycle drag hypothesis* that monetary and fiscal policy settings should systematically take into account the development of a financial cycle and thereby reduce, alongside using tools of macro-prudential economy, their negative economic impact. Borio (2017) adds that counter-cyclical economic policy settings are nowadays crucial, because productivity growth is unusually low, global debt levels are historically high and room for policy manoeuvre is remarkably narrow.

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Appendix

A. Data Description

Table 1A: NACE Aggregation

Description	**NACE, Rev. 2**
Agriculture, forestry and fishing	A
Mining and quarrying	B, D, E
Manufacturing	C
Construction	F
Trade and private services	G, H, I, J, L, M, N
Financial and insurance activities	K
Public services	O, P, Q
Sources of GDP, Other activities	R, S, T, U

Table 2A: Czech Dataset

The table shows all time-series incorporated in the analysis. Used abbreviations stands for: CSO = Czech Statistical Office, CNB – Czech National Bank database ARAD, IMF – International Monetary Fund database, ECB – European Central Bank Statistical Data Warehouse. The transformation codes (TC) are: 1 – no transformation; 2 – first difference; 4 – logarithm; 5 – first difference of logarithm. An asterisk, '', next to the transformation code number denotes a seasonally adjusted variables using CENSUS X13. S/F ranks variables as slow or fast moving in the estimation.*

Group	No.	Series description	Unit	Source	TC	S/F
Real economy	1	Industrial production index, industry total	Index 2010=100	CSO -Industry, energy	5*	S
	2	Industrial production index, mining and quarrying	Index 2010=100	CSO -Industry, energy	5*	S
	3	Industrial production index, manufacturing	Index 2010=100	CSO -Industry, energy	5*	S
	4	Industrial production index, electricity, gas, steam and air conditioning supply	Index 2010=100	CSO -Industry, energy	5*	S
	5	Sales from industrial activity, industry total	Index 2010=100	CSO -Industry, energy	5*	S
	6	Sales from industrial activity, mining and quarrying	Index 2010=100	CSO -Industry, energy	5*	S
	7	Sales from industrial activity, manufacturing	Index 2010=100	CSO -Industry, energy	5*	S
	8	Sales from industrial activity, electricity, gas, steam and air conditioning supply	Index 2010=100	CSO -Industry, energy	5*	S
	9	Direct export sales, industry total	Index 2010=100	CSO -Industry, energy	5*	S
	10	Direct export sales, mining and quarrying	Index 2010=100	CSO -Industry, energy	5*	S
	11	Direct export sales, manufacturing	Index 2010=100	CSO -Industry, energy	5*	S

Group	No.	Series description	Unit	Source	TC	S/F
Real economy	12	Domestic sales, industry total	Index 2010=100	CSO -Industry, energy	5*	S
	13	Domestic sales, mining and quarrying	Index 2010=100	CSO -Industry, energy	5*	S
	14	Domestic sales, manufacturing	Index 2010=100	CSO -Industry, energy	5*	S
	15	Domestic sales, electricity, gas, steam and air conditioning supply	Index 2010=100	CSO -Industry, energy	5*	S
	16	New industrial orders, industry total	Index 2010=100	CSO -Industry, energy	5*	S
	17	Non-domestic new orders	Index 2010=100	CSO -Industry, energy	5*	S
	18	Domestic new orders	Index 2010=100	CSO -Industry, energy	5*	S
	19	Construction production index	Index 2010=100	CSO - Construction	5*	S
	20	Construction production index, buildings	Index 2010=100	CSO - Construction	5*	S
	21	Construction production index, civil engineering works	Index 2010=100	CSO - Construction	5*	S
	22	Retail trade receipts	Index 2010=100	CNB, ARAD	5*	S
	23	Gross domestic product, market prices	Millions CZK	CSO - Gross domestic product	5*	S
	24	GDP deflator	Index 2010=100	CNB, ARAD	5*	S
	25	Final consumption expenditures, total, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	26	Final consumption expenditures, households, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	27	Final consumption expenditures, government, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	28	Final consumption expenditures, non-profit organisations, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	29	Gross capital formation, total, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	30	Export, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	31	Import, current prices	Millions CZK	CSO - Gross domestic product	5*	S
	32	Real gross domestic product	Millions CZK	CSO - Gross domestic product	5*	S
	33	Sources of GDP, Agriculture, forestry and fishing	Millions CZK	CSO - Gross domestic product	5*	S
	34	Sources of GDP, Mining and quarrying	Millions CZK	CSO - Gross domestic product	5*	S
	35	Sources of GDP, Manufacturing	Millions CZK	CSO - Gross domestic product	5*	S
	36	Sources of GDP, Construction	Millions CZK	CSO - Gross domestic product	5*	S
	37	Sources of GDP, Trade and private services	Millions CZK	CSO - Gross domestic product	5*	S
	38	Sources of GDP, Financial and insurance activities	Millions CZK	CSO - Gross domestic product	5*	S
	39	Sources of GDP, Public services	Millions CZK	CSO - Gross domestic product	5*	S
	40	Sources of GDP, Other activities	Millions CZK	CSO - Gross domestic product	5*	S
Labour market	41	Industry total, average number of persons employed (ANPE)	number of persons	CSO -Industry, energy	5*	S
	42	Industry total, average gross nominal wage (AGNW)	CZK per person	CSO -Industry, energy	5*	S

Group	No.	Series description	Unit	Source	TC	S/F
Labour market	43	Employees total, hours worked	thousand hours	CSO - Gross domestic product	5*	S
	44	General unemployment rate of the aged 15 to 64 years	%	CNB, ARAD	1*	S
	45	Job Vacancies	thousand	CNB, ARAD	5*	S
	46	Unplaced job seekers	thousand	CNB, ARAD	5*	S
	47	Employees, Agriculture, forestry and fishing	number of persons	CSO -Industry, energy	5*	S
	48	Employees, Mining and quarrying	number of persons	CSO -Industry, energy	5*	S
	49	Employees, Manufacturing	number of persons	CSO -Industry, energy	5*	S
	50	Employees, Construction	number of persons	CSO -Industry, energy	5*	S
	51	Employees, Trade and private services	number of persons	CSO -Industry, energy	5*	S
	52	Employees, Financial and insurance activities	number of persons	CSO -Industry, energy	5*	S
	53	Employees, Public services	number of persons	CSO -Industry, energy	5*	S
	54	Employees, Other activities	number of persons	CSO -Industry, energy	5*	S
	55	Wages and salaries, Agriculture, forestry and fishing	Millions CZK	CSO -Industry, energy	5*	S
	56	Wages and salaries, Mining and quarrying	Millions CZK	CSO -Industry, energy	5*	S
	57	Wages and salaries, Manufacturing	Millions CZK	CSO -Industry, energy	5*	S
	58	Wages and salaries, Construction	Millions CZK	CSO -Industry, energy	5*	S
	59	Wages and salaries, Trade and private services	Millions CZK	CSO -Industry, energy	5*	S
	60	Wages and salaries, Financial and insurance activities	Millions CZK	CSO -Industry, energy	5*	S
	61	Wages and salaries, Public services	Millions CZK	CSO -Industry, energy	5*	S
	62	Wages and salaries, Other activities	Millions CZK	CSO -Industry, energy	5*	S
Government	63	Government debt, total	Millions CZK	CSO - General Government	5*	S
	64	Debt securities, total	Millions CZK	CSO - General Government	5*	S
	65	Debt securities, short-term	Millions CZK	CSO - General Government	5*	S
	66	Debt securities, long-term	Millions CZK	CSO - General Government	5*	S
	67	Government loans, total	Millions CZK	CSO - General Government	5*	S
	68	Government loans, short-term	Millions CZK	CSO - General Government	5*	S
	69	Government loans, long-term	Millions CZK	CSO - General Government	5*	S
	70	Debt interests payed	Millions CZK	CSO - General Government	5*	S
	71	Government expenditures, total	Millions CZK	CSO - General Government	5*	S
	72	Government revenue, total	Millions CZK	CSO - General Government	5*	S

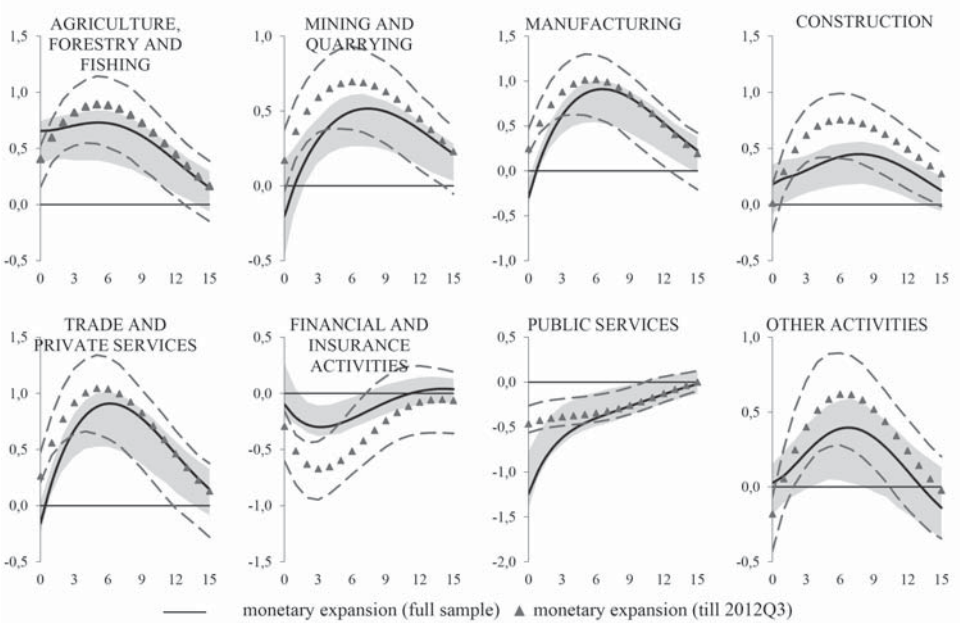
Group	No.	Series description	Unit	Source	TC	S/F
Govern-ment	73	Debt to GDP ratio	ratio	own calculation	1	S
	74	Debt service costs = interests payed in t / debt in t-1	ratio	own calculation	1	S
Prices and price expectations	75	Consumer Price Index (CPI), total	Index 2015 = 100	CNB, ARAD	5*	S
	76	CPI, food and non-alcoholic beverages	Index 2015 = 100	CSO - Prices	5*	S
	77	CPI, alcoholic beverages, tobacco	Index 2015 = 100	CSO - Prices	5*	S
	78	CPI, clothing and footwear	Index 2015 = 100	CSO - Prices	5*	S
	79	CPI, housing, water, electricity, gas and other fuels	Index 2015 = 100	CSO - Prices	5*	S
	80	CPI, furnishings, household equipment, routine maintenance of the house	Index 2015 = 100	CSO - Prices	5*	S
	81	CPI, health	Index 2015 = 100	CSO - Prices	5*	S
	82	CPI, transport	Index 2015 = 100	CSO - Prices	5*	S
	83	CPI, communications	Index 2015 = 100	CSO - Prices	5*	S
	84	CPI, recreation and culture	Index 2015 = 100	CSO - Prices	5*	S
	85	CPI, education	Index 2015 = 100	CSO - Prices	5*	S
	86	CPI, restaurants and hotels	Index 2015 = 100	CSO - Prices	5*	S
	87	CPI, miscellaneous goods and services	Index 2015 = 100	CSO - Prices	5*	S
	88	Industrial Producer Prices (IPP), total	Index 2015 = 100	CSO - Prices	5*	S
	89	IPP, mining and quarrying	Index 2015 = 100	CSO - Prices	5*	S
	90	IPP, manufacturing	Index 2015 = 100	CSO - Prices	5*	S
	91	IPP, electricity, gas, steam and air conditioning supply	Index 2015 = 100	CSO - Prices	5*	S
	92	IPP, water supply; sewerage, waste management and remediation activities	Index 2015 = 100	CSO - Prices	5*	S
	93	Market services price indices in the business sphere, total	Index 2005 = 100	CSO - Prices	5*	S
	94	Inflation expectations of non-financial corporations and companies for the 1Y horizon	%	CNB, ARAD	1*	F
	95	Financial market inflation expectations for 1Y horizon	%	CNB, ARAD	1*	F
Interest rates and credits	96	Repo rate - 2 weeks	%	CNB, ARAD	1	F
	97	PRIBOR 3M	%	CNB, ARAD	1	F
	98	PRIBOR 1Y	%	CNB, ARAD	1	F
	99	Government bond yield 2Y	%	CNB, ARAD	1	F
	100	Government bond yield 5Y	%	CNB, ARAD	1	F
	101	Government bond yield 10Y	%	CNB, ARAD	1	F
	102	Bank interest rates on CZK-denominated loans, households total	%	CNB, ARAD	1	F
	103	Bank interest rates on CZK-denominated loans, households, up to 1Y	%	CNB, ARAD	1	F
	104	Bank interest rates on CZK-denominated loans, households, up to 5Y	%	CNB, ARAD	1	F
	105	Bank interest rates on CZK-denominated loans, households, over 5Y	%	CNB, ARAD	1	F
	106	Bank interest rates on CZK-denominated loans, households consumer credit - total	%	CNB, ARAD	1	F
	107	Bank interest rates on CZK-denominated loans, households for house purchase - total	%	CNB, ARAD	1	F
	108	Bank interest rates on CZK-denominated loans, households other loans - total	%	CNB, ARAD	1	F
	109	Bank interest rates on CZK-denominated loans, non-financial corporations	%	CNB, ARAD	1	F
	110	Bank interest rates on CZK-denominated loans, non-financial corporations, up to 1Y	%	CNB, ARAD	1	F

Group	No.	Series description	Unit	Source	TC	S/F
Interest rates and credits	111	Bank interest rates on CZK-denominated loans, non-financial corporations, up to 5Y	%	CNB, ARAD	1	F
	112	Bank interest rates on CZK-denominated loans, non-financial corporations, over 5Y	%	CNB, ARAD	1	F
	113	Monetary base, monthly average	Billions CZK	CNB, ARAD	5	F
	114	Monetary aggregate M1	Millions CZK	CNB, ARAD	5	F
	115	Monetary aggregate M2	Millions CZK	CNB, ARAD	5	F
	116	Loans to residents and non-residents - MFIs	Millions CZK	CNB, ARAD	5	F
	117	Loans to non-financial corporations - MFIs	Millions CZK	CNB, ARAD	5	F
	118	Loans to financial corporations - MFIs	Millions CZK	CNB, ARAD	5	F
	119	Loans to government	Millions CZK	CNB, ARAD	5	F
	120	Loans to households	Millions CZK	CNB, ARAD	5	F
	121	Loans, short-term (up to 1Y)	Millions CZK	CNB, ARAD	5	F
	122	Loans, medium-term (up to 5Y)	Millions CZK	CNB, ARAD	5	F
	123	Loans, long-term (over 5Y)	Millions CZK	CNB, ARAD	5	F
	124	Consumption loans, total	Millions CZK	CNB, ARAD	5	F
	125	Mortgages, total	Millions CZK	CNB, ARAD	5	F
	126	Other loans, total	Millions CZK	CNB, ARAD	5	F
	127	Client loans, Agriculture, forestry and fishing	Millions CZK	CNB, ARAD	5	F
	128	Client loans, Mining and quarrying	Millions CZK	CNB, ARAD	5	F
	129	Client loans, Manufacturing	Millions CZK	CNB, ARAD	5	F
	130	Client loans, Construction	Millions CZK	CNB, ARAD	5	F
	131	Client loans, Trade and private services	Millions CZK	CNB, ARAD	5	F
	132	Client loans, Financial and insurance activities	Millions CZK	CNB, ARAD	5	F
	133	Client loans, Public services	Millions CZK	CNB, ARAD	5	F
	134	Client loans, Other activities	Millions CZK	CNB, ARAD	5	F
Financial sector	135	Capital adequancy ratio, total	%	CNB - non-public data	1*	F
	136	Leverage ratio, total	%	CNB - non-public data	1*	F
	137	Risk-weighted assets to total assets	%	CNB - non-public data	1	F
	138	Non-performing loans to total assets	%	CNB - non-public data	1	F
	139	Loans to total assets (LTA)	%	CNB - non-public data	1	F
	140	Spread, defined as the difference between 10Y gov. bonds yield and PRIBOR 3M	%	own calculation	1	F
	141	Composite indicator of sovereign stress	0-1 interval	ECB Statistical Data Warehouse	1	F
	142	Financial cycle indicator	0-1 interval	CNB - Report on Financial Stability 2016/2017	1	F
	143	Index PX	value	PSE, Prague Stock Exchange	5	F
	144	MFI total assets	Millions CZK	CNB - ARAD	5	F
	145	House price index	Index 2010 = 100	CSO - Prices	5	F
	146	Banks provisioning	value	CSO - Prices	5	F
	147	House price gap - CNB calculations	value	CNB - Report on Financial Stability 2016/2017	1	F
	148	Overvaluation of commercial property prices - CNB calculations	value	CNB - Report on Financial Stability 2016/2017	1	F

Group	No.	Series description	Unit	Source	TC	S/F
Exchange rates	149	Real effective exchange rate	Index 2015=100	CNB, ARAD	5*	F
	150	Nominal exchange rate CZK/EUR, monthly average	value	CNB, ARAD	5	F
	151	Nominal exchange rate CZK/GBP, monthly average	value	CNB, ARAD	5	F
	152	Nominal exchange rate CZK/USD, monthly average	value	CNB, ARAD	5	F
	153	Nominal exchange rate CZK/JPY, monthly average	value	CNB, ARAD	5	F
	154	Nominal effective exchange rate	Index 2015=100	CNB, ARAD	5	F
External environment	155	Government bond yield 2Y - eurozone	%	CNB, ARAD	1	F
	156	Government bond yield 5Y - eurozone	%	CNB, ARAD	1	F
	157	Government bond yield 10Y - eurozone	%	CNB, ARAD	1	F
	158	Yield spreads on risky private sector bonds	value	CNB - Report on Financial Stability 2016/2017	5	F
	159	Crude oil, Brendt, $/bbl, current Europe	USD/barel	EIA	5	F
	160	Crude oil, Brendt, $/bbl, current US	USD/barel	EIA	5	F
	161	Crude Oil Production, US fields	thousand barrels	EIA	5	F
	162	Composite indicator of systemic stress, eurozone	index 0-1	ECB Statistical Data Warehouse	1	F
	163	EURIBOR 3M	%	ECB Statistical Data Warehouse	1	F
	164	GDP, chain index volumes, Eurozone (changing composition)	Index 2010 = 100	Eurostat	5	F
	165	DAX index	value	Datastream	5	S
	166	Industrial production index, total Germany	Index 2005 = 100	Eurostat, ipp_st_m	5	S
	167	Ifo - Business Climate Index, Germany	Index 2005 = 100	CESifo	5	S
	168	All Commodity Price Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	169	Non-Fuel Price Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	170	Food and Beverage Price Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	171	Industrial Inputs Price Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	172	Agricultural Raw Materials Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	173	Metals Price Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	174	Fuel (Energy) Index	Index 2005 = 100	IMF Primary Commodity Prices	5	S
	175	Crude Oil (petroleum), Price index	Index 2005 = 100	IMF Primary Commodity Prices	5	S

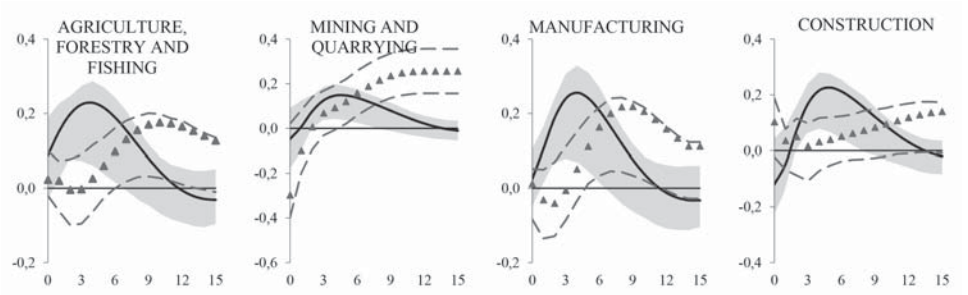
B. Impulse Responses of Client Loans

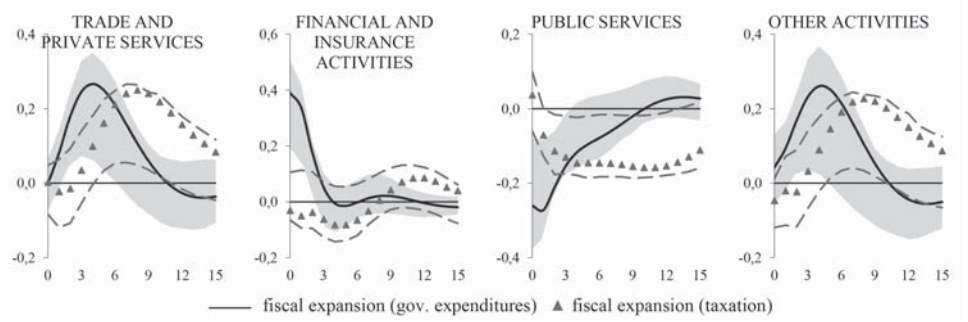
Figure 1B: Impulse Responses of Client Loans to Monetary Policy Expansion – sector breakdown



Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables response in percentages; the x-axis is in quarters after the shock.

Figure 2B: Impulse Responses of Client Loans to Fiscal Policy Expansion – sector breakdown

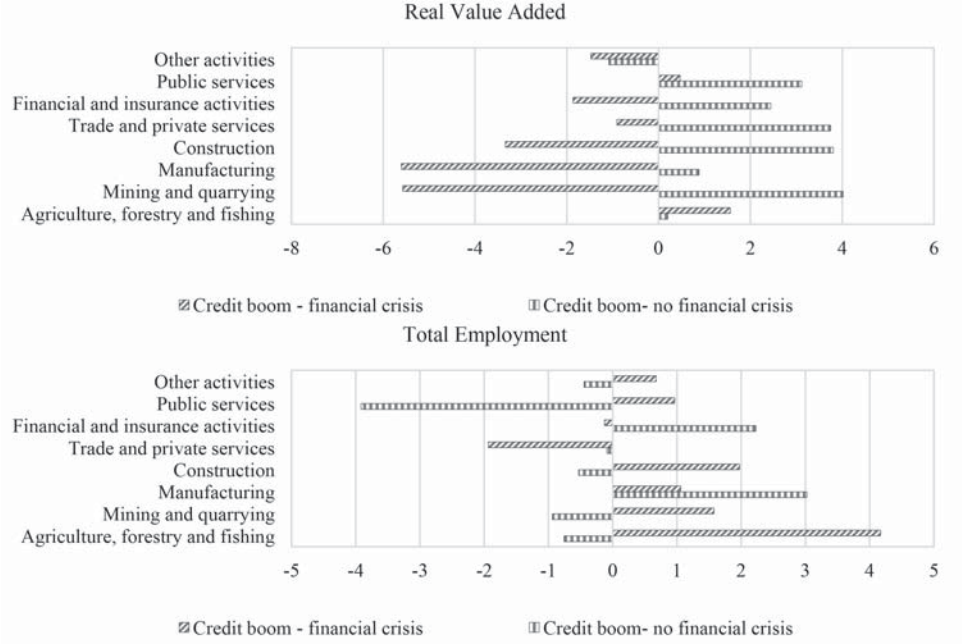




Notes: Median impulse responses are reported with 90% probability bands. The y-axis measures the strength of variables response in percentages; the x-axis is in quarters after the shock.

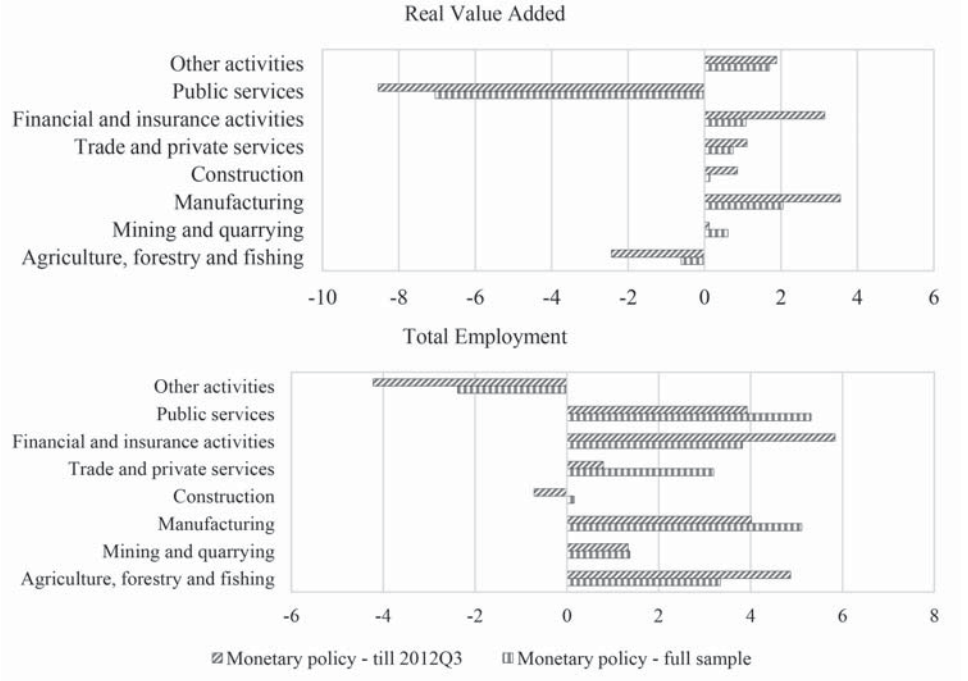
C. Impulse Responses of Real Value Added and Total Employment per Economic Sectors

Figure 1C: Accumulated Responses of Real Value Added and Total Employment to Credit Boom



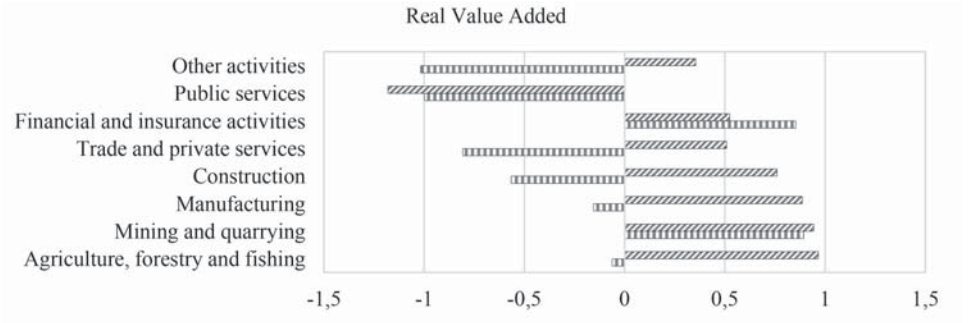
Notes: The responses were accumulated over 3-year period to account for any labour reallocations. Y-axis: economic sectors, x-axis: responses in percentage points.

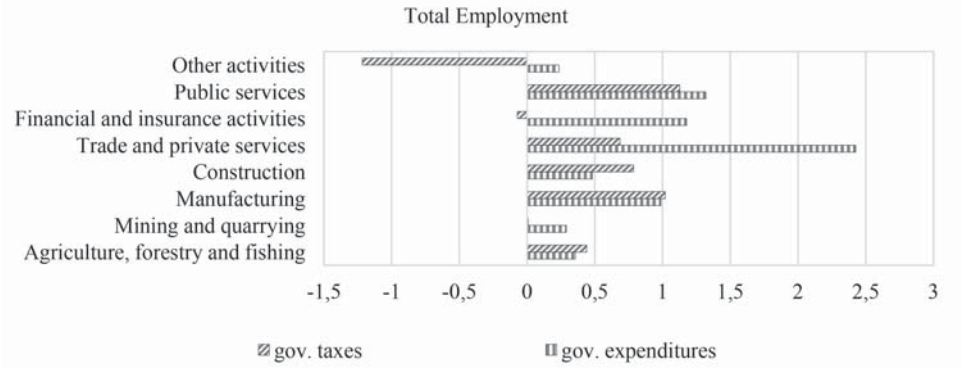
Figure 2C: Accumulated Responses of Real Value Added and Total Employment to Monetary Expansion



Notes: The responses were accumulated over 3-year period to account for any labour reallocations. Y-axis: economic sectors, x-axis: responses in percentage points.

Figure 3C: Accumulated Responses of Real Value Added and Total Employment to Fiscal Expansion





Notes: The responses were accumulated over 3-year period to account for any labour reallocations. Y-axis: economic sectors, x-axis: responses in percentage points.

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

Dopad uvolněné monetární politiky na konkurenceschopnost českých firem

VERONIKA KAJUROVÁ
DAGMAR LINNERTOVÁ

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 competiveness, 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 Zawojska (2014) or Jambor and Babu (2016).

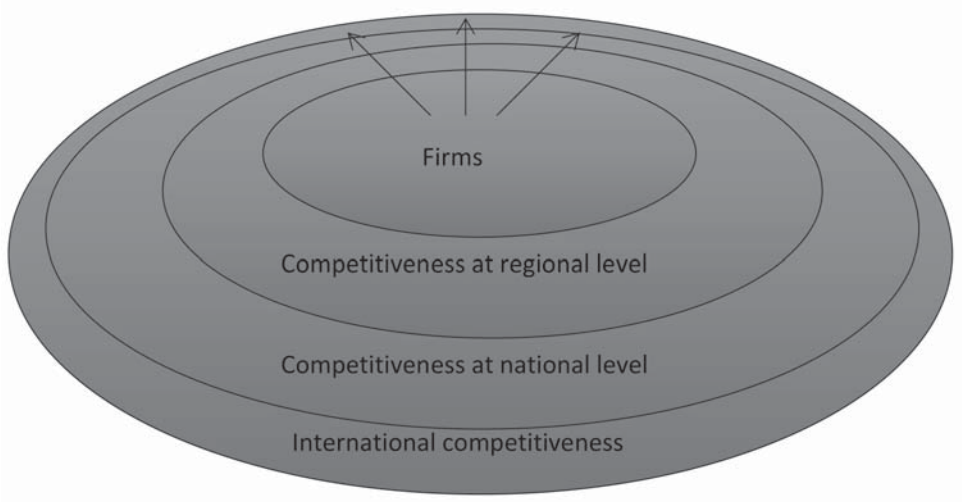
In this study, we do not intend to provide a detailed review of different competitiveness perspectives on different levels, since it is focused on the effects of monetary policy on firms' competitiveness. The provided review is focused on the current state of knowledge concerning competitiveness at the 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 Zawojska (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 7,997to 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:

$$ROA = \frac{EBIT}{total\ assets} \tag{1}$$

$$ROE = \frac{EBIT}{equity} \tag{2}$$

$$ROS = \frac{EBIT}{sales} \tag{3}$$

$$profit\ margin = \frac{EBIT}{sales} \tag{4}$$

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:

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

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, $\alpha_2 \ldots \alpha_7$ 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, $\Delta \mathrm{SENT}_t$ 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:

$$Y_{it} = \alpha_1 + \alpha_2 MP_{t-1} + \alpha_3 \Delta \mathrm{SENT}_t + \alpha_4 X_{it} MP_{t-1} + \alpha_5 d\_small_{it} + \alpha_6 d\_large_{it} + \alpha_7 d\_int_{it} + e_{it} \quad (8)$$

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 at 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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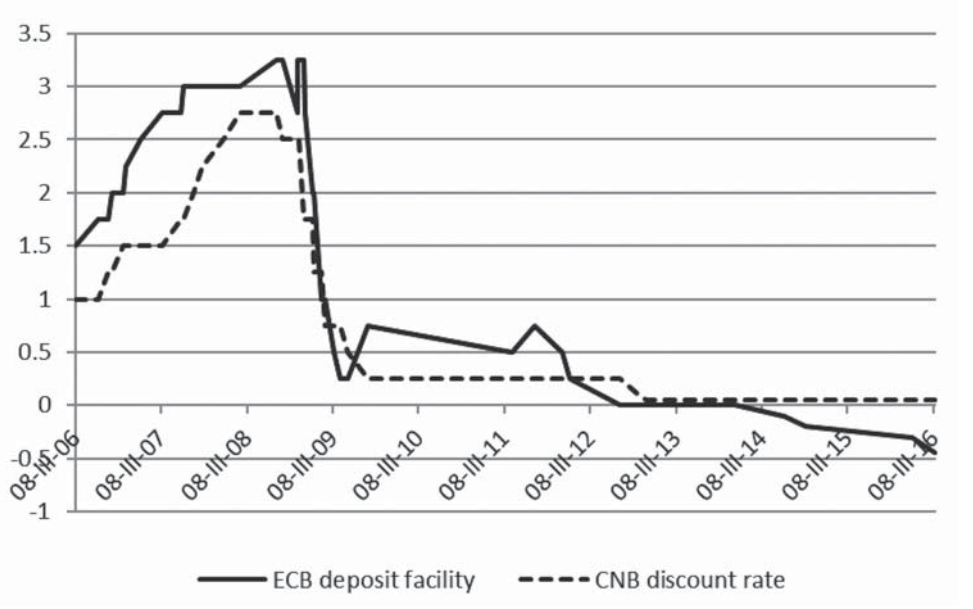
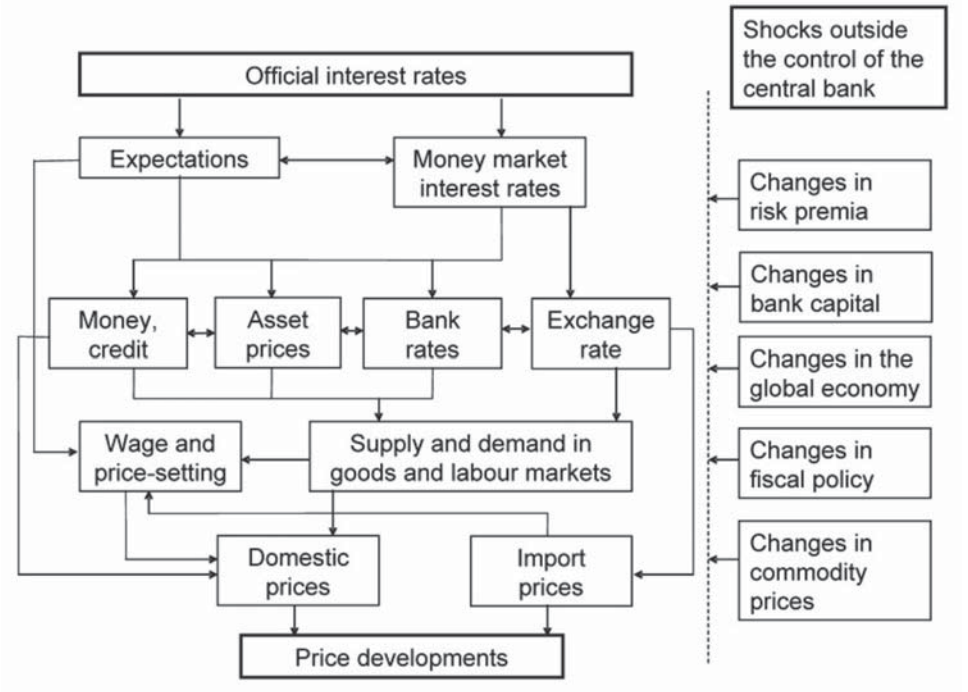
Appendices

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)	-13.5544c (-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	-1.1515a (-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.

The Tax Competitiveness of Tourism Enterprises in an International Context

Daňová konkurenceschopnost podniků cestovního ruchu v mezinárodním kontextu

LENKA ŘÍHOVÁ

Abstract

Competitiveness at the micro level of individual enterprises is an important issue for the national economy, but the international competitiveness of enterprises represents a direct expression of the state's superiority. The escalating growth of competition is now noticeable in many sectors, with each sector simultaneously facing different threats. Tourism is a specific sector with prices that are largely dependent on labour costs and other tax burdens. At the same time, this sector features the lowest wage level in the Czech Republic. The present work is focused on analysing the most important types of taxes in the tourism sector in the Czech Republic, Slovakia and Austria and their impact on the international competitiveness of enterprises. The countries were selected based on their demographic and geographical similarities. The most important tax in this regard is value added tax (VAT), which has a direct impact on the final price of goods and services consumed by tourists. The total level of direct tax on tourist consumption is calculated as the weighted average of VAT rates for each selected country. Entities conducting business in hotel and catering face a high share of labour costs relative to the cost of other capital that can also be transferred to tourists through higher prices. The aim of this contribution is to provide a ranking of selected countries according to the tax burden directly imposed on tourism consumption and to determine the relative tax competitiveness of the Czech Republic as a tourist destination for 2017.

Keywords

competitiveness of enterprises, VAT, taxes, taxation

JEL codes

E62, Z3, H2

Abstrakt

Konkurenceschopnost na mikroúrovni jednotlivých podniků je pro národní ekonomiku důležité téma, ovšem mezinárodní konkurenceschopnost podniků je přímým vyjádřením převahy daného státu. Eskalující nárůst konkurence je nyní znatelný v mnoha odvětvích, přičemž každé odvětví zároveň postihují jiné hrozby. Jedním ze specifických odvětví je cestovní ruch. Tedy odvětví, jehož ceny jsou z velké části odvislé od nákladů práce a další daňové zátěže. Zároveň je v České republice nejnižší úroveň mezd právě v tomto odvětví. Předkládaná práce je zaměřena na analýzu nejdůležitějších typů daní v oblasti cestovního ruchu v České republice, Slovensku a Rakousku a jejich vliv na mezinárodní konkurenceschopnost podniků. Výběr zemí byl proveden na základě demografické a geografické podobnosti. Nejvýznamnější daní v tomto pojetí je daň z přidané hodnoty

(DPH), která má přímý vliv na finální cenu zboží a služeb spotřebovaných turisty. Celková úroveň přímého zdanění spotřeby turistů je počítána jako vážený průměr sazeb DPH za každou vybranou zemi. Subjekty podnikající v pohostinství čelí vysokému podílu nákladů na pracovní sílu vůči nákladům na ostatní kapitál, které mohou být také přeneseny na turisty prostřednictvím vyšších cen. Cílem práce je poskytnout žebříček vybraných zemí podle výše daňové zátěže přímo uvalené na spotřebu v oblasti turismu a určit tak relativní daňovou konkurenceschopnost České republiky jako turistické destinace pro rok 2017.

Klíčová slova
konkurenceschopnost podniků, DPH, daně, zdanění

Introduction

The 21st century is characterised by its dynamic changes and rapid development across the microeconomic and macroeconomic environments as well as the whole of society. Rapid development is particularly evident in the IT technology that penetrates many industries, including tourism. Co-founder of Intel, Gordon Moore's statement on the development of technology became a "law" commenting on perceptions regarding the price and performance of semiconductors (Intel, 2017). These changes have also brought negative effects, such as the global financial crisis and the associated economic downturn or stagnation in many economies. Countries of the European Union have also particularly been affected by the debt crisis in the euro area. However, it is not just technology and the financial markets that are undergoing dynamic development: society as a whole has been influenced by the US terrorist attacks in 2001 and other attacks, the last one, for example, in London in 2017. The Enron scandal and the fall of Lehman Brothers, among other events, have impacted the entrepreneurial environment. At the same time, entrepreneurs have to face many threats, and high market orientation and competitiveness is key to their success.

Although the concept of competitiveness is a common term, its definition often differs. At the most general level, competitiveness can be understood as the ability to achieve set objectives – the ability to use resources efficiently, flexibly and in an innovative way to meet the interests of all stakeholders (Palatková and Zichová, 2014).

Competitiveness is widely discussed by the broad professional public at all levels. The macroeconomic view is devoted to national competitiveness, where GDP is a key indicator but also takes into account the other twelve pillars such as infrastructure, labour market, financial market, education, health care, etc. (World Economic Forum, 2016). Methods of enhancing the competitiveness of countries, for example, by increasing education and training of employees, logically follow (Cherung and Chan, 2012). Competitiveness is also measured with respect to enterprises, but using different criteria depending on the nature of the business or individual markets, for example, measuring competitiveness through a procurement system (Dilek and Hakan, 2013). Individual impacts on the competitiveness of enterprises in the form of the impact of a change in the used currency are also analysed and the adoption of the euro in Slovakia may serve as an example (Lalinský, 2010). The

professional public also pays particular attention to small and medium-sized enterprises and their competitiveness in the market (Ceptureanu, 2015).

In addition to the supporters of competitiveness, there are also critics of this idea. Such authors claim competitiveness to be a seductive idea that promises easy answers to complex problems. They claim that this obsession, however, results in misallocated resources, commercial friction, and poor domestic economic policies. (Krugman, 1994).

As can be seen from the literature research conducted, the competitiveness of enterprises can fundamentally influence a country's fiscal policy. The present work is, therefore, focused on the tax competitiveness of enterprises. The thesis contains an analysis of the most important types of taxes in the field of tourism in the Czech Republic, Slovakia and Austria and their influence on the international competitiveness of enterprises. The selection of the industry was influenced by its nature. Tourism, apart from growing competition, is also affected by additional threats such as an increase in bureaucratic burdens in the form of EETs and the specific existence of the lowest wage level by industry in the Czech Republic (2017 average earnings information system). The selection of countries was based on demographic and geographical similarities.

The most important tax in this concept is value added tax (VAT), which has a direct impact on the final price of goods and services consumed by tourists. The total level of direct tax on tourist consumption is calculated as the weighted average of VAT rates for each selected country. Entities conducting business in the hotel and catering field face a high share of labour costs relative to the costs of other capital that can also be passed on to tourists through higher prices. An important role in pricing and assessing the tax burden is also played by excise duty outside value added tax.

The aim of the thesis is to provide a ranking of selected countries according to the tax burden directly imposed on consumption (VAT) in the field of tourism and to determine the relative tax competitiveness of the Czech Republic as a tourist destination for 2017. The excise duty projected in the final cost of goods and tax burden on wages will be analysed through the partial goals of achieving a comprehensive comparison of the tax competitiveness of businesses in tourism.

The objectives of the thesis will be achieved by a model comparison based on the identification of relevant taxes and the determination of their significance presented by their assigned weight.

The work is divided into several sections. The first part is focused on tourism and its economic importance. The second part is focused on the identification of taxes related to tourism business. The third, most extensive, part comprises the determination of the competitiveness of tourism enterprises in the Czech Republic, Austria and Slovakia. The competitiveness of enterprises is affected by other significant influences, which are presented in the fourth part. Before the final part of the thesis, there is a summary of recommendations resulting from the main findings.

1 Tourism and its economic significance

Tourism can be considered as a cross-cutting industry because of its influence on and continuity with other sectors such as engineering construction, specialised construction activities, retail, transport, information activities, real estate activities, advertising and market research and others. Definitions of tourism, therefore, often differ.

Internationally, tourism is defined as an activity of persons travelling to and staying in places outside their usual environment for a period of less than one whole year in order to spend their free time, trade and other non-business activities, for which they remunerate the place visited (Czech Statistical Office, 2017).

Although the above definition defines the notion of tourism as much as possible, it is necessary to point out that residents of the European Union can interpret this term differently. The understanding of the notion of tourism is greatly affected by the maturity of the country. Countries in the north of the European Union, in comparison to the southern states, are characterised by more developed industry and urbanisation, but higher incomes of the population and higher labour costs (Beran, Říhová 2015). The inhabitants of these advanced economies have a different view of spending leisure time, hotels and tourism as a whole, than those of the less developed countries. On the other hand, swift changes are making some southern states more economically developed, which is reflected in the specifics of perception and participation in tourism. For example, in the past, southern European countries did not target large numbers of tourists abroad, but these countries had and still have large domestic tourism markets, which must simultaneously meet the demand of foreign and domestic clients (Horner and Swarbrooke, 2003).

This thesis focuses on the tax competitiveness of three European countries, namely the Czech Republic, Slovakia and Austria, from the point of view of tourism enterprises. It would not be appropriate to compare countries that are diametrically geographically and culturally different, as the results of such a comparison would be irrelevant. Nevertheless, one cannot forget the view of tourism on a global scale. According to the most up-to-date data from 2015, Europe is the world's fastest growing area in terms of the influx of tourists (World Travel Organization, 2016) compared to other continents; the influx of international tourists increased by 5% in 2015. The rapid growth of interest in the countries of Europe thus not only increases pressure to focus on the competitiveness of tourism enterprises, but also offers remarkable information with regard to the size of the European countries on a global scale.

The macroeconomic view of the importance of tourism in the EU-28 is illustrated in Table 1 below. In terms of GDP revenue, international tourism is most significant for Croatia, Malta and Cyprus. This is not a surprise, given the nature of these destinations. Cyprus and Malta are relatively small islands, and due to their size and climate, it is obvious that tourism is very important from the point of view of the economy. Although Croatia is not an island country, its geographical characteristics do not allow this country to participate more in industry or agriculture.

Table 1: Tourism revenue and expenditure in the balance of payments in 2010 and 2015

	Receipts (million EUR)		Relative to GDP	Expenditure (million EUR)		Relative to GDP	Balance (million EUR)
	2010	2015	2015 (%)	2010	2015	2015 (%)	2015
EU-28 (*)	76 117	115 808	0.8	86 503	101 026	0.7	14 783
Belgium	8 620	10 788	2.6	14 313	17 066	4.2	-6 278
Bulgaria	2 574	2 838	6.3	626	1 006	2.2	1 832
Czech Republic	5 419	5 465	3.3	3 216	4 304	2.6	1 161
Denmark	4 420	6 028	2.2	6 809	8 042	3.0	-2 014
Germany	26 159	33 265	1.1	58 934	69 859	2.3	-36 594
Estonia	809	1 287	6.4	478	885	4.4	402
Ireland	3 106	4 320	1.7	5 358	5 121	2.0	-801
Greece	9 611	14 126	8.0	2 156	2 038	1.2	12 088
Spain	41 218	50 892	4.7	12 788	15 654	1.5	35 238
France	35 464	41 387	1.9	29 016	34 628	1.6	6 759
Croatia	6 221	7 954	18.1	629	681	1.6	7 273
Italy	29 257	35 555	2.2	20 415	22 013	1.3	13 542
Cyprus	1 629	2 241	12.7	956	961	5.4	1 280
Latvia	484	807	3.3	490	554	2.3	253
Lithuania	729	1 040	2.8	644	858	2.3	182
Luxembourg	3 128	3 873	7.4	2 670	2 988	5.7	885
Hungary	4 235	4 797	4.4	1 821	1 649	1.5	3 147
Malta	814	1 247	13.4	234	332	3.6	915
Netherlands	8 850	11 907	1.8	14 473	16 138	2.4	-4 231
Austria	14 027	16 420	4.8	7 717	8 206	2.4	8 214
Poland	7 259	9 440	2.2	6 505	7 154	1.7	2 286
Portugal	7 600	11 451	6.4	2 953	3 612	2.0	7 839
Romania	860	1 542	1.0	1 238	1 855	1.2	-313
Slovenia	1 926	2 257	5.9	923	822	2.1	1 435
Slovakia	1 684	2 192	2.8	1 471	1 917	2.4	275
Finland	2 301	2 307	1.1	3 251	4 305	2.1	-1 998
Sweden	6 324	10 201	2.3	9 172	12 997	2.9	-2 796
United Kingdom	24 923	41 116	1.6	41 631	57 192	2.2	-16 075

Source: Eurostat, Statistics Explained, 2015.

Tourism is insignificant even for the Czech Republic; in 2015 tourism revenue accounted for 3.3% of its GDP. Compared to the EU-28 average, it is above average. The other countries that will be analysed in this thesis are Austria and Slovakia. For Austria, the income from tourism with respect to GDP is also higher than the EU-28 average, but this is higher than in the Czech Republic, reaching 4.8%. In Slovakia, in 2015 tourism revenue accounted for 2.8% of GDP. The higher income from tourism with respect to GDP in Austria can be caused by several factors. Geographical differences can serve as examples. In Austria, are found ski resorts popular with an international clientele with which the Czech Republic and Slovakia cannot compete.

When comparing the analysed countries, the number of nights spent by tourists used by non-residents cannot be ignored. In 2015, more than 75 million non-resident nights were recorded in Austria. The Czech Republic with less than 25 million overnight stays reaches the imaginary second place. Last but not least, Slovakia has fewer than 10 million overnight stays from this point of view. (Eurostat, 2015).

2 Taxes and tourism

In view of the nature of tourism as a cross-sectional sector (as defined above), we can state that tourism is affected not only by taxes directly related to tourism (specific taxes) but also general taxes. This division of tourism taxes is supported by the World Tourism Organization (WTO, 1998), ANTA (Australian National Tourism Alliance, 2003, p. 4–7), Gooroochurn and Sinclair (2003, p. 4–7) and Durbarry and Sinclair (2001).

General taxes on tourism comprise:

- Value added tax on goods and services;
- Taxes associated with transport (tax on fuel, car rental charges, etc.);

- Income tax for businesses (possibly specialised taxes on restaurants and businesses);
- Employee income tax (social security, surcharges, etc.);
- Import duties;
- Tax relating to ownership of land or other property.

Specialised taxes for tourism may comprise:

- International transport charges (air transport, taxes and duties, airports/sea ports/roads);
- Tourist fees for visitors;
- Entry and exit taxes and permits (visa fees, etc.);
- Local charges for accommodation;
- Taxes associated with gambling.

The most important tax for tourism is the value added tax levied on end-use goods. For Member States of the European Union, a minimum value added tax of 15% is applied. In selected cases, it is also possible to use the reduced VAT rate of 5% or the zero tax rate (2006). From the tourism point of view, it is important that governments can apply the reduced value added tax rate to accommodation services.

The aim of this work is to provide a ranking of selected countries according to the amount of tax burden directly imposed on consumption in the area of tourism and thus to determine the relative tax competitiveness of the Czech Republic as a tourist destination for 2017. For this reason the table below presents a summary of tax rates in the Czech Republic, Austria and Slovakia in 2017.

Table 2: Overview of tax rates in the Czech Republic, Austria and Slovakia in 2017 in %

Countries	Standard VAT	Decreased VAT	Super low or zero VAT	Hotels (accommodation)	Restaurants (food)	Bars and cafes (beverages)		Shops	
						Non-alcoholic beverages	Alcoholic beverages	Food	Non-alcoholic beverages
Czech Republic	21	10 / 15	-	15	15	15	21	10 / 15	15
Austria	20*	10 / 13		13	10	20	20/13	10	20
Slovakia	20	10	-	20	20	20	20	20/10	20

Source: European Commission, 2017.

** Geographical features of the application of VAT in the EU. A special rate of 19% applies in Jungholz and Mittelberg.*

It is important to assess other cultural, economic and other specifics of the analysed countries to assess their competitiveness. For this reason, other areas that have a close impact on tourism business, such as illegal labour or monetary policy, will be assessed after the tax analysis.

3 Determining the competitiveness of tourism businesses in the Czech Republic, Austria and Slovakia

Taxes are a significant public revenue; statistics show that more than 90% of all public revenues are revenue of a fiscal nature (Hamerníková and Maaytová, 2007). At the same time, taxes significantly influence the behaviour of individual subjects in the economy, especially motives for doing business.

In order to determine the tax competitiveness of businesses in the tourism sector, consideration must first be given to value added tax. This is an indirect general consumption tax. It is applied the delivery of goods, the provision of services, the transfer of real estate and the import of goods from abroad. (Hamerníková and Maaytová, 2007)

The value added tax rate is not only differentiated, but it also has a different weight for each item from the tourism point of view. In order to assess tax competitiveness from the value added tax point of view, items that are closely linked to tourism were selected first. The selected items included: accommodation, meals, soft and alcoholic drinks, cultural events, sporting events and domestic passenger transport. These items were subsequently assigned values according to their significance.

The most important item, i.e., the item with the highest weight is accommodation, followed by food, alcoholic beverages, entry to sporting events and cultural events, national transport and the last item with the lowest weight, non-alcoholic beverages. Specific weights for each item were determined using a cost estimate from a tourist perspective.

Table 3 below shows the rates per item of travel expenses and weighted average rates for tourist consumption. For greater clarity, specific weights are listed for each item.

Table 3: Rates by item of tourist expenses and weighted average rates for tourist consumption (%), 2017

Group of items and their corresponding weights	Czech Republic	Austria	Slovakia
Accommodation (hotel) 0.45	15 (6.75)	20 (9.0)	20 (9.0)
Food 0.15	15 (2.25)	10 (1.5)	20 (3.0)
Non-alcoholic beverages 0.05	15 (0.75)	20 (1.0)	20 (1.0)
Alcoholic beverages 0.10	21 (2.1)	20 (2.0)	20 (2.0)
Cultural events (show, theatre, cinema) 0.09	15 (1.35)	13 (1.17)	20 (1.8)
Intrastate transport of passengers 0.07	21 (1.47) *	10 (0.7) **	20 (1.4)
Entry to sports events 0.09	15 (1.35)	13 (1.17)	20 (1.8)
Weighted average of value added tax	**16.02**	**16.54**	**20.00**

Source: European Commission, 2017 and author's own calculation on the basis of the model created.

** The decreased rate of 15% is in the case of regular transport not used by regular tourists.*

*** The increased rate of 13% is in the case of air transport, which is, however, within the interstate transport of country of 83,878.99 km² not suitable to be included in the calculation.*

Table 3 above shows, in addition to the results included in the following paragraph, several partial findings. The view of the value added tax amount itself in the analysed countries is interesting. Slovakia can be characterised as a country with a greater uniformity of value added tax compared to the Czech Republic and Austria. For the items considered, the value added tax is 20% in Slovakia. In Austria, the value added tax is overall the lowest in the selected items, with the lowest rate of 10% for food and national passenger transport. In the Czech Republic, food is also subject to lower value added tax (15%), but domestic passenger transport is subject to the highest value added tax of 21%.

The last line of table 3 represents a weighted average value added tax, i.e., a key finding. The lowest average weighted rate of value added tax burdens entities in the Czech Republic (16.02%); the next higher burden is in Austria (16.54%) and the highest burden is in Slovakia (20.00%). The Czech Republic and Austria are favoured in comparison with Slovakia.

To assess tax competitiveness, other aspects need to be added to value added tax. One of these aspects may appear to be the relevant excise duty. Excise duties are selective taxes on consumption applied to four commodities: mineral oil tax, tax on alcohol and spirits, tax on wine, beer and intermediates, and tax on cigarettes and tobacco products. The number of physical units represents a tax base. Rates are fixed and differentiated (Hamerníková and Maaytová, 2007).

In theory, it would be appropriate to include excise duty in tax competitiveness considerations: excise duty significantly affects the final cost of products and thus the competitiveness of businesses. However, business entities often try to avoid taxation, not only in the Czech Republic but also in other European Union countries (European

Commission, 2015). Especially in the case of excise duty, tax evasion represents quite a complex matter. A brewery in the Czech Republic where the excise tax rate may range from CZK 16/hl to CZK 32/hl (Act No. 353/2003 Coll., on Excise Tax) may serve as an exemplary theoretical example. The tax rate is a significant factor for the brewery to determine the selling price. In the event that the brewery decides to increase production from the original 45,000 hl per year to 55,000 hl per year, the tax rate will rise from 19.20 CZK to 22.40 CZK. The brewery would thus have to increase the selling price of beer, which would reduce its competitiveness. Consumers might not accept the price increase and could replace the product with the product of another brewery. Of course, it would be possible to reduce the cost of scale here, but this option cannot be applied with an increase in production of only 10,000 hl per year. The brewery has another option, though, namely to establish a new brewery and distribute its production, thus reducing the rate of excise duty through tax evasion. The circumvention of tax obligations constitutes a reason for excluding excise taxes from the considerations of the tax competitiveness of tourism businesses.

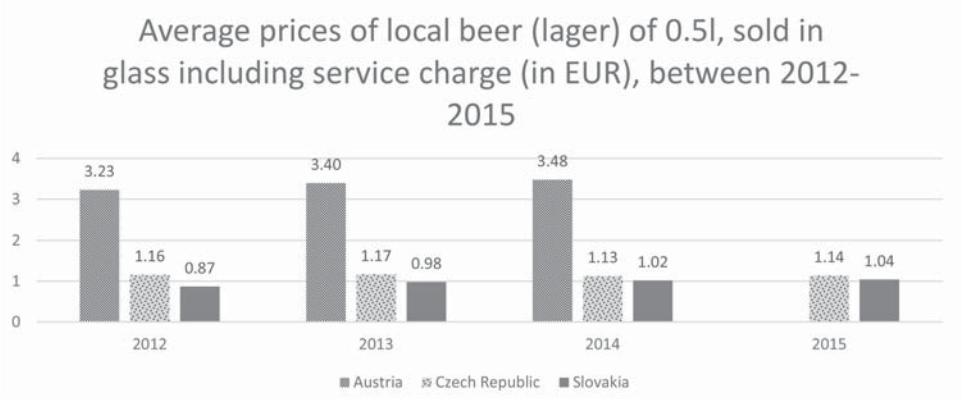
For the above reasons, the excise tax rate itself in the analysed countries will not be compared, but the final prices of selected goods and services in which excise duty is included are. Figures 1, 2 and 3 present the average prices for beer, accommodation and travel by public transport.

The commodity of beer is an important economic aspect, especially for the Czech Republic; according to the Czech Statistical Office, beer exports in 2016 accounted for CZK 6.248 million, while imports amounted to only CZK 359 million. Slovakia is one of the largest customers of Czech beer. (CSO, 2017)

In view of the growing interest of tourists and the professional public (Bujdosó and Szucs, 2012) in beer tourism, the price of the product itself is very important for consumers.

From Figure 1 illustrating the average price of local beer (lager) served in a glass including the service charge, it is clear that the highest average price is in Austria. Compared with the average prices in the Czech Republic, prices in Austria are up to three times higher. Austrian price data for 2015 are missing; for this year, the Austrians did not provide the monitored data. However, on the basis of price developments in the years to come, and in view of political and economic developments in 2015, it can be assumed that the cost of an asset oscillated around 3.4.

Figure 1: Average prices of local beer (lager) of 0.5l, sold in glass including service charge (in EUR), between 2012–2015

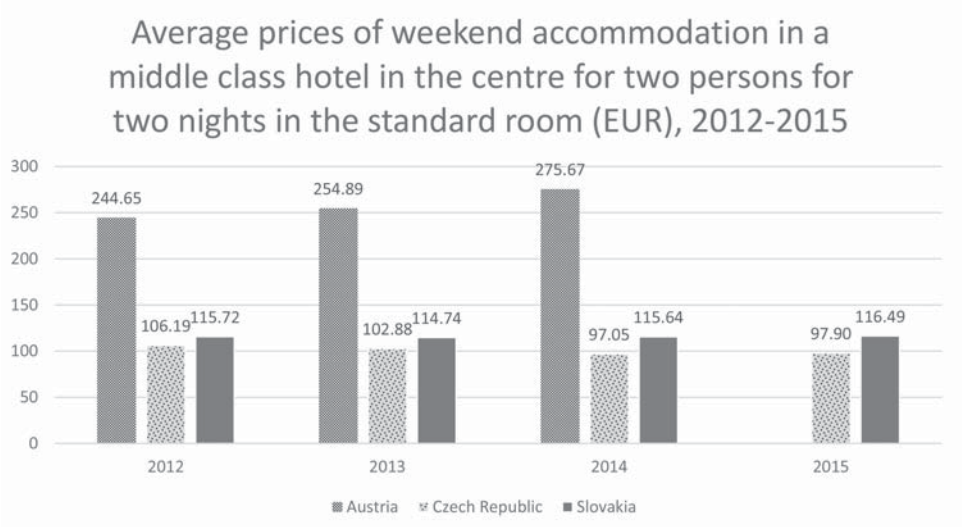


Source: Detailed Average Prices, Eurostat, author's own figure.

From the findings it can be stated that the Czech Republic has a competitive advantage compared to Austria in the price of the first analysed asset. When comparing the Czech Republic with Slovakia this cannot be stated unambiguously. In the monitored years 2012 to 2015, it is clear from the price differential that Slovakia has a competitive advantage, but the difference in average prices is marginal (a difference in the amount of around one tenth of a euro). It is therefore necessary to look for the competitive advantage in other characteristics, in this case more important for the tourists/consumers than the price, of the product's quality, respectively the recipe and the resulting taste.

Similarly to the first analysed asset (Figure 1) a gap between the average accommodation prices (Figure 2) in Austria compared to the other analysed countries is evident. While the average price of weekend accommodation in a middle-class hotel in the centre for two persons per two nights in a standard room in Austria in 2014 exceeded the threshold of EUR 275, the highest average price in the Czech Republic in 2012 was EUR 106; less than half. Interestingly, the average price of accommodation in the Czech Republic has been decreasing since 2012. Average prices of accommodation in all years 2012 to 2015 are the lowest in the Czech Republic. As regards prices, it can therefore be stated that Czech hotels have a price competitive advantage over Slovakia and Austria.

Figure 2: Average prices of weekend accommodation in a middle-class hotel in the centre for two persons for two nights in a standard room (EUR), 2012–2015

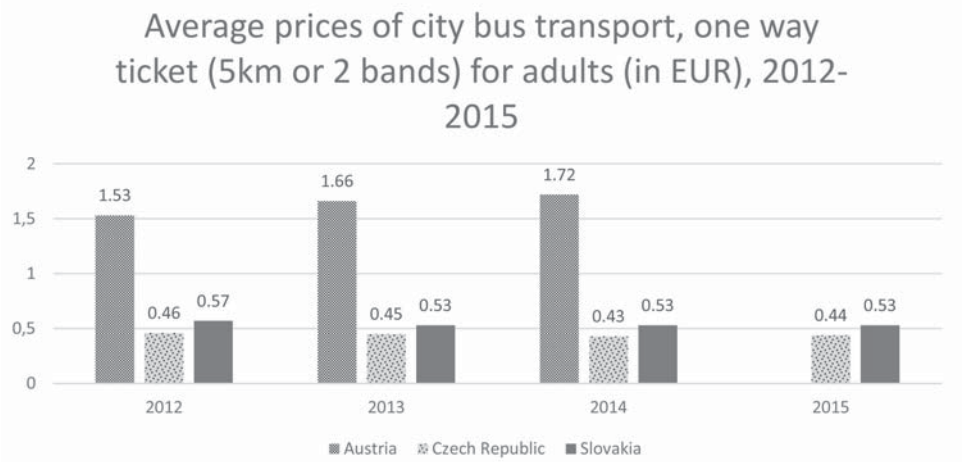


Source: Detailed Average Prices, Eurostat, author's own figure.

Similarly to Figure 1, the figure for Austria is missing for 2015, and the Austrians did not provide the data for this year. However, on the basis of price developments in previous years, and in light of political and economic developments in 2015, it could be assumed that the cost of an asset oscillated around the value of 276.

Accommodation costs may form a significant factor for tourists when choosing between countries, but transport costs are also an important aspect. Below we analyse the average prices of urban bus transport in individual years in the monitored countries of the Czech Republic, Slovakia and Austria.

Figure 3: Average prices of city bus transport, one way ticket (5km or 2 bands) for adults (in EUR), 2012–2015



Source: Detailed Average Prices,Eurostat, author's own figure.

As in the case of the average price for accommodation, in the case of city transport the most expensive country is Austria, the second place is taken by Slovakia and the cheapest country is the Czech Republic.

As with Figures 1 and 2, the prices in Austria are missing for 2015; for this year, the Austrians did not provide the monitored data. However, on the basis of price developments in previous years and in view of political and economic developments in 2015, it can be assumed that the cost of an asset oscillated around 1.7.

Based on the observed average prices of selected goods in each country, a price competitiveness chart has been compiled, as shown in Table 4 below.

Table 4: Price competitiveness chart for the Czech Republic, Slovakia and Austria for beer, accommodation and transport for 2012–2015

Country	**Beer**	**Accommodation**	**Transport**
Czech Republic	2.	1.	1.
Slovakia	1.	2.	2.
Austria	3.	3.	3.

Source: Author's own results on the basis of the previous analysis.

Price competitiveness, which is largely influenced by the tax burden, is highly desirable for assessing the competitiveness of tourism businesses. In pricing, the tax burden, especially the excise tax, represents a fixed cost (Lazar, 2012). This constitutes the undeniable impact of fiscal policy on the competitiveness of tourism businesses.

Another cost that an enterprise has to include in the final price of goods or services produced is the cost of employees, respectively labour costs and labour as a factor of production.[1] Since 2008, labour costs have gradually increased in the European Union as a whole (Aries and Rih, 2015), but it is necessary to focus on each individual analysed country separately. Hourly labour costs in the Czech Republic, Austria and Slovakia are shown in Table 5 below.

Austria features the highest hourly labour costs. Hourly costs have a growing trend over six consecutive years. Taking into account the economic development between 2015 and 2017 it can be assumed that the hourly labour costs for these years will grow. Hourly labour costs in Austria for 2014 amounted to EUR 31.4. This is more than three times higher than the situation in the Czech Republic, where hourly labour costs were EUR 9.4 and in Slovakia, where they were EUR 9.7 in the same year. Although hourly labour costs in 2014 in the Czech Republic and Slovakia differ only slightly, it is important to highlight the growth in hourly labour costs in Slovakia. The percentage increase in hourly labour costs in Slovakia between 2009 and 2014 is 27.6. This is a relatively rapid growth compared to the situation in the Czech Republic.

From the point of view of hourly labour costs, the Czech Republic is the cheapest country for employers, including entrepreneurs/employers in tourism, with Slovakia being the second cheapest country. On the contrary, the most expensive country in this case was Austria.

Table 5: Hourly labour costs in analysed countries in 2009–2014, in EUR
Country Levels in euro Addition in % 2014/2009 Yearly addition in % 2014/2009

Country	Levels in euro						Addition in % 2014/2009	Yearly addition in % 2014/2009
	2009	2010	2011	2012	2013	2014		
Czech Republic	9.1	9.8	10.5	10.0	9.8	9.4	3.3	0.7
Austria	27.6	28.0	29.0	29.7	30.6	31.4	13.8	2.6
Slovakia	7.6	7.7	8.0	8.9	9.2	9.7	27.6	5.0

Source: Beran 2016.

When determining the level of wages, the employer must decide on a number of factors, such as legislative conditions and entitlements to fair remuneration, employee

1 *In response to a certain inconsistency in the calculation of labour costs Výzkumný ústav práce a sociálních věcí, v.v.i. (the Labour and Social Affairs Institute), a uniform calculation methodology, which is also used by the Ministry of Labour and Social Affairs of the Czech Republic was used. Methodological findings and outputs in the form of regular newsletters were used in this part of the work as an information source. Data on labour costs are published retrospectively with a minimum of two years' delay. For this reason, labour costs are analysed for 2009-2014.*

performance, etc. Overall, the cost of the employee can be divided into direct and indirect costs, as follows:

Direct costs:
- Wages and salaries;
- Social benefits.

Indirect costs:
- Legal;
- Other social expenses and expenses, personnel costs, taxes and subsidies.

The structure of direct and indirect costs is illustrated in Table 6 below. In terms of the share of direct and indirect labour costs in the Czech Republic, Austria and Slovakia, there is a certain similarity across the analysed states.

Table 6: Labour cost structure of analysed countries in 2009–2014 in %

Country	Item	Share in %						Addition in 2014–2009
		2009	2010	2011	2012	2013	2014	
Czech Republic	Direct costs (wages and compensation)	73.6	73.2	73.1	73.0	73.2	72.3	-1.3
	Total indirect costs	26.4	26.8	26.9	27.0	26.8	26.6	0.2
Austria	Direct costs (wages and compensation)	73.6	73.6	73.4	73.7	73.8	73.6	0.0
	Total indirect costs	26.4	26.4	26.6	26.3	26.2	26.4	0.0
Slovakia	Direct costs (wages and compensation)	73.7	74.0	73.8	74.2	73.1	73.2	-0.5
	Total indirect costs	26.3	26.0	26.3	25.8	26.9	26.8	0.5

Source: Beran 2016.

An important aspect is the structure and overall taxation of wages in individual countries. We can notice an interesting split in case of social security paid by an employee and an employer. While in the Czech Republic and Slovakia, the employee participation is one third of the employer's, in Austria the employee's participation is much higher.

Table 7: Structure of wage tax in the analysed countries in 2009–2014 in %

Country	Item		Share from the cost of labour in %						Addition in 2014–2009
			2009	2010	2011	2012	2013	2014	
Czech Republic	Social security:	Employee	8.2	8.2	8.2	8.2	8.2	8.2	0.0
		Employer	25.4	25.4	25.4	25.4	25.4	25.4	0.0
	Income tax		8.3	8.6	8.9	8.8	8.8	9.1	0.8
	Total		41.9	42.2	42.5	42.4	42.4	42.6	0.7
Austria	Social security:	Employee	14.8	14.0	14.0	14.0	14.0	14.0	- 0.8
		Employer	17.8	22.6	22.6	22.6	22.6	22.6	4.8
	Income tax		12.1	11.4	11.9	12.3	12.6	12.8	0.7
	Total		44.7	47.9	48.4	48.9	49.1	49.4	4.7
Slovakia	Social security:	Employee	10.6	10.6	10.6	10.5	10.2	10.2	- 0.4
		Employer	20.8	20.8	20.8	21.8	23.8	23.8	3.0
	Income tax		6.3	6.4	7.5	7.4	7.1	7.2	0.9
	Total		37.6	37.8	38.9	39.6	41.1	41.2	3.6

Source: Beran 2016.

From the analysis of the taxation of wages and labour costs, it is possible to compile a certain ranking of competitiveness in the Czech Republic, Austria and Slovakia. The ranking shows in which countries entrepreneurs have the lowest cost of the above items, and thus gain advantage and tax competitiveness as compared to businesses in other countries. The competitiveness scoreboard is shown in Table 8 below.

Table 8: Competitiveness ranking of the Czech Republic, Slovakia and Austria for the area:

Country	**Hourly costs of labour**	**Income tax**	**Overall wage taxation**
Czech Republic	1.	2.	2.
Slovakia	2.	1.	1.
Austria	3.	3.	3.

Source: Author's own results on the basis of the previous analysis.

From the point of view of enterprise competitiveness in terms of hourly labour costs, income tax and total wage taxation, it is clear that Austria is the least competitive. The second place is divided between the Czech Republic in the case of hourly labour costs and Slovakia in the case of income tax and the amount of total wage taxation.

The analyses carried out show that the competitiveness of tourism businesses in the Czech Republic has a very good position in terms of the level of fiscal policy interventions in this sector, both in terms of excise duty, value added tax and the cost of employing workers. Czech businesses operating in the field of tourism are fiscally competitive, but

their success can be influenced by other significant matters, which are focused on the following part of the work.

4 Other significant influences affecting the competitiveness of tourism businesses

Apart from fiscal policy interventions, which do not only significantly affect the competitiveness of tourism businesses, it is necessary to draw attention to the existence of other effects. The following part of the thesis is therefore focused on a brief description of other influences affecting the competitiveness of tourism businesses. The roles and effects of the grey economy and the effects of monetary policy will be explained.

The accommodation, catering and hotel sector in the Czech Republic has long been the area with the lowest average wage compared to the average wages of all other sectors (Czech Statistical Office: Public database, 2017). The cause or eventual consequence of such low wages is the presence of the grey economy. The grey economy is a significant phenomenon that many authors focus on (Schneider 2012, Schneider 2014, Nikopour and Habibullah, 2010). The description of the grey economy and its possible minimisation is all the more complicated because neither its measurement nor its estimation is unambiguous (Zídková, 2012). Practice in the Czech Republic comprises an official payment of only a small part of the wage, so that the employer minimises their costs; another part of the remuneration will be paid to the employee "under the table" in the form of a cash payment. By reducing non-traditional cost reductions, businesses are becoming more competitive, but this is not a path that would be desirable for the economy or society as a whole. A certain modification of this type of cost reduction also comprises the "Švarc system", or a situation where the employees of the enterprise are not in an employment relationship, but work as self-employed persons ("OSVČ"). In such a situation, the self-employed person works exclusively for one enterprise and uses the tools of that undertaking for their performance. In this situation, illegal activity occurs due to tax evasion. (Veber, Srpová et al., 2012). Another possibility involves the movement of the self-employed in the field of the shadow economy, i.e., creation of unreported or unregistered business activities in order to avoid tax. However, this activity goes beyond the law and is thus criminally punishable.

In particular, tourism has been strongly influenced by the shared economy over the last few years (Kagermeier, Köller and Stors, 2016), in particular, in the area of accommodation. Certain turmoil across the European Union, but also the US and other continents, has been provided by the AirBnb Internet platform. These are Peer-to-Peer transactions, often in the grey/shadow economy. Accommodation is affordable for tourists, but lessors often achieve low prices due to tax evasion.

The competitiveness of tourism enterprises is affected not only by the situation of the state in conducting business and the influence of fiscal policy, but also other areas of the economy, the situation abroad and the relationship with foreign countries, in this case represented by the exchange rate. With regard to the analysed countries, it is necessary to consider the relationship between the national currencies used, namely the euro in the case of Slovakia and Austria, and the Czech crown in the case of the Czech Republic,

and their impact on the competitiveness of enterprises. The intervention of the Czech National Bank, which kept the exchange rate at a fixed amount during the period 11/2013 to 4/2017, can be considered a recent milestone in this area. During this period, the Czech crown ("koruna") weakened against the euro thanks to foreign exchange interventions (Czech National Bank, 2017). The weakening of the crown in the context of international tourism meant the strengthening of the euro, thus, increasing the wealth of foreign tourists vis-à-vis the Czechs. For foreign visitors, the prices in the Czech Republic were more favourable and this step by the Czech National Bank had the ambition of strengthening the motivation of foreign tourists to visit the Czech Republic. For businesses operating in domestic tourism, such a situation means an increase in competitiveness over foreign companies. The influx of foreign tourists could then cause more consumption and thus GDP growth. Although the Czech National Bank's actions were not initially focused on tourism, the impact of its practices also affected this area.

5 Recommendations

The results of the analysis suggest that businesses in the Czech Republic are more competitive fiscally/in cost and have a significant competitive advantage over tourism businesses in Slovakia or Austria. Fiscal policy instruments offer an excellent starting point for these businesses. In the long run, however, the fiscal policy of the Czech Republic should not focus on the price competitiveness of enterprises. Excessive pressure on price competitiveness can lead to the minimisation of costs for entrepreneurs and hence the reduction of wage costs for employees. Reducing wages in the tourism sector, where wages are already below average, will not lead to an increase in the quality of services and will in the long run cause the competitiveness to weaken. The existence of a grey economy and the use of the "Švarc system" shows the gap in the income tax collections of employees and self-employed persons. The partial decision and overall direction of fiscal policy should encourage the motivation of businesses not only to become competitive at a competitive price, but also to seek competitiveness in the quality of the goods and services offered.

The major problem that today's economies should address, including the Czech, Slovak and Austrian economies, comprises the issue of regulating the shared economy. For tourism, this is primarily the AirBnb (2017) platform, which focuses on accommodation services. On the other hand, other platforms, such as Uber, focused on transporting people (Uber, 2017) cannot be overlooked. The extremely low prices generated by these platforms have a major impact on labour cost creation in the economy. Especially for the Czech Republic, where wages are low, this impact cannot be overlooked. Low-priced services are due to seeming occasional businesses that individuals perform beyond their main income, often resulting from employment. For competitive businesses in the tourism sector, therefore, there needs to be a constructive framework for regulating the shared economy, which is currently lacking.

Conclusions

The aim of this paper was to provide a ranking of the analysed countries according to the tax burden directly imposed on consumption in the field of tourism and to determine the relative tax competitiveness of the Czech Republic as a tourist destination for 2017. Partial targets for achieving a comprehensive comparison of the tax competitiveness of enterprises in tourism analysed the excise tax projected in the final cost of goods and the tax burden imposed on wages.

In order to assess the tax competitiveness from the point of view of value added tax, a model calculation was created, which by its content and construction constitutes a considerable added value of this work. For the model calculation of the weighted tax rates in individual countries, items that are closely linked to tourism were selected first. The selected items were accommodation, meals, soft drinks and alcoholic beverages, cultural events, sporting events and domestic passenger transport. These items were subsequently assigned to scales according to their significance. The lowest average weighted rate of value added tax burdens entities in the Czech Republic (16.02%), the second lowest burden is in Austria (16.54%) and the highest burden is in Slovakia (20.00%). The Czech Republic, along with Austria, is favoured in comparison with Slovakia.

To assess tax competitiveness, other aspects such as excise duty have to be taken into account in addition to the value added tax. For the reason of companies' efforts to minimise tax, the excise duty rates in the analysed countries were not compared, but the final prices of selected goods and services, namely beer prices, accommodation and travel costs by public transport. In case of beer prices, the Czech Republic has a clear price competitive advantage compared to Austria. When comparing the Czech Republic with Slovakia, however, such a clear judgement cannot be established, as prices are similar and quality is decisive. As in the case of the average price for accommodation, Austria is the most expensive country even with respect to city transport, Slovakia comes second and the Czech Republic is the cheapest country. Businesses in the Czech Republic have the highest price/tax competitiveness over all of the products analysed.

Another cost that an enterprise has to include in the final price of goods or services produced is the cost of employees; respectively labour costs and labour as a factor of production. From the point of view of hourly labour costs, the Czech Republic is the cheapest country for employers, including employers in tourism; the second cheapest country is Slovakia, followed by Austria.

An analysis of the taxation of wages and labour costs makes it possible to compile a ranking of competitiveness. Looking at the enterprises' competitiveness ranking for hourly labour costs, income tax and total wage taxation, it is clear that Austria is the least competitive. The Czech Republic shares second place in the case of hourly labour costs with Slovakia in the case of income tax and the amount of total wage taxation.

The analyses carried out show that the competitiveness of tourism enterprises in the Czech Republic has a very good position as regards the level of fiscal policy interventions

in this sector, from the point of view of excise duty, value added tax and costs related to the employment of workers.

Czech businesses doing business in the tourism sector are fiscally competitive, but other significant effects, such as the presence of the grey economy and monetary policy intervention, can affect their success.

However, it remains questionable whether the strategic focus on tax/price competitiveness of tourism businesses is tactical in the long run. In the long run, not only for businesses, but also for the whole economy, a more valuable competitive advantage stemming from a mix of innovation, the growth of product and service quality and wages approaching wage relations in other advanced economies would boost GDP growth but also increase the satisfaction of the population.

It also cannot be overlooked that despite the fact that businesses in the Czech Republic operating in the field of tourism are at competitive prices compared to companies in Austria and Slovakia, it is necessary to take into account the cultural differences of the countries. It cannot be assumed that tourism will continue to grow in the Czech Republic while maintaining the lowest prices. Sooner or later, the law of decreasing marginal utility may affect tourists, and after repeated visit to the Czech Republic, they will also want to visit Slovakia or Austria.

Although the issue of competitiveness in tourism is very wide, at the beginning of the 21st century, no economy should underestimate the influence of the shared economy. The shared economy in its present form is an area with insufficient regulation, creating room for the shadow economy, especially in the area of passenger transport and accommodation. Extremely low prices for these unregulated services in a stronger economy also have a negative impact on wage and labour costs in general. It would be very desirable to create shared economy regulation, but not to eliminate this trend.

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Doctoral students present their research
Doktorandi představují svůj výzkum

Helísek M. (ed.) (2017). *Development of Economics. Results of Research Carried Out by Doctoral Students*. Prague: University of Finance and Administration (VŠFS).

The publication entitled "*Development of Economics. Results of Research Carried Out by Doctoral Students*" was issued by the University of Finance and Administration in paper copy and, in parallel, on a CD-ROM. The publication consists of nineteen expert contributions presented by doctoral students at the fourth expert conference for doctoral students; the CD-ROM contains their texts in full. The full contents are also available at www.vsfs.cz/konferencedoktorandu/.

All contributions were subject to a bilaterally anonymous review procedure, which undoubtedly improved their quality.

As usual, the conference was attended by doctoral students not only from the University of Finance and Administration, but also other universities – the University of Economics in Prague, the Comenius University in Bratislava, the Technical University in Liberec, and University of Defence. Some lecturers, members of the departmental council for doctoral studies and other interested persons also came to listen to the presentations of the doctoral students.

"It has already become a tradition that the contributions have a broad thematic focus ranging from business economics and competitiveness, through internal audit, rating and financial law to transformation of the Chinese economy. The topic dealing with publication opportunities in scientific journals brought extra diversification," describes Professor Mojmír Helísek, VŠFS Vice-Rector for research and development, chairman of the conference committee, where appropriate, and editor of this collection.

The publication contains articles of the following authors:

In her paper, **Dagmar Benediktová** addressed supplier evaluation methods used by businesses.

Vadim Beneš identified psychosocial factors having a negative effect in the risk assessment process, with the aim of helping internal auditors.

Michal Bezvoda evaluated whether the risk level of bonds can be efficiently determined on the basis of agency ratings and using the current development of five-year Credit Default Swaps.

Michal Bock described the future perspectives of P2P lending.

Michal Erben analysed the differences in the level of contributions paid by self-employed persons and employees, primarily in health care and social security system.

Blanka Havlíčková elaborated a comprehensive fundamental overview covering the refugee crisis in Europe and the related concerns of the Czech general public, including the effect on the outgoing tourism of Czech citizens.

Richard Heligman and **Ľubomíra Strážovská** focused on the challenges faced by business incubators in Slovakia.

Tomáš Jeřábek presented a possible approach to calculating expected loss throughout the life of a credit instrument.

Eliška Kačírková searched for key factors in social-economic models that contribute the most to increased competitiveness of countries.

Jaroslav Kaizr examined the functioning of companies dealing with investments in industrial real estate.

Michal Konvalinka assessed the potential of narrative interview method for the purpose of publishing in prime scientific journals.

Kristína Kováčiková and **Monika Jančovičová** focused on the average wage developments following the 2008 economic crisis, which brought about negative fluctuations in the labour market.

Petr Maule analysed the constitutionalization of financial law or, more specifically, a branch thereof – budget law –, in the Slovak legal system.

Veronika Pastorová drew up an overview of instruments of economic war.

Lenka Říhová identified the development specificities of the P2P lending market for small and medium enterprises in the Czech Republic and certain selected countries in the world.

In her research, **Miroslava Sedláčková** studied changes in contracts concluded on the basis of tendering procedures held under Act No. 134/2016 Coll., on Public Procurement.

Luděk Toman evaluated the market transformation of China resulting in a situation called market socialism or socialism with Chinese features.

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(ed.)

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