BULGARIAN NATIONAL BANK

DISCUSSION PAPERS
DP/110/2018

Determinants of Investment in Bulgaria

Evgeni Ivanov
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Daniel Kasabov
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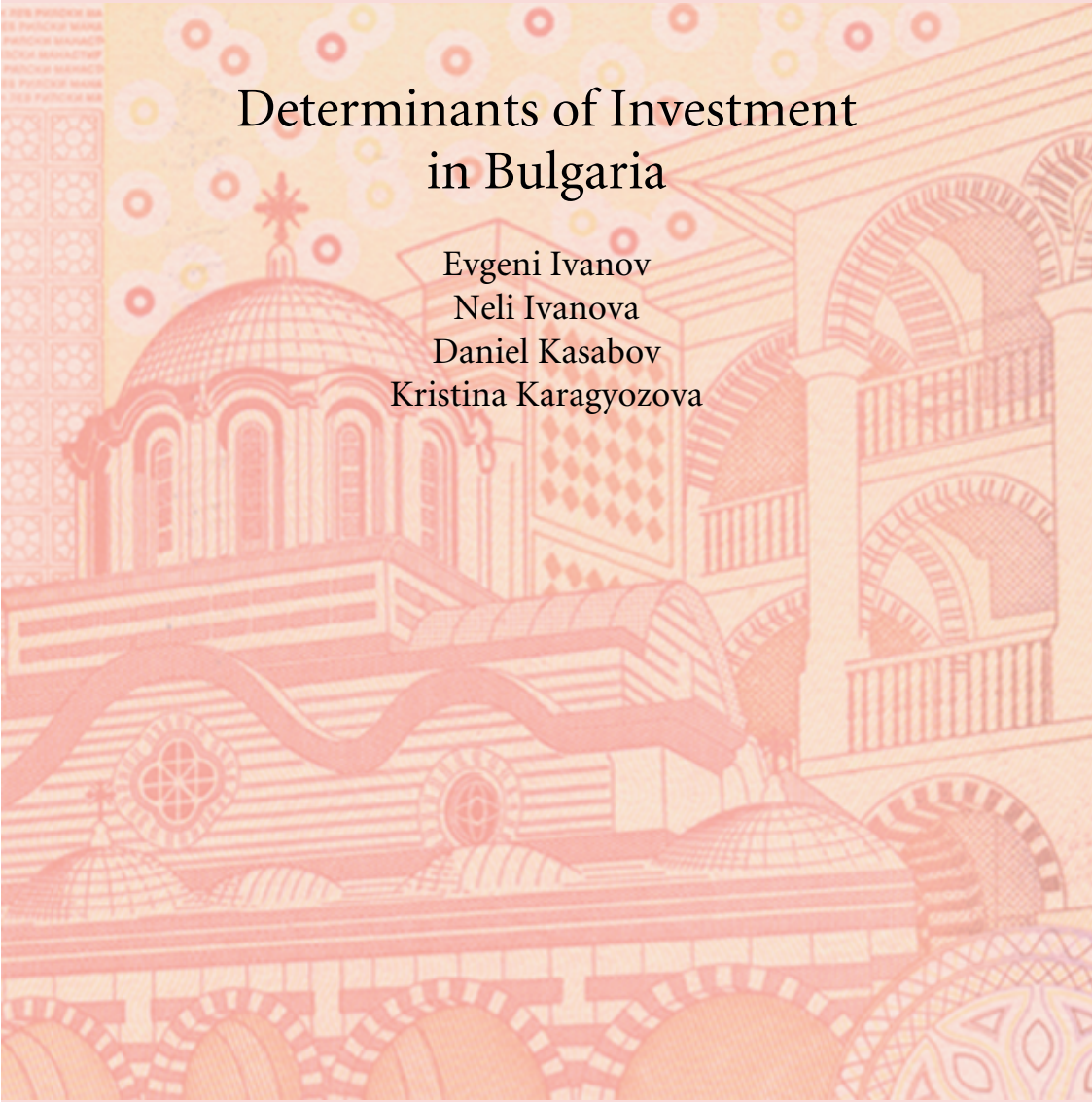

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CONTENTS

1. Introduction 5

2. Literature Review 7

3. Investment Dynamics in Bulgaria 10
   3.1. General Overview of Investment in Bulgaria 10
   3.2. Main Factors behind Investment 14

4. Data and Methodology 25
   4.1. Methodology 26
   4.2. Data 27

5. Results 30

6. Conclusion 34

Appendices
   1. Investment Data 36
   2. Survey Results on the Purpose of Investment and Factors Driving Investment Activity 39
   3. Measures of Uncertainty 41
   4. Variables Used 43
   5. EU Funds and Their Role for Government and Corporate Investment 44

Bibliography 47

Abstract: Investment activity in Bulgaria, as in many EU countries, contracted substantially during the Great Recession and despite the recently witnessed recovery of business investment remains below pre-crisis levels. The main purpose of this study is to empirically examine the impact of key drivers of business investment in Bulgaria. We estimate a Bayesian VAR model to evaluate the importance of cyclical factors, such as demand, capacity utilisation, economic uncertainty, availability of financing (external and internal) and cost of financing for investment dynamics over the period 2000Q1 – 2017Q1. We establish external demand as the main driver of business investment in the country. Investment dynamics in Bulgaria are also strongly dependent on the levels of economic uncertainty and corporate profits, while foreign financing and lending rates appear to have lower impact. Our empirical results suggest that the observed slowdown of business investment in the post-crisis period can be explained by the reduced external demand and the increased economic uncertainty in the immediate aftermath of the crisis. After 2013 the negative effects from decreased external demand and heightened uncertainty fade away and these two factors contribute positively to investment growth. However, low corporate profits and tightening of financial conditions in the aftermath of the sovereign debt crisis prevented a more notable recovery. After the second half of 2015, our results point to a recovery in corporate profits, as well as favourable financing conditions, which on top of the already observed growth in external demand and decreasing economic uncertainty support the recovery of investment activity in the country. A large part of the fluctuations in business investment in most recent years and especially in 2015 and 2016 that could not be explained by the VAR analysis of demand factors, uncertainty and financing resources, seems to be driven by the dynamics of EU co-financed investment.

Keywords: Investment, Structural VAR, Bulgaria

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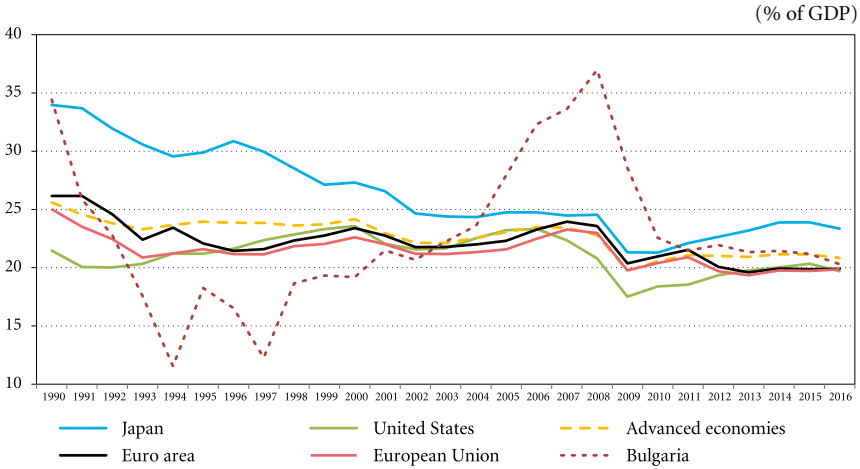
1. Introduction

Investment plays a key role not only in determining short-run growth prospects through cyclical swings but also in determining the long-run potential growth of the country through capital stock accumulation. Without sufficient investment, the capital stock cannot be renewed regularly, which impedes technological progress and prevents capital deepening from increasing labour productivity (ECB, 2016:1).

Figure 1. **Total Investment as Share of GDP**



Source: IMF WEO April 2017

Investment across countries from the European Union (EU), including Bulgaria, has been hit hard since the onset of the Great Recession in 2009 and the subsequent recovery was slower than in other advanced economies, such as the US and Japan (see Figure 1). While initially after the Great Recession investment in the EU started to recover in line with investment in other advanced economies, the sovereign debt crisis in Europe in 2012 led to a new weakening of investment in the region (EIB, 2016), including in Bulgaria. The fall in EU's total investment witnessed during the Great Recession and the decline in investment in 2011–2012 were a result not only of lower non-construction investment[1], but also a strong downward correction in overheating housing markets and persisting budgetary constraints that resulted in lower construction and public investment in some countries (ECB, 2016:1). As of 2016 total investment

[1] Non-construction investment covers investment in (1) machinery, equipment and weapons systems, (2) intellectual property products and (3) agricultural products.

as a share of GDP remained below its pre-crisis level in the EU even though a slow recovery has been observed in most Member States since early 2013, driven mainly by non-construction investment.

Similar dynamics were observed in Bulgaria. Following a period of strong growth in the period 2002–2008, total investment in Bulgaria decreased sharply in 2009 with both non-construction and construction investment contributing to this decrease. In the following years investment in Bulgaria remained weak, with non-construction investment starting to recover more notably after 2013. At the same time construction investment remained depressed after the real estate boom and bust and is unlikely to regain its pre-crisis levels soon[2].

Recent studies on the topic (Barkbu et al, 2015; ECB, 2016:1; Kose et al., 2017) have identified that the factors that determine the dynamics of non-construction investment are different from those determining the dynamics of construction investment. Moreover, these studies suggest focusing on the so-called "business investment", which typically encompasses certain components of the non-construction investment, and is particularly relevant in boosting an economy's future productive capacity. Relevant studies have identified several factors which have played a key role for the observed business investment weakness in the EU after the 2009 crisis. Among them are weak demand, depressed profit margins, impaired financial sectors and economic and political uncertainty[3].

The aim of this paper is to empirically assess the impact of such cyclical factors on business investment[4] dynamics in Bulgaria and to quantify their contributions, which will shed more light on the determinants behind the business investment slowdown observed in the country after the Great Recession. The estimation is done using a Bayesian Vector Autoregression model (BVAR), based on quarterly data for Bulgaria for the period 2000Q1 – 2017Q1. The paper also attempts to examine in more details the role of EU-related investments for the country's investment dynamics, given that in recent years public investment, co-financed by the EU under different operational programs, has played an important role in Bulgaria, as was the case in most Central and Eastern European countries (EIB, 2016). To the best of our knowledge this paper is the first attempt to disentangle and quantify the drivers behind business investment dynamics for the case of Bulgaria.

[2] See Section 3 for more details.

[3] See Section 2 for a more detailed overview of the main findings in related studies.

[4] We use real investment in machinery, equipment and weapons systems as a proxy for business investment in Bulgaria. For more information on the choice of investment proxy, please refer to Appendix 1 A.

The paper is structured as follows: Section 2 gives an overview of the results of similar studies on the causes and factors behind the investment slowdown, focusing mainly on countries from the EU. Section 3 outlines the historical developments in investment in Bulgaria, offering more descriptive details about its composition and dynamics, which reinforces the choice of model specification and facilitates the interpretation of the empirical results of the paper. Section 4 presents the technical details on the methodology and data used for our analysis and the motivation behind choosing them. Section 5 presents and discusses the results from our analysis. Finally, in Section 6 we conclude by summarising our results.

2. Literature Review

Given the importance of investment for the overall economic growth, the topic of what the drivers of investment are and why the recovery in investment has been weak in most advanced economies in the years after the Great Recession has become one of the central research topics in many international institutions, among which are the IMF (2014), the ECB (2016:1), the World Bank (Vashakmadze et al., 2017) and the EIB (2015). The preferred method used in empirical studies on the determinants of investment typically is structural VAR models, which is also the approach that we have adopted in this paper. Evidence suggests that financial crises have long-lasting effects on investment with a decline of 3 to 3.5 percentage points in the investment-to-GDP ratio three years after the crisis (Barkbu et al., 2015). The recovery in the aftermath of the 2008–2009 financial crisis was particularly slow across most EU countries, including Bulgaria, and the factors behind it have been thoroughly analysed. Some of the identified factors in the literature include weak demand, economic uncertainty, financing conditions, profit expectations and capacity utilisation.

Weak demand and the prospects for sluggish future economic growth have been established as one of the core reasons for the weak post-crisis recovery of investment across Europe (EIB, 2015). The European Commission (2017) has repeatedly identified insufficient demand as one of the most important factors limiting firms' production in its industrial surveys, which is likely to have a negative impact on firm's investment decisions. Furthermore, according to analysis conducted by the IMF (2014), output changes can explain trends in investments activity in most euro area (EA) member states. This was further supported by an empirical study on the case of Spain which empirically proves, using an accelerator model, that output almost entirely explains the dynamics of investment in the country (Barkbu et al, 2015). Busetti et al. (2015) examine the causes of exceptionally low investment in Italy since 2007 and find that demand

conditions, along with cost of capital, uncertainty and credit supply have a statistically significant impact on firms' capital spending. External demand, in particular, has been found to play a dominant role in explaining investment dynamics in small open economies (CNB, 2017). Kose et al. (2017) explore the evolution of investment growth in emerging market and developing economies (EMDE), using a structural VAR model. They conclude that the investment slowdown in EMDE could be attributed to a large extent to the weak economic activity in major economies.

Another important factor for investment dynamics that has been established in the existing literature is economic uncertainty. In general increased uncertainty is considered to lead to a postponement of investment (Busetti et al., 2015). As Bloom et al. (2007) present, heightened uncertainty, apart from affecting directly investment, also reduces the responsiveness of investment to a demand increase, which reduces the effects of policy stimulus. There are many other studies that examine the potentially adverse impact of uncertainty on investment. A recent study by Meinen and Rohe (2016) develops five types of uncertainty measures to investigate the role of uncertainty for investment decisions with a focus on Germany, France, Italy and Spain. Based on both descriptive analysis and VAR models, the authors conclude that investment responds negatively to uncertainty shocks and that uncertainty can account for a significant portion of the decrease in investment in the course of the Great Recession. A report published by the EIB (2013) proves that uncertainty, together with demand, have been the main drivers of the investment slowdown in the euro area since 2010. A study by the European Commission (2013) concludes that the increase in uncertainty has a significant negative effect both on investment and on consumption. Busetti et al. (2015) confirm that uncertainty had a negative impact on investment during the Great Recession and establish it as one of the factors explaining the delayed recovery of the economy.

Credit constraints can also have a sizeable negative impact on investment since they limit the availability of resources that firms could use to expand their activities. However, studies for the euro area find that financing conditions have been a constraining factor only in certain countries. Barkbu et al. (2015) establish a negative correlation between financial constraints and investment for Italy, Portugal and Spain. In addition, applying an extended version of an accelerator model, Busetti et al. (2015) estimate that for the case of Italy constraints imposed by tight credit conditions accounted for about one-third of the fall in investment in the periods 2008–2009 and 2012–2013. The ECB (2016:1) uses a VAR model and finds that credit constraints have been one of the main factors supressing the euro area's business investment in the years after the sovereign debt crisis.

Earned profit is another factor that has been found to play a role in firms' decisions to invest. Sustaining profits means that firms can invest without having to borrow funds from credit markets and, thus, could easily and more quickly expand their production if they assess that there is enough demand for their products. Profitability is also a positive signal which may lead to further investments in case returns are high enough to compensate for the risk and the cost of capital (EIB, 2016). The ECB (2016:1) finds that the current business investment recovery in the euro area is being driven mostly by profit growth, improving demand and falling interest rates. Mizen and Vermeulen (2005) confirm that investment in Germany and the UK is sensitive to sales growth and operating profits.

Capacity utilisation could also be considered as a factor that can determine investment activity (ECB, 2016:1, Busetti et al., 2015), since it reflects firms' choices on how to meet current and expected demand. Capacity utilisation can give an indication of the cyclical position of the economy. For example, in the aftermath of the Great Recession demand was greatly reduced and as a result capacity utilisation decreased, which in turn made firms' new investments in production extension unjustified. On the other hand, in times of economic expansion when demand is booming and capacity utilisation is rising, firms are under pressure to invest more in order to extend or improve their production capabilities.

In addition to traditional borrowed and own financial resources, transfers from the EU have also played an important role in determining investment dynamics, especially in new member state countries (EC, 2016:2). EU co-financed investment is unevenly spread across the years and as such affects significantly not only the level, but also the growth rate of economy wide investment (Eesti Pank, 2016). In some member states, EU transfers have played a countercyclical role in the aftermath of the crisis, offsetting declines in other investment (EC, 2016:2 and Eesti Pank, 2016). For other member states, positive contributions from EU co-financed investment were concentrated mostly in 2014–2015 and apart from their impact on government investment they have also played a prominent role in explaining the dynamics of investment by non-financial corporations (CNB, 2016). In 2016 EU funds absorption declined at the switchover between the programing periods, having an adverse impact on investment growth in all Central and Eastern European countries (NBP, 2017).

Having already identified the main cyclical factors proposed in the economic literature as key drivers of investment dynamics, it is worth discussing in more details how investment in Bulgaria has evolved over the years and which of the outlined factors have been in play.

3. Investment Dynamics in Bulgaria

This section analyses the investment dynamics in Bulgaria over the period 2000–2016 and aims at identifying the main drivers of investment in Bulgaria before, during and after the global financial crisis, outlining the possible factors behind the slow recovery of investment after 2009. The main findings are used as an input for section 5 where we quantify the impact of the identified factors on investment activity through the lens of a Bayesian VAR model.

3.1. General Overview of Investment in Bulgaria

Gross fixed capital formation in Bulgaria accounts for more than 20% of GDP. As such it plays a key role not only in determining short-run growth prospects through cyclical swings but also in determining the long-run potential growth and the productive capacity of the economy.

Following the introduction of the currency board arrangement in July 1997 and the achieved macroeconomic stabilisation, Bulgaria had significant investment needs. This reflected the low initial level of the capital stock (relative to the size of the economy) compared with other new member state countries (NMS)[5] and the high rate of depreciation of the existing capital stock (see Table 1). In addition to this, a mix of cyclical factors that we will discuss here has also contributed to developments of investment in the country.

Table 1. **Indicators Related to Investment Activity in Bulgaria**

Indicators	2000–2003	2004–2008	2009–2011	2012–2016
Investment (% of GDP)	18.8%	27.2%	23.7%	20.7%
Nomianl interest rates on new business, non-fnancial corporations	10.9%	8.5%	8.7%	7.0%
Real (*ex-post*) interest rates on new business, non-financial corporations	6.4%	1.7%	5.6%	7.8%
Capital stock-to-GDP ratio	1.9	1.8	2.1	2.2
Capital stock-to-GDP ratio (new member states)*	*2.0*	*2.0*	*2.2*	*2.3*
Capital intensity (net capital stock at 2010 prices per person employed)	30.04	32.98	42.78	51.19
Consumption of fixed capital (% of previous period net capital stock)	8.1%	9.1%	7.5%	6.7%
Consumption of fixed capital (% of GDP)	14.4%	15.1%	14.8%	14.4%
Marginal efficiency of capital (change in GDP at constant market prices of year T *per* unit of gross fixed capital formation at constant prices of year T-5)	0.28	0.26	0.01	0.09
Net returns on net capital stock (2010 = 100)	104.68	127.59	103.57	84.87

**New member state countries (NMS) are Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia.*

Source: European Commission (AMECO database), BNB

[5] Here we include the countries that joined the EU after 2004 and that have similar economic and historical development to Bulgaria. These countries are Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia.

Based on its dynamics, investment activity in Bulgaria could be divided into three main periods. The first period spans from 2000 to 2008 and is characterised by an investment boom. The share of investment during that period increased substantially from a low of 16.8% of GDP in 2000 to a peak of 33.0% in 2008. This period was characterised by favourable cyclical developments in Bulgaria and in our main trading partners from the EU, the construction boom in Bulgaria over the period 2004–2008 and a decline in investors' risk perceptions. The second period covers the post-crisis years (2009–2011) and is characterised by a decline in investment. The cumulative decline in real gross fixed capital formation for that period was around 35%. The observed weak recovery of investment activity in 2012–2016 can be distinguished as the third period. During this period the growth rate of real gross fixed capital formation in Bulgaria averaged 0.8% per year for a total increase of 4.1%, with government investment playing an important role. The EU funds programming cycle has had a notable effect on investment in this third period, with EU funds supporting investment activity in the period 2012–2015 and leading to a temporary decline in 2016.

We can generally distinguish between two broad categories of investment – construction investment and non-construction investment. Examining the breakdown of gross fixed capital formation by asset type could shed more light on how the identified factors have affected investment activity over the post-crisis period and which components have driven the observed investment recovery in recent years. Data suggests that the decline in investment after the global financial crisis was the consequence both of a strong downward adjustment in the construction sector and of lower non-construction investment activity (see Figures 2 and 4). Eight years after the crisis gross fixed capital formation in construction, both residential and non-residential, is still around 40% below its pre-crisis peak level. Although gross fixed capital formation in assets other than construction has recovered somewhat recently, it is still more than 20% below the peak reached in 2008 (see Figure 4).

Figure 2. **Breakdown of Real Total Investment**

(annual percentage changes, percentage points)

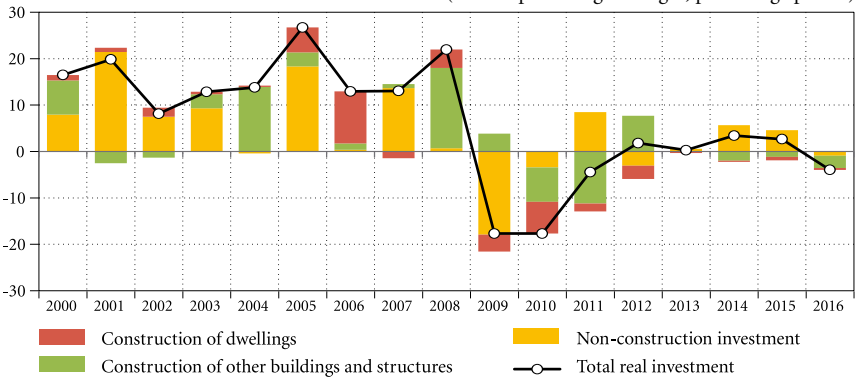
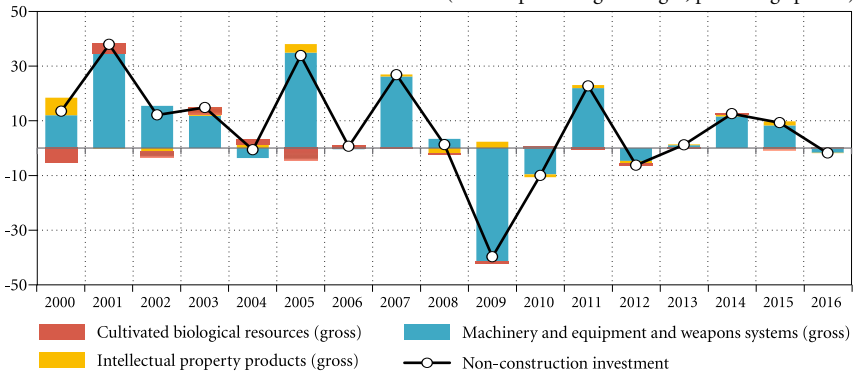


Figure 3. **Non-construction Investment Growth Rate and Contribution by Major Asset Type**

(annual percentage changes, percentage points)



Source: Eurostat

The decline in construction investment after the global financial crisis reflected mainly a prolonged period of housing market adjustment to the changed economic environment in Bulgaria. The heightened economic uncertainty, negative labour market developments, increased saving rate, negligible FDI inflow to the residential sector and tightened financial conditions suppressed household demand for dwellings, resulting in a prolonged period of decline in house prices. Starting from the second half of 2008, house prices tended to decline strongly and by the end of 2011 they were already more than 30% lower than the pre-crisis levels. This dampened investment in the construction sector (BNB, 2017).

Apart from housing, the depressed economic activity reduced the need for new non-residential buildings and also forced the public sector to cut back on infrastructure expenditures, especially in the period 2010–2011.

Figure 4. **Real Investment Compared with the Pre-crisis Peak Levels**

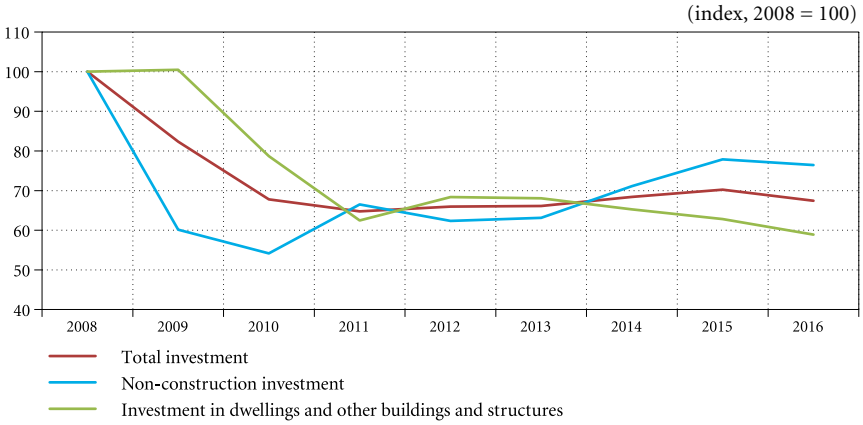


Figure 5. **Ratio of Real Non-construction Investment to Value Added**

Note: Long-term average is calculated for the period 1998–2016.

Source: Eurostat

Non-construction investment declined markedly in period 2009–2010 and started to recover afterwards, though at much slower growth rates compared with the pre-crisis period. Currently, the level of non-construction investment is significantly below the pre-crisis peak observed in 2008 (see Figure 4). Figure 5 indicates that in the run-up to the global financial crisis there was some "over-investment" in Bulgaria, measured by the ratio of real non-construction invest-

ment to value added[6], which possibly reflected favourable cyclical conditions, high marginal return on capital and positive firms' expectations about future demand, lower cost of finance and large FDI flows. In the aftermath of the global financial crisis both the level and growth rate of non-construction investment fell by much more than the value added. Following the cyclical recovery of the economy, however, the ratio of real non-construction investment to value added started to rise and now it is close to its long-run average[7]. In the years after the 2008/09 crisis, non-construction investment, which in Bulgaria consists almost entirely of investment in "machinery, equipment and weapon systems", has become the main driver of gross fixed capital formation (see Figures 3 and 4).

Having briefly discussed how investment in Bulgaria has evolved over the years we now turn to a more detailed discussion on the likely significance of key factors that drive investment decisions in Bulgaria.

3.2. Main Factors behind Investment

As already discussed in Section 2, according to the economic literature the level of firms' desired capital stock is determined mostly by demand conditions, expectations of return on capital, the cost of financing, availability of funding and economic uncertainty. In the case of Bulgaria, EU funds are also likely to play a role for investment dynamics. The detailed elaboration of the potential effects of the identified factors on investment dynamics in Bulgaria would be useful in order to interpret the results from our VAR model in Section 5.

Demand Conditions

Demand for investment in Bulgaria was strong in the post-1997 period taking into account the low initial level of the capital stock and the high rate of depreciation of the existing capital stock (see Table 1). Since mid-1997 the Bulgarian economy began to open up, with the exports of goods and services-to-GDP ratio reaching 64% in 2016, up from 36% in 2000. The EU became Bulgaria's most important trading partner and the trade and financial linkages between them deepened further as a result of Bulgaria's accession in the EU. Apart from trade, this process was also supported by the observed at the time large FDI inflows from EU countries in the financial sector and in the export-oriented manufac-

[6] The ratio of real non-construction investment to value added gives a measure of the size of investment in the overall economy. As this ratio tends to be pro-cyclical over time, comparing it with the long-term value gives an indication of the cyclical behaviour of investment and the presence of over/under-investment (ECB, 2016:1).

[7] Long-run average is calculated for the period 1998–2016. In addition to the business cycle, the ratio of real business investment to gross value added reflects factors such as the capital intensity of the economy (see Table 1) and structural changes over time.

turing sector, which helped facilitate the integration of Bulgaria in Global Value Chains. As a result, investment activity in Bulgaria became more and more closely related to the cyclical developments in the EU, and, respectively, to the external demand for Bulgarian goods and services (see Figure 6).

Figure 6. **Non-construction Investment and External Demand for Bulgarian Exports (at constant prices)**

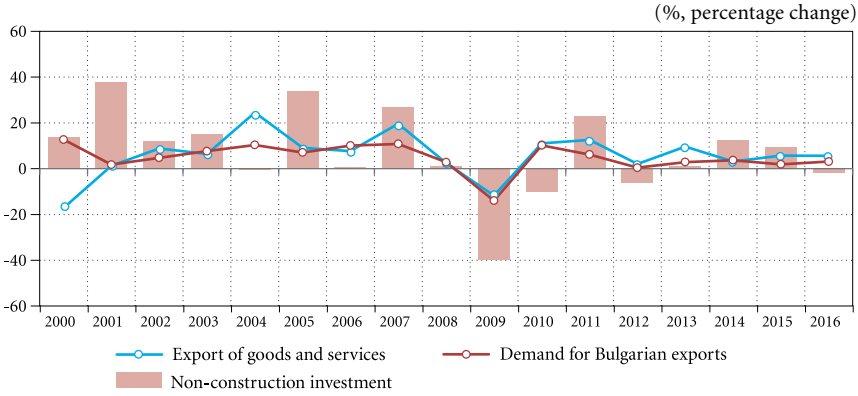
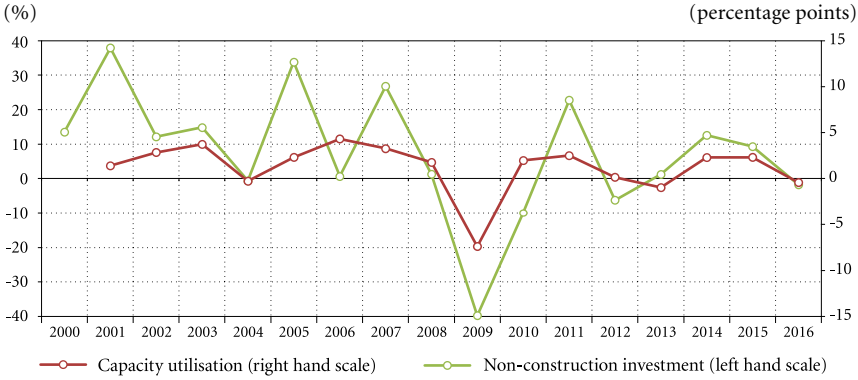


Figure 7. **Change in Capacity Utilisation in the Manufacturing Sector and Growth Rate of Real Non-construction Investment**



Note: Non-construction investment in Figures 6 and 7 is defined as overall investment excluding construction and is used as a proxy for investment in manufacturing.

Source: ECB, NSI

Over the period 2000–2008 demand for investment was stimulated by favourable cyclical conditions in both Bulgaria and our main trading partners from the EU. On the one hand, firms were faced with strong external and domestic

demand at a time of high capacity utilisation, which pushed up non-construction investment (see Figure 7). On the other hand, the rising demand for new dwellings and non-residential buildings, stimulated by the positive labour markets developments, the easing financial conditions and FDI inflows in real estate activities, supported investment in the construction sector (Kotseva and Yanchev, 2017).

Survey data reveals that during the pre-crisis period more than 40% of firms in the manufacturing sector tended to report demand as the most important positive driver of investment[8]. As a result, the share of investment serving extension purpose increased from 32% in 2002 to 50% in 2008. The increase in capacity utilisation observed at that time in the manufacturing sector was another factor which necessitated further expansions of firms' capital stock (see Figure 7).

During the post-crisis period (2009–2011) investment in Bulgaria was pushed down by cyclical conditions as the economy (especially the construction sector) underwent large downward economic adjustments, accompanied by a gradual deleveraging of the private sector. Due to a prolonged depressed domestic demand, investments were aimed mostly at rationalisation rather than expansion of productive capacity. At the same time, given the importance of exports to the EU for the total growth of the Bulgarian economy, weak external demand over the period 2009–2011 amid the sovereign debt crisis in Europe amplified negative domestic developments. The deterioration of demand conditions created significant production capacity under-utilisation during the post-crisis period which limited the need for further increases in gross fixed capital formation. With the strengthening of economic activity in Bulgaria and the EU in recent years, investment activity has started to recover and since 2014 the share of firms that undertake investment in order to expand productive capacity has been increasing. Data on the capacity utilisation rate in the manufacturing sector also suggests increasing needs for further investment.

Economic Uncertainty

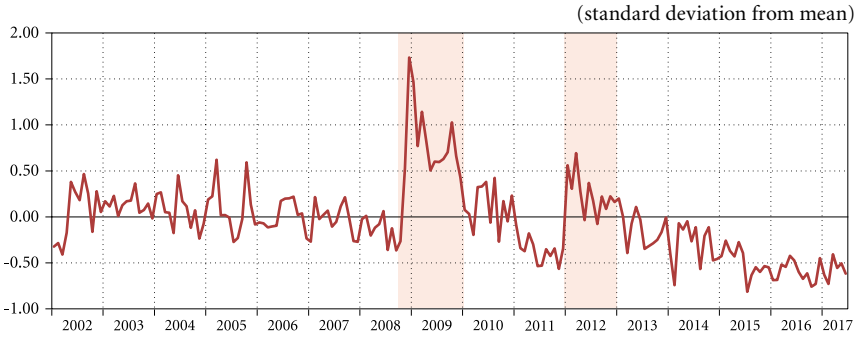
Economic theory suggests that uncertainty has a detrimental effect on economic activity by giving economic agents the incentive to postpone investment, consumption and employment decisions until uncertainty is resolved, and by pushing up the cost of capital through increased risk premia (EC, 2013).

In this paper we use five uncertainty indicators, constructed by Ivanov (2018), following the methodology of Girardi and Reuter (2017). These indicators are based on monthly qualitative survey data, taken from the European Commis-

[8] See Appendix 2 "Survey results on the purpose of investment and factors, driving investment activity" for more information.

sion's Business and Consumer Survey. The core underlying assumption is that the more economic agents disagree in their assessment and expectations about current and future economic activity, the higher is the uncertainty in the economy[9]. In this section we present only the composite uncertainty indicator for Bulgaria, which consolidates the information of the different uncertainty indicators (see Figure 8) but for the purposes of the VAR model we use all five uncertainty indicators before selecting the most appropriate one for the empirical estimation.

Figure 8. **Composite Uncertainty Indicator, Bulgaria**



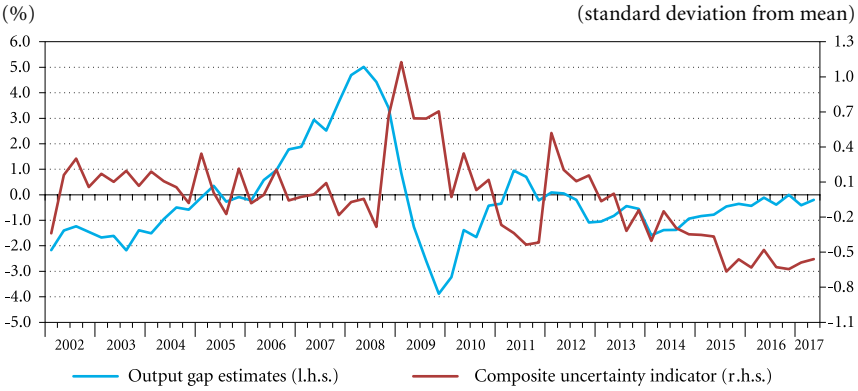
Note: Since the index is standardised a value of zero would mean that the level of uncertainty in the economy is "average", while values above zero indicate periods with heightened uncertainty and values below zero are associated with periods with "below-average" uncertainty. Movements along the Y-axis are measured in standard deviations due to the standardisation transformation.

Source: EU Commission BCS Survey, own calculations

Based on this indicator we can see that the global financial crisis and sovereign debt crisis triggered an increase in uncertainty in Bulgaria (indicated by the shaded area in Figure 8), likely depressing economic activity and investment. In recent years (2013–2017) uncertainty has declined in line with the strengthening of economic activity in Bulgaria and our trading partners, which is likely to have had a positive effect on investment dynamics.

[9] For more information on the construction and specificities of these indicators please refer to Appendix 3.

Figure 9. **Uncertainty and the Business Cycle in Bulgaria**



Notes: "Output gap estimates" refers to our assessment of the output gap in Bulgaria, estimated using a production function approach on quarterly data. The composite uncertainty indicator is also transformed to have quarterly frequency in order to be comparable to the output gap estimates.

Source: NSI, EU Commission BCS Survey, own calculations

As expected, the uncertainty index in Bulgaria moves in the opposite direction of the business cycle in the country (see Figure 9). One reason is that negative news shocks (such as terrorist attacks or wars) that can trigger recessions also cause higher uncertainty. Another reason for heightened uncertainty during recessions is that recessions might themselves increase uncertainty (ECB, 2016:2).

Cost of Financing and Availability of Funding

The investment boom in Bulgaria over the period 2000–2008 was sustained by large FDI inflows (see Figure 10). FDI inflows followed an upward trend from 5.6% of GDP in 2002 to a peak of 27.9% in 2007 and 18.1% in 2008. Most of the FDI inflows were absorbed by the construction, real estate, financial, manufacturing, trade and transport sectors. On average, around half of the FDI inflows in Bulgaria were used to finance corporate investment (mostly manufacturing and development of domestic trade infrastructure), one fifth were allocated to the banking sector (stimulating domestic credit), while the remainder went to the corporate real estate sector – largely financing the building of vacation real estate aimed at foreigners (Mitra, 2011). Rapid credit growth in the pre-crisis period and declining interest rates further supported accumulation of capital (see Table 1 and Figure 11). This reflected sound macroeconomic fundamentals (successful macroeconomic stabilisation, restoration of confidence in the bank-

ing sector and strong GDP growth), capital inflows and increased competition in the banking sector following the privatisation of state banks.

Figure 10. **FDI Inflows by Sector of Economic Activity**

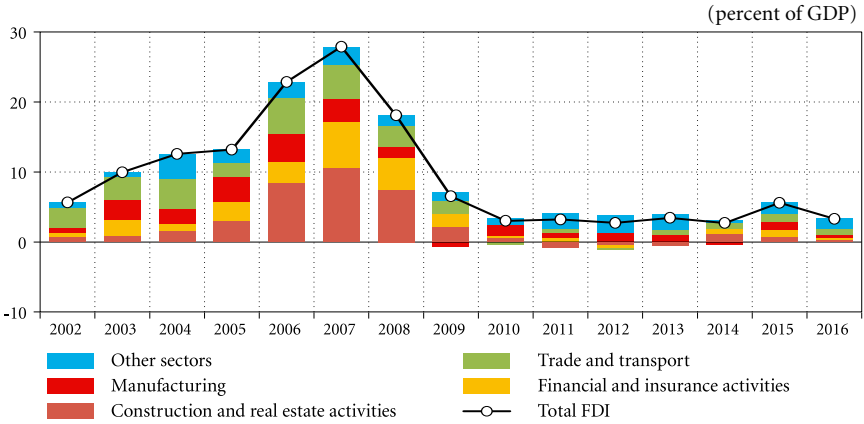
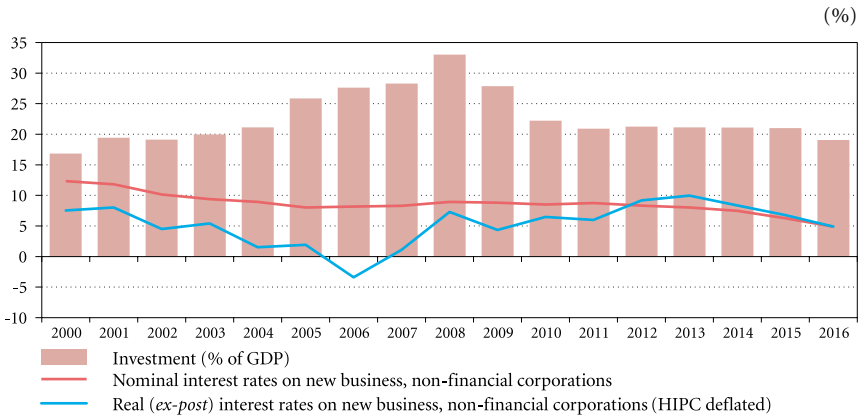


Figure 11. **Investment and Cost of Financing**



Source: European Commission (AMECO database), BNB

The global financial crisis and sovereign debt crisis increased economic uncertainty across Europe and FDI inflows decelerated markedly due to investors' increased risk-aversion. As a result one of the financing channels that Bulgarian firms had at their disposal in the pre-crisis period was substantially reduced. At the same time, real financing costs for firms (proxied by real (ex-post) interest rates) increased in the post-crisis period (see Table 1) as spreads rose and banks experienced problems with deteriorating portfolios. Thus, bank lending

conditions deteriorated and credit-supply shocks limited investment activity. According to the Bulgarian National Bank's quarterly bank lending survey, banks tightened credit standards markedly over the period from the third quarter of 2008 to the first quarter of 2010 (Karamisheva, 2016). Since the beginning of 2010 an easing of credit standards has been observed. In recent years nominal and real costs of external financing have trended downwards and have become increasingly supportive of business investment due mostly to the expansionary monetary measures in the euro area. With the recovery of bank lending, more firms have been able to take advantage of low interest rates to invest more.

Corporate Profits and Expectations of Returns on Capital

Other factors that determine investment decisions are the dynamics of corporate profits and expectations of returns on invested capital. The levels of corporate profits and retained earnings influence firms' capacity to finance investment with internal means. During the pre-crisis period gross investment rate tended to increase in line with the upward trend of gross profit share[10] (see Figure 12 or net returns on capital stock in Table 1). This profitability-type indicator corresponds to the share of the value added created during the production process remunerating capital and could be viewed as an approximation of operating profit before depreciation. The increase in gross profit share for the overall economy reflected the low initial level of the capital stock and thus the high marginal efficiency of capital (see Table 1). Declining risk perceptions and expectations of higher future returns based on the EU membership and prospects of euro adoption (IMF, 2007) further stimulated investment activity.

After the global financial crisis firms' profitability, measured by gross profit share, deteriorated, likely having a negative effect on gross fixed capital formation. Gross profit share dynamics was a consequence of successive years of lacklustre GDP growth rate and a prolonged period of housing market adjustment. In addition to the business cycle, structural factors also contributed to the weakening of investment activity. The post-crisis period was marked by a substantial slowdown in TFP growth and potential output growth, which were not expected prior to the crisis (see Figure 13). As a result economic agents revised corporate profit growth expectations downwards compared with the pre-crisis period, thereby depressing domestic and foreign investment.

[10] Gross profit share is a measure of profitability and is calculated as the ratio of gross operating surplus to value added.

Figure 12. **Gross Investment Rate and Profit Share (Total Economy)**

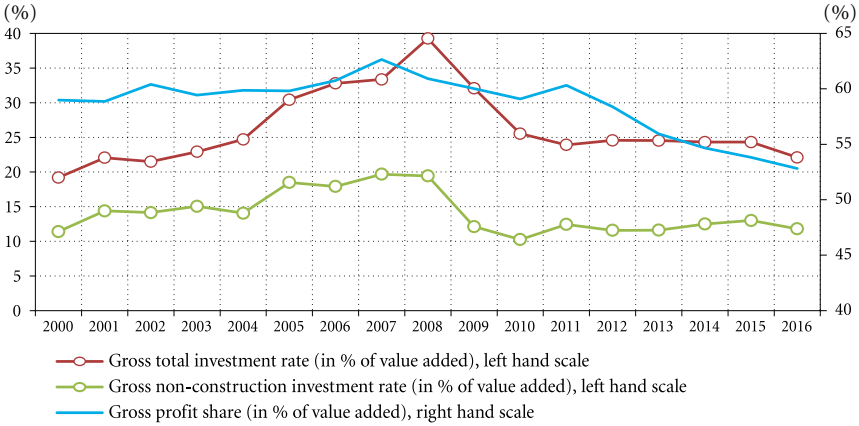
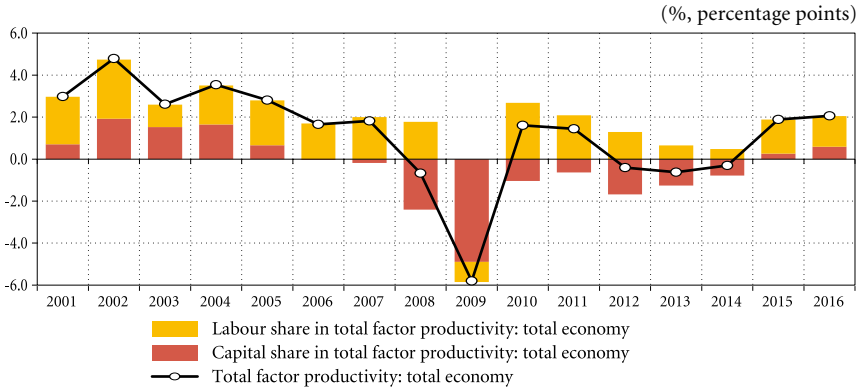


Figure 13. **Breakdown of Total Factor Productivity (TFP) Growth Rate**



Notes: (i) Non-construction investment in Figure 12 is defined as overall investment excluding construction; (ii) TFP decomposition in Figure 13 is based on estimates of the European Commission. According to the methodology used, potential output is estimated by using a Cobb-Douglas production function, and unlike standard approaches it explicitly accounts for the level of efficiency with which inputs (capital and labour) are being used in the production process. As a result, TFP is explicitly modelled as a function of the level of efficiency of factor inputs (Havik, K. et al., 2014).

Source: NSI, European Commission (AMECO database)

Impact of EU Funds on Public and Private Investment

The programming cycle of EU funds is another factor that influences investment activity since the country joined the EU in 2007[11]. Similar to other NMS countries, the absorption of EU funds in Bulgaria has probably played an important role in explaining recent developments in business investment that could not be explained by demand factors, uncertainty or financing resources.

The largest part of the EU structural and investment funds in Bulgaria under both 2007–2013 and 2014–2020 financial frameworks have been allocated in support of government investment in transport and environmental projects[12]. Some of the infrastructure projects have also been undertaken by state owned companies that are classified outside the general government sector (a notable example is the expansion of the underground railway in Sofia with financial support from the EU and the national budget amounting to BGN 1 billion or 8% of the 2007–2013 ERDF and Cohesion Fund allocations)[13]. EU transfers to private companies have remained more limited, even though their role has increased in the 2014–2020 programming period as compared to the 2007–2013 financial framework. As an alternative to grant funding, the EU-wide priorities for the current programming period have focussed more on various financial instruments, which mobilise banks' financing and private capital to support investment projects. The role of these instruments for stimulating productive private investment has been strengthened by the additional mechanisms, available under the Investment plan for Europe, launched in 2014[14].

Given the financing priorities of the EU cohesion policy, one could expect three main channels through which EU co-financed investment could stimulate business investment: 1) providing direct financial support for individual investment projects in non-financial corporations, 2) creating favourable conditions for business investment through better infrastructure, technologies and enhanced human capital as a result of higher government investment and 3) lowering the cost of bank lending for business investment projects as a result of either explicit guarantees through various financial instruments in place or lower risk profile of EU co-financed investment projects.

There are, however, concerns that the stimulating impact of EU funds might remain limited if EU co-financed investment does not add to but rather replaces

[11] Before joining the EU in 2007 Bulgaria had access to pre-accession EU funds. For further details of the pre-accession EU funds please refer to Paliova and Lybek (2014).

[12] Details on the allocations and financing priorities in the 2007–2013 and 2014–2020 programming periods can be found in MF (2016).

[13] Source: Unified management system for the EU structural instruments in Bulgaria, www.eufunds.bg.

[14] See Appendix 5 on detailed information for EU funds allocations and financial priorities.

market-based investment. Moreover, if national government spending on co-financing EU projects increases considerably and this translates into tax or government debt increases, real interest rates may also increase, resulting in private investment crowding-out. Last but not least, if EU grants are not spent efficiently, their impact on business investment might be rather limited and short-lived.

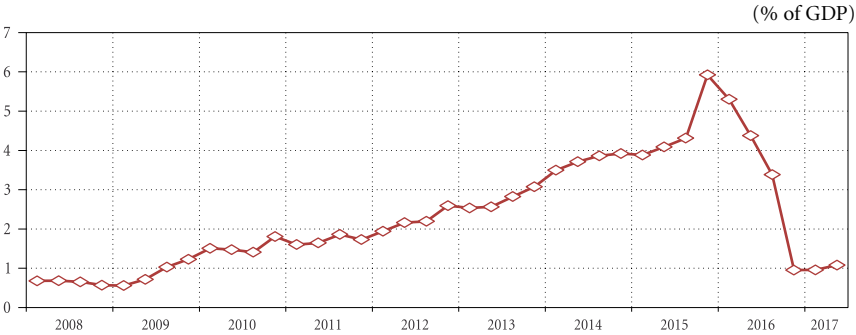
Given the large scope of EU co-financed extensions and improvements in existing infrastructure in Bulgaria[15], there is a strong argument in support of a positive overall impact of EU funds on business investment. While substitution effects may not be completely ruled out, the access to cheaper and more certain EU-related financing is likely to have supported the implementation of projects that may not have been undertaken otherwise, especially in the aftermath of the global financing crisis, when investment activity was impeded by growing uncertainty and scarce external and domestic sources of financing.

The available data on EU funds absorption rates, EU co-financed government investment and capital transfers from EU budget to non-financial corporations (see Appendix 1B on available data sources) indicates that EU related flows to both the government and non-financial corporations have played an important role in explaining the dynamics of business investment, especially in most recent years. The impact of EU funds-related flows was relatively weak until the end of 2011 as the absorption rate (as defined by the rate of payments relative to the overall funding available[16]) was less than a quarter of the allocated Cohesion policy budget (23.8%). The absorption rate strongly increased in 2013–2015 and as a result EU co-financed government investment had a notable positive contribution for economy-wide investment in 2012–2014 and was the main factor behind investment growth in 2015 (see Figure 15). Capital transfers from government to non-financial corporations, related to the implementation of EU co-financed projects, have also increased substantially after 2012 and have peaked in 2015.

[15] The implementation of infrastructural investment projects under the 2007–2013 programming period resulted in the completion of 175 km. of new roads and the reconstruction of respectively 1040 km. and 234 km. of roads and railroads (data as of 2014, EC, 2016:1)

[16] MoF data on Cohesion policy payments (both EU and nationally co-financed). The total budget has been augmented in the course of the implementation of the programming periods to reflect shift in financing and deductions.

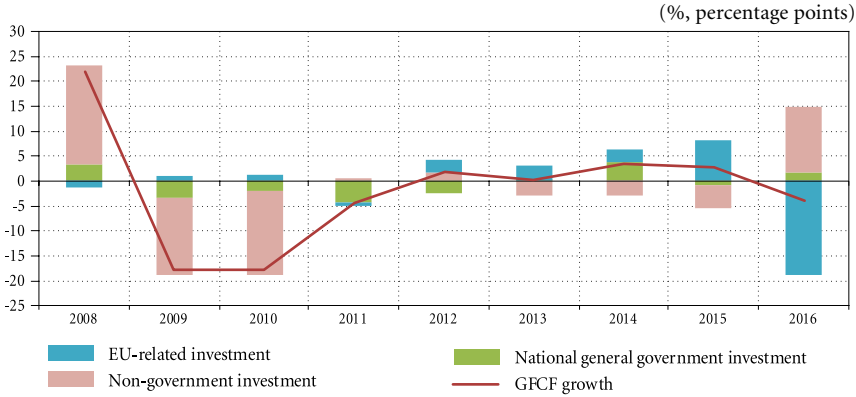
Figure 14. **Capital Spending on EU Programmes**



Note: Four quarters rolling data, includes capital spending in government units and transfers to non-government units on programmes financed by the pre-accession funds, Structural funds, the Cohesion fund, European Agriculture Fund for Rural Development and European Fisheries Fund, as well as other projects and programs, financed with EU funds. Includes co-financing from the national budget.

Source: MoF monthly reports on the implementation of the Consolidated fiscal programmes

Figure 15. **Contribution of EU Co-financed Government Investment to the Growth of Economy Wide Investment**



Note: EU co-financed government investment is proxied by quarterly data on capital transfers received by the government and an additional adjustment is made to account for co-financing from the national budget.

Source: Eurostat, own estimates

The switchover of the 2007–2013 and the 2014–2020 financial frameworks resulted in delays in the implementation of projects under the new program-

ming period[17]. As a result there was a sharp decline in EU co-financed investment in 2016 that caused a decline of economy wide investment, despite favourable non-government investment and national government investment dynamics (see Figure 15). EU flows to direct SME support and other capital transfers to non-financial corporations were also lower as compared to the peak, recorded in 2015.

In summary of this section, it can be argued that mostly cyclical factors supported the slow investment recovery in recent years. The investment recovery in Bulgaria reflected mainly increased non-construction investment, particularly business investment, and is likely to have been driven by improving demand, lower economic uncertainty and easing financing conditions, with additional support from EU-fund related investments.

4. Data and Methodology

Having reviewed the related literature on the topic and having identified the most relevant drivers behind investment dynamics we can now focus on building the econometric framework which will be used to analyse business investment in Bulgaria. The descriptive analysis above reveals that investment activity in Bulgaria over the period 2000Q1–2017Q1 was driven mostly by the cyclical developments in factors, such as external demand, uncertainty and financing conditions. The quantification of the relative importance of each of these factors could be estimated through the lens of a Bayesian VAR model.

4.1. Methodology

From a methodological perspective, we use Bayesian VAR models to estimate the impact of the identified factors on business investment activity. Vector autoregression models (VARs) are very flexible time series models that can capture complex dynamic interrelationships between macroeconomic variables. The flexibility and ability to fit the data comes from the rich parameterization of VAR models. However, that comes at the risk of overfitting the data, of having imprecise inference and large uncertainty about the future paths projected by the model. The relatively short time span of most macroeconomic time series for countries like Bulgaria further aggravates the problem of dense parametrization. A solution to this issue is to employ Bayesian techniques to estimate the VAR model. In Bayesian estimation we use informative priors in order to shrink the

[17] The delay was common across all NMS and was explained largely by common factors: complex legislative and administrative procedures, which require: 1) adoption of relevant EU regulations at the EU level, and 2) negotiations between member states and the EU for finalising the operational programmes and partnership agreements.

richly parameterised unrestricted model towards a parsimonious naïve benchmark model, hence reducing estimation uncertainty (Giannone et al., 2012).

A general VAR model with n endogenous variables, p lags and m exogenous variables can be written as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + C x_t + \varepsilon_t, \text{ where } t = 1, 2 \ldots, T \quad (1)$$

$$E(\varepsilon_t) = 0 \quad (2)$$

$$E(\varepsilon_t \varepsilon'_s) = \Sigma \text{ if } t = s \quad (3)$$

$$E(\varepsilon_t \varepsilon'_s) = 0 \text{ if } t \neq s \quad (4)$$

$y_t = (y_{1,t}, y_{1,t}, ..., y_{n,t})$ is a $n \times 1$ vector of endogenous variables, $A_1, A_2, \ldots, A_p$ are p matrices of dimension n×n, C is a $n \times m$ matrix, and xt is a $m \times 1$ vector of exogenous regressors which can be constant terms, time trends, or exogenous data series. $\varepsilon_t = (\varepsilon_{1,t}, \varepsilon_{1,t}, ..., \varepsilon_{n,t})$ is a vector of residuals following a multivariate normal distribution, *i.e.* $\varepsilon_t \sim N(0, \Sigma)$

In more compact notation, the VAR model can be written as:

$$Y = XB + \varepsilon \quad (5)$$

Where Y is a $T \times N$ matrix, where T denotes the total number of observations and N stands for the number of variables (endogenous and exogenous), while B is a matrix of suitable dimension containing the model's unknown parameters.

In the VAR framework the parameters of interest are the coefficients of the model, gathered in a matrix B in (5), along with the residual covariance matrix Σ. Unlike the traditional frequentist approach, in Bayesian econometrics every parameter of interest is treated as a random variable, characterised by some underlying probability distribution. The ultimate goal in Bayesian econometrics is to identify these distributions in order to produce estimates and carry inference on the model. This is done by combining the prior information we may have about the distribution of these parameters (the prior distribution) with the information contained in the data (the likelihood function) to obtain an updated distribution accounting for both these sources of information. This updated distribution is commonly known as the posterior distribution.

For the estimation of the VAR model we use a Matlab package, called *Bayesian Estimation, Analysis and Regression (BEAR) Toolbox*, developed by Dieppe et al. (2016). The model parameters are estimated using an Independent Normal-

Inverse-Wishart prior distribution[18], similar to Meinen and Rohe (2016). This prior has an advantage over the standard Minnesota and the Normal-Inverse-Wishart priors because it allows for more estimation flexibility. Unlike the Normal-Inverse-Wishart, the Independent Normal-Inverse-Wishart prior does not impose dependence between the variance of the residual term and the variance of the VAR coefficients (Dieppe et al., 2016). As the name suggests, it involves setting the prior for the VAR coefficients and the error covariance independently. Under this prior, analytical expressions for the marginal posterior distributions are not available, but numerical methods, such as the Gibbs sampling algorithm, could be used for posterior inferences (Blake and Mumtaz, 2012).

Since the number of parameters in the VAR model is large and presenting all of them is cumbersome, in Section 5 we adhere to the commonly accepted practice to report functions of the VAR coefficients, which summarise information better. In particular, we report impulse response functions and historical decompositions. Impulse response functions describe the response of variable y_i following a shock in variable y_j, everything else being constant. In turn, historical decomposition allows us to decompose the variance of each endogenous variable into its constituent components, whereby each component is due to one structural shock in the model. Structural shocks are identified using a recursive ordering (Cholesky decomposition).

4.2. Data

In this section we describe the choice of variables that we have used for the empirical estimation in the analysis. For the purpose of our VAR specifications we use quarterly data on a number of macroeconomic series, most of which cover the period from 2000Q1 up to 2017Q1. For a detailed list of the sources and individual series coverage please refer to Appendix 4.

The series that we use as a proxy for business investment in Bulgaria is real investment in machinery, equipment and weapons systems published by EUROSTAT. For more information on the choice of a measure of investment and the issues related to this choice please refer to Appendix 1 A.

External demand in the model is proxied by the weighted real import of goods and services of Bulgaria's main trading partners – a series compiled by the ECB. As indicated in the literature review section, weak demand and sluggish growth outlook have been empirically identified as some of the core reasons

[18] Specifically, we set hyperparameter $\lambda_1 = 0.8$, $\lambda_2 = 0.5$, $\lambda_3 = 1$, and $\lambda_4 = 100$ which are the recommended values in the BEAR Toolbox for this particular prior. We also set the number of iterations to 10 000 with the number of burn-in iterations equal to 9 000.

for the investment slowdown, especially for small open economies. This is why we expect higher external demand to lead to higher investment and in the case of Bulgaria this effect is likely to be quite significant as the country is export-oriented.

To account for economic uncertainty in Bulgaria we use 5 different indicators that have been calculated from the EU Commission's Business and Consumer Survey (BCS), following a methodology by Giradi and Reuter (2017). For more information on the calculation and the interpretation of these uncertainty indicators please refer to Appendix 3. Although each of the five uncertainty measures has been separately used in our estimations, in the final model we present the results of the uncertainty indicator that gives us the best fit and economic interpretation. We expect that heightened uncertainty will have a negative impact on investment in the country as suggested by both theoretical and empirical work.

Capacity utilisation in the manufacturing sector is included in the specification in order to account for the economy's supply side motives for investment. We expect that higher levels of capacity utilisation will result in higher investments.

The effect of profits on investment activity in our model is represented by including in the VAR the share of gross operating surplus in gross value added for the manufacturing sector. Data is taken from the National Statistical Institute. In line with relevant literature we expect that an increase in profits would lead to higher investment.

To account for availability and importance of external funding for Bulgaria we have included FDI flows, the data for which we have obtained from the BNB statistics. An increase in FDI flows in the economy is expected to increase investment activity through the external financing of investment channel.

To account for possible credit constraints and cost of financing we include the weighted interest rate on new loans to the corporate sector. This data is taken from the BNB's interest rate statistics. We expect that the lower the interest rates to the corporate sector are, the easier the access to loan financing is, and, thus, the higher will be the increase in investment.

As suggested by recent studies certain variables enter the VAR model in (log) levels (CNB, 2017; Meinen and Rohe, 2016; Manteu and Serra, 2017). Investment and external demand series are transformed by taking their natural logarithm and FDI flows are taken as a share of GDP.

Using the outlined variables, we have estimated a VAR model with six lags of each endogenous variable for the case of Bulgaria over the 2000:Q1 – 2017:Q1 period. We have chosen the following recursive ordering of variables, which would allow us to obtain the structural shocks of our VAR model:

External demand
Uncertainty
Capacity Utilisation
Gross Profit Share
FDI Flow
Real NFC Lending Rates
Business Investment

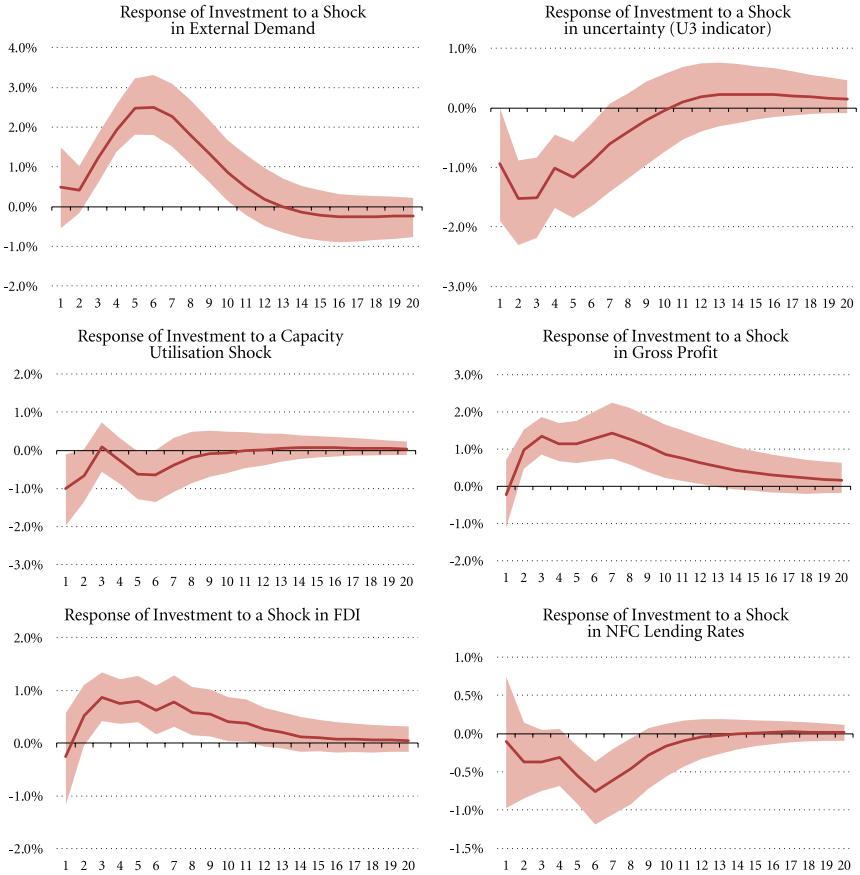
This Choleski ordering is similar to imposing short-run restrictions, such that we impose a particular causal chain on the data. In this setup the variable ordered first (in our case external demand) does not contemporaneously react to variables ordered below it, but will affect all the ones ordered below it contemporaneously. The variable ordered second (uncertainty in Bulgaria) responds contemporaneously only to the variable above it in the ordering. Finally, the variable ordered last (business investment) responds contemporaneously to shocks in all variables ordered above it but shocks in investment do not affect the variables above it in the current period.

A possible shortcoming of our specification is that we do not explicitly include a proxy for future demand expectations, such as the Economic Sentiment Indicator (ESI), published by the EC. However, expectations indicators such as the ESI focus mainly on the near-term future, typically 3 months for firms and 12 months for consumers. As investment decisions tend to have long-term consequences for firms, they are planned carefully and medium to long-term demand expectations are likely to be more important. In the short-run firms can face changes in demand by altering their capacity utilisation. Similar to Barkbu et al. (2015), ECB (2016:1) and Meinen and Rohe (2016) the setup of our model does not include an expectations proxy, which would suggest that economic agents are backward-looking and future demand prospects are assessed primarily based on current demand developments. However, short-term future expectations of economic agents are partly accounted for by the uncertainty indicator, which is based on economic agents' disagreement on future production dynamics.

5. Results

In order to determine the direction in which each of the factors above affects business investment and to establish their significance we look at the impulse response functions (IRFs) from the estimated VAR Model (see Figure 16).

Figure 16. **Impulse Response Functions**



Notes:
The line denotes the median response of investment and the blue area around it denotes the 90% confidence bands.
On the X-axis are plotted the 20 time periods (which in our case are quarters) for which we examine the effect of shocks in our endogenous variables. On the Y-axis we have the response of business investment (in percent from baseline path) to a positive one standard-deviation structural shock in each variable of interest.

The results from the impulse response functions suggest that in Bulgaria one of the factors that has the biggest and most persistent effect on business investment is external demand. This is consistent with findings in the literature on investment drivers in small open economies (CNB, 2017) and supports the initial hypothesis based on the descriptive analysis in Section 3. The maximum impact on business investment from one standard deviation increase in external demand is observed in the second year after the shock.

The effects of uncertainty shocks to investment in Bulgaria are provided in the top right panel. Here, we present the results of the model when the U3 uncertainty indicator is used, as it appears to be the most significant and the one that fits best in the model. This is intuitive given that U3 is an indicator that was specifically designed to account for the economic uncertainty in the industrial sector, which is the main investor in gross fixed assets. When we substitute the U3 uncertainty indicator in our model with another of our uncertainty measures we obtain impulse responses that are correct in terms of the expected direction of the effect but there is a certain loss of statistical significance. The statistically significant response of investment to uncertainty shocks proves that uncertainty has a crucial and long-lasting negative effect on economic agents' investment decisions in Bulgaria. As expected, higher uncertainty constrains investment and leads to firms postponing their investment decisions. Under higher uncertainty agents in Bulgaria tend to adopt a "wait-and-see" approach, depressing investment activity for up to two years.

Judging from the impulse response functions, increases in capacity utilisation do not have a significant impact on business investment in Bulgaria. One possible explanation is that high capacity utilisation on its own does not necessarily transfer into an immediate investment increase. If firms are uncertain about how sustainable demand prospects are, they may choose to respond to the increased demand by pushing up further their production capacity, thereby deferring new investments. This would imply that positive effects on investment from increased capacity utilisation would tend to materialise in the medium term conditional on continuous improvement in demand conditions and firms' sentiments.

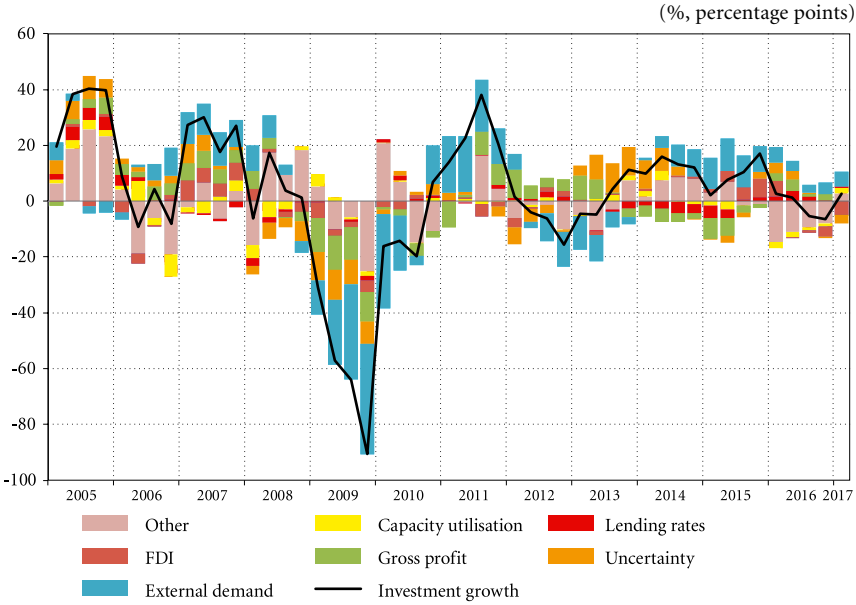
Increases in profit (proxied by the share of gross operating surplus in gross value added for the manufacturing sector) have a positive impact on business investment, reflecting firms' increased capacity to finance investment with internal means. The positive reaction of business investment is very persistent and is maximised in the end of the first year after the initial shock in profit. This result is consistent with empirical research that establishes a positive link between increasing profits and investment decisions (ECB, 2016:1).

Moving to external sources of financing, the reaction of business investment to increases in foreign direct investment is positive and significant (after the second quarter), confirming our findings in Section 3 that FDI has been an important investment financing channel in Bulgaria.

The results from the applied VAR suggest that the reaction of business investment to changes in the cost of financing is relatively less significant. The negative response of investment activity to an increase in the non-financial corporations' lending rates materialises from the first quarter after the initial shock in interest rates and the maximum (negative) impact from an increase in lending rates is observed in the sixth quarter after the shock.

The Choleski ordering in our VAR model also allows us to construct a historical decomposition of business investment dynamics and in this way to quantify the effects of different factors that have driven business investment in different periods of time. Figure 17 shows that results from the VAR broadly confirm our initial expectations about the main drivers of business investment that were stated in Section 3.

Figure 17. **Business Investment Growth – Historical Decomposition**



Note: "Other" here includes the combined effects from the lagged investment and from the exogenous shocks.

Based on the historical decompositions of the VAR model it can be noted that business investment in Bulgaria in the years right before the crisis was largely driven by the observed increases of external demand associated with the cyclical upturn in our main trading partners and optimism, related to Bulgaria's accession in the EU. Increasing corporate profits and low levels of uncertainty further supported the dynamics of business investment in the years prior to the crisis. Furthermore, we can conclude that financing conditions also had quite a notable contribution to the investment boom in the run-up to the crisis. In 2005 and 2006 we observe a positive contribution from favourable domestic lending rates, which in 2007 and 2008 is overtaken by the positive contribution of foreign financing in the form of FDI inflows. Firms' capacity to finance investment with internal means, proxied by the profit share, was also a particularly important factor for business investment after 2005.

In the 2009 – 2010 period lower external demand and the negative impact it had on the overall economy appear to have been the biggest drag on business investment. The negative effect of the lower external demand was further amplified by the heightened uncertainty triggered by the global financial crisis. Both the internal and the external channels of financing of investment were impaired, which exacerbated the decline in investment. Firms' profits and ability to finance investment using internal sources were negatively affected, which is suggested by the observed negative contribution of the share of gross operating surplus in GVA to business investment dynamics. Moreover, the higher risk-aversion of investors as a result of the crisis was reflected in lower FDI flows which also limited business investment in the period. The historical decomposition of the VAR model also indicates that the increase in real non-financial corporations' lending rates up until the end of 2009 had a negative impact on business investment.

With the recovery of external demand and the exhaustion of the negative impact of uncertainty, business investment in Bulgaria also started to recover in the beginning of 2011. However, the 2012 sovereign debt crisis in Europe lead to a new increase in uncertainty, followed by a supressed external demand, which resulted in another weakening of business investment in Bulgaria that lasted up to the second half of 2013.

As evidenced by the historical decomposition, the decrease in uncertainty supported the recovery of business investment in Bulgaria after the second half of 2013. Higher external demand also contributed to investment growth especially after the second half of 2014, offsetting a temporary increase in uncertainty around the end of 2014 and the first half of 2015 triggered by domestic and international developments (see Appendix 3 for more information). In 2014 and

2015 the increasing external demand, the recovery of FDI flows and the increasing absorption of EU funds (assumed to be reflected in "other factors") were the main factors that helped investment return to positive growth rates despite the negative contribution from low corporate profits and tight financial conditions. The sharp decline of EU co-financed investment observed throughout 2016 could explain the decreasing business investment dynamics in spite of the positive impact of demand factors, lower uncertainty and recovering profitability. In the beginning of 2017 business investment recorded positive growth rates on account of continued recovery of external demand.

Overall, the results from the VAR model suggest that external demand has been the most significant determinant of business investment. In addition, the effect of uncertainty on investment activity has also been quite substantial. Availability of financing (both domestic and external) has had a more pronounced effect on investment in the pre-crisis years as compared to the post-crisis period. Constraints regarding availability of funding have been mainly a drag on investment in the aftermath of the crisis. The absorption of EU funds could also be identified as an important factor for business investment in Bulgaria, judging by the contribution of the "other factors" component throughout the years. Together with demand factors it could explain most of the observed investment growth in the beginning of 2017.

6. Conclusion

Gross fixed capital formation is a key driver of the business cycle and plays a prominent role in determining the potential growth of a country. As such, the observed slowdown in investment activity across advanced economies, and particularly countries in the EU, including Bulgaria, observed after the Great Recession, has raised questions on the drivers behind this slowdown.

This paper looks into the drivers behind business investment in Bulgaria and quantifies their effect in order to explain the observed slowdown of investment in the aftermath of the Great Recession and the followed weak recovery in more recent years. This is done using a Bayesian VAR estimation with which we have evaluated the relative importance of factors, such as demand, capacity utilisation, economic uncertainty, firms' profitability, foreign direct investments and lending rates for business investment dynamics during the period 2000Q1 – 2017Q1. Separately from the VAR analysis, we have also examined the role of EU-related funds for explaining business investment dynamics in Bulgaria, given the considerable amount that Bulgaria managed to absorb in recent years under EU programmes.

The results from our VAR model suggest that external demand is the main driver of business investment in the country, which is consistent with the findings of similar studies on small open economies. Apart from external demand, we find that the level of economic uncertainty and corporate profits also play a crucial role in determining the level of business investment in the economy. At the same time the importance of foreign direct investment and lending rates for investment activity appears to be less significant.

From the historical decomposition, obtained from our VAR model, we can conclude that almost all of the factors considered in the analysis contributed positively for the business investment growth in the run-up to the Great Recession. External demand increases, associated with the cyclical upturn in our main trading partners, low levels of uncertainty and increasing corporate profits were the main factors that stimulated investment growth in Bulgaria in that period. Lending rates (in 2005–2006) and FDI inflows (in 2007–2008) also contributed to the business investment growth. Our estimations suggest that the observed slowdown of business investment in the post-crisis period can be explained by the reduced external demand and the increased economic uncertainty in the immediate aftermath of the crisis, which lasted up to mid–2013. After the second half of 2015 our results point to a recovery in corporate profits, as well as favourable financing conditions, which on top of the already observed growth in external demand and decreasing economic uncertainty support the recovery of investment activity in the country. Additional evidence suggest that the dynamics of EU co-financed investment has also been a notable factor in explaining business investment dynamics, especially in 2015 and 2016.

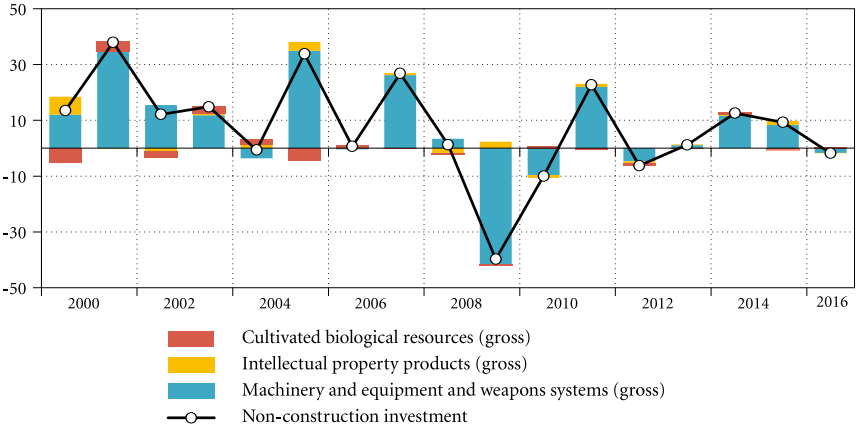
Appendix 1. **Investment Data**

A. Business Investment Data

In this paper we follow the example of recent studies on the topic (Barkbu et al, 2015; ECB, 2016:1; Kose et al., 2017) and for the purpose of our VAR analysis we separate construction investment from total investment in order to extract the part of investment that is particularly relevant in boosting an economy's future productive capacity. In order to obtain our investment proxy we use the breakdown of Gross Fixed Capital Formation by main asset type, which is available from Eurostat for all EU countries. As can be seen in Figure 18, non-construction investment in Bulgaria is driven almost entirely by investment in "machinery, equipment and weapons systems" (encompassing transport investment, information and communication technology (ICT) equipment, other machinery and equipment, and weapons systems).

Figure 18. **Non-construction Investment Growth Rate and Contributions by Major Asset Type**

(annual percentage changes, percentage points)



Source: Eurostat

As such we have decided to use investment in machinery, equipment and weapons systems as our proxy for "business" investment, similar to Meinen and Rohe (2016). Our choice is further supported by the fact that machinery and equipment investment arises mainly in the corporate sector and, thus, its dynamics should reflect firms' investment decisions (ECB, 2016:1). We should note that

in the way that we have defined business investment it is not only private sector investment but also contains some part of public investment. Unfortunately, due to data limitations, we cannot separate out this public investment component which for Bulgaria and other NMS could be relevant in particular periods, especially in the years with high absorption rates of EU-related funds, related to the programming cycle of EU funds. For more advanced countries such as the "core" euro area economies this public investment component is likely to be relatively smaller, with the ECB (2016:1) estimating it at around 10% of euro area investment, with some variation across countries.

B. EU Funds-related Data

Regarding the impact of EU funds on government investment we can use two sources of information: 1) annual data on EU transfers to government and non-government units (source: ESCB Government Finance Statistics, EU budget transactions) and 2) quarterly data on capital transfers received by the government (source: Eurostat, quarterly non-financial accounts of the general government sector). The latter is preferred in this analysis due to its higher frequency and the inclusion of capital transfers from pre-accession funds, which had a significant share in government GFCF in the 2007–2009 period[19].

Assessing the impact of EU funds on non-government investment is not straightforward. Data on capital transfers from the EU budget to non-government units from the ESCB GFS on EU budget transactions is not available for Bulgaria, while data from the same source for NMS[20] indicates that the share of capital transfers to non-government in all capital transfers from the EU budget has varied a lot across years and across countries. On average for these countries, capital transfers to non-government units represented between 34-42% of all capital transfers in the period 2007–2015, but have increased notably in 2016 to 48.1% of all capital transfers.

As alternative sources of data that provide indications for the relative importance of EU funds in financing private investment we use 1) Consolidated Fiscal Programme national methodology cash-based data on capital transfers to non-financial corporations, related to the implementation of EU co-financed projects from all five EU funds and 2) payments on projects financed by Operational Programme "Competitiveness" excluding payments related to financial

[19] While Table GFS Table 1b also includes information on transfers from pre-accession funds, these flows are not split between capital and current transfers and their impact on government investment cannot be assessed.

[20] Data is available for Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

instruments. Both sources provide information only on projects' costs, financed by the EU budget and the national budget, while the amount provided by final beneficiaries could also be quite substantial (up to 50% of the total budget). These sources are clearly second best alternatives as they are both cash-based and their coverage does not correspond to the sectoral coverage of the national accounts. In particular, the first source includes EU financed and national budget financing to non-financial corporations that have been classified in the general government sector (notably the National Railway Infrastructure Company). The second source has a more limited coverage and includes data on the one operational programme aimed to support projects in SME. It does not include support for investment by agricultural producers from the EAFRD. The beneficiaries of OP "Competitiveness" are typically private companies and both financial and no-financial corporations are eligible for support from this programme.

Appendix 2. **Survey Results on the Purpose of Investment and Factors Driving Investment Activity**

Two times per year, in spring and autumn, the European Commission conducts a survey among the companies in the manufacturing sector, collecting information on realised and planned investment, purpose of investment and main factors influencing investment. This appendix summarises the results of this survey for Bulgaria over the period 2002–2016.

Survey results suggest that over the period 2002–2003 around 60% of overall investment was dedicated to the replacement of worn-out equipment and/or rationalisation. In the following years, however, this pattern changed and firms tended to report more investments as serving extension purposes (see Figure 19). The gradual shift in the focus of investment projects could be attributed to the significant FDI inflows over the period 2004–2008, the integration of domestic firms in global value chains as well as to the business cycle (Ivanova and Ivanov, 2017). During periods of economic upswings it could be expected that more investments are dedicated to the expansion of production capacity, compared with downturns when investments are likely to aim mainly at replacing worn-out plant or equipment. Similar to findings for other EU countries, the relative share of investments dedicated to the extension of production sights in Bulgaria is positively correlated with the growth rate in gross fixed capital formation (EC, 2017). Contrary to the pre-crisis period, in the aftermath of the global financial crisis (2010–2014) investment in Bulgaria has mainly served rationalisation purposes as firms aimed at improving their efficiency and competitiveness. In 2013 the share of investment for rationalisation stood at its highest level since the start of the survey 2002. With the cyclical recovery of the economy in 2015–2017, firms started again to report investments that are more aimed at the extension of production capacity.

In terms of the factors that stimulate or limit investment activity, the survey distinguishes between demand, financial, technical (*e.g.* technological factors and the availability of labour) and other factors (*e.g.* taxation). Demand and financial conditions are by far the most important factors behind investment decisions in Bulgaria, regardless of the phase of the business cycle (see Figure 20). In the pre-crisis period demand and financial factors exerted a stimulating effect on investment. This reflected the robust domestic demand growth over the period 2000–2008 combined with favourable external environment. At the same time, the downward trend of interest rates and the availability of credits contributed to easing in financial conditions. In 2009 all factors declined while investment activity contracted severely following the global financial crisis. In 2011–2013 firms in the manufacturing sector that participated in the survey

reported an increase in realised investment, with demand and financial factors being the two main contributors. This was in line with the increase in capacity utilisation over the same period and the gradual recovery of the economy. In addition to demand and financial conditions, increasingly more managers started to report technical factors as relevant for investment decisions, with the share of those managers outpacing pre-crisis levels. According to survey results, investment has declined over the last two years but this possibly could be attributed to the end of the EU programming period.

Figure 19. **Purpose of Investing**

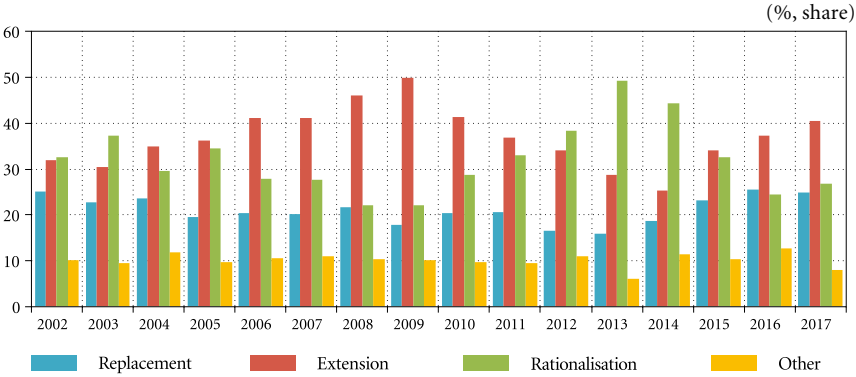
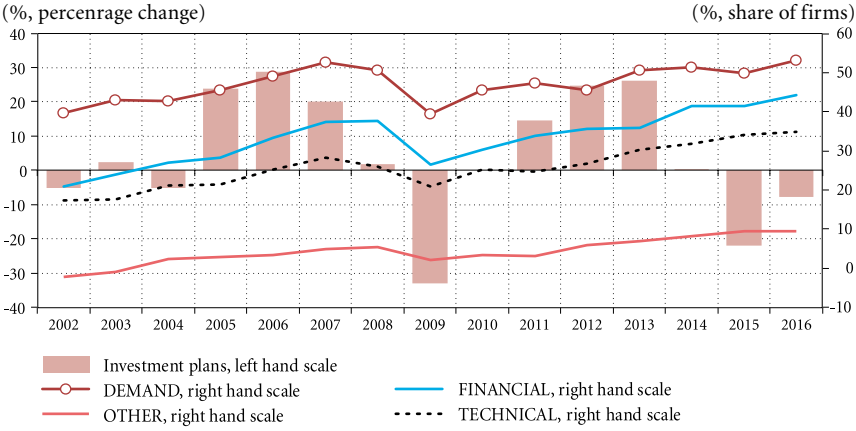


Figure 20. **Factors Driving Investment and Realised Investment in the Manufacturing Sector**



Source: European Commission (AMECO database)

Appendix 3. **Measures of Uncertainty**

There are a number of methods (EC, 2017) that are used to indirectly measure uncertainty, such as financial market volatility indicators, disagreement among professional forecasters, survey-derived indicators and Economic Policy Uncertainty indicators. All of these approaches have their pros and cons.

For our analysis we have chosen to use measures for uncertainty constructed from survey data, since economic uncertainty is measured "at source", i.e. directly at the level of the economic agents who make investment and consumption spending decisions (EC, 2013). To that aim we use data from the European Commission Business and Consumer Survey (BCS)[21] and by following the methodology of Girardi and Reuter (2017) we obtain 4 different uncertainty indicators and a composite uncertainty indicator for Bulgaria, similar to Ivanov (2018)[22]. The derived indicators measure the divergence of business and consumer expectations about the economy and about their finances. The core underlying assumption is that the more economic agents disagree in their assessment or expectations about economic activity, the higher is the uncertainty in the economy. Uncertainty can, thus, be illustrated as a mean preserving increase in the "tails" of the probability distribution of an event (EC, 2013). This distinguishes it from risk, where economic agents are able to form views about the probability distribution of possible future states, based on logic or on past experience (ECB, 2016:2).

The first indicator (U1) measures the disagreement for future activity across all sectors (industry, services, retail trade, consumers, construction) and, thus, should capture uncertainty at the level of the whole economy. This is an expectations-based uncertainty indicator.

The second indicator (U2) does not only focus on disagreement for future activity but also takes into account respondents' backward-looking assessments for the same variables in subsequent survey rounds across all sectors (Girardi and Reuter, 2017). This indicator is a type of ex-post uncertainty measure, based on indirect evaluation of respondents' forecast errors.

The third indicator (U3) is similar to the first indicator (U1) but it measures the disagreement only related to the future production in the industry sector (single question in the survey), rather than the uncertainty in the whole economy

[21] For more information see European Commission Business and Consumer Surveys: https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys_en

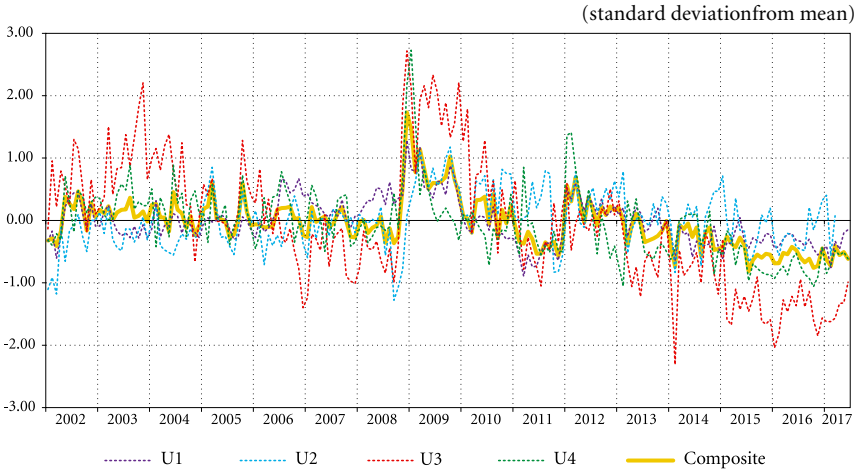
[22] In this section we give a short overview of the methodology and finding of Ivanov (2018). For more information and a detailed discussion on how the uncertainty measures for Bulgaria were derived, please refer to that paper.

(which was the case for U1). This indicator is particularly relevant in explaining investment dynamics in Bulgaria, since the industrial sector is the main investor in gross fixed assets in the country.

The fourth indicator (U4) is constructed in a slightly different way, compared to the previous three indicators. Rather than using the detailed breakdown of "increase" and "decrease" responses from the BCS, this indicator uses dispersion of changes in the overall balance of replies between consecutive rounds of the survey (Girardi and Reuter, 2017). The idea is that a high degree of uncertainty may not be only reflected in disagreement between respondents to a given question but may also be reflected in the resulting balance scores diverging across different questions, i.e. increased dispersion across questions rather than within questions (Manteu and Serra, 2017).

Given that no indicator is a perfect proxy for uncertainty, it might be preferable to compile a composite measure of uncertainty which captures and consolidates the information content of the different uncertainty proxies (ECB, 2016:2). We have chosen to use the median aggregation approach, similar to the ECB (2016:2), in order to obtain a composite uncertainty indicator. The four uncertainty indicators and the composite indicator are presented in Figure 21.

Figure 21. **Uncertainty Indicators, Bulgaria**



Source: EU Commission BCS Survey, own calculations

Appendix 4. **Variables Used**

The table in this section contains detailed information on the variables used in the empirical part of our analysis.

Name	Variable	Source	Coverage	Transformation
INV_M	**Business Investment** – real investment in machinery, equipment and weapon systems	Eurostat, seasonally adjusted	2000Q1-2017Q2	Natural logarithm transformation
WTV	**External Demand for Bulgarian Goods and Services** – weighted index of the real imports of Bulgaria's main trading partners	ECB, seasonally adjusted	2000Q1-2017Q2	Natural logarithm transformation
U1	**Uncertainty Indicator 1** – related to the future expectations in the economy	BCS, own calculations	2000Q1-2017Q1	Standardised index
U2	**Uncertainty Indicator 2** – related to backward-looking assessments	BCS, own calculations	2000Q1-2017Q1	Standardised index
U3	**Uncertainty Indicator 3** – related to the future production in the industry sector	BCS, own calculations	2000Q1-2017Q1	Standardised index
U4	**Uncertainty Indicator 4** – obtained from balance scores	BCS, own calculations	2000Q1-2017Q1	Standardised index
U_C	**Composite Uncertainty Indicator**	BCS, own calculations	2000Q1-2017Q1	Standardised index
GOS_P	**Share of Gross Operating Surplus in GVA for the manufacturing sector**	National Accounts, four quarters rolling data	2000Q1–2017Q1	Natural logarithm transformation
CU	**Capacity Utilisation in the Manufacturing Sector**	Business Surveys, BNB seasonally adjusted	2000Q1 – 2017 Q1	N/A
IR	**Real Non-Financial Corporations (NFC) Lending Rates (GVA deflated)**	BNB Interest Rates Statistics	2000Q1–2017Q1	N/A
FDIFLOW_GDP	**FDI Inflow as a Share of GDP**	BNB Balance of Payment Statistics (BPM5 and BPM6)	2000Q1–2017Q1	N/A

Appendix 5. **EU Funds and Their Role for Government and Corporate Investment**

As described in Appendix 1B two alternative sets of data are used to quantify the impact of EU funds on government investment and investment of non-financial corporations.

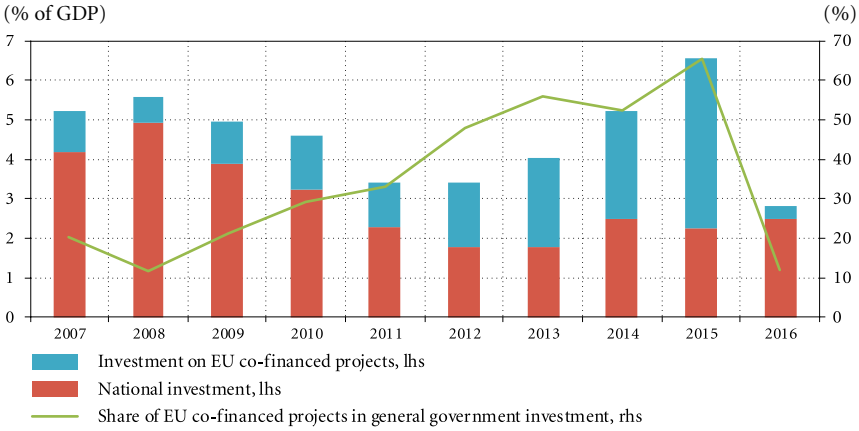
As already noted, EU funds have been one of the major factor for the dynamics of government investment in recent years. The share of EU co-financed projects in total government investment has increased from just 11.7% in 2008 to the substantial 65% in 2015, when EU co-financed investment peaked at 4.3% of GDP (see Figure 22).

Capital transfers from government to non-financial corporations, related to the implementation of EU co-financed projects, have also increased substantially after 2012 and have peaked in 2015, when they accounted for 1.2% of GDP, or 8.8% of total investment by non-financial corporations (see Figure 23). It has to be notes that these transfers also included co-financing on projects, implemented by state owned companies, while direct support to small and medium enterprises was more limited. Under the 2007–2013 framework, the total budget of the Operational programme "Competitiveness of the Bulgarian economy" amounted to EUR 1.2 billion or 1.9% of private investment (0.4% of GDP) and under the 2014–2020 framework, there are two operational programmes (OPs "Innovations and Competitiveness" and "SME Initiative") that finance projects related to enterprise support and innovation with a total budget of EUR 1.4 billion, or 2.4% of private investment (0.4% of GDP).

In addition to grants, EU funded financial instruments are also meant to play an important role in supporting private investment. Around 30% of the 2007–2013 Operational programme "Competitiveness of the Bulgarian economy" budget was allocated to financial instruments for enterprises (JEREMIE initiative). The funds allocated to financial instruments for enterprises under the 2014–2020 financial framework amount to EUR 337 million and include 100% of the budget of the "SME Initiative" (EUR 102 million) and the contracted funds of Fund Manager of Financial Instruments in Bulgaria EAD on OP "Innovations and Competitiveness" (EUR 235 million)[23].

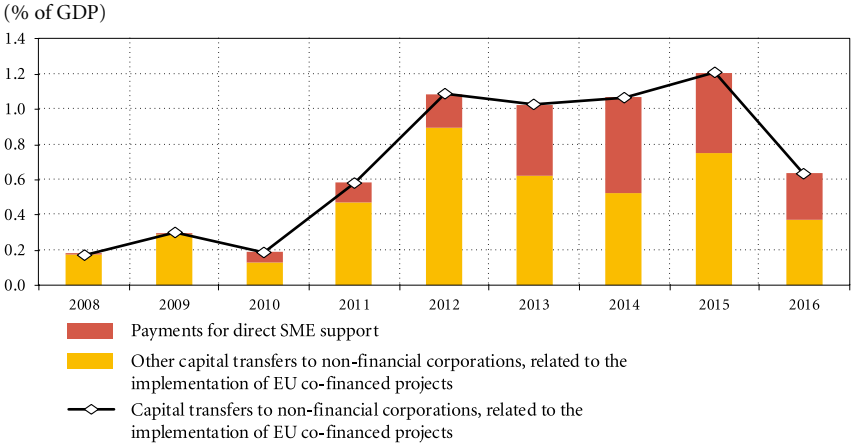
[23] As of April 2017 the Fund Manager of Financial Instruments in Bulgaria EAD has contracted financial resources from four operational programmes totalling BGN 1.2 billion. In the previous programing period, the majority of the funds allocated to financial instruments were the funds under the JEREMIE programme (finances as part of OP "Competitiveness), while financial engineering instruments for urban development, energy efficiency and renewable energies (Jessica initiative) were of marginal important (EUR 33 million).

Figure 22. **EU Co-financed Investment as a Share of Total Government Investment**



Source: Eurostat, own estimates

Figure 23. **Capital Transfers from Government to Non-financial Corporations, Related to the Implementation of EU Co-financed Projects**



Note: Payments to direct SME support represent yearly payments under OP "Competitiveness" excluding payments related to financial instruments for enterprises.

Source: MoF, Unified management system for the EU structural instruments in Bulgaria, own estimates

With the launch of the Investment plan for Europe ("Juncker Plan") in 2014, the scope for interventions to stimulate investment in EU countries has been broadened further. The Juncker Plan's European Fund for Strategic Investments (EFSI) aims to support strategic investments in key areas such as infrastructure, education, research and innovation, as well as risk finance for small businesses. Its main goal is to overcome bottlenecks in current investment environment and to mobilise private investment in times when public resources are scarce. As of May 2017 total financing in Bulgaria under the Juncker Plan's for SME support and support of infrastructure and innovation projects amounts to of EUR 206.9 million, with expected overall impact on investment of nearly EUR 1.124 billion (after financial intermediaries' and private companies' capital has been mobilised).[24]

[24] According to latest information published on MoF website as of July 2017.

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