INTERNATIONAL MONETARY FUND

IMF Country Report No. 18/47

BULGARIA

SELECTED ISSUES

February 2018

This Selected Issues paper on Bulgaria was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with Bulgaria. It is based on the information available at the time it was completed on January 31, 2018.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
PO Box 92780 • Washington, D.C. 20090
Telephone: (202) 623-7430 • Fax: (202) 623-7201
E-mail: publications@imf.org Web: http://www.imf.org
Price: $18.00 per printed copy

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

BULGARIA

SELECTED ISSUES

January 30, 2018

Approved By
European Department

Prepared by Nemanja Jovanovic, Yi Wu, and Hiroaki Miyamoto

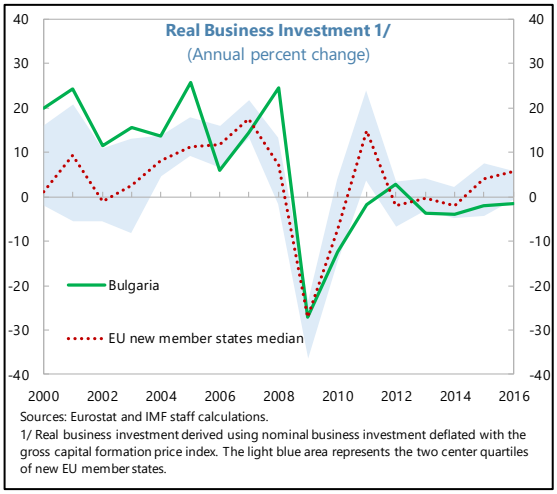
CONTENTS

NON-FINANCIAL CORPORATE DEBT OVERHANG AND INVESTMENT IN BULGARIA[1]

This chapter investigates the role of debt overhang in explaining weak non-financial corporate investment in Bulgaria using firm-level data. The findings suggest that high corporate debt could be an important drag on investment.

A. Introduction

1. Business investment growth in Bulgaria has been weak since the onset of the 2008-09 global financial crisis (GFC). While weak private investment after the GFC has been a global phenomenon (see, e.g., IMF 2015a[2]), business investment growth in Bulgaria has been weaker than other EU new member states (NMS),[3] in particular in more recent years. Although business investment growth is estimated to have turned positive in 2017 amid strong economy, it is still well below pre-crisis levels. Before the GFC, moreover, investment growth in Bulgaria has been mostly stronger than in other NMS.



Sources: Eurostat and IMF staff calculations.
1/ Real business investment derived using nominal business investment deflated with the gross capital formation price index. The light blue area represents the two center quartiles of new EU member states.

2. Debt overhang has been widely identified to depress investment in cross-country studies. For example, using aggregated firm-level data for twenty one sectors of eight euro area countries for 2000–10, Goretti and Souto (2013) confirm a negative sensitivity of firms' investment to debt overhang. IMF (2015b) looks into firm-level data for Central, Eastern and Southeastern European countries over 2004–13, and finds that for a given decline in sales, more leveraged firms tend to cut more in employment and investment. Bluedorn and Ebeke (2016) find a negative relationship between a firm's debt and investment for euro area economies during 2001–13, and that this negative effect is greater for small and medium enterprises (SMEs).

3. This chapter investigates how debt overhang affects non-financial corporate (NFC) investment in Bulgaria. In the finance literature, debt overhang is defined as high levels of debt that are curtailing investment because the benefits from additional investment in firms financed with risky debt will mainly benefit debt holders instead of shareholders (Myers, 1977). Bulgaria's NFC sector has higher indebtedness than in other NMS. Goretti (2015) examines the link between the high debt overhang and NFC investment for Bulgaria using firm-level data. It employs two measures

[1] Prepared by Nemanja Jovanovic and Yi Wu.

[2] IMF (2015a) identifies the overriding factor holding private fixed investment back as the overall weakness of economic activity. Other contributing factors include financial constraints and policy uncertainty.

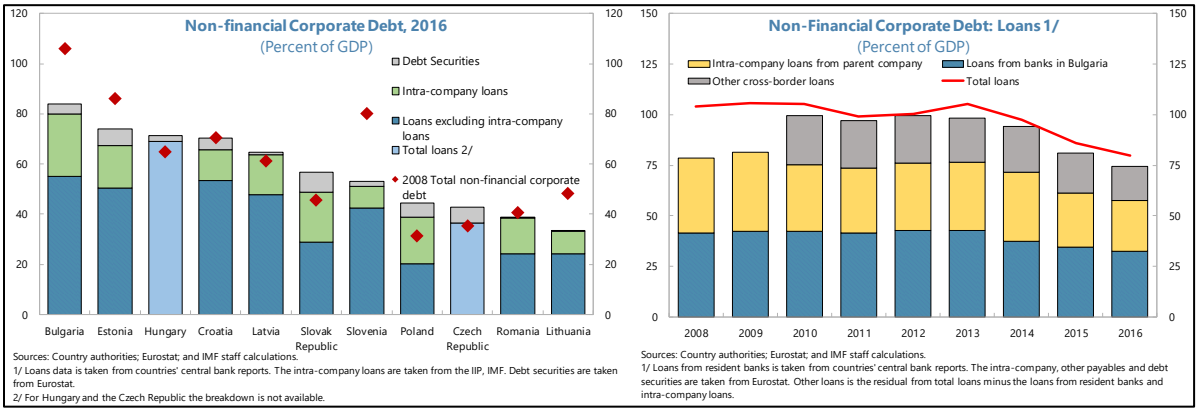
[3] Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

of debt overhang: interest coverage ratio (ICR) and debt-to-equity ratio. Using both measures a high debt overhang is associated with low investment, for debt-to-equity ratio the association is statistically significant only for the post-GFC period of 2011-13. This study investigates this relationship again using expanded data and with more analysis by sector and firm types. We use two commonly used proxies for debt overhang: ICR and debt-to-asset ratio. Kalemli-Ozcan et al. (2015) argue that debt overhang is not only about high levels of debt but rather the ability to generate sufficient cash flows to repay the debt.[4] From this perspective, ICR would be a better measure of debt overhang and we give more weight to the results using ICR. We find that debt overhang is negatively associated with NFC investment in Bulgaria, both before and after the GFC, and across sectors and firm sizes and ownership. It should be noted that the goal of the study is to test for the association between these commonly-used proxies for debt overhang and investment, instead of analyzing whether Bulgaria's NFC debt levels are high compared with economic fundamentals.

4. We proceed as follows. Section II reviews stylized facts. Section III describes the empirical framework and data. Section IV presents the analysis. Section VII concludes.

B. Stylized Facts Using Aggregate Data

5. Bulgaria's NFC debt is high compared with its regional peers. Between 2000 and the onset of the GFC, the indebtedness of Bulgaria's NFCs increased rapidly and Bulgaria was among the EU countries with the fastest debt growth (Bulgaria National Bank, 2013). While Bulgaria's NFC debt has declined markedly from 106 percent of GDP in 2008 to 84 percent of GDP in 2016 (consolidated data, excluding loans between corporates resident in Bulgaria), it remains the highest among the NMS.



- *Intra-company loans*. These are borrowing from a foreign parent or sister company based on international investment position (IIP) data. Although Bulgaria's intra-company loans have declined from 37 percent of GDP in 2008 to 25 percent of GDP in 2016 (with a particularly large decline in 2015), it remains the highest among the NMS. This reflects the importance of foreign-owned firms in Bulgaria's economy: non-financial FDI stock amounted to 65 percent of GDP as of 2017Q3. Centralized funding is likely to be cheaper for multinational companies. Some of the intra-company borrowing could be related to transfer pricing but there is little evidence of it,

[4] Corporate profitability has been recovering in recent years but is still below pre-GFC levels.

and there have been few court cases related to transfer pricing issues in Bulgaria (PwC, 2013/14). While high intra-company debt is a concern, it is arguable that loans from a parent or sister company may not present the same risk as would be the case for other types of debt exposures. Nevertheless, Bulgaria's NFC debt remains high among peers even excluding intra-company loans.

- *Loans from banks in Bulgaria*. Corporate credit growth has been weak since the GFC, standing at 1.3 percent y/y as of November 2017. Nevertheless, stock of loans from local banks (including subsidiaries and branches of foreign banks) amounted to 32 percent of GDP as of November 2017, which is among the highest in NMS (averaging 20 percent for other countries).

- *Other cross-border loans*. Bulgarian corporates also have sizable other cross-border loan borrowing, standing at 17 percent of GDP in 2016 based on IIP data (data only available starting from 2010).[5] This includes both bank and nonbank loans. Other cross-border borrowing by Bulgarian NFCs has also declined since 2010. A single resident bank may not be able or want to finance a significant loan to a large corporate, which thus may prefer to borrow directly from international banks. For most other NMS, IIP data don't report cross-border loans. Using the residual of total loans and loans from resident banks and intra-company loans as a proxy for cross-border borrowing suggests that other cross-border borrowing is higher in Bulgaria than most other NMS.[6]

- *Securities*. Debt securities are low in all NMS. It amounted to only 4.0 percent of GDP for Bulgarian NFCs in 2016. This also reflects the underdevelopment of Bulgaria's capital markets.

- *Other payables*. It should be noted that the total debt does not include other payables. This follows the European System of National and Regional Accounts (ESA 2010), which treats accounts payable as obligations but not debt. Bulgarian NFC's other payables-to-GDP ratio stood at 23.4 percent at end-2016, which is slightly higher than the NMS average. An important component of other payables is trade credit. For Bulgarian NFCs it accounts for about one third of other payables (higher in most other NMS).

C. The Analytical Framework and Basic Statistics

6. We use annual firm-level data covering 2003 to 2016 from the Orbis database. Variables are converted from dollar to lev, and then to real terms using the CPI. We then estimate the following regression which is commonly used in the literature:

$$IK_{it} = \alpha + \beta\, IK_{it-1} + \delta\, D_{it-1} + \gamma\, SK_{it-1} + u_{it}, \qquad (1)$$

$$\text{where the error term } u_{it} = v_i + \varepsilon_{it},$$

[5] This includes loans borrowed by households and nonprofit institutions serving households which are likely to be small.

[6] This needs to be interpreted cautiously as there could be sizable measure errors. Since components of debt are from different sources, they do not add up exactly to total debt.

- *i* stands for firm, *t* for year.

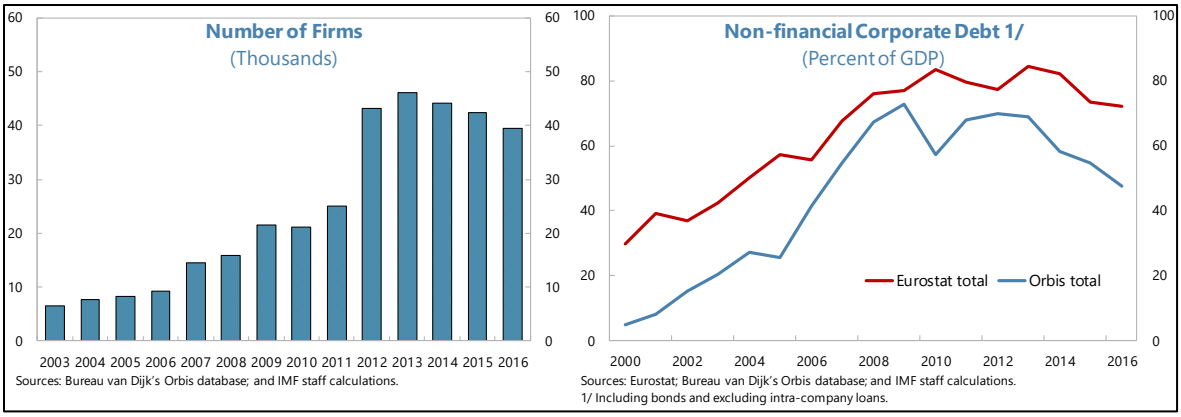
- *IK* is the investment-to-capital ratio. In the baseline, we use the gross investment which is constructed as the change in total fixed assets plus depreciation. In robustness tests we also use two alternative measures of investment: gross investment in tangible fixed assets and net investment. Both are commonly used in the literature (see, e.g., Turk 2017, Kalemli-Ozcan et al. 2015b; Lang et al. 1996). Net investment is measured as simply the annual change in total fixed assets. One could argue that net investment is what matters for future production capacity. Another advantage of using net investment is that a significant number of firms with missing depreciation data would be kept in the sample. The correlation of the gross investment with the two alternative measures of investment is 0.95 and 0.92, respectively.

- *D* represents two measures of corporate debt overhang: ICR (measured as earnings before interest and taxes divided by interest expenses) and debt-to-asset ratio. In line with earlier discussions, the debt data do not include trade credit. However, they also exclude intra-company loans. This is because in Orbits data intra-company loans are lumped together with other current liabilities including trade credit as well as tax, pension, and personnel liabilities. About half of the firms have zero debt. This may represent misreporting. These firms are excluded in the baseline regressions. Including them does not change the conclusion. Finally, lagged debt is used to control for potential endogeneity.

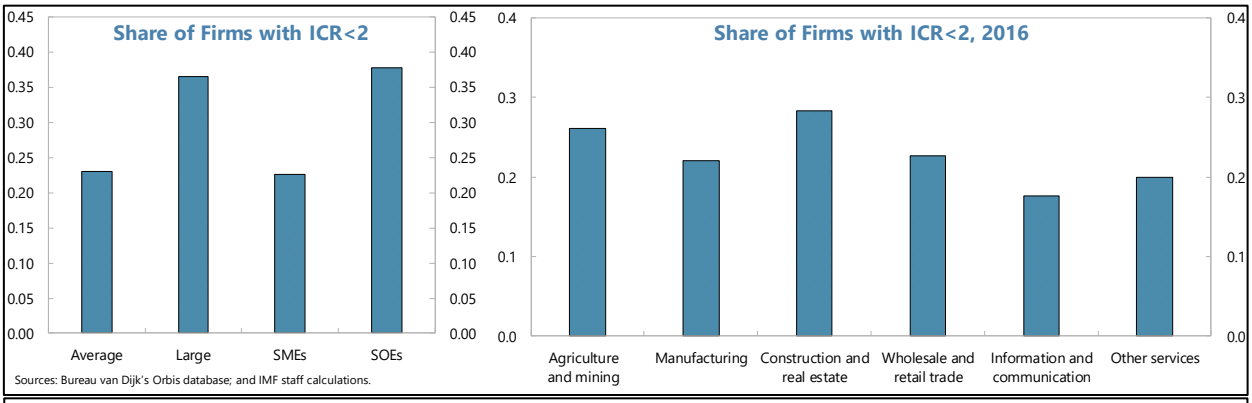
- SK represents the sales-to-capital ratio to control for standard sales-accelerator effects.

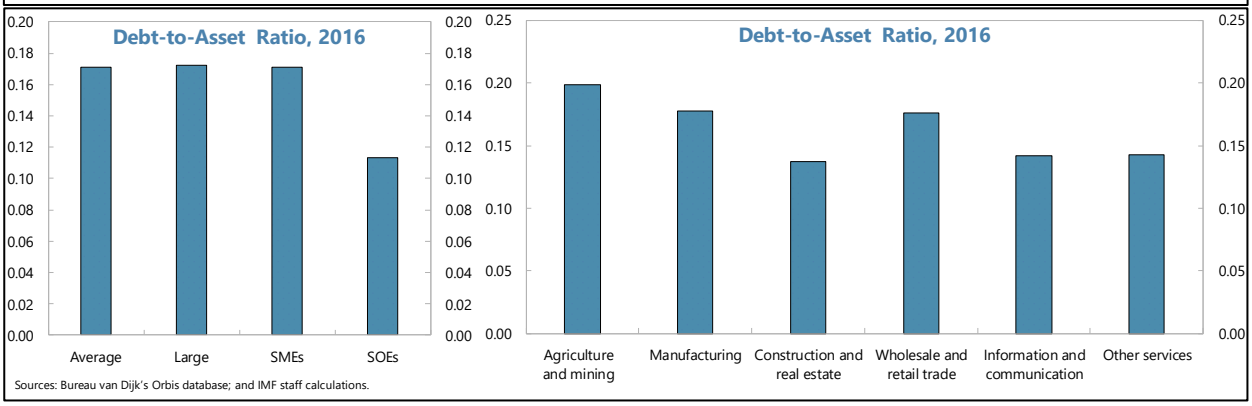
7. We use the Blundell and Bond (1998) two-step system GMM for the estimation. The standard panel fixed effects estimator would be inconsistent since the lagged dependent variable is correlated with the error term u_{it} in equation (1) (which cannot be addressed by the within transformation). Blundell and Bond (1998) proposed a system estimator that estimates equation (1) both in level and in difference, using lagged differences as instruments for the level equation and lagged levels as instruments for the differenced equation. This system estimation is more efficient than single equation estimation, while producing consistent estimates for dynamic micro panels with a large number of individuals over a short time period.

8. We clean the data following the common practice in the literature (see, e.g., Kalemli-Ozcan et al., 2015; Duval and Hong, 2017). In particular, we drop duplicates in terms of firm ID and year, and drop the entire company (all years) if total fixed assets, tangible fixed assets, or sales are negative in any year. We also restrict our analysis to firms with at least four consecutive observations and at least three employees. Excluding very small firms is due to concerns on data reliability and data consistency over time. Finally, to minimize the impact of outliers we exclude observations at the top and bottom 5th percentile for each variable. The number of firms increases substantially since 2008.



9. Orbits debt data seem to represent aggregate data reasonably well. While the total NFC debt from Orbits (by adding up firm-level debt) is smaller than the total debt from Eurostat, the two series move broadly in line. Table 1 reports the summary statistics. Average ICR stands at 13.4 (median 4.6) and average debt-to-asset ratio is 18 percent (median 15 percent). But for both variations across firms are large. Across firm types, SOEs and large firms have relatively higher share of firms with ICR lower than two (more than 35 percent). For SOEs this is despite the fact that their debt-to-asset ratio is relatively low, suggesting low profitability. SMEs (defined as firms with less than 250 employees) have relatively low share of firms with ICR lower than two. The construction and real estate sectors have the highest share of firms with ICR lower than two (28 percent) even though the leverage of the sectors is not particularly high, again reflecting low profitability. The information and communication sectors have the lowest share of firms with ICR lower than two, corresponding to relatively low debt-to-asset ratio. The agriculture and mining sectors have the highest debt-to-asset ratio, followed by the manufacturing and wholesale and retail trade sectors.





D. Empirical Results

10. High NFC debt overhang is found be to be negatively associated with investment in the baseline regressions (Table 2). High debt overhang (as measured by low ICR or high debt-to-asset ratio) are found to have a negative and statistically significant association with investment for the whole sample at 1 percent level of statistical significance. The results suggest that if a firm's ICR is raised from the 25th percentile (1.6) to the 75th percentile (15.5), the investment-to-asset ratio would rise by 2.6 p.p., or 9 percent. If a firm's debt-to-asset ratio declines from the 75th percentile (28 percent) to the 25th percentile (6 percent), the investment-to-capital ratio would rise by 2.3 p.p., or 8 percent. Sales enter the regressions with expected sign and are statistically significant at the 1 percent level.

11. The results hold for both the pre- and post-GFC periods. Both ICR and debt-to-equity ratio are significant at the 1 percent level with expected sign in both sub-periods. Somewhat surprisingly, the association is larger in the pre-GFC period. We note that the firm size in the pre-GFC sample is substantially smaller. For debt-to-asset ratio, a possible explanation is that the post-GFC low interest rates have made the impact of corporate leverage on investment smaller, as the interest payment would be smaller for the same level of debt. In all regressions, the Arellano-Bond test finds no second-order correlation for residuals in differences. The Hansen test of overidentifying restrictions rejects the null that the instruments are jointly exogenous. However, it has been argued that the Hansen test should not be relied upon too faithfully, because it is prone to weakness (see, e.g., Roodman 2009).

12. Sectoral analysis also points to the same conclusion (Tables 3 and 4). Across all sectors, firms with lower ICR tend to invest less, and the coefficients are statistically significant. The effect is the largest in the agriculture and mining sectors (where the coefficient is significant at the 1 percent level), and the smallest in the information and communication and other services sectors (where the coefficients are significant only at the 10 percent level). For the manufacturing and construction real estate sectors, the coefficients are in between in magnitude and are also significant at the 1 percent level. Firms with higher debt-to-asset ratio also invest less, although the coefficients are not statistically significant in the construction/real estate and information/communication sectors. The sample size for the latter is the smallest among all sectors. The association between NFC leverage and investment is the highest for the agriculture and mining sectors, followed by the other services sector, and the coefficients are statistically significant at the 1 percent level. For the manufacturing and wholesale and retail trade sectors, high indebtedness is also associated with lower investment, though the coefficients are smaller and only significant at the 10 and 5 percent levels, respectively. In all regressions sales enter the regression with the expected sign and are statistically significant at the 1 percent level.

13. Additional robustness checks broadly confirm the negative association of debt overhang with firm investment.

- Table 5 reports the results for large firms and SMEs separately. SMEs account for about 97 percent of total firms. For both groups firms with lower ICR tend to invest less and the

coefficients are statistically significant at the 1 percent level. Unlike in Bluedorn and Ebeke (2016) which cover Eurozone countries, we find the association of NFC debt with investment smaller for SMEs. Debt-to-asset ratio is negative as expected, though only statistically significant for SMEs.

- Table 6 reports the results using gross investment in tangible fixed assets and net investment instead of gross total fixed investment. Both ICR and debt-to-asset ratio enter the regression with the expected sign and are statistically significant.

- Table 7 reports the results using debt-to-equity ratio instead of debt-to-asset ratio. Firms with debt-to-equity ratio also invest less, both for the whole sample and sub-periods, and the coefficients are statistically significant.

- Table 8 reports results keeping all firms with zero debt. Both debt-to-asset and debt-to-equity ratios are negative, but only the debt-to-equity ratio is statistically significant at the 10 percent level (Columns (1) and (4)). We then include a dummy for firms with zero debt and its interaction with sales. Both terms are insignificant but the significance levels of debt-to-asset and debt-to-equity have improved, now at the 1 percent and 5 percent levels, respectively (Columns (2) and (5)). We further create a dummy for firms with 0 or low debt, where low debt is defined using the cutoff of 25th percentile among firms with positive debt. The results are reported in Columns (3) and (6) which also include the interactions of the low debt dummy with debt overhang and sales. Notwithstanding potential measurement errors for firms with zero debt, the results suggest that for firms with low debt, debt would not be a deterrent for investment.

E. Concluding Remarks

14. The study confirms a negative association between measures of debt overhang and investment for Bulgarian NFCs using firm-level data. Bulgaria's NFCs are the most leveraged among NMS. The findings suggest that high NFC debt overhang could be an important drag on investment. While credit demand is likely to pick up in line with economic activity, high NFC indebtedness could continue to stand in the way of corporate credit recovery. A possible direction for future work is to investigate the existence of different investment cycles across business activities/sectors, and their role in explaining the identified negative relationship.

15. Policies that help reduce the corporate debt overhang could help boost credit and growth. Policy initiatives such as an efficient corporate debt restructuring framework and tax measures could help corporate deleveraging (Goretti 2015). Reforms that improve business environment (e.g., strengthening governance) could help improve corporate productivity and profitability.

Table 1. Bulgaria: Summary Statistics (2003-16)						
	Obs.	Mean	Std. Dev.	25th perc.	Median	75th perc.
Investment-to-capital ratio	345,182	0.28	0.52	-0.01	0.08	0.35
Interest coverage ratio	298,864	13.4	21.3	1.6	4.6	15.5
Debt-to-asset ratio	191,138	0.18	0.14	0.06	0.15	0.28
Sales-to-capital ratio	392,110	13.1	25.5	1.8	4.6	14.2
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.						

Table 2. Bulgaria: Corporate Debt Overhang and Investment (baseline)						
	(1)	(2)	(3)	(4)	(5)	(6)
	ICR	*Debt/asset*	*ICR*		*Debt-to-asset ratio*	
	whole sample period		*2003-2008*	*2009-16*	*2003-08*	*2009-16*
Lagged investment	0.020***	0.029***	0.051***	0.010**	0.058***	0.018***
	(0.004)	(0.005)	(0.011)	(0.004)	(0.014)	(0.005)
Debt overhang	0.002***	-0.108***	0.003***	0.002***	-0.404***	-0.135***
	(0.000)	(0.034)	(0.001)	(0.000)	(0.062)	(0.036)
Sales	0.003***	0.005***	0.006***	0.003***	0.008***	0.004***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)
AR(1) test	-60.49***	-53.61***	-19.1***	-57.2***	-18.61***	-49.66***
AR(2) test	-0.98	-0.67	-1.34	-1.25	-1.50	-1.03
Hansen test	932.27***	675.5***	264.0***	772.0***	225.92***	535.77***
No. of obs.	168860	112585	18001	149858	15113	97472
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.						
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.						

Table 3. Bulgaria: Corporate Debt Overhang and Investment (by sectors using ICR)						
	Agriculture/mining	Manufacturing	Construction/real estate	Wholesale and retail trade	Information/ communication	Other services
Lagged investment	0.021***	0.024***	0.043***	0.010*	-0.018	0.027***
	(0.008)	(0.008)	(0.010)	(0.006)	(0.012)	(0.010)
ICR	0.003***	0.002***	0.002***	0.002***	0.001*	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Sales	0.004***	0.004***	0.004***	0.003***	0.006***	0.004***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
AR(1) test	-21.4***	-28.1***	-17.9***	-40.5***	-9.28***	-18.0***
AR(2) test	0.89	-2.03**	1.53	-1.20	-0.78	0.27
Hansen test	243.0**	388.5***	136.1***	488.4***	66.8**	141.5***
No. of obs.	15739	37130	19116	73998	4619	18171
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.						
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.						

Table 4. Bulgaria: Corporate Debt Overhang and Investment (by sectors using debt-to-asset ratio)						
	Agriculture/mining	Manufacturing	Construction/real estate	Wholesale and retail trade	Information/ communication	Other services
Lagged investment	0.031***	0.037***	0.057***	0.025***	0.011	0.036***
	(0.007)	(0.009)	(0.013)	(0.007)	(0.026)	(0.013)
Debt-to-asset ratio	-0.427***	-0.121*	-0.129	-0.125**	-0.242	-0.309***
	(0.065)	(0.066)	(0.092)	(0.051)	(0.252)	(0.081)
Sales	0.004***	0.006***	0.005***	0.004***	0.009***	0.005***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)
AR(1) test	-19.86***	-24.6***	-16.5***	-35.7***	-8.0***	-15.0***
AR(2) test	-0.79	-1.98**	-1.96**	-0.95	-0.95	-0.99
Hansen test	211.0***	190.4***	97.6***	562.1***	54.4*	96.9***
No. of obs.	12287	26334	12959	49413	2453	9055
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.						
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.						

Table 5. Bulgaria: Corporate Debt Overhang and Investment (by firm size)				
	ICR		*Debt-to-asset ratio*	
	Large firms	*SMEs*	*Large firms*	*SMEs*
Lagged investment	0.102***	0.017***	0.081***	0.026***
	(0.009)	(0.004)	(0.012)	(0.005)
Debt overhang	0.002***	0.002***	-0.059	-0.108***
	(0.001)	(0.000)	(0.130)	(0.035)
Sales	0.005***	0.003***	0.033***	0.005***
	(0.002)	(0.000)	(0.005)	(0.000)
AR(1) test	-10.1***	-59.4***	-9.17***	-52.6***
AR(2) test	-1.74*	-0.95	-2.53**	-0.62
Hansen test	111.8***	899.2***	73.8**	653.6***
No. of obs.	5138	163692	4113	108446
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.				
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.				

Table 6. Bulgaria: Robustness Tests (alternative measures of investment)				
	Gross investment in tangible fixed assets		Net investment	
	ICR	*Debt-to-asset ratio*	*ICR*	*Debt-to-asset ratio*
Lagged investment	0.024***	0.032***	0.039***	0.049***
	(0.003)	(0.004)	(0.004)	(0.004)
Debt Overhang	0.002***	-0.128***	0.002***	-0.074***
	(0.000)	(0.037)	(0.000)	(0.029)
Sales	0.004***	0.005***	0.001***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
AR(1) test	-60.0***	-53.2***	-66.7***	-57.0***
AR(2) test	-1.73*	-1.33	-0.74	-0.31
Hansen test	994.6***	674.2***	817.2***	935.3***
No. of obs.	183991	123002	180223	121483
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.				
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.				

Table 7. Bulgaria: Robustness Tests (alternative measure of leverage)			
	2003-16	*2003-08*	*2009-16*
Lagged investment	0.041***	0.087***	0.028***
	(0.004)	(0.015)	(0.005)
Debt-to-equity ratio	-0.014**	-0.040***	-0.024***
	(0.006)	(0.013)	(0.007)
Sales	0.005**	0.012**	0.004**
	(0.000)	(0.002)	(0.000)
AR(1) test	-53.0***	-17.9***	-49.6***
AR(2) test	-0.25	-1.76*	-0.40
Hansen test	1009.4***	271.4***	811.0***
No. of obs.	113772	12736	101036
Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis. Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.			

Table 8. Bulgaria: Robustness Tests (keeping firms with zero debt)						
	Debt-to-asset ratio			Debt-to-equity ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged investment	0.041***	0.040***	0.041***	0.043***	0.042***	0.042***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Debt overhang	-0.032	-0.063***	-0.053*	-0.009*	-0.011**	-0.012***
	(0.024)	(0.020)	(0.027)	(0.005)	(0.005)	(0.004)
Sales	0.001***	0.002***	0.002***	0.001***	0.002***	0.002***
	(0.0002)	(0.0003)	(0.000)	(0.0002)	(0.0003)	(0.000)
Dummy for debt=0		-0.002			-0.001	
		(0.006)			(0.006)	
Dummy for debt/asset <6.5%			0.002			0.002
			(0.008)			(0.006)
Debt overhang* low debt dummy			0.332**			0.078***
			(0.130)			(0.023)
Sales*zero or low debt dummy		-0.0004	-0.0004		-0.0004	-0.0004
		(0.0003)	(0.0003)		(0.0003)	(0.0003)
AR(1) test	-83.6***	-82.6***	-83.3***	-84.1***	-84.1***	-81.0***
AR(2) test	-1.87*	-1.98*	-1.96*	-1.75*	-1.86*	-1.70*
Hansen test	1451***	1696***	1799***	1400***	1637***	1713***
No. of obs	241792	241792	241792	242380	242380	242380

Note: ***, **, * indicate significance at 1, 5, and 10% level. Standard errors in parenthesis.
Sources: Bureau van Dijk's Orbis database; and IMF staff calculations.

References

Bluedorn, John and Christian Ebeke, 2016, "Investment, Firm Size, And The Corporate Debt Burden: A Firm-level Analysis Of The Euro Area," IMF Country Report No. 16/220 (Selected Issues Paper).

Blundell, R. and S. Bond, 1998. Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, Elsevier, vol. 87(1), pages 115–143, August.

Bulgaria National Bank, 2013, *Economic Review* 2013/1.

Duval, Romain and Gee Hee Hong, 2017, "The Impact of Firm Balance Sheet Vulnerabilities And Credit Conditions on the Postcrisis Productivity Slowdown," Technical Appendix II of "Gone with the Headwinds: Global Productivity," IMF Discussion Note 17/04.

Goretti, Manuela, 2015, "Non-financial Corporate Debt Overhang In Bulgaria," IMF Country Report No. 15/120 (Selected Issues Paper).

Goretti, Manuela, Marcos R. Souto, 2013, "Macro-Financial Implications of Corporate (De)Leveraging in the Euro Area Periphery," IMF Working Paper No. 13/154.

International Monetary Fund, 2015a, World Economic Outlook, April, Chapter 4, "Private Investment: What's the Holdup?"

International Monetary Fund, 2015b, Central, Eastern, and Southeastern Europe Regional Economic Issues.

Kalemli-Ozcan, Sebnem, Bent Sorensen, Carolina Villegas-Sanchez, Vadym Volosovych, Sevcan Yesiltas, 2015a, "How to Construct Nationally Representative Firm Level Data From the Orbis Global Database," NBER Working Paper 21558.

Kalemli-Ozcan, Luc Laeven, David Moreno, 2015b, "Debt Overhang, Rollover Risk and Investment In Europe," manuscript.

Lang, Larry, Eli Ofek, and Rene M. Stulz. 1996. "Leverage, Investment, and Firm Growth." *Journal of Financial Economics* 40 (1):3–29.

Lang, Larry, Eli Ofek, and Rene M. Stulz. 1996. "Leverage, Investment, and Firm Growth." *Journal of Financial Economics* 40 (1):3–29.

Myers, Stewart C. 1977. "Determinants of Corporate Borrowing." *Journal of Financial Economics* 5 (2):147–175.

Roodman, David, 2009, "How to do xtabond2: An introduction to difference and system GMM in Stata," The Stata Journal 9, Number 1, pp. 86–136.

PricewaterhouseCoopers, 2013/14, "International Transfer Pricing."

Turk, Rima, 2017, "Dynamics of Firm Investment in Denmark: Role of Leverage, Demand, and Knowledge Intensity," IMF Country Report 17/159.

EFFICIENCY ANALYSIS FOR EXPENDITURES IN PUBLIC INVESTMENT AND EDUCATION[1]

A. Introduction

1. Improving public spending efficiency is important for Bulgaria to reconcile development needs and fiscal sustainability. Bulgaria needs to maintain adequate public expenditure for public services and infrastructure which are key to raising economic growth potential and improving living standards. Meanwhile, Bulgaria needs to restrain public expenditure in order to meet the medium-term fiscal consolidation objective and to cope with an expected increase in fiscal costs due to population aging. Given the potential conflict between development needs and fiscal sustainability, it is essential for Bulgaria to improve the efficiency of public spending. Indeed, Bulgaria envisages strengthening public spending efficiency in its medium-term budget framework 2018-2020.

2. This paper assesses the efficiency of Bulgaria's public spending in two areas: public investment and education. These two areas are important determinants of economic growth. Public investment could increase productivity and support growth through the provision of public services and infrastructure (Aschauer, 1989; Aghion and Howitt, 2009; Fournier, 2016). Education could foster economic growth through human capital development (Mankiw et al., 1992; Sala-i-Martin et al., 2004).[2] Education is also chosen as it could play an important role in reducing income inequality in Bulgaria, which remains one of the highest in EU (Dabla-Norris et al., 2015).

3. The efficiency of public spending is measured by using the Data Envelopment Analysis (DEA).[3] The DEA is among the most useful and widely used methods to measure the efficiency of various public spending. The DEA evaluates the expenditure efficiency of a country by comparing it with that of the best performing countries (Annex I).

4. This paper finds that there is a large scope for improving public investment efficiency, and to a lesser extent, spending efficiency on education. The analysis shows that Bulgaria's public investment efficiency is lower than the average of the New Member States (NMS), and strengthening public investment management institutions is a key to improving the efficiency of public investment. On the other hand, Bulgaria's efficiency of education spending is found to be

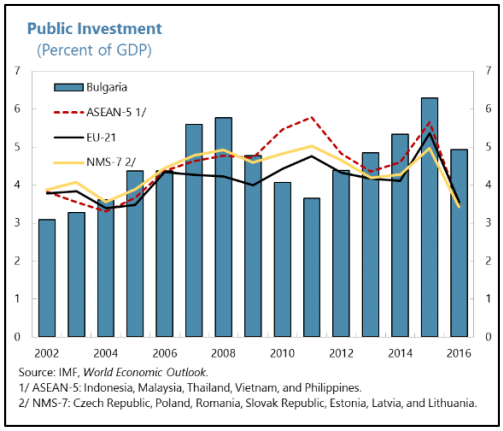
[1] Prepared by Hiroaki Miyamoto.

[2] Moreover, the recent studies find that the economic impact of public investment and education depends on their efficiency. Gupta et al. (2014) and IMF (2014) show that countries with more efficient public investment also see stronger relationships between investment and economic growth. Gonald (2007) demonstrates that efficient education spending amplifies the impact of education on growth.

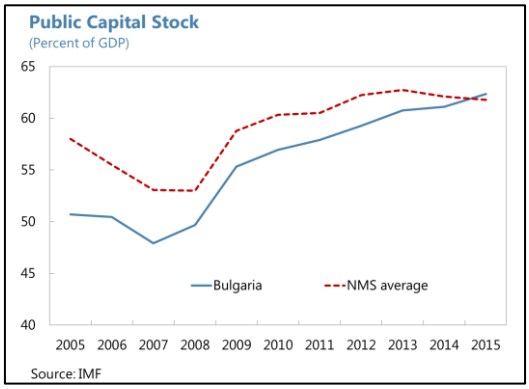
[3] This paper also uses Expenditure Assessment Tool (EAT) developed by IMF (2017b).

higher than NMS peers, but its education spending and educational outcomes remain low. More resources and access to education are needed to improve educational outcomes.

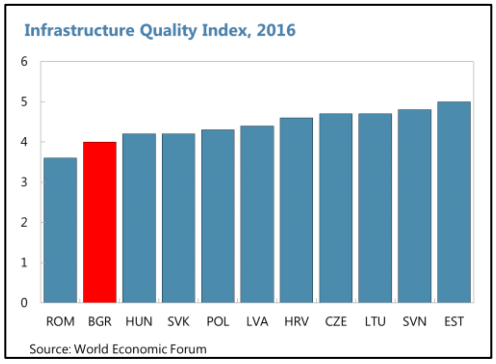
B. Public Investment



5. Bulgaria's public investment has been higher than the averages of the NMS and the EU countries. During the period between 2002-2016, the average public investment in Bulgaria was 4.5 percent of GDP.[4] This was higher than the NMS average of 4.3 percent and the EU average of 4.1 percent. In recent years, public investment relative to GDP has been even higher than that in fast-growing ASEAN-5 countries. Public investment in Bulgaria relies significantly on the EU funds and its profile follows the EU funds programming cycle (Box.1). EU funds accounted for around half of public investment during the period between 2007-2016.



6. Bulgaria's public capital stock caught up with the average of the NMS. Public capital stock data are drawn from IMF Investment and Capital Stock Dataset, which constructs public capital stock by using the perpetual inventory method.[5] Bulgaria's public capital stock was 50.7 percent of GDP in 2005, which was much lower than the NMS average of 58 percent. However, due to the increased public investment, the stock of public capital increased to 62.3 percent of GDP in 2015, and is now in line with the NMS average (Figure 1).



7. However, quality of Bulgaria's infrastructure is seen to be lagging, implying inefficient public investment. According to the 2016 WEF Global Competitive Index, Bulgaria's perceived infrastructure quality ranked 70th out of 138 countries, which was the second lowest among the NMS.[6] When compared to NMS peers, the quality of transport infrastructure is weak in all areas, particularly in roads. Regarding access and coverage of social and economic infrastructure, measures for roads and education are much lower than peers, while other areas are comparable to peers (Figure. 1).

[4] Public investment is measured using gross fixed capital formation of the general government.

[5] IMF (2017a) describes in great detail the investment series' definitions as well as the methodology in constructing the stock series.

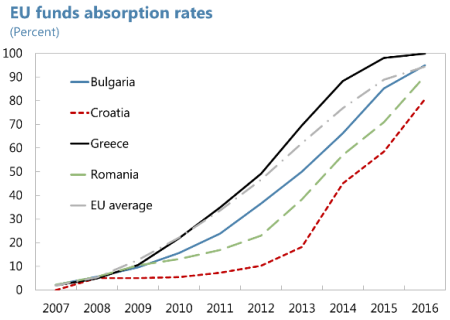
[6] Atoyan et al. (2017) assess shortfalls of public infrastructure in the Western Balkans and find these gaps to be large.

Box 1. EU Funds

The EU Funds are designed and implemented in a partnership between the European Commission (EC) and national authorities. The funding is always accompanied by public and private financing with the co-financing rate of 15 percent of the project costs.

The programming period is 7 years and the project finance consists of three stages. When the program is set up, there is initial pre-financing and afterwards there are subsequent interim and post payments. This financial management scheme creates the difference between cash and accrual fiscal balances. Due to the "N+3 rule" that gives the country 3 more years to spend the money allocated, the actual implementation period is 10 years.

In the 2007-2013 programming period, Bulgaria's EU funds absorption rate was 95 percent, which was in line with the EU average. Since it takes time to plan, submit, and adopt projects, the absorption of the EU funds is often low in the first years of the program period. By contrast, typically large amounts of payments are claimed towards the end of the project implementation and thus the absorption of the EU funds is heavily back-loaded.

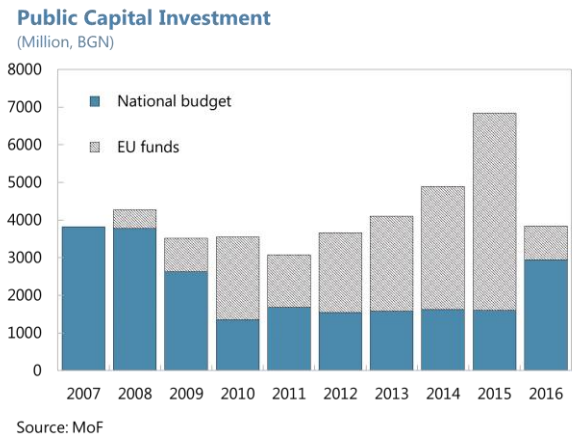


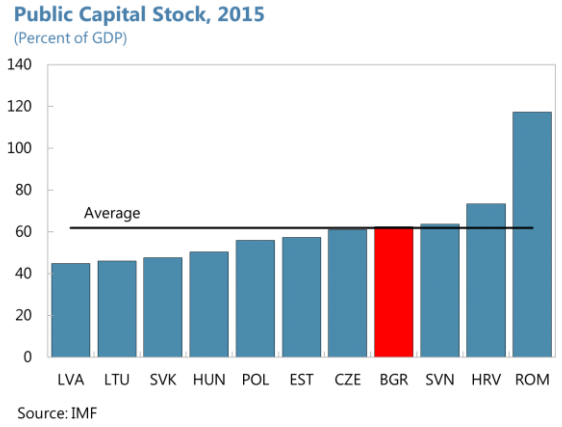
Source: European Commission and IMF staff calculations

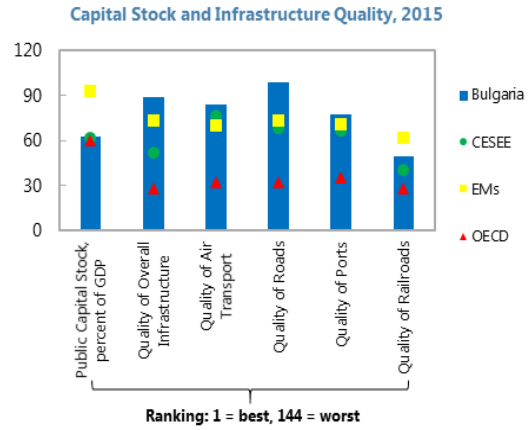
EC has introduced a new regulatory framework to incentivize countries to deliver on EU priorities in the 2014-2020 programming period. Before the programs are adopted, countries have to fulfill a set of legal, policy, and institutional requirements (ex-ante conditionalities). To ensure that programs are kept on track to achieve their objectives, the performance framework and reserve are also included as compulsory elements.

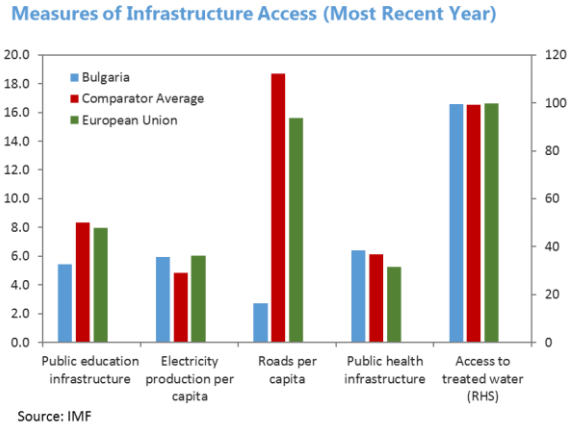
For the programing period of 2014-2020, Bulgaria has been allocated 9.88 billion euro, which is more than twenty percent of GDP. With a national contribution of 1.86 billion euro, Bulgaria has a total budget of 11.73 billion euro. Due to the closure of the previous program cycle and the delay of regulation setting by EC, the absorption rate of EU funds has been low under the current program. However, Bulgaria's EU funds absorption rate in 2017 is higher than the average of EU countries. This is owing to some reforms such as introducing e-application and e-reporting, and accumulated experience from the previous programming period.

Figure 1. Bulgaria: Public Investment, Public Capital Stock, and Infrastructure Quality







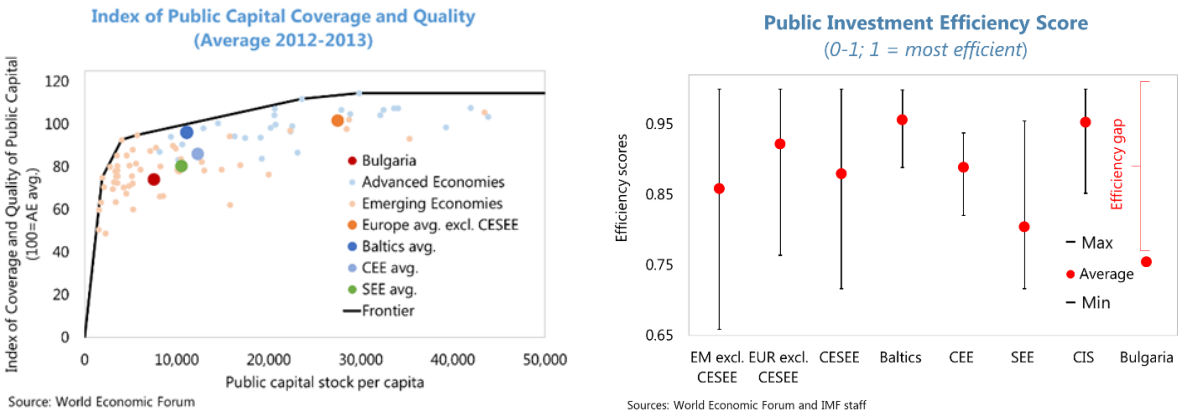


8. Quantitative analysis confirms that the efficiency gap of public investment in Bulgaria is larger than peer countries. The efficiency of public investment is assessed by using the DEA. It compares a country's input-outcome combination with an efficiency frontier comprised of countries, each of which attains the highest level of outcome for a given level of input among sample countries (details in Annex I). The country's distance from the efficiency frontier provides a measure of its efficiency, which is summarized by an efficiency score.[7] The efficiency score is used to estimate potential gains by improving efficiency to the levels of best performers. Using the level of public capital stock as the input indicator and Public Capital Coverage and Quality index as the outcome

[7] The efficiency scores take values between 0 and 1. The closer to the efficiency frontier, the higher the efficiency score.

indicator, the analysis shows that Bulgaria is far away from the efficiency frontier.[8] The estimated efficiency score of Bulgaria is 0.75, which is lower than that of peer countries. The efficiency score implies that Bulgaria has an efficiency gap of 25 percent.

Figure 2. Bulgaria: Public Investment Efficiency



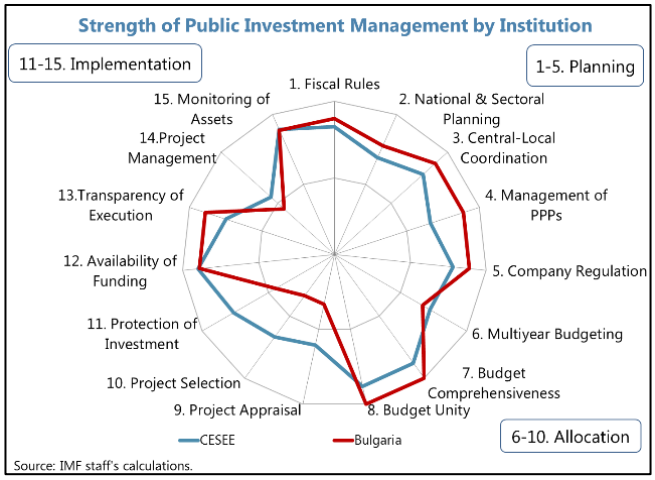
9. Public investment efficiency can be improved by strengthening public investment management (PIM) institutions. Public investment efficiency could be affected by many factors including the level of economic development, the quality of governance, and structural characteristics of the economy (IMF, 2016). Nonetheless, there is growing evidence that public investment management is one of the most important factors of public investment efficiency (Balassone and Franco, 2000; Dabla-Norris et al., 2012). IMF (2015) develops the case that stronger PIM institutions lead to more efficient public investment, which in turn improves the growth dividend of investment and increases the impact of public capital on economic and social outcomes.

10. Staff analysis identifies areas of PIM institutions for improvement. The Public Investment Management Assessment (PIMA) framework developed by IMF identifies areas of weakness in a country's public investment management system.[9] Although Bulgaria has not undertaken the PIMA assessment, IMF (2016) computed the PIMA scores for Bulgaria based on the assessments of country authorities and IMF staff.[10] The results suggest that Bulgaria is weak in project appraisal and selection, protection of investment, and project management.

[8] In order to capture both quantity and quality of infrastructure, this paper uses the Public Capital Coverage and Quality index that combines indicators of the quality of infrastructure (from World Economic Forum) with indicators of coverage of public capital stock (reflecting access to water, roads, electricity, health, schools). See IMF (2015) for further details.

[9] Specifically, the PIMA evaluates 15 key institutions for planning, allocating, and implementing public investment. For each of the 15 institutions, three key features are identified, each of which can be fully met, partly met, or not met. Based on how many of these key features are in place, countries are given scores.

[10] The scores are based on the PIMA's questionnaire that assesses 15 PIM institutions. The scoring was performed by IMF staff on the basis of country authorities' answers to the questionnaire.



11. In general, to address these identified weaknesses in PIM institutions, several reform actions are recommended. To improve project appraisal and selection as well as project management, the following actions are important: (i) undertaking and publishing appraisals for all major projects, (ii) developing procedures for project adjustment throughout the implementation, and (iii) conducting ex-post review/evaluation of projects. While Bulgaria made some progress in these areas, a comprehensive assessment of PIM can be useful. In the area of project appraisal, for instance, the authorities have undertaken cost-benefit analyses for major EU-funded projects. In light of the importance of significantly improving PIM institutions and in view of the weakness in several areas, PIMA can provide a more comprehensive analysis and practical country-specific recommendations.

C. Education

12. In Bulgaria, public spending on education remains low and educational resources are not sufficiently provided. Although public spending on education increased to 4 percent of GDP in 2015 from 3.6 percent in the mid-2000s, it was still below the NMS average of 4.9 percent and among the lowest in the EU countries (Figure 3). The composition of education spending shows that the low education spending arises from low spending on wage bills, and goods and services. In per-student terms, Bulgaria's public spending on education is lower than peers at all levels of education, particularly at the tertiary level. The teacher-student ratios in Bulgaria are lower than those in the region. Regarding instruction time, the average minimum instruction time per year in primary education is 468 hours in Bulgaria, much lower than the EU average of 734 hours (Eurydice, 2017). Furthermore, teachers in Bulgaria are among the lowest-paid in Europe and half of them are close to retirement.

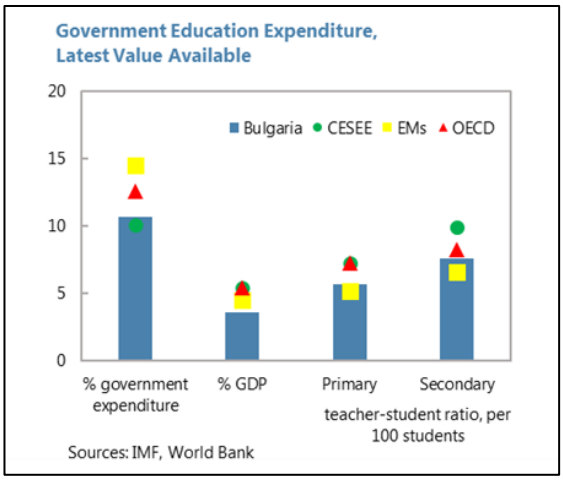
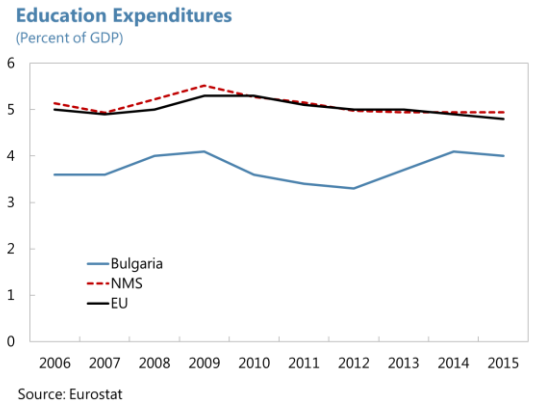
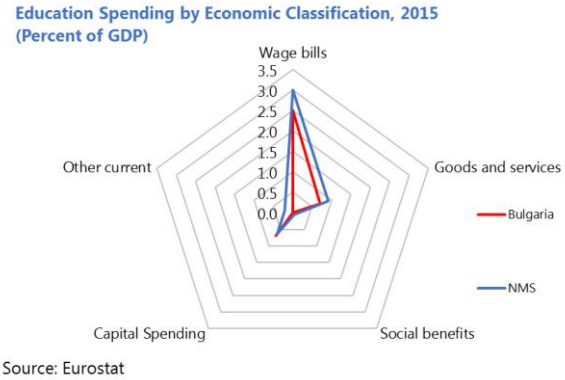


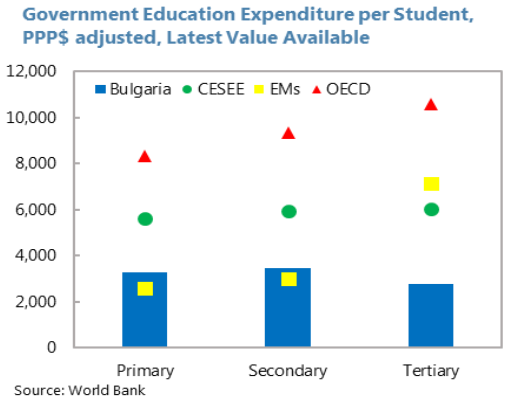
Figure 3. Bulgaria: Education Inputs and Outcomes



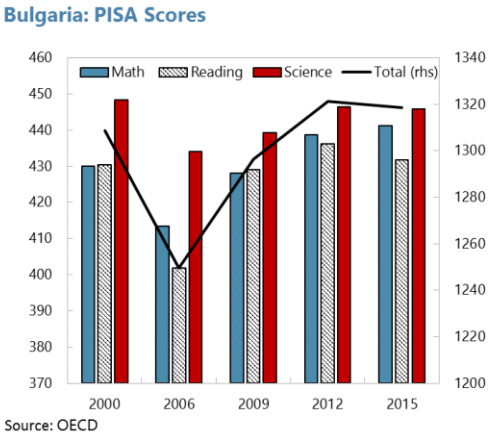
Source: Eurostat



Source: Eurostat

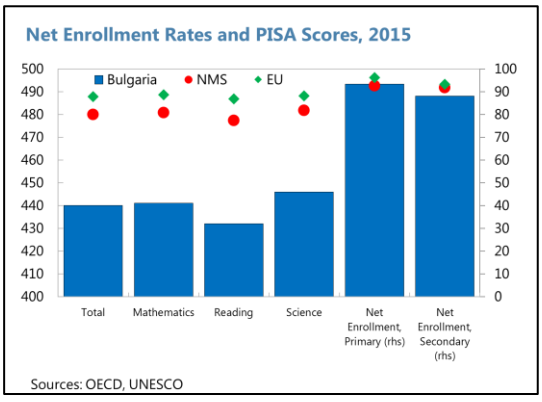


Source: World Bank



Source: OECD

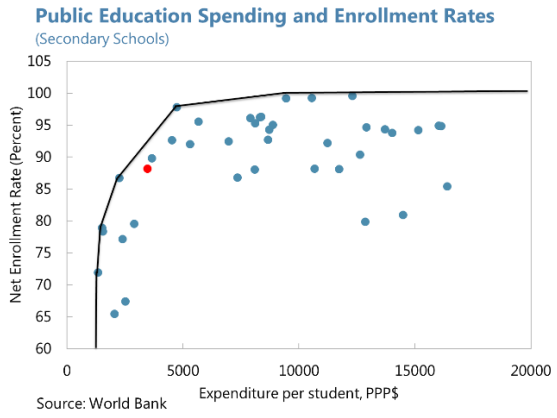
13. Performance of education appears to be mixed. Bulgaria's enrollment rates at primary and secondary education in 2015 were 93.3 percent and 88.3 percent respectively, in line with peers. However, students' achievement in basic skills is lagging. Performance in the 2015 Program for International Student Assessment (PISA) was low compared to the EU standard and peers' average in all subjects, though the overall PISA scores had gradually increased (Figure 3). The poor performance in PISA 2015 was due to a combination of equity challenges and educational factors such as curricula and teaching (EC, 2017). Around 60 percent of students from the bottom socio-economic quartile failed to achieve a minimum level of basic skills, indicating that low educational outcomes are linked to socio-economic background. At the same time, the proportion of top-performing students in PISA was low relative to the EU average. This suggests the need to strengthen the quality of education alongside improvement in equity.

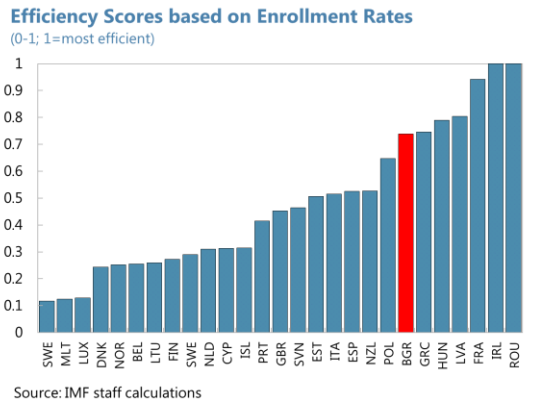


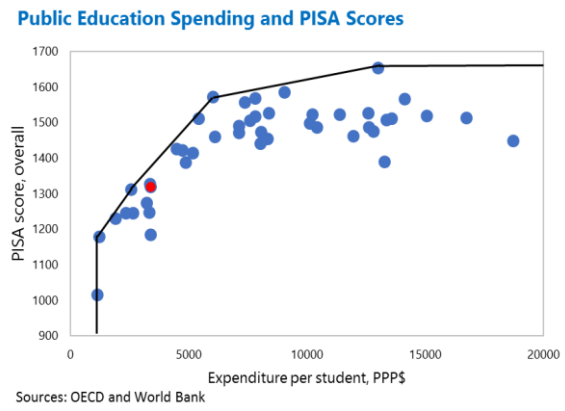
Sources: OECD, UNESCO

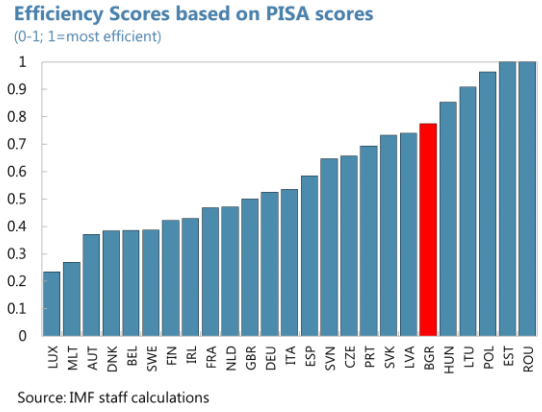
14. However, the DEA suggests that the efficiency of education spending in Bulgaria is higher than NMS peers. The DEA can use either enrollment rates or the PISA scores as the output indicator. When enrollment rates of secondary schools are used, the analysis uses the public secondary education expenditure per student ($US PPP) as the input indicator. When the PISA scores are used, the input indicator is the public primary and secondary education expenditure per student ($US PPP). In both cases, the DEA shows that Bulgaria is close to the efficiency frontier (Figure 4). Bulgaria's estimated efficiency scores are 0.74 for the case of enrollment rates and 0.78 for the case of the PISA scores. They are higher than the corresponding NMS averages of 0.65 and 0.62. The efficiency scores imply potential gains of 22-26 percent of public spending on education.

Figure 4. Bulgaria: Education Spending Efficiency

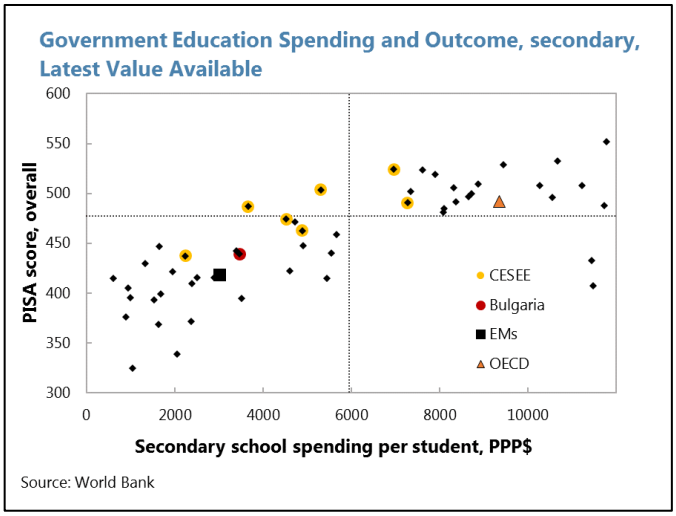








15. The priority should be put on improving educational outcomes and equal access to education. Although Bulgaria's efficiency of education spending is found to be higher than NMS peers, its education spending and educational outcomes remain low. As there is a positive correlation between spending on education and educational outcomes, Bulgaria could consider increasing its spending on education to enhance educational outcomes, as long as fiscal space allows it, including by cutting spending on other areas with low priority. In this context, the recent efforts to update the school curricula and textbooks as well as the plans to appreciably raise teachers' low salaries to attract young and qualified teachers are welcome. However, equal access to quality education remains a major problem for especially disadvantaged groups. Given the strong correlation between academic performance and socio-economic status in Bulgaria, additional efforts to provide a better and more equal access to quality education are needed.



D. Conclusion

16. Given the fact that improving public spending efficiency is crucial for Bulgaria to balance development needs and fiscal sustainability, this paper assesses the efficiency of Bulgaria's public spending. The DEA is employed to evaluate the efficiency of public expenditure on investment and education. The main findings include the following:

- **Public investment**: The DEA shows that the efficiency of public investment in Bulgaria is lower than NMS peers. Bulgaria's low efficiency of public investment could be improved by strengthening its PIM institutions. In particular, Bulgaria has weakness in project appraisal, selection, and management.

- **Education**: Bulgaria's efficiency of public spending on education is found to be higher than NMS peers, but its educational outcomes remain low. While Bulgaria is updating the curricula and raising teachers' salaries to improve educational outcome, further efforts, particularly to provide a better and more equal access to quality education, are needed.

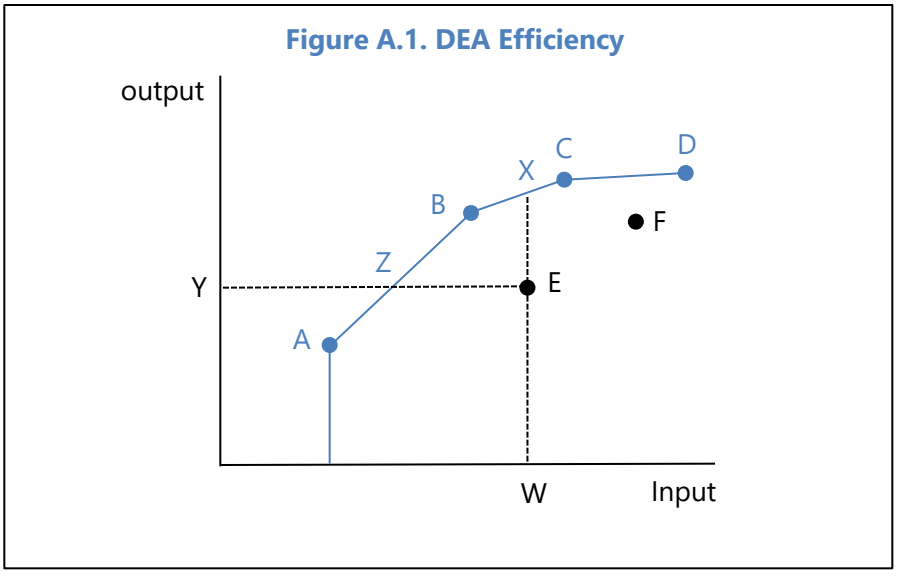
Annex I. Data Envelopment Analysis

1. The Data Envelopment Analysis (DEA) is a non-parametric approach that assesses the relative efficiency of decision making units. Based on the assumption of a convex production possibilities set, an efficiency frontier is constructed as the linear combination of efficient input and outcome combinations in the cross-country sample using linear programming techniques. The efficiency frontier is then used to measure the efficiency of individual countries. Specifically, a country's distance from the efficiency frontier provides a measure of its efficiency, which is summarized by an efficiency score. The efficiency scores take values between zero and one. The closer to the efficiency frontier, the higher the efficiency score.

2. Efficiency gains can be defined as the amount by which input could be reduced while leaving the level of output unchanged (input-based efficiency), or the amount by which output could be increased while holding the level of input constant (output-based efficiency). Figure A. 1 illustrates an example of the DEA based on a single input and output across countries. The efficiency frontier connects countries A to D as these countries dominate other input-output pairs (countries E and F). The convexity assumption allows an inefficient country (point E) to be assessed relative to a hypothetical position on the efficiency frontier (point Z) by taking a liner combination of efficient country pairs, such as points A and B. In this manner, an input-based efficiency score can be calculated as the ratio of YZ to YE. Similarly, an output-based efficiency score can be calculated as the ratio of XW to EW. This score reflects the improvement in output for given inputs that could be achieved from efficiency enhancement.

3. The DEA is a powerful tool to assess the relative efficiency of spending, but has important caveats. Results are highly sensitive to sample selection and measurement errors. Outliers are likely to have large impacts on the efficiency scores and the shape of the frontier. Thus, proper sample selection is critical to ensure that cross-country input-output bundles are comparable.

Figure A.1. DEA Efficiency



References

Aghion, P., and P. Howitt. 2009. Economics of Growth (Cambridge, MA: MIT Press).

Aschauer, D., 1989. "Is Public Expenditure Productive?" *Journal of Monetary Economics* 23: 177-200.

Atoyan, R., D. Benedek, E. Cabezon, G. Cipollone, J. Miniane, N. Nguyen, M. Petri, J. Reinke, and J. Roaf. 2017. "Public Infrastructure in the Western Balkans: Shifting Gears—Opportunities and Challenges," European Departmental Paper Series. International Monetary Fund, Washington, D.C.

Balassone, F., and D. Franco. 2000. "Public Investment, the Stability Pact, and the 'Golden Rule,'" *Fiscal Studies* 21 (2): 207-29.

Dabla-Norris, E., J. Brumby, A. Kyobe, Z. Mills, and C. Papageorgiou. 2012. "Investing in Public Investment: An Index of Public Investment Efficiency," *Journal of Economic Growth* 17 (3): 235-66.

Dabla-Norris, E., K. Kochhar, F. Ricka, N. Suphaphiphat, and E. Tsounta. 2015. "Causes and Consequences of Income Inequality: A Global Perspective," IMF Staff Discussion Note SDN/15/13, Washington, D.C.

European Commission (EC). 2017. Country Report Bulgaria 2017. Brussels.

Eurydice. 2017. Recommended Annual Instruction Time in Full-time Compulsory Education in Europe – 2016/17. Eurydice – Facts and Figures. Luxembourg: Publications Office of the European Union.

Fournier, J-M. 2016. "The Positive Effect of Public Investment on Potential Growth," *OECD Economic Department Working Papers*, No. 1345, OECD.

Gonand, F. 2007. "The Impact on Growth of Higher. Efficiency of Public Spending on Schools," *OECD Economics Department Working Papers*, No. 1347, OECD.

Gupta, S., A. Kangur, A, Wane, and C. Papageorgiou. 2014. "Efficiency-Adjusted Public Capital and Growth," *World Economic Development* 57(C): 164–78.

International Monetary Fund (IMF). 2014. "Is It Time for an Infrastructure Push? The Macroeconomic Effects of Public Investment," in World Economic Outlook, October 2014, Legacies, Clouds, Uncertainties, Chapter 3: October, pp. 75-114, ed. by Abdul Abiad and others (Washington).

———. 2015. Making Public Investment More Efficient. IMF Policy Paper. Washington, D.C.

———. 2016. Central, Eastern, and Southeastern Europe Regional Economic Issues. Washington, D.C.

———. 2017a. Estimating the stock of public capital in 170 countries. Washington, D.C. https://www.imf.org/external/np/fad/publicinvestment/pdf/csupdate_jan17.pdf

———. 2017b. Expenditure Assessment Tool (EAT). Technical Notes and Manuals. Washington, D.C.

Mankiw, N. G., D. Romer, and D. Weil. 1992. "A contribution to the empirics of economic growth," *Quarterly Journal of Economics* 107(2): 407–437.

Sala-i-Martin, X., G. Doppelhofer, and R. I. Miller. 2004. "Determinants of long-term growth: A Bayesian averaging of classical estimates (BACE) approach," *American Economic Review* 94(4): 813–835.