

Bulgaria: Spending Review on Policing and Firefighting



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ABBREVIATIONS AND ACRONYMS

BGN	Bulgarian Lev
BNP	Bulgarian National Police
COFOG	Classification of the Functions of Government
DDF	Directional Distance Function
DEA	Data Envelopment Analysis
DMU	Decision Management Union
ESA	European System of Accounts
EU	European Union
FM	Financial Management
GCI	Global Competitiveness Index
GDFSPP	General Directorate for Fire Safety and Protection of Population
GDNP	General Directorate National Police
GDP	Gross Domestic Product
GCI	Global Competitiveness Index
GOB	Government of Bulgaria
HQ	Headquarters
HR	Human Resources
ICT	Information and Communication Technologies
MOF	Ministry of Finance
MOI	Ministry of Interior
O&M	Operations and Maintenance
OSAMD	Ownership and Social Activities Management Department
RD	Regional Directorate
R&D	Research and Development
SLBU	Secondary Level Budget Unit
SR	Spending Review
TLBU	Third Level Budget Unit
UK	United Kingdom
UN	United Nations
WB	World Bank
WJP	World Justice Project

Executive summary

1. This study is an input to the first pilot Spending Review (SR) on Bulgaria. In 2016, the Government of Bulgaria (GoB) decided to initiate spending reviews to improve the efficiency and effectiveness of its spending in the context of a moderate fiscal consolidation process. Though Bulgaria has one of the lowest overall spending in the European Union (EU), spending outcomes lag those of other EU member states. In the case of public order and safety, Bulgaria spends the most among comparable EU countries but outcomes are not satisfactory. Surveys show that citizens have low confidence on the effectiveness of police. Police and firefighters in turn, have said that their effectiveness is constrained by the condition of equipment, excessive time spent on paperwork, additional responsibilities imposed in the frequently changed legislation, and by curtailed staff benefits.
2. To help address these challenges the Ministry of Finance (MoF) requested analytical and advisory support from the World Bank. Such support was intended to identify spending pressures and potential efficiency and effectiveness gains in policing and firefighting. In contrast to most spending reviews, where saving targets are identified upfront and the primary objective is to find ways of reducing the budget, the primary objective of this review is to increase performance and use any savings derived from efficiency gains for additional priority spending on policing and firefighting. A secondary objective is for this SR to help increase the transparency of spending on policing and firefighting, as information on spending categories and staff numbers has been very limited. The last objective is to inform forthcoming SRs produced by the GoB by creating awareness of different methodologies available for analysis.
3. Collaboration with MoI and MoF staff was critical in providing information for the analysis and serving as a sounding board for preliminary findings and conclusions. The usual caveats nevertheless apply, particularly given data issues and tight deadline. The findings are derived from standard methodologies that are based on assumptions and partial data, and thus need to be interpreted with caution. The timeline limited the depth of the analysis, and therefore, the report focuses on broad trends, noting interesting findings as well as unexpected findings. Understanding the underlying causes of these unexpected findings, as well as obtaining more specific recommendations would require additional analysis. It is hoped that this first attempt at understanding efficiency and effectiveness in police and firefighting spending will motivate further analysis in the area.
4. Recently, the MoI introduced reforms to contain spending and improve its effectiveness. The employment cuts over the last years have brought down the number of police officers to the EU average, a significant feat as Bulgaria had in 2008 one of the largest numbers of police officers relative to its population in the EU. The number of administrative staff was also reduced in line with the restructuring of MoI's organization and consolidating of second level budget units. In 2017, administrative and other low risk jobs were reclassified to general civil servants or under labor code to reduce the large social contributions paid by the MoI. Investments were made to modernize the transport park of police and firefighters, which until recently relied on donations from abroad. In addition, in 2017, the Ministry provided cash benefits to staff who had not received uniforms for five years in a row due to failures in procurement procedure.
5. Despite these improvements, the police and firefighting sector still faces three challenges. First, citizen perception of the reliability of police services remains the second lowest in the EU. Second, spending on public order and safety remains the highest among regional peers driven by personnel spending. Last, this high personnel spending leaves little space for some important spending of today and the future, like the modernization of equipment and systems.
6. Based on other country experiences, overcoming the above challenges will require actions around the following three pillars: 1) better use of human resources; 2) greater and better use of

complementary inputs; and 3) pay policies. These proposed actions require careful preparation and a strategy for implementation.

7. Human resources could be better used by reallocating staff across functions and across districts so that there are enough police and firefighters on the streets and by streamlining administration so that less staff time is spent on administration and more is spent on combating crime and ensuring safety. Cross-country comparisons suggest that the number of police officers in Bulgaria is comparable to other EU countries and therefore Bulgaria does not need more police officers. However, the number of MoI staff devoted to administrative functions is excessive. This is due to a complex organizational structure with duplication of administrative functions. The MoI has one of the largest number of second level budget units—functional and territorial—each with its own administration. While the structure was revised several times over the past years, there is still a large number of regional directorates (RDs) – the Czech Republic for example has half the number of RDs with 30 percent more population. The inefficiency in administrative spending is further increased by the inefficient allocation of administrative staff across RDs. These allocative inefficiencies are also present in the case of police officers. A data envelopment analysis (DEA) suggests that a significant share of the police and technology inputs at the regional level is not put to best use due to organizational factors internal to the MoI. The DEA suggests that there is significant scope for poor performing districts to learn from better performing districts, given the wide differences in efficiency across districts. There also appear to be issues with the allocation of firefighters, which could be improved to provide better services to population.

8. Human resources can be better used through the consolidation of administrative services, the use of shared administrative services and the efficient allocation of police and fire brigade staff. The existing 28 RDs could be consolidated into a smaller number of RDs, as some agencies in Bulgaria have already done. The sharing of some administrative services could also be established to support the RDs and the territorial units of the Gendarmerie and the General Directorate for Fire Safety and Protection of Population (GDFSPP). Such consolidation and sharing of services would help to allocate resources (human, financial and technological) more efficiently and provide savings for other needed spending. In addition, the allocation of police and fire brigade staff where they are most needed and can be most effective together with the reduction of paperwork will help improve public service enhancing citizen perception. This requires analyzing first the reasons for the inefficient use of staff and of their time and developing an action plan to address them. Monitoring performance will help ensure the continued efficient use of staff over time. The MoI has already introduced monitoring of performance of RDs, which is a good step. Linking such performance monitoring to spending and comparing performance and efficiency across RDs and units and over time will help ensure money is being well spent. Making such monitoring public would enable citizens to help identify reasons for the allocative inefficiencies.

9. Regarding greater and better use of complementary inputs, the issue is not so much the amount spent on operations and maintenance (O&M), which is similar to regional peers, but the fact that O&M spending gets squeezed by personnel spending when the latter increases. O&M is mostly allocated to utilities and external services, and there are apparent inefficiencies in such spending. For instance, there is large variation in electricity and water bills per staff across the RDs. A fragmented and weak procurement function and limited planning appears to be affecting utility spending and constraining the purchase of modern equipment and inputs. Inefficiencies in the allocation of complementary inputs further hinder performance. The DEA analysis shows that there is scope to improve the use of vehicles and technology, as some RDs use them more effectively in combating crime than others. Due to internal reasons within the MoI a significant share of cars and technology inputs are being inefficiently used, ranging from 3 percent in Bourgas to 29 percent in Kjustendil.

10. Spending on complementary inputs can be improved through more efficient contracting, efficient allocation, and improved procurement. The renegotiation of utility contracts, which has already been initiated by the MoI, the consolidation of unused premises through sharing, rental or sale, the

identification of inefficiencies in the allocation of vehicles and technology, improved O&M planning, the consolidation of procurement functions and improvements in effectiveness and speed of procurement, would all help better address spending needs in O&M and increase impact.

11. Pay policies affect significantly the efficiency and effectiveness of police and firefighting spending. Contrary to popular belief, police salaries in Bulgaria do not appear low. Once differences in income per capita are considered, police salaries are at the same level as in Sweden and Slovenia, and higher than in Denmark, Estonia, Lithuania and Latvia. Within Bulgaria, MoI staff are among the better paid at an average monthly personnel cost per staff of BGN 1,776 in 2016. The main driver of this high average monthly personnel cost per staff is social contribution, which represents 51 percent of the wage spending. A key driver of the high social contribution payments until 2017 was the large number of staff classified under the high-risk category (specialized civil servants with a social contribution rate of 74 percent as high-risk professions retire earlier) even though many do not do high risk work. Another contributor to the high social contribution expense is the payment by the MoI of the employee portion of social contributions, unlike other MoIs in the EU. The case for such high social contributions is further weakened by the fact that police and firefighters do not seem to account for their higher social contribution when comparing their salary with other ministries, which leads to dissatisfaction and complaints about net salary. Finally, another contributor to the high personnel cost is the high vacancy rate in the MoI of 13.5 percent. Such a high vacancy rate affects police and firefighter morale and performance. More than half of the vacancies are in the lowest pay grade category. Staff in this category have few career opportunities within the MoI system.

12. Changes in policies in the area of social contribution based on risky work and of career progression could help improve staff motivation, reduce vacancies, decrease overtime and free savings. Increasing the mandatory length of service necessary for retirement and lowering the social contribution rate would help better balance present versus future incentives. This rebalancing together with improved career opportunities for staff in the lowest pay category to increase the attractiveness of such positions, would help reduce vacancies and decrease overtime payments. In addition, discontinuing gradually the coverage of the employee portion of social contribution and reviewing the reclassification of some administrative and other low-risk positions that started in early 2017, would help free resources in the future for other needed spending.

13. A better use of human resources, the reallocation of complementary inputs, and revised pay policies would help increase efficiency, free resources for boosting skills of staff and equipment modernization, improve policing and firefighting performance and raise citizens' perceptions of policing to the level of Bulgaria's regional peers.

14. The recommended actions and their estimated impact are displayed in Box 1. Some of the proposed actions require careful preparation and a strategy for implementation. For example, consolidation of regional offices should be based on a well-prepared strategy to modernize the IT system and business processes across regional departments and functional units, review of roles and responsibilities of staff, preparation and implementation of a training program, a plan to modernize equipment and offices, and an effective internal and external communication. Additional more in-depth analysis will be needed to map out the building blocks of such strategy and estimate its costs and benefits.

Box 1. Recommended actions and their estimated impact

Better use of human resources:

- Analyzing the reasons for inefficient use of resources in RDs – human, as well as vehicles and technology – and agreeing an action plan would be an important first step to reduce inefficiency. The DEA suggests that 19 percent of the police and technology inputs at the regional level are not put to their best use due to organizational factors internal to the MoI. Using the same total number of firefighters and available technology and vehicles, but distributing them differently across districts could save 22 percent more lives and prevent 22 percent of the material losses.
- Reducing the number of RDs would help reallocate administrative resources more efficiently and yield savings for needed spending. For example, a consolidation that halved administrative personnel could save BGN 28.5 million, assuming 1,272 positions are reduced. If RDs provide administrative services to DG FSPP territorial units, annual savings could reach BGN 6.5 million, assuming a reduction of 290 administrative positions. The reduction in positions could be done gradually combining the retraining of staff, voluntary separation, and natural attrition (positions are not filled in when staff leave or retire).
- Consolidating administrative staff in shared services units to support the RDs and the territorial units of the Gendarmerie and the General Directorate for Fire Safety would avoid duplication and improve the efficiency, quality, accuracy and reliability of administrative services, as in other EU countries. For instance, a merger of the general administrations at the regional level, with MoI Regional Directorates being assigned the role of servicing the Fire Safety and Gendarmerie, could generate an estimated BGN 12.0 million annual savings, assuming the merger resulted in a reduction of the general administration of the Fire Safety and Gendarmerie by 67 percent. This annual saving is almost equivalent to the 2016 spending on police uniform and equipment (BGN12.1 million).

Greater and better use of complementary inputs:

- Identifying ways to limit spending on water and electricity bills (renegotiating contracts, consolidating unused premises, improving energy efficiency of buildings, etc.) could yield savings of up to 40 percent in water and electricity spending.
- Consolidating some procurement functions where possible, addressing reasons for delays and inefficiencies in procurement and strengthening anti-corruption measures would generate significant savings in O&M spending.

Revised pay policies:

- Increasing career opportunities for staff in the lowest pay category would increase staff motivation and reduce vacancies.
- Increasing the mandatory length of service in MoI civil service for early retirement, raising the retirement age and expanding the number of civil servant/labor code positions will help reduce the high social contribution payments in the future and free space for other needed spending. Discontinuing the coverage of the employee's portion of social and health contributions for all MoI employees would also help free resources for other spending on policing and firefighting.

1. Introduction

1. **This report is intended to be used as an input to the first pilot spending review (SR) in Bulgaria.** In 2016, the Government of Bulgaria (GoB) decided to initiate spending reviews to improve efficiency and effectiveness of its spending in the context of a moderate fiscal consolidation process. With the advisory and analytical support of the World Bank, a high-level analysis of spending of seven ministries and 21 municipalities was conducted and several areas with potentially large inefficiencies were identified. Based on this analysis the GoB selected two pilot areas for in-depth assessment—public order and safety and waste management. In both areas, Bulgaria spends much more than its regional peers with one of the lowest effectiveness of spending. The World Bank was asked to prepare together with the relevant authorities two reports as inputs to the two pilot spending reviews. This is one of the two reports.

2. **Given the tight deadline set on this report, its focus was narrowed within the broad area of public order and safety.** The report only covers policing and firefighting and excludes activities related to combating organized crime, state security, border police, ID issuance, and Ministry of Interior (MoI) academy and hospital, among others. In terms of organizational structures, the analysis focuses mostly on police and fire safety activities or activities of the General Directorate National Police (GDNP), General Directorate for Fire Safety and Protection of Population (GDFSPP), and 28 regional directorates (RDs) of MoI. Despite this narrower focus, police and fire safety represent a significant share of MoI spending (75 percent) and staff (50 percent) and therefore the analysis looks at broader issues and proposals.

3. **The objectives set by the GoB for this policing and firefighting report are threefold.** First, to identify areas of efficiency gains within the existing budget envelope. Unlike some other SRs, the objective is not to cut MoI's budget, but to increase performance and use any savings derived from the efficiency gains for additional priority spending in policing and firefighting. The second objective is to improve the transparency of spending in policing and firefighting. Public information on MoI spending categories and staff numbers have not been available to the public for most of the transition to a market economy. The third objective is to inform GoB's pilot SRs and, together with the SR Manual, create awareness of the methodologies available for the implementation of SRs in Bulgaria. This report is a first attempt at better understanding spending efficiency and effectiveness in policing and firefighting in Bulgaria. It has not analyzed the roles and responsibilities of MoI and how they compare with other countries.¹ In a limited amount of time and with the existing data limitations, it provides a first round of preliminary findings and identifies some areas where more detailed data and further analysis will be needed.

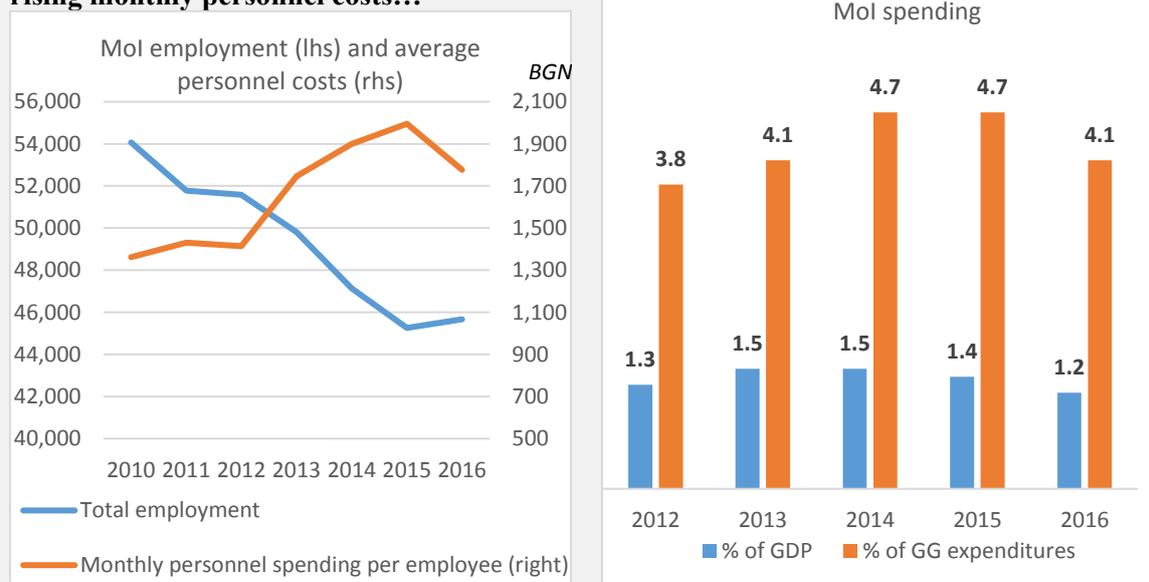
4. **The report is structured as follows.** This section has presented the scope and objectives of this study. The second section identifies GoB's challenges in terms of spending efficiency and effectiveness. The third section proposes actions around three pillars to help overcome these challenges. The last section concludes.

¹ The responsibilities of MoI's structures to collaborate with other state institutions activities are regulated in 90 pieces of legislation.

2. Challenges in spending efficiency and effectiveness

5. **Overall, the MoI has been successful in containing its spending over the past years.** This was mainly achieved through significant employment cuts and organizational restructuring and optimization. Almost 9,000 positions were shed between 2010 and 2015, contributing to contain spending despite increases in average personnel costs (Figure 1 and Figure 2). These cuts brought down the number of police officers to the EU average, a significant accomplishment as Bulgaria had in 2008 one of the largest numbers of police officers relative to its population in the EU. The number of administrative staff was also reduced in line with the restructuring of MoI's organization and consolidating of second level budget units. These employment cuts were driven by government-wide efforts to optimize government administration and consolidate wage spending. The most recent of these efforts was the mandated cut of personnel spending by 10 percent for each ministry in 2015. While MoI reduced staff by 4 percent in 2015, it was not sufficient to achieve the planned 10 percent saving in personnel spending for that year due to an increase in monthly personnel spending per employee – to some extent due to the related increase in severance payments. Though personnel spending per employee was subsequently reduced in 2016, the reduction of personnel spending was mitigated by an increase in staff numbers in 2016.

Figure 1. Employment cuts in the context of rising monthly personnel costs... **Figure 2. ...helped contain overall MoI spending**



Source: Authors' calculations based on MoI and Ministry of Finance data.

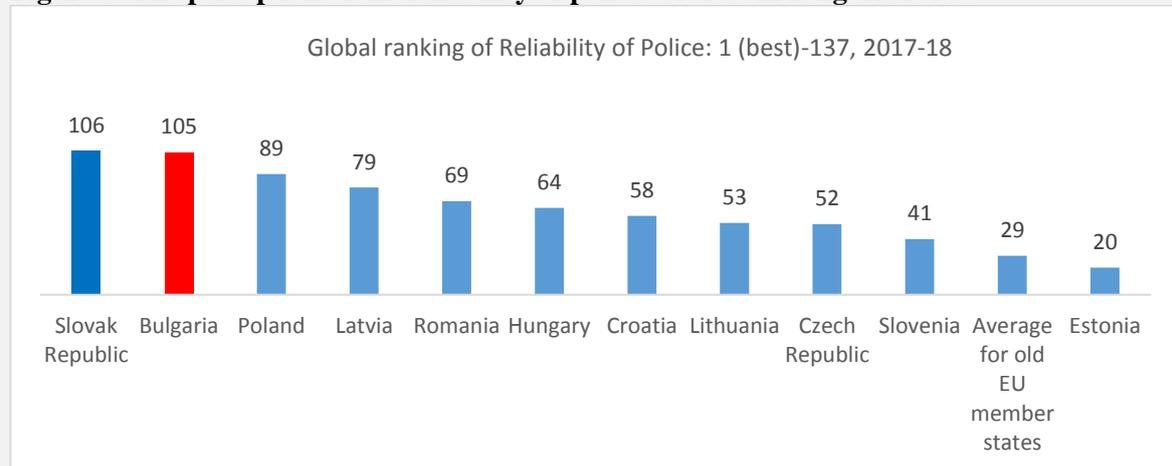
Note: GG stands for general government.

6. **The MoI introduced additional reforms in 2017 to contain spending and improve its effectiveness.** Administrative and other low risk jobs were reclassified to general civil servants or under labor code to reduce the large social contributions paid by the MoI. Investments were made in modernizing the transport park of police and firefighters, which until recently relied on donations from abroad. In addition, the MoI provided cash benefits to staff who had not received uniforms for five years in a row due to failures in procurement procedure.

7. **Despite this recent progress, the MoI faces three key challenges: the first is that the perception of the reliability of police services in Bulgaria remains low.** It is the lowest

in the EU according to the Order and Security index of the World Justice Project (2017)² and the second lowest according to the World Economic Forum’s Reliability of Police index (Figure 3). Perception of police reliability could be affected by several factors, some outside the control of the MoI. Nevertheless, it is an important outcome indicator of government spending, especially given the large public resources allocated to the sector.

Figure 3. The perception of the reliability of police services in Bulgaria is low



Source: World Economic Forum’s Global Competitiveness Index (GCI), 2017-18.

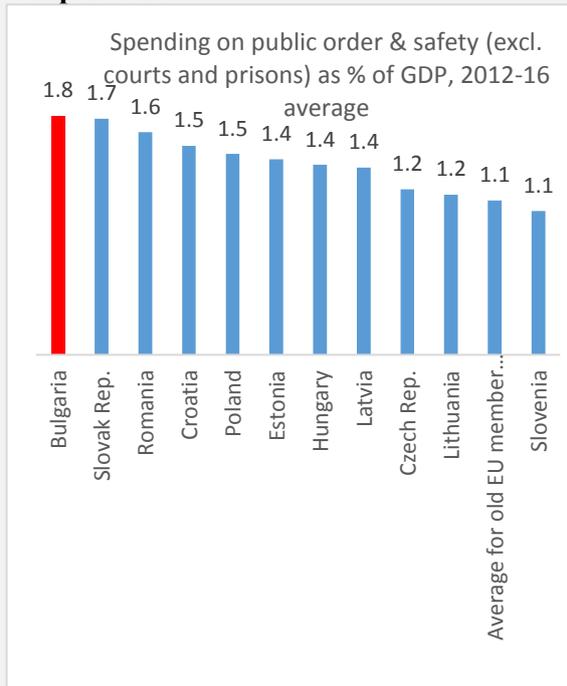
Notes: The GCI ranks the Reliability of Police Services across countries based on the scores to the question: In your country, to what extent can police services be relied upon to enforce law and order? [1 = not at all; 7 = to a great extent]. A lower score is better. <http://reports.weforum.org/global-competitiveness-report-2015-2016/appendix-a-measurement-of-key-concepts-and-preliminary-index-structure/>

8. **The second challenge is that Bulgaria’s spending on public order and safety remains the highest among regional comparators³** (Figure 4). The weak performance in terms of citizen perceptions of public order and safety cannot be attributed to low spending. Bulgaria’s high spending on public order and safety is driven by high personnel spending, which has remained high over the years (Figure 5). The MoI explained that its responsibilities include activities that are not typical activities for MoIs in other EU countries. As regulated in 90 pieces of legislation, Bulgaria’s police and firefighters are required to provide services to citizens, state and local institutions.

² The WJP Rule of Law Index 2017-2018 measures rule of law adherence in 113 countries and jurisdictions worldwide based on more than 110,000 household and 3,000 expert surveys. The WJP Rule of Law Index measures countries’ rule of law performance across eight factors, one of them being Order and Security. The WJP report can be downloaded at <https://worldjusticeproject.org/our-work/wjp-rule-law-index/wjp-rule-law-index-2017%E2%80%932018>

³ Regional comparators are all new EU member states except Cyprus and Malta. They were selected as comparators as they all have low GDP per capita in the EU, all have been hit by financial crisis and undertook consolidation measures, all share to a large extent a similar developmental path – from socialism to market economy; all have implemented institutional reforms to meet EU political, economic and institutional requirements; all are unitary (not federal) states, and all perform similar functions regarding public order and safety.

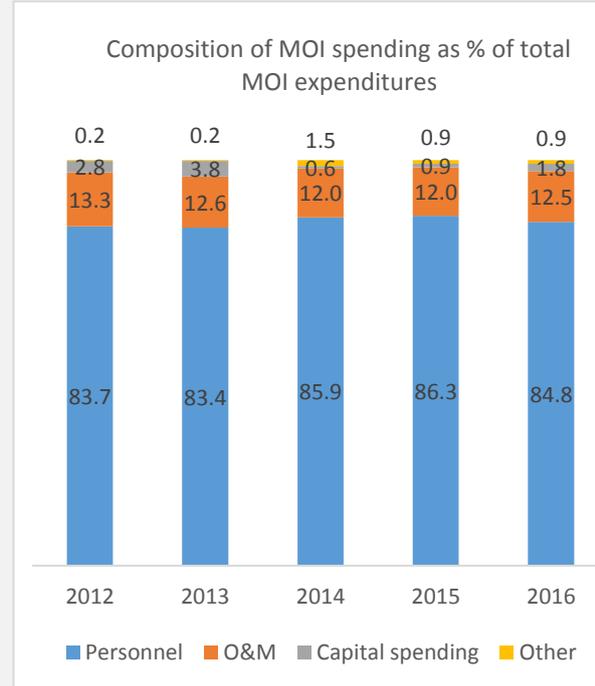
Figure 4. Bulgaria has higher spending on public order and safety than regional comparators



Source: Eurostat.

Notes: The two-digit COFOG categories included in the analysis are: police services, fire-protection services, R&D public order & safety, and public order & safety expenditures not classified elsewhere.

Figure 5. And this high spending is driven by personnel spending



Source: MoI.

9. **The third challenge is that high personnel spending leaves little space for some important spending of today and the future.** For instance, the car fleet is very old and in great need of being replaced. Uniforms, protective gear and equipment also need upgrading. Greater training of staff is required to respond to emerging challenges (increased technological sophistication of crime) and the increasing expectations of society for quality public services. Finally, the IT equipment needs to be expanded and modernized and systems need to be automated to reduce paperwork and increase efficiency.

3. Proposed actions to address challenges

10. **As the experience of other countries shows, the solution to improve efficiency and effectiveness of spending and address citizens' safety needs relies critically on using resources better rather than simply spending more.** A very clear example is the recent police reform in the UK, which aimed to make people feel safer by reducing administration and getting more police to front line services. The reform yielded significant impact (Box 2). Other country examples of Police SRs can be found in Annex 1.

Box 2. Spending more is not necessarily the answer – the case of the United Kingdom (UK)

The Policing Minister, Nick Herbert, kick started the reform of the UK police with the following statement:

even if resources are tighter, we can still get officers out onto the streets, where the public want to see them. We can't carry on with the assumption that spending more money is the answer.

The police service needs to look hard at its spending more generally - everything from vehicles and buildings that are not fully used, to costly travel and refreshments, or overtime.

We want police forces to pool resources to deliver their services more cheaply and effectively, both in back office areas like HR and finance and in operation support functions such as case processing and forensics. And we are determined to make savings on how the police procure goods, services and IT. (July 2010).

Such statement was followed up by a series of reforms informed by the UK's 2010 Police Spending Review:

- Provided remuneration and conditions of service that are fair for taxpayer, police officers and staff. Changed remuneration and conditions to maximize frontline deployment
- Increased efficiencies in IT, procurement and back office to deliver savings
- Consolidation of functions (merger of agencies)
- Modern management practices.

As noted in the UK's 2015 Police Spending Review, the reform has already yielded significant results:

- During this time, the proportion of officers in frontline roles increased to 92 percent, victim satisfaction with the police remained strong, and crime fell by more than a quarter
- £1.5 billion (BGN 3.3 billion) of savings in local police force budgets over five years
- Savings allowed to respond to new threats with increased investments in cyber security and counter terrorism and increased investment in IT modernization.

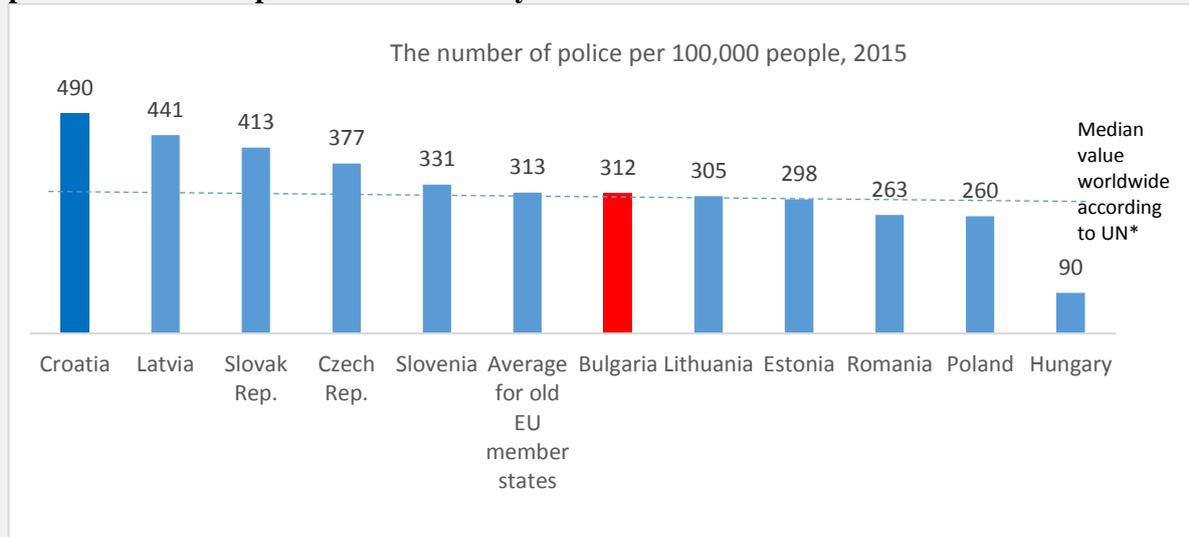
Sources: Treasury Committee (2010 and 2015).

11. Overcoming Bulgaria's challenges in public order and safety will require actions around the following three pillars: 1) better use of human resources; 2) greater and better use of complementary inputs; and 3) pay policies.

3.1. Better use of human resources

12. Based on cross-country comparisons, Bulgaria may not need more police officers to improve service delivery (Figure 6). With 312 police staff per a hundred thousand people, Bulgaria is very close to the EU average of 313, and slightly above the 300-median value worldwide (UN 2006).

Figure 6. Based on comparisons with regional comparators, Bulgaria may not need more police officers to improve service delivery



Source: Eurostat.

Notes: These numbers do not include administrative staff. Data for Germany and Ireland is from 2013 and 2014, respectively. The above comparison does not consider country peculiarities in the delivery of security, like the abundance of remote areas, though Bulgaria is not an outlier in this regard.

* Source of the UN survey: www.unodc.org/documents/crime-congress/12th-Crime-Congress/Documents/A_CONF.213_3/V1050608e.pdf Note: Two-digit COFOG categories included to in the analysis are police services, fire-protection services, R&D public order & safety, and public order & safety expenditures not classified elsewhere.

13. **The issue is how to use staff better to increase the impact of spending.** This subsection focuses on three questions in this area:

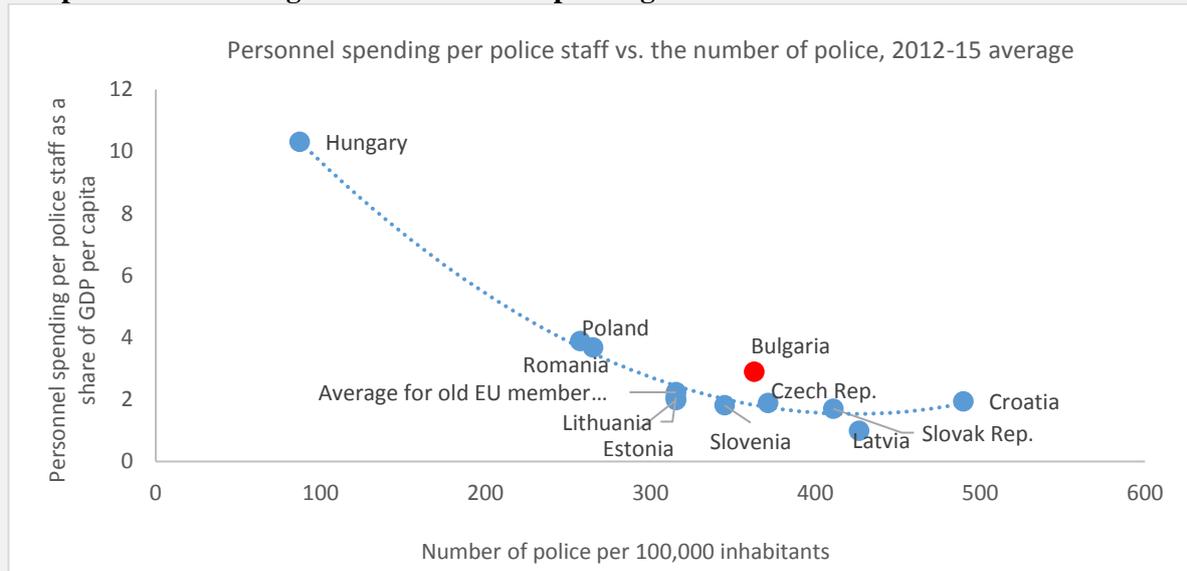
- 1) Is the number of staff devoted to administration and management appropriate?
- 2) Can the allocation of police officers to districts be improved? And
- 3) Can the allocation of fire brigade staff to districts be improved?

14. **The large number of administrative posts in MoI results in high administrative spending for the number of existing police and contributes to the high spending on personnel.** Personnel spending per police staff in Bulgaria is higher than in regional comparators due in part to higher spending on general administration and support functions (Figure 7). The MoI with its 45,637⁴ staff is the largest employer in the country and its staff of 8,778 with general and specialized administration functions exceeds the total number of staff of central administration of all ministries.⁵ The general and specialized administration of MOI represents 19 percent of total staff and includes also staff involved in provision of specific services such as issuing identity documents (75), administering emergency calls at the single European 112 number (471), border police (968) and others that are not subject of this analysis. The administration appears oversized and should be analyzed further to identify potential efficiency gains.

⁴ Annual average actual employment in 2016.

⁵ Excluding Ministry of Defence. These numbers are based on the Council of Ministers' report on the State of the Administration, 2016.

Figure 7. Personnel spending per police staff in Bulgaria is higher than in regional comparators due to higher administrative spending



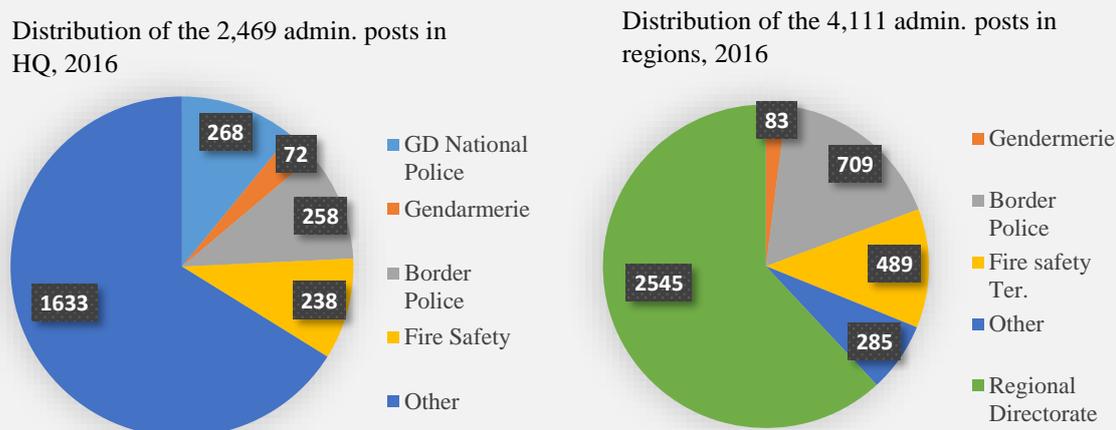
Source: Eurostat.

Notes: Personnel spending per police staff is computed as compensation of employees spent to deliver policing services (i.e. including administration and management) divided by the number of police. It is divided by GDP per capita to control for differences in income per capita across countries. The number of police includes personnel in public agencies as at 31 December whose principal functions are the prevention, detection and investigation of crime and the apprehension of alleged offenders. The number of police does not include support staff (secretaries, clerks, etc.).

15. **Duplication of administrative services is driving high administrative costs.** Despite several reorganizations, with its 52 second level budget units (SLBUs) the MoI is still the ministry with one of the largest numbers of SLBUs. The manager of each unit manages the human, material and financial resources of the unit. As a result, administrative staff are spread across these 52 units including the 28 RDs but also across 28 territorial fire safety directorates (third level budget units) and eight zonal Gendarmerie units. For example, fire safety territorial units are located in the same 28 cities, as MoI RDs, but their general administrations are totally separate (Figure 8). Similarly, the Gendarmerie has eight zonal units, seven of which are in the cities where the RDs are based. General administration⁶ more directly involved in policing and firefighting totals 3,695, or 11 percent of total employment of policing and firefighting (RDs, GD NP, Gendarmerie, and GDFSP).

⁶ GD NP, RDs, and GD FSPP.

Figure 8. Many staff work on general administration across the MoI



Source: MoI data from payroll.

Note: Gendarmerie data in the first level budget unit includes 41 assistants and guards and in the regions it includes 5 guards.

16. **The second driver of administrative spending is the large number of RDs in the MoI relative to regional comparators** (Table 1). With 28 RDs, the MoI of Bulgaria has double the number of RDs than the Czech Republic, a country with 30 percent more population. The large number of RDs in the Bulgarian MoI results in low area and population coverage leading to large administrative spending. On average a RD in the Bulgarian MoI serves only about two-thirds the area and about one third the population of a RD in the Czech Republic or the Slovak Republic, and about one third the area and about two-thirds the population of a RD in Latvia and Estonia.

Table 1. The number of regional directorates in the Bulgarian MoI given the country's population is much larger than in regional comparators

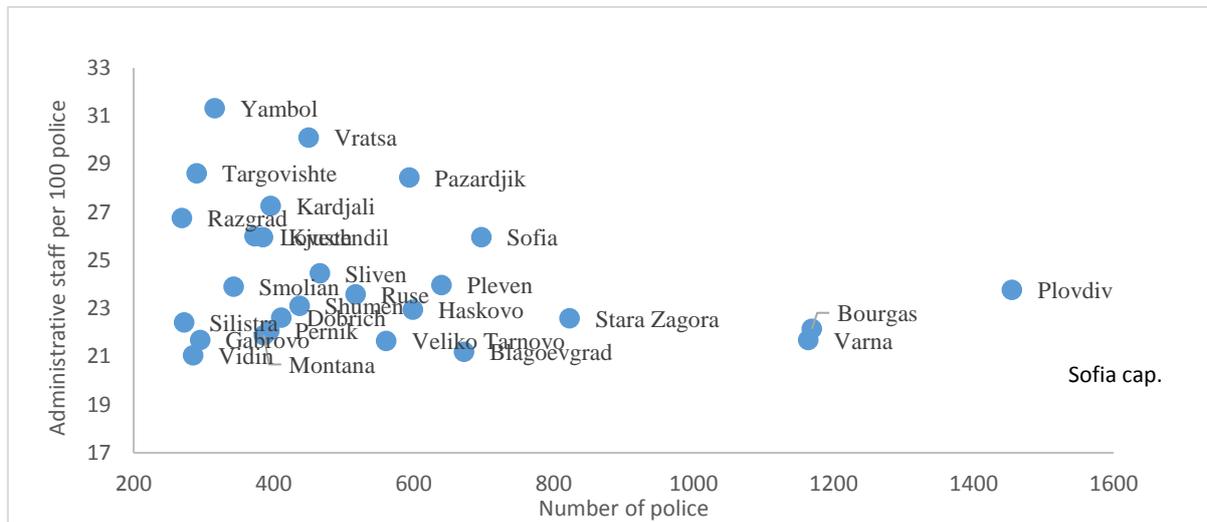
Country	Population, million	Number of MoI RDs	Area per RD, sq. km	Average population per RD, in million
Bulgaria	7.2	28	3,964	0.26
Poland	38.0	16	19,493	2.37
Czech Rep.	10.6	14	5,633	0.76
Slovak Rep.	5.5	8	6,129	0.68
Latvia	2.0	5	12,912	0.39
Estonia	1.3	4	11,300	0.33

Source: Country data and number of territorial directorates compiled by WB staff.

17. **The efficiency of administrative spending is affected not only by the high number of administrative staff, but also by their inefficient allocation.** There is a mismatch in many RDs between the number of administrative staff and the size of the RD. RDs with similar number of police officers vary widely in the number of administrative staff. In addition,

contrary to expectations, the number of administrative staff per police officer in large RDs is not lower than in some other small RDs, as would be expected due to economies of scale.⁷

Figure 9. The allocation of administrative staff across the RDs does not appear efficient, as larger RDs would be expected to have smaller shares of administrative staff due to economies of scale

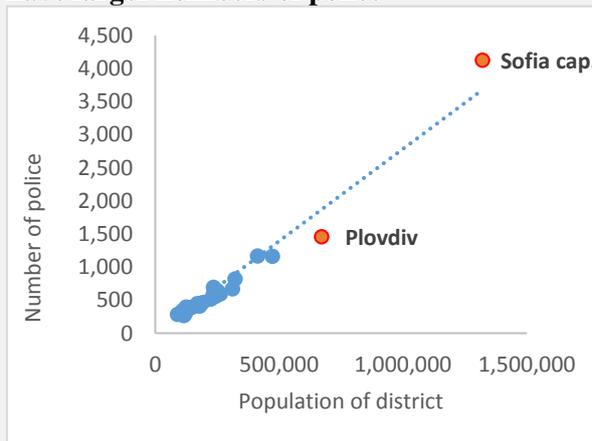


Source: World Bank calculations based on MoI.

Notes: Administrative staff is calculated as total employment minus the number of police officers.

18. **The allocation of police officers to districts follows the expected pattern.** Police is being allocated to where it is needed most – districts with larger populations have larger numbers of police (Figure 10) and districts with higher crime rates tend to have larger numbers of police (Figure 11).

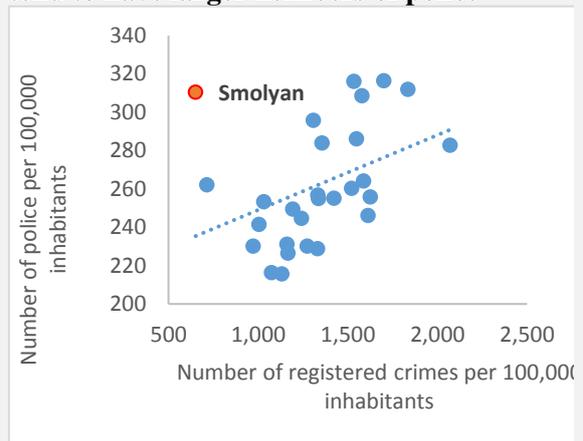
Figure 10. Districts with larger populations have larger numbers of police



Source: World Bank calculations based on MoI.

Notes: Red markers show outliers. Values are for 2016.

Figure 11. Districts with higher crime rates tend to have larger numbers of police



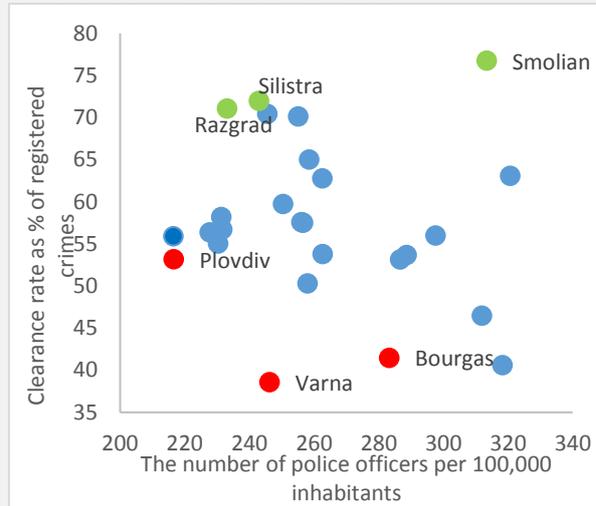
Source: World Bank calculations based on MoI.

Notes: Red markers show outliers. Values are for 2016.

⁷ In smaller RDs, the number of police officers is smaller, so the ratio of administrative staff to police officer is high. As the RD becomes larger, the number of administrative staff would not be expected to increase proportionally with the number of police officers because the administrative work does not increase proportionally, so the ratio of administrative staff to police officer should be lower than in smaller RDs.

19. **But significant variation in the distribution of police officers according to crime rates suggests there might be scope for enhancing efficiency through better police allocation.** Furthermore, the efficiency of police in solving crime varies significantly across districts, further indicating that there is room for improvement. Districts with more crime have more police, but lower crime clearance rates (Figure 12 and Figure 13). This suggests that police could be more effective at resolving crime.

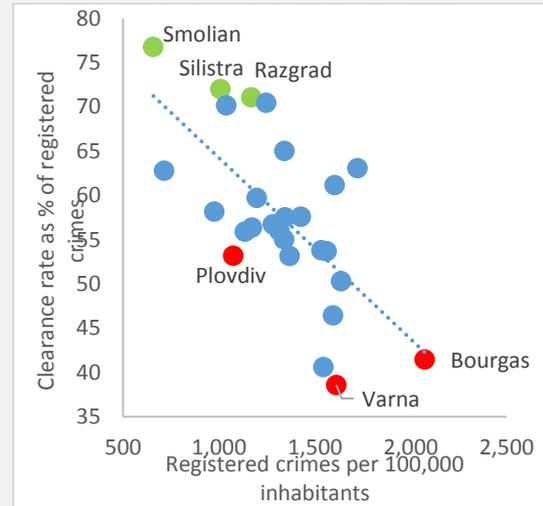
Figure 12. The same number of police leads to different crime clearance rates



Source: World Bank calculations based on MoI.

Notes: Registered crime is not the perfect measure of actual crime, as some crime may not be reported or registered. However, since a better alternative is not available, this is the most commonly adopted crime indicator in research.

Figure 13. Districts with higher crime tend to have lower crime clearance rates



Source: World Bank calculations based on MoI.

20. **This study uses two types of data envelopment analysis (DEA) to measure the extent to which spending efficiency could be improved.** DEA is a powerful tool to measure the efficiency of complex public-sector institutions like police and fire safety. We employed an input-oriented DEA model to examine police efficiency and a directional distance function (DDF) for the fire emergency services. The input-oriented DEA model examines police efficiency by comparing its outputs with its inputs. In the case of fire emergency services we use a DDF instead of an input-oriented DEA model because the former is commonly employed to examine efficiency in the presence of desirable and undesirable outputs. An example of how an undesirable output affects efficiency can be seen in a factory that produces paper but at the same time produces also environmental pollutants. For this factory to improve its efficiency, it would have to not only increase its production with its given number of inputs but also reduce the amount of pollutants. Similarly, fire safety services produce desirable outputs (lives saved) and occasionally undesirable outputs (lives lost and material losses).⁸ The DDF allows to simultaneously maximize desirable outputs and minimize undesirable outputs. Annex 2 provides details on the two methodologies.

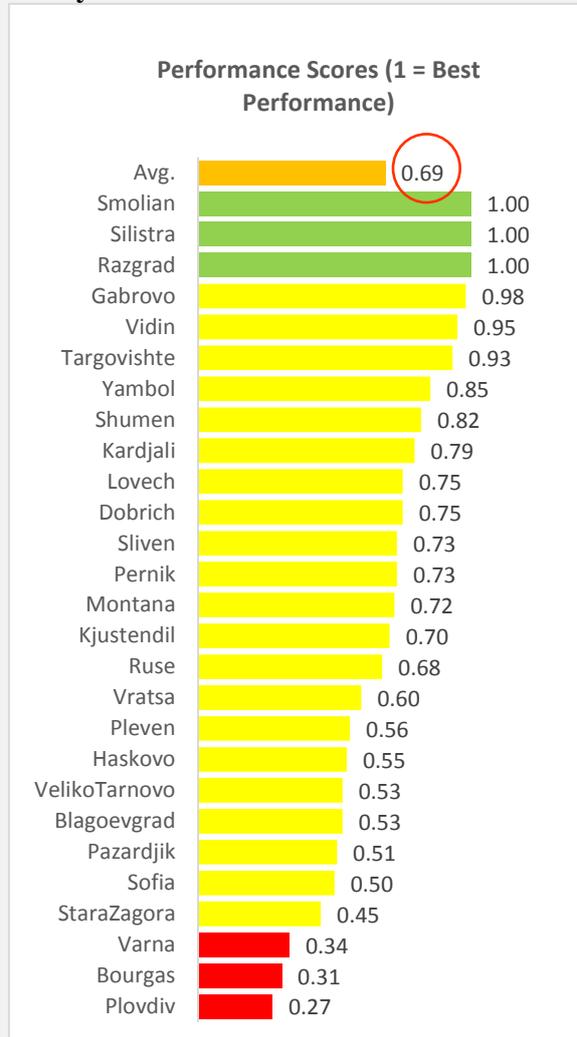
21. **The input-oriented DEA compares the performance of police, measured in terms of crime clearance rate, across different districts taking into account the number of police**

⁸ We recognize that there are factors beyond the control of fire safety services that may affect the performance of fire safety services.

officers and technology inputs used. It identifies first the districts that are most efficient in terms of achieving the highest crime clearance for a given number of police and technology inputs. It then compares how many more police and technology inputs a district uses compared with the best performing district that has a similar clearance rate controlling for differences due to other factors that affect the crime clearance rate (like unemployment, crime rate, poverty, and income inequality). Those additional police and technology inputs are being used inefficiently as the best performing district is able to achieve a similar clearance rate without them.

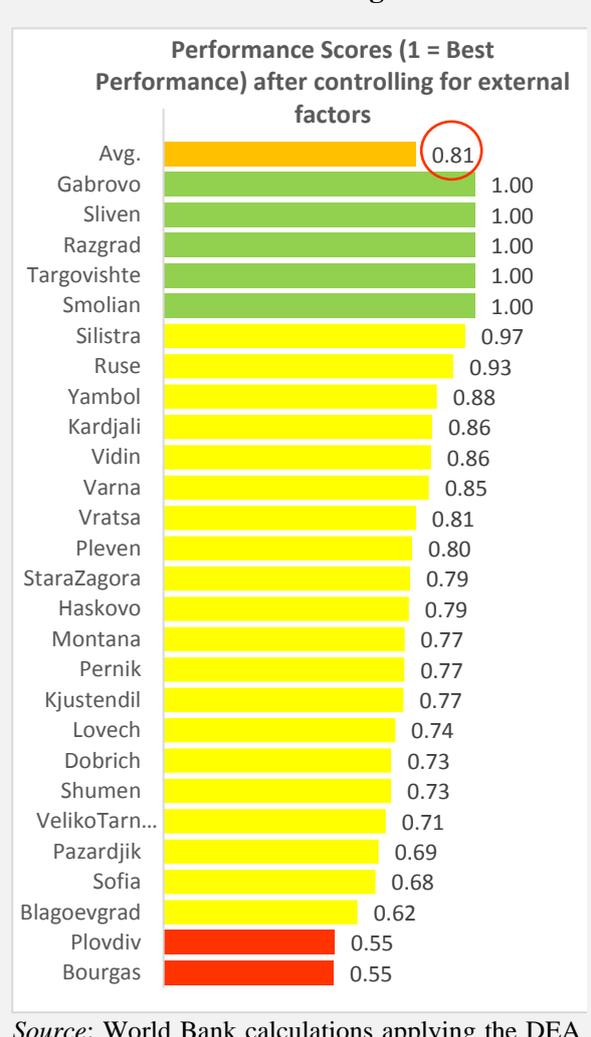
22. **The input-oriented DEA indicates that there is significant scope for improving the efficiency of police spending.** According to the DEA, the magnitude of inefficiency in police spending due to internal factors to the MoI is large – 19 percent of the police and technology inputs at the regional level are not put to their best use due to reasons that can be addressed by MoI. The most likely reasons for these inefficiencies are internal organizational factors. If these factors were addressed, the same crime clearance rate could be achieved with 19 percent less inputs of police and technology. Complementary policies that tackle external reasons for the inefficiency in police spending at the regional level, such as youth unemployment, crime rate, poverty, and income inequality could enhance the scope for effective policing, allowing to achieve the same crime clearance rate with 11 percent less inputs of police and technology. Addressing the internal and external factors for inefficiency in police spending would therefore help achieve the same crime clearance rates with 31 percent less inputs of police and technology or alternatively significantly increase crime clearance rates across districts with the existing police and technology inputs (Figure 14 and Figure 15).

Figure 14. External and internal factors to the MoI account for 31 percent of the police and technology inputs at regional level not being put to their best use, with efficiency varying widely across districts



Source: World Bank calculations applying the DEA on MoI data.

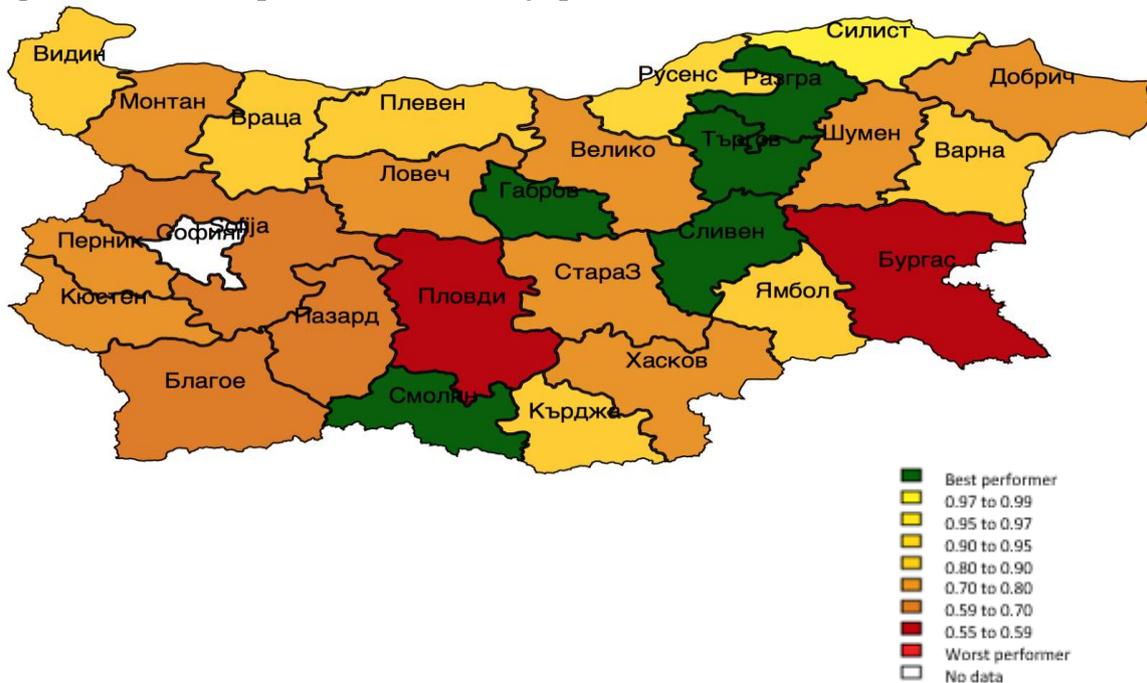
Figure 15. After controlling for the factors that are beyond MoI's control, the DEA finds that 19 percent of inputs are still not being put to their best use and differences in efficiency between districts are still large



Source: World Bank calculations applying the DEA on MoI data.

23. **The significant differences in efficiency across RDs suggest that there is scope for learning from each other.** Least efficient districts (after controlling for external factors) like Plovdiv and Bourgas, could learn from the more efficient and neighboring districts, such as Gabrovo, Sliven, Razgrad, Targovishte, and Smolian). There are also indications of clustering among districts (see Figure 16, which presents the values in the previous figure in a map using a color scheme, with red being worst and green being best), which may suggest potential efficiency spillovers between neighboring districts through resource sharing.

Figure 16. There is a potential for efficiency spillover across district



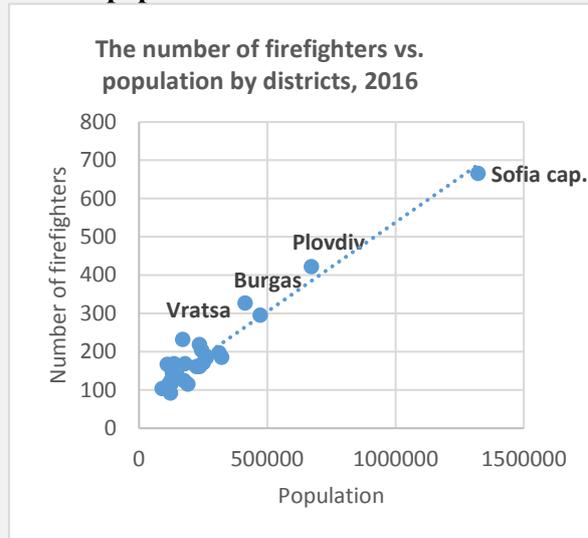
Source: World Bank calculations applying the DEA on MoI data.

Notes: We use a color scheme (based on traffic light colors) in the map to denote the relative efficiency of police in a district. The value of the relative efficiency of police in a district is estimated by comparing police’s input composition and output production in that district with that of other districts. A value of 0 indicates worst performer and is denoted in red color. Police in such districts are relatively inefficient because, relative to other districts, they produced less output given their set of inputs. A value of 100 indicates best performer and is denoted in green because, relative to the rest of the sample, police in these districts produced more output given their set of inputs. The orange and yellow colors indicate ranges between the worst and best performers (with orange closer to the worst performers and yellow closer to the best performers). In the case of red, orange and yellow districts, police efficiency can be improved by reducing their input combination and still obtaining the same output.

24. **The DEA results, though based on one output indicator—crime clearance rate—are similar to the results using MoI’s performance indicator.** The MoI has developed and implements a comprehensive system for monitoring the effectiveness of RDs. Its performance indicator is based on six areas (prevention, security, countering corruption crimes, operational search, investigation, and crime clearance) and 25 indicators. The MoI’s performance indicator is strongly correlated with crime clearance rate and thus provides similar results (see Annex 3).

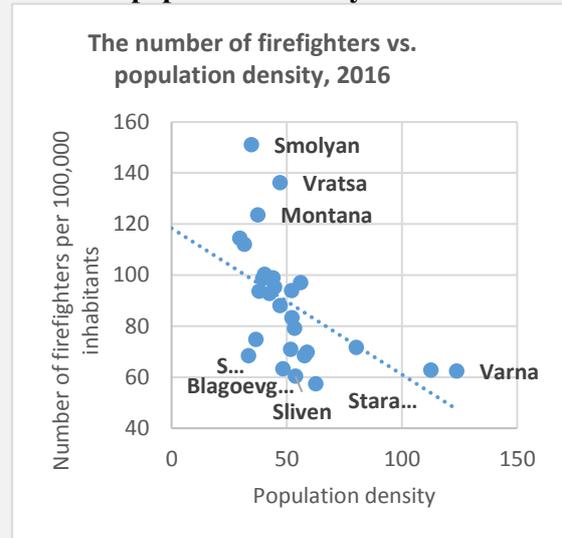
25. **The allocation of firefighters does not seem to follow the expected pattern.** The general directorate and the regional services for fire safety use a complex formula for allocating firefighters and complementary inputs across different districts. This formula seems to be based on six distinct indicators for three categories of districts. The fact that areas with lower population density appear to have more firefighters per person raises the question if the complex formula may be leading to some resource misallocations. According to MoI the formula is designed to ensure access to firefighting services to all populations even in the less populated areas.

Figure 17. Firefighters are allocated based on district population...



Source: World Bank calculations based on MOI data.

Figure 18. ...but without considering district's population density

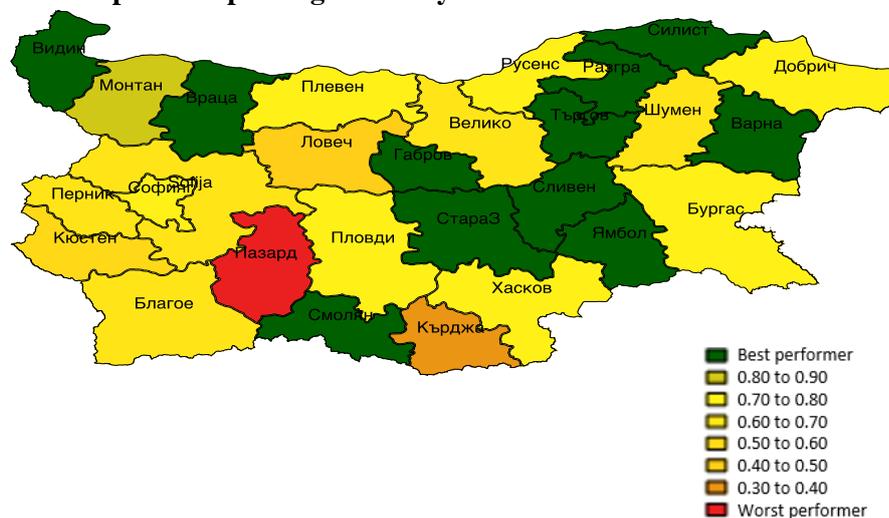


Source: World Bank calculations based on MOI data.

26. **The DFF analysis allows us to compare the efficiency of the fire emergency services across districts taking into account lives saved as well as lives lost and material losses.** It identifies first the districts that are most efficient in terms of achieving the highest combination of lives saved and lowest number of lives lost and the material losses for a given number of firefighters and vehicles and available technology. It then compares the lives saved, lives lost and material losses of a district with those of the best performing district that has a similar number of firefighters, vehicles and technology controlling for differences due to external factors.

27. **The DDF analysis indicates that there is scope for improving the efficiency of fire services at the district level.** The analysis shows that there are significant differences in efficiency across districts (Figure 19). It estimates that using the same total number of firefighters and available technology and vehicles, but distributing them differently across districts could save 22 percent more lives and prevent 22 percent of material losses.

Figure 19. There is scope for improving efficiency of fire services at the district level



Source: World Bank calculations applying the DFF analysis on MoI data.

Notes: We use a color scheme (based on traffic light colors) in the map to denote the relative efficiency of firefighters in a district. The value of the relative efficiency of firefighters in a district is estimated through a DFF analysis by comparing the input composition of the fire brigade and output production in that district with those of other districts. Because the outputs include one desirable output (lives saved) and two undesirable outputs (lives lost and material losses), the comparison among districts considers the number of desirable outputs and undesirable outputs produced. A value of 0 indicates worst performer and is denoted in red color. Firefighters in such districts are relatively inefficient because, relative to the rest of the sample, they produced less of the desirable output and more of the undesirable output given their set of inputs. A value of 100 indicates best performer and is denoted in green because, relative to the rest of the sample, firefighters in these districts produced more of the desirable output and less of the undesirable output given their set of inputs. The orange and yellow colors indicate ranges between the worst and best performers (with orange closer to the worst performers and yellow closer to the best performers). In the case of red, orange and yellow districts, firefighters can improve their efficiency by simultaneously minimizing undesirable outputs and maximizing the desirable outputs.

Suggested recommendations to make better use of human resources:

28. Analyze reasons for the inefficient use of human resources in RDs and agree an action plan to reduce inefficiency. MoI's performance monitoring could be a good start for the analysis if enhanced to include spending efficiency (to link spending to performance) and if comparisons across different RDs are made to motivate healthy competition and promote spending efficiency (at present no comparisons are made, only trends over time are examined).

29. Consider consolidating the administrative services of RDs in the MoI. Bulgaria could consider consolidation of the RDs of MoI from 28 to a smaller number of larger RDs, using the existing Planning Regions. Such larger RDs would facilitate consolidation of the staff performing general administration, e.g., providing HR, procurement, property management, and financial management support. The map below (Figure 20) provides an example of potential consolidation into 6+1 RDs following the EU NUTS-2 division of Bulgaria plus a separate RD of Capital City. Consolidation of administrative functions shall not preclude provision of essential services at the district (oblast) level. A similar reform was implemented in the National Revenue Agency and in the National Statistical Institute in Bulgaria, as well as in Estonia's MoI. In 2010 Estonia consolidated its territorial offices from 18 to 4, together with consolidation of some functional units related to border police, public order, criminal police, and citizens & migration issues. Estonia's spending on public order & safety declined from 1.8 percent of GDP in 2010 to 1.4 percent in 2015. And its worldwide ranking on the perception of the reliability of police moved up from 33 to 20 over this period.

Figure 20. Bulgaria's has 6 Planning Regions



Source: https://en.wikipedia.org/wiki/NUTS_statistical_regions_of_Bulgaria.

30. **The consolidation of offices should be prepared carefully and requires a well-developed strategy for implementation.** This strategy should include review of the roles and responsibilities of staff, identification of training needs, plans to modernize IT system and business processes, and plans to modernize equipment and offices. Efficiency gains identified in this analysis could be used to finance the costs of modernization of IT system, equipment, and offices. The consolidation of RDs would help allocate resources (human, financial and technological) more efficiently and provide significant savings. For instance, a consolidation from 28 to seven RDs that may result in halving of administrative personnel, would save BGN 28.5 million annually, assuming 1,272 positions are reduced. Additional annual savings of upto 6.5 million could be obtained if RDs provide administrative services to the territorial entities of DG Fire Safety and Protection of Population assuming a reduction of 290 administrative positions. The reduction in positions could be done gradually combining the retraining of staff, voluntary separation, and natural attrition (positions are not filled in when people retire or leave).

31. **Consider creating shared administrative services to support the RDs and the territorial units of the Gendarmerie and the General Directorate for Fire Safety.** Consolidating administrative staff in shared services would avoid duplication of staffing, information systems, and other resources, and is expected to align business processes across the MoI. The savings envisaged from the implementation of shared services will be achieved through consolidation of administrative staff in shared services units which will serve a larger number of employees. Also, rather than duplicating information technology solutions in every SLBU and TLBU, the shared services unit will rely on a single information platform thus generating operational savings by avoiding expense on maintenance of parallel information systems. The sharing of services will require modernized ICT systems and a well-developed strategy for implementation. Some services will be more amenable to sharing than others. The MoI has already experience with shared ICT services and could expand the provision to include human resources and financial management. Those EU countries that have implemented shared services demonstrate high efficiency in delivery of administrative services as well as provide

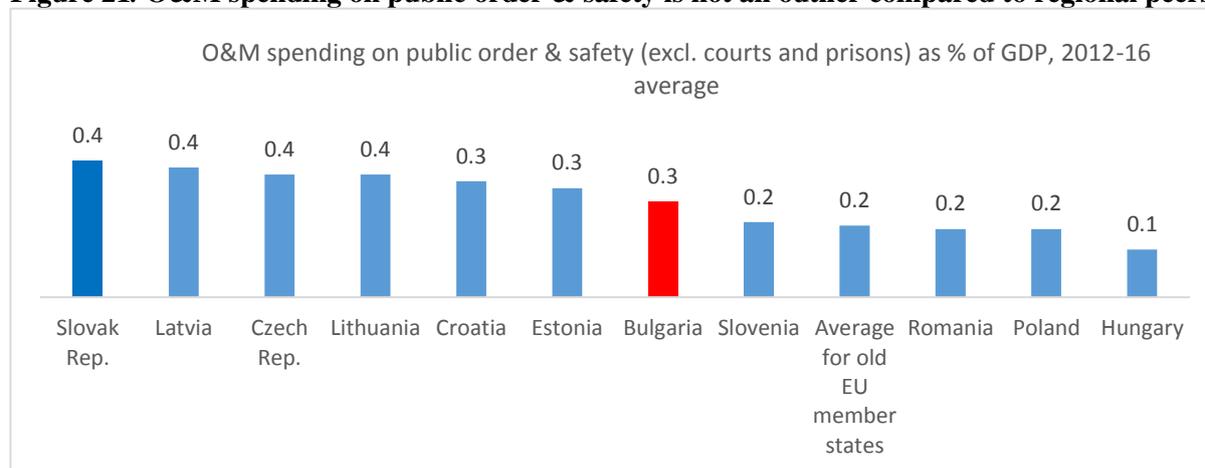
higher level of service quality, accuracy and reliability compared to the decentralized delivery of these services in the past.⁹ The GoB is piloting the implementation of shared services for HR and financial management (FM) functions in the Ministry of Health and the Bulgarian Food Security Agency. One shared services unit will be established for each of these administrations to provide selected HR and FM services to Secondary Level Budgetary Units (SLBU) and Tertiary Level Budgetary Units (TLBU).

32. **A merger of the general administrations of territorial units of police, fire safety and gendarmerie could generate significant savings.** Regional Fire Safety and Protection of Population units and zonal units of Gendarmerie with 28 MoI’s Regional Directorates (without further consolidation to above suggested seven RDs), could generate significant savings. It could generate an estimated BGN 12.04 million in annual savings, assuming the merger would result in a reduction of the general administration of the Fire Safety and Gendarmerie by 67 percent. This annual saving is almost equivalent to the 2016 spending on police uniform and equipment (BGN 12.14 million).

3.2. Greater and better use of complementary inputs

33. **Operations and maintenance (O&M) spending on public order and safety is not an outlier compared to regional peers.** At 0.3 percent of GDP, it is below that of the Slovak Republic, Estonia, Lithuania, Latvia, the Czech Republic and Croatia (Figure 21). On the positive side, MoI’s O&M spending has been increasing as a share of the government’s total O&M spending. On the negative side, O&M spending is squeezed by personnel spending, decreasing when personnel spending rises and limiting the purchase of complementary inputs (Figure 22 and Figure 23).

Figure 21. O&M spending on public order & safety is not an outlier compared to regional peers

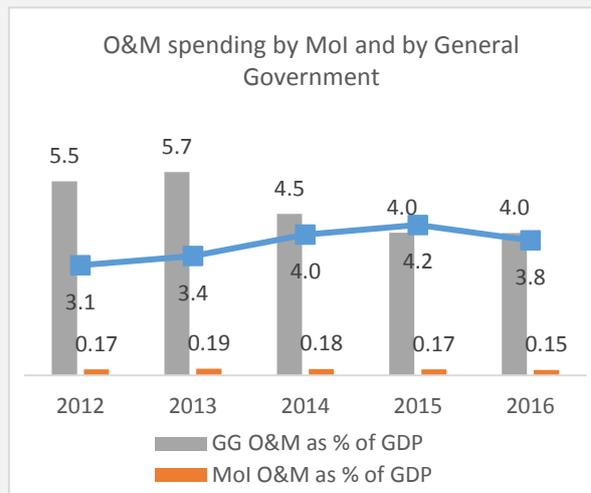


Source: Eurostat.

Notes: ESA’s intermediate consumption is used for operations & maintenance spending. Two-digit COFOG categories included in the analysis are police services, fire-protection services, R&D public order & safety, and public order & safety expenditures not classified elsewhere.

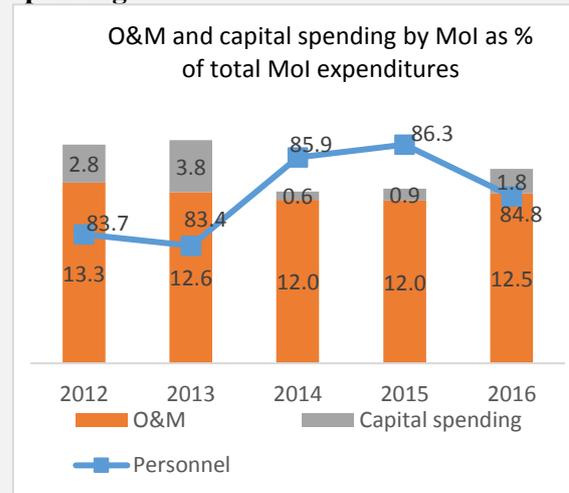
⁹ The detailed information on benefits of implementation of shared services in HR and FM areas is presented in the World Bank Baseline Report, prepared in March 2018 as part of the outputs of the Reimbursable Advisory Services on implementation of shared services in government.

Figure 22. MoI's share in general government's O&M spending increased over the past years



Source: World Bank calculations with MoF and MoI data.

Figure 23. MoI's personnel spending (rather than fiscal pressure) is constraining O&M spending

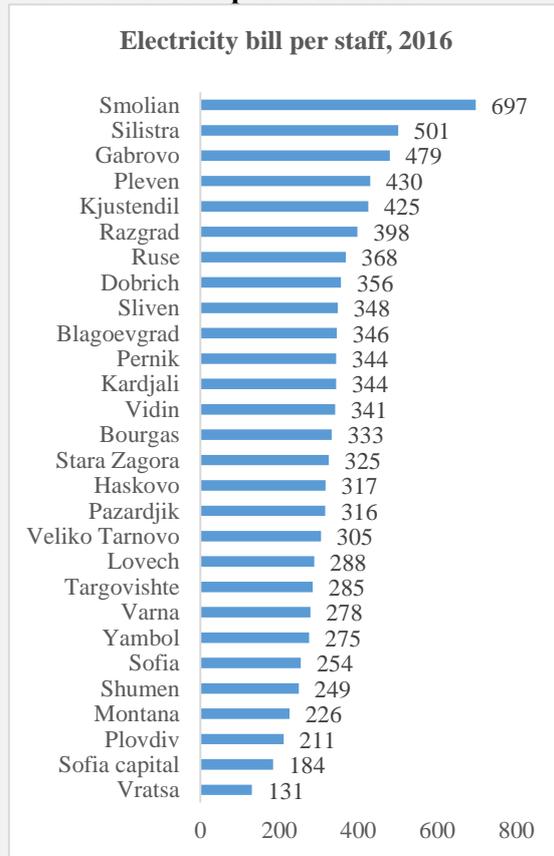


Source: World Bank calculations with MoI data.

34. **Most of MoI's O&M is allocated to utilities and external services, and some inefficiencies are apparent.** MoI spends close to 12 percent of its budget on O&M, a lower share compared to other ministries but in absolute terms MoI's O&M is significant and therefore spending efficiency is important, especially on the back of unmet needs for new uniforms, for modern equipment and IT systems. Spending is very concentrated - about 58 percent of O&M spending is on utilities and external services.

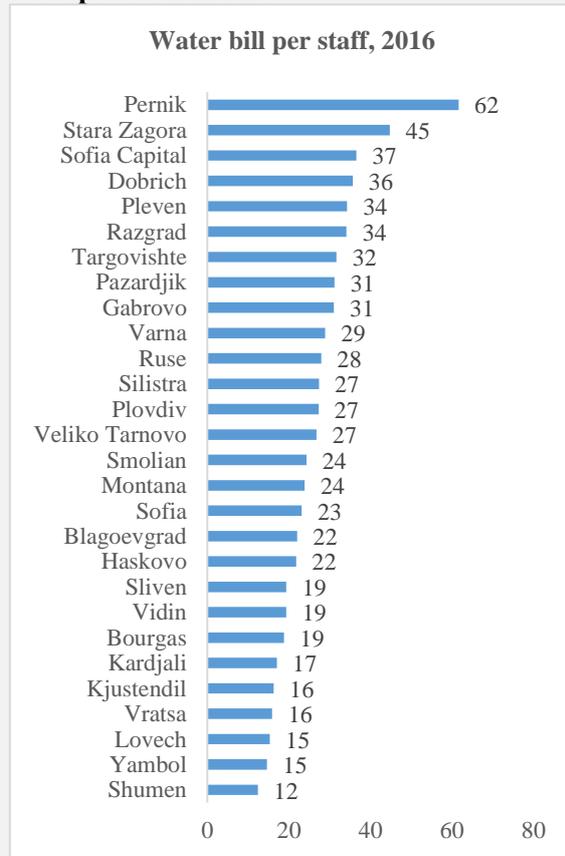
35. **Spending on utility bills shows a high variation of costs per staff in RDs.** Such variation is greater than could be explained by regional price differences, with some districts spending four times more on water and electricity bills per staff than others. For example, in 2016, electricity price in Smolian was by 1.36 percent higher than the price in Vratsa but the electricity cost per staff in Smolian was five times higher (430 percent) than the cost per staff in Vratsa. Difference in water prices between Pernik and Shumen was 35 percent while difference in water cost per staff was 417 percent. Electricity bills make up 27 percent of police and fire safety O&M spending. While electricity costs have come down over recent years, efficiency gains could still be achieved. The MoI has already started renegotiating contracts with electricity distribution companies and was able to negotiate prices below the regulated electricity prices.

Figure 24. Spending on the electricity bill could be more efficient as shown by the high variation of costs per staff in RDs



Source: World Bank based on MoI data.

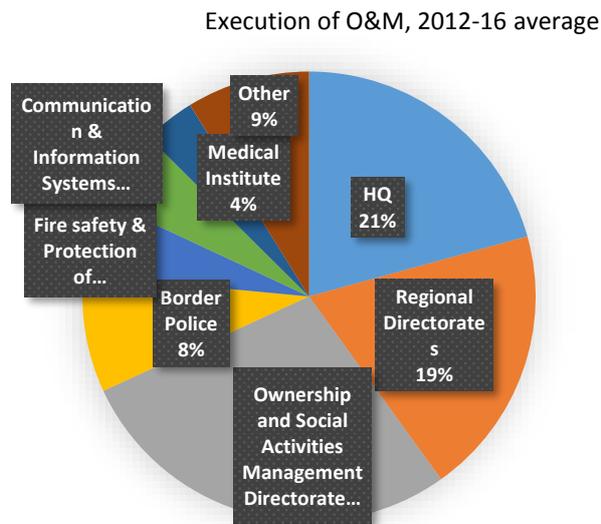
Figure 25. Spending on the water bill could be more efficient as shown by the high variation of costs per staff in RDs



Source: World Bank based on MoI data.

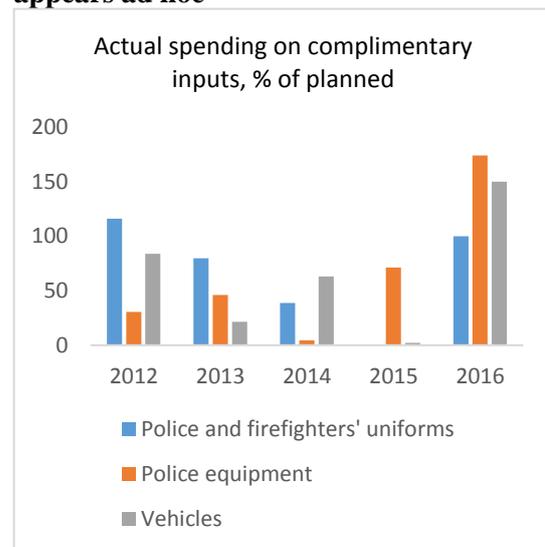
36. **A fragmented procurement function appears to be constraining the purchase of modern equipment and inputs.** The O&M spending is executed by different procurement departments (Figure 26)—in the MoI HQ, in the second level budget unit Ownership and Social Activities Management Department (OSAMD), in GD NP, in GDFSPP, as well as in territorial police and fire safety departments (for small purchases). Large volume purchases are managed by OSAMD but several failed procedures and significant share of purchases done in other departments prevents MoI to benefit from lower prices associated with larger volumes. The procurement procedures for uniforms, for example, failed several times leaving some police officers without new uniforms for five years in a row. There is scope to make more use of centralized procurement given that OSAMD has handled only 28 percent of purchases.

Figure 26. O&M spending is executed under a fragmented structure



Source: World Bank calculations based on MoI data.

Figure 27. Planning of needed inputs appears ad hoc



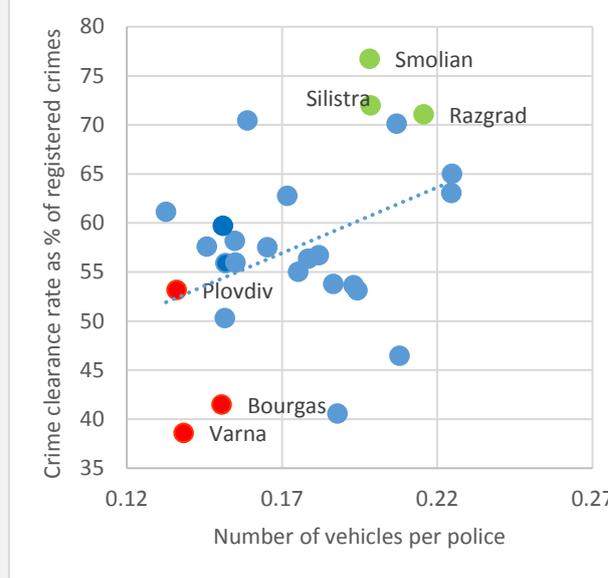
Source: World Bank calculations based on MoI data.

37. **Delays in procurement bring uncertainty in budget planning.** Despite reported unmet O&M needs, MoI spent well below planned amounts for uniforms, equipment, and vehicles (Figure 27). Underspending reduces the predictability of future budget allocations.

38. **In 2017, the MoI took steps to address some of these issues.** Staff who have not received uniforms over the previous five years were provided with cash benefits, totaling BGN 17.5 million. The modernization of equipment that started in 2016 continued in 2017 with purchases of vehicles and a contract was signed for a long-delayed procedure for delivery of anti-bullet vests.

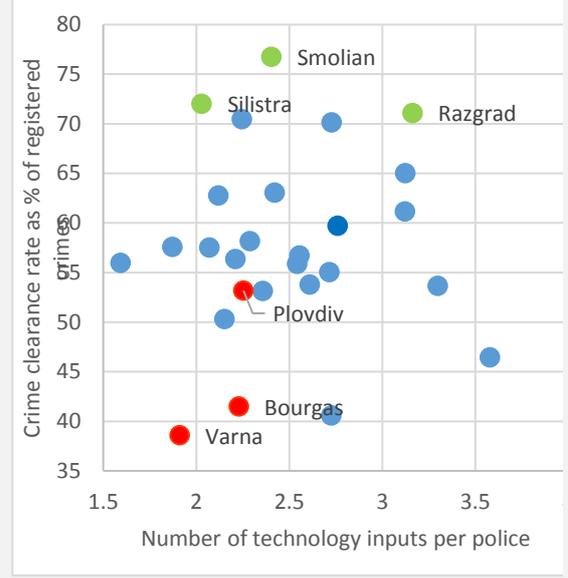
39. **Significant inefficiencies in the allocation of purchased complementary inputs further hinder performance.** The DEA analysis shows that there is scope to improve the use of vehicles and technology, as some RDs use them more effectively in combating crime than others (Figure 28 and Figure 29). About 41 percent of technology inputs in the RDs are not being used efficiently to support police operations. External factors are to a large extent responsible for the different performance of RDs in their use of technology inputs, but internal factors are also responsible for such inefficiency, ranging from 3 percent of technology inputs in Bourgas to 29 percent in Kjustendil (Figure 30).

Figure 28. Districts with higher crime clearance rates tend to have more vehicles, but there is great variation



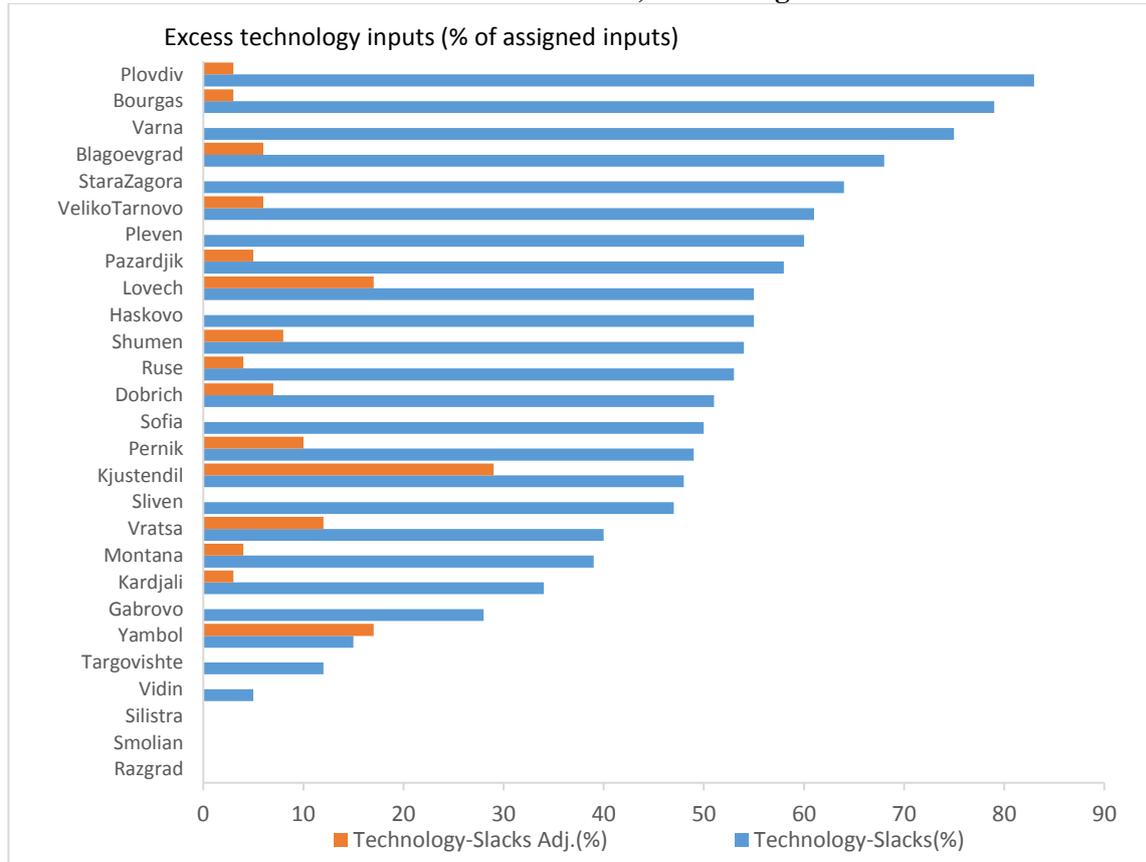
Source: World Bank calculations based on MoI data.

Figure 29. There is no clear link between number of technology inputs in a district and crime clearance rate



Source: World Bank calculations based on MoI data.

Figure 30. After accounting for external factors, the percentage of inputs (technology) that are in excess and could be reallocated are reduced, but still significant



Source: World Bank based on MoI data.

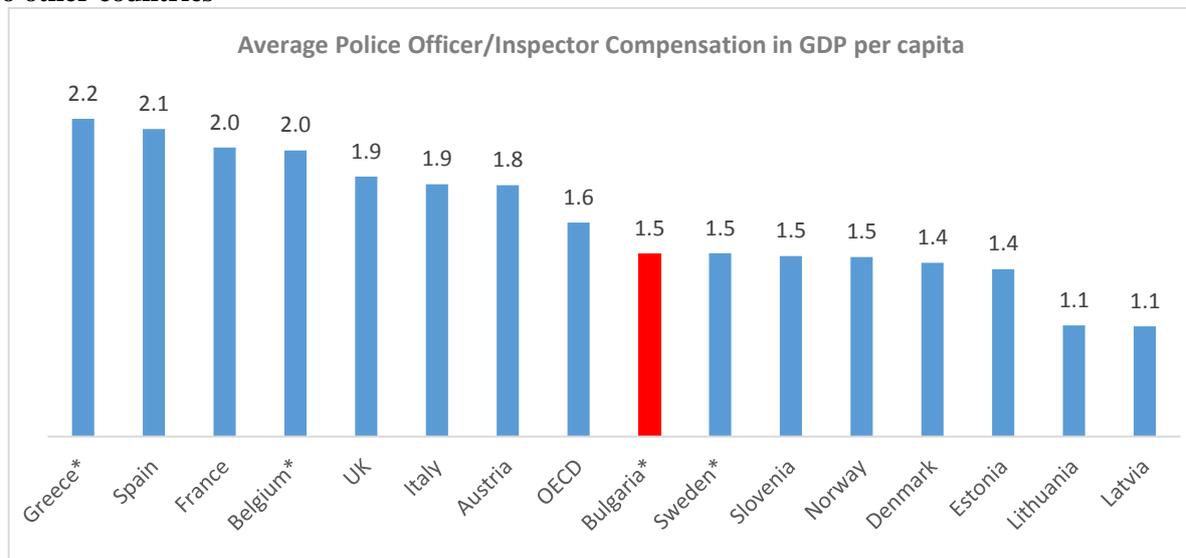
40. **Suggested recommendations for greater and better use of complementary inputs:**

- Analyze reasons for inefficient use of resources in RDs—vehicles and technology, among others—and agree on an action plan to reduce these inefficiencies.
- Consolidate some procurement functions where warranted, analyze reasons for delays and inefficiencies in procurement and put in place further anti-corruption measures.
- Identify measures to limit spending on utility bills (renegotiating contracts, selling, renting or sharing unused premises, improving energy efficiency of buildings, etc.). Such measures could yield savings of up to 40 percent of water and electricity spendings. The MoI has already started to take first steps in this regard.

3.3. Pay policies

41. **Contrary to popular belief, police salaries in Bulgaria do not appear low relative to GDP per capita.** Accounting for differences in GDP per capita, police salaries in Bulgaria are not lower than in regional comparators and even some old Member States (Figure 31). The average compensation of Bulgarian police officers expressed relative to GDP per capita is at the same level as in Sweden and Slovenia, and higher than in Denmark, Estonia, Lithuania, and Latvia. In all cases, the compensation includes the employer social contribution, which is highest in Bulgaria.

Figure 31. Contrary to popular belief, police salaries in Bulgaria do not appear low compared to other countries



Source: Government at a Glance 2017 - © OECD 2017, MoI data on BG salaries and WB staff computation.

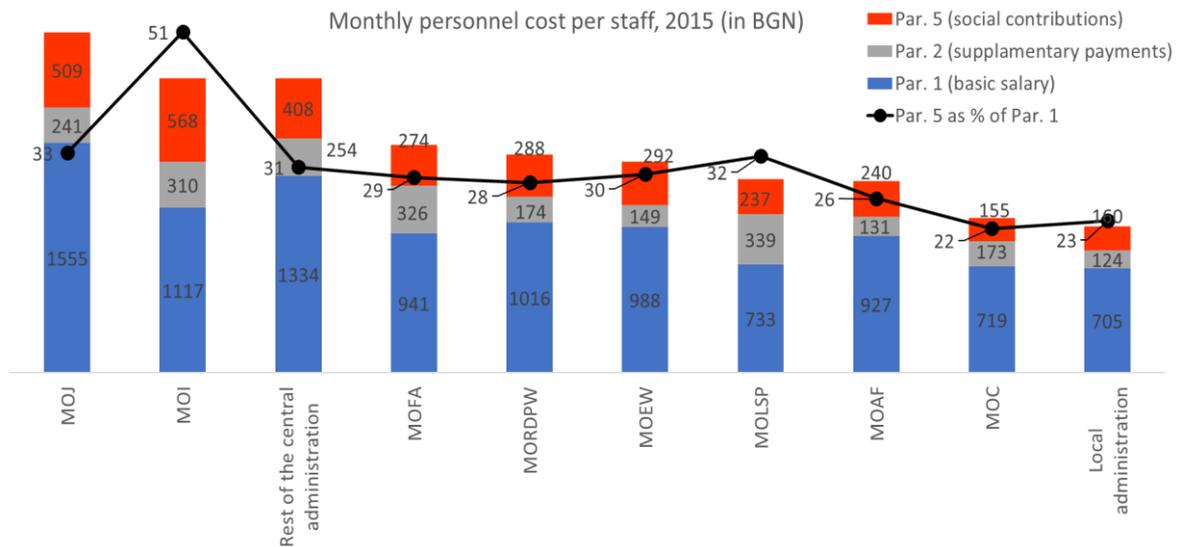
Notes: Compensation includes employer social security contributions.

* Greece, Belgium, Bulgaria, Sweden do not distinguish between police officer's and police inspector's salaries. Therefore, averages were used to compare with countries that report these categories separately.

42. **Within Bulgaria, MoI staff are among the better paid and have the highest social contributions.** Monthly salary spending per staff (excluding social contributions) is one of the highest (Figure 32) despite the higher share of staff with secondary education in the MoI. The main driver of high personnel spending of MoI is social contributions, which represents 51 percent of the salary spending for the total MoI personnel. Nevertheless, the police trade unions

complain that police officers are underpaid, the adjustment of wages is low while responsibilities of staff are growing. In 2018 MoI received an increase of BGN 155 million for personnel spending.

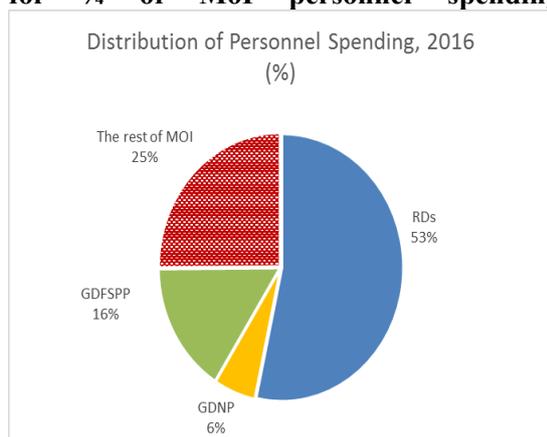
Figure 32. MoI staff are among the better in the GoB due to generous social contributions



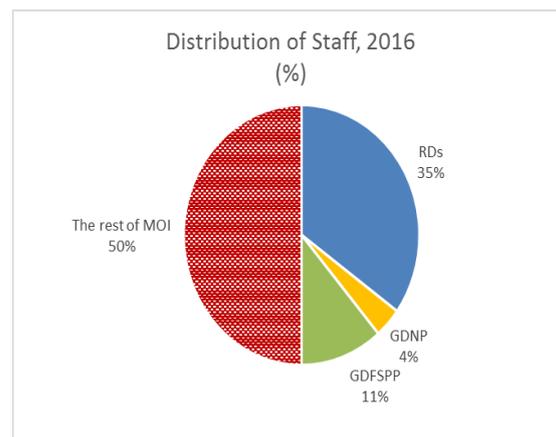
Source: World Bank calculations with MoI and MoF data.

43. **High social contributions contribute to police and firefighting personnel spending.** Personnel spending of police and firefighting account for three fourths of overall personnel spending of the MoI (Figure 33) while staff numbers are only half of MoI staff (Figure 34). This due to higher social contributions that increase personnel costs per staff for police and firefighters compared to the rest of MoI staff.

Figure 33. Police and firefighting is responsible for ¾ of MoI personnel spending... **Figure 34. ... and only ½ of staff numbers**



Source: World Bank calculations based on MoI data.



Source: World Bank calculations based on MoI data.

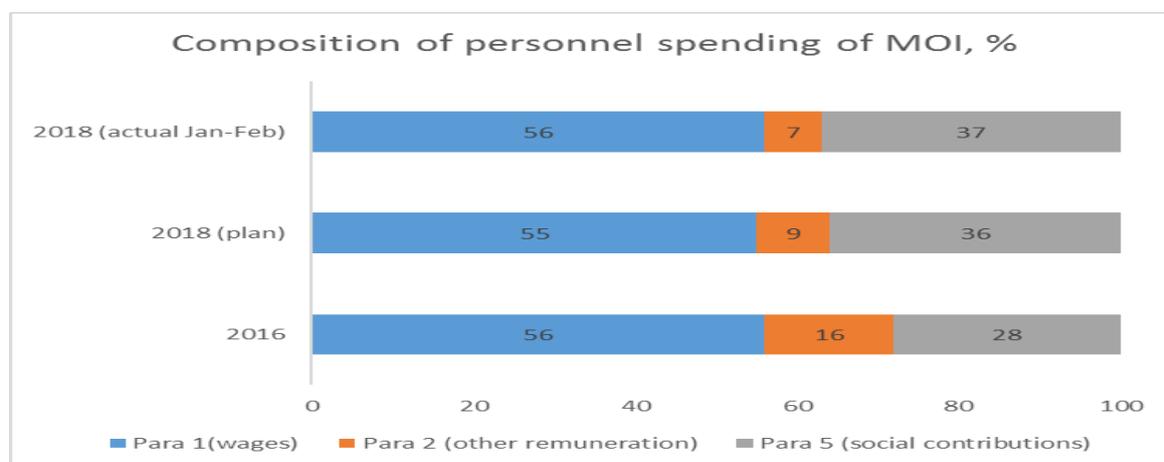
44. **A key driver of the high social contribution spending is the eligibility for early retirement for most MoI staff, which places great pressure on the police pension fund.** In 2016, 76 percent of MoI staff were eligible for early retirement (specialized civil servants under

MoI Act retire almost 10 years earlier than general categories of labor and civil servants¹⁰) and the pension contribution rate was 40.8 percent (compared to 22.3 percent for civil servants) and together with health, other contributions and insurance the overall social contribution rate for specialized civil servants was 54 percent. Early retirement and thus a high social contribution rate is justified when work poses high risk, but not for staff doing deskwork who do not experience higher risk than those in other ministries.

45. **In February 2017, some positions in MoI were reclassified to recognize that administrative positions are not subject to risk.** Employees in financial management and accounting, facility and equipment administration, legal services, personnel management, communication and ICT services were reclassified to civil servants and are no longer eligible for early retirement as special civil servants of the MoI. The reclassification of employees in the administrative positions to general civil service or labor employment regime made sense, as administrative staff should not have the same privileges as those special civil servants exposed to danger and risk.

46. **However, this change has not resulted in a reduction of social contribution spending.** The reclassification of administrative civil servants and employees did not reduce social contribution spending because the pension contribution rate for specialized civil servant under the MOI Act was increased from 40.8 to 60.8 percent in 2017 to cover the shortfall in the pension fund. As a result, the share of social contribution in personnel spending increased 9 percentage points by February 2018 relative to 2016 (Figure 35).

Figure 35. The number of persons eligible to high social security contribution decreased, but the share of social contributions in the wage bill expanded because the pension contribution rate increased



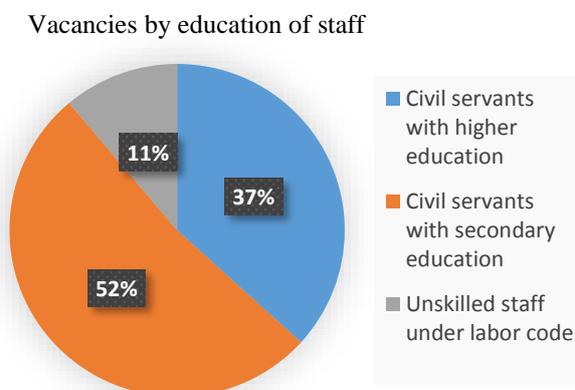
Source: World Bank calculations based on MoF data.

47. **Another important driver of the high social contributions in the MoI is the fact that the state pays the employee portion of the social contribution.** The high social contribution payments for police officers and firefighters are fully paid out of the state budget, including the employee portion of social contributions, which in most other European countries is paid by the employee.

¹⁰ Art. 69 of the Code on Social Insurance provides a possibility for specialized civil servants under MoI Act to retire as young as 53 years and 2 months of age, if these employees have completed 27 years of service, of which two-thirds or 18 years are spent with a status of special civil service (e.g., police officer, firefighters, etc.).

48. **High social security contributions, while creating favorable retirement conditions, reduce the fiscal space for actual salaries, especially for those police and firefighters with secondary education.** The salaries in this category became unattractive causing significant systemic vacancies. Vacancies have persisted in MoI over time. A high vacancy rate affects police officers' and firefighters' morale and performance. While the state continues providing for the social well-being of its special civil servants through various instruments – an around 2 percent salary increment every year,¹¹ additional payment for the dangerous and harmful working conditions, performance bonus, meals or compensation for meals, free public transportation, severance pay of up to 20 monthly salaries upon retirement, free health services, extensive training, subsidized housing, and subsidized vacation homes – the low base salary is unattractive for new entrants and is a reason for vacancies, perpetual public complaints and demands for higher pay.

Figure 36. A large share of vacancies take place in lower skilled positions



Source: World Bank calculations based on MoI data.

49. **More than half of the vacancies are in the lowest pay grade category, which does not appear to provide a sufficiently attractive pay package** (see Figure 37). The incentives to join the police force and fire safety directorate are (i) early retirement and high severance payments and (ii) additional supplements for dangerous and hazardous conditions. The first incentive is focused on the future, while the prospects in the present and near future for staff in the lowest pay grade (staff with only secondary education) are bleak due to the low size of pay and very few career opportunities. Therefore, filling vacancies at this bottom level of professional civil service will continue to be an issue, unless there is a better balancing of present versus future incentives (early retirement age) and better career opportunities are offered to policemen whose base salary starts at BGN 663. At higher education levels, attraction of qualified personnel may be difficult because of higher qualification requirements than the labor market can offer.

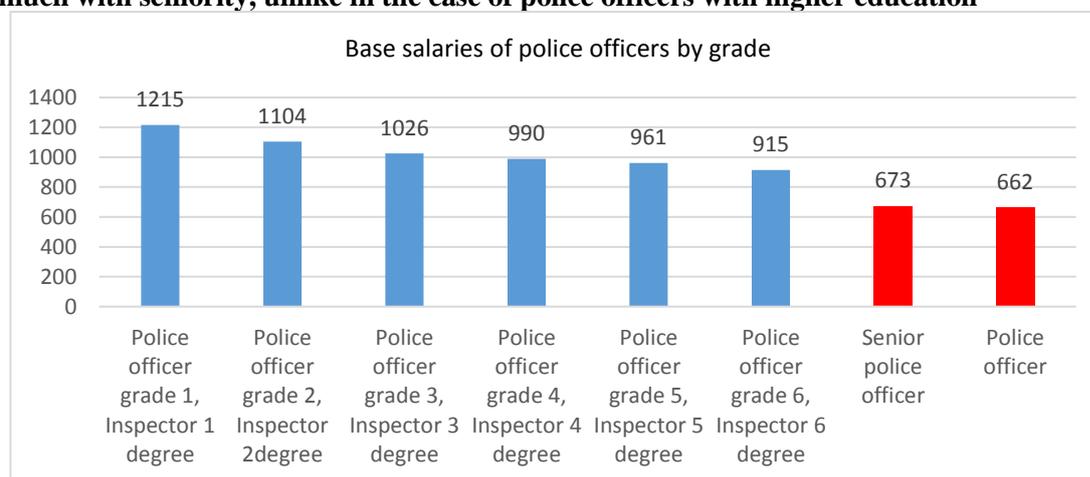
50. **Staff in the lowest pay grade category have few career opportunities within the MoI system** (Figure 37). Though police and firefighters with higher education can be promoted along six different pay categories, there is only one pay category for police and firefighters with secondary education, who represent 63 percent of staff in GD NP and GDFSPP. The difference in base pay between senior police officer and police officer is only 1.6 percent, or BGN 11(see Figure 37, red columns). For firefighters with secondary education, the base

¹¹ This increase varies by position but it is around 2 percent.

salaries are the same as for police officers and so is the difference between senior firefighter and firefighter, who earn BGN 673 and BGN 662, respectively. For a police officer to breach the salary gap with the police officer with the higher education, it will take 17 years, when the base salary reaches BGN 927, the entry level for police officers with higher education.

51. **Nevertheless, at the lower level of hierarchy, salaries of MoI staff are higher than in the general civil service though the rate of salary progression is lower.** For example, the lowest salary for a junior expert (Expert level 7) with higher education at entry level is BGN 420 (2016) and the highest possible base salary for outstanding performers could reach BGN 2,400 after 18 years in the same position. In practice, the lowest salary for Expert level 7 in the regional directorate of the Ministry of Environment and Water in 2016 was BGN 435, well below the salary of police or firefighters with secondary education. Civil Service does not employ specialists without higher education. Persons with secondary education in the general civil service could be given a consultant position with the entry base salary of BGN 420 and the highest base salary of BGN 1,600 after some 18 years. The rate of salary progression in the general civil service is thus higher than for police officers with secondary education.

Figure 37. Base salaries of police officers with secondary education do not increase much with seniority, unlike in the case of police officers with higher education



Source: MoI internal regulation on position salaries.

Suggested recommendations regarding pay policies:

52. **Provide incentives for career progression to police officers and firefighters with secondary education.** The MoI could consider a faster salary progression for good performers, as well as other non-financial incentives, to improve attractiveness of their positions.

53. **Consider limiting further the eligibility for early retirement to staff who perform high risk work.** The reclassification of staff to general civil servants or employees under labor code could be continued to cover more jobs that do not involve risky work. Even within the police and firefighters there are positions that involve mainly desk work.

54. **Consider reducing the gap of retirement age and years of service between specialized civil servants and general civil servants.** This will enhance the sustainability and fairness of the pension system. While early retirement for police officers and firefighters is applied in other EU countries, the gap is usually smaller. For example, UK police officers now retire at the age of 60 compared to 65 for general categories, similar for German police officers—60 compared to 65 and 7 months.

4. Conclusion

55. **Citizen perception of reliability of police services in Bulgaria is one of the lowest in the EU despite the highest public spending on public order and safety among comparator countries.** As the experience of other countries shows,¹² the solution to make people feel safer and to minimize lives lost and property damage from fires is to use resources better rather than necessarily spending more.

56. **Going forward, a better use of human resources, greater use and reallocation of complementary inputs, and revised pay policies will help increase efficiency, free resources for equipment and skill upgrade and improve performance.** This in turn will enhance citizens' perceptions of public order and safety bringing them up to the level of comparator countries and increasing citizen welfare.

57. **Human resources can be better used through the consolidation of administrative services, the use of shared administrative services and the efficient allocation of police and fire brigade staff.** The existing 28 RDs could be consolidated into a smaller number of RDs, as some agencies in Bulgaria have already done. Shared administrative services could also be established to support the RDs and the territorial units of the Gendarmerie and the General Directorate for Fire Safety. Such consolidation and sharing of services would help to allocate resources (human, financial and technological) more efficiently and provide savings for other needed spending. In addition, the allocation of police and fire brigade staff where they are most needed and can be most effective will help improve public service enhancing citizen perception. This requires analyzing first the reason for the inefficient use of staff and developing an action plan to address them. Monitoring performance will help ensure the continued efficient use of staff over time. The monitoring of performance by the MoI is a good step. Linking such performance monitoring to spending will help assess the efficiency in spending. Making comparisons across RDs rather than just comparisons across time will compare efficiency and promote healthy competition.

58. **Spending on complementary inputs can be improved through more efficient contracting, efficient allocation, and enhanced procurement.** The renegotiation of utility contracts, which has already been initiated by the MoI, the consolidation (through selling, renting or sharing) of unused premises, the identification of inefficiencies in the allocation of vehicles and technology, improved O&M planning, the consolidation of procurement functions and improvements in anti-corruption and speed of procurement, would help better address spending needs in O&M and increase impact.

59. **Changes in pay policies in the area of social contribution and of career progression could help improve staff motivation, reduce vacancies, decrease overtime and free needed resources.** Increasing the mandatory length of service necessary for retirement, better balancing present versus future incentives, gradually discontinuing the coverage of the employee portion of social contribution and ensuring that all staff who receive a high social contribution rate perform risky work would free resources for other needed spending. Such resources could be spent for instance on improving career opportunities for staff in the lowest pay category, which will in turn contribute to reduce vacancies and decrease overtime payments.

¹² See Box 1 and Annex 1.

REFERENCES

- Alda, E. (2013). *Performance of Police Forces in Guatemala and Nicaragua*. Research. Justice, Law and Criminology. The American University. Washington, D.C.
- Alda, E. (2014). How are police doing in combating crime? An exploratory study of efficiency analysis of the Policia Nacional Civil in Guatemala. *Policing: an international journal of police strategies & management*, 37(1), 87-107.
- Alda, E. (2016). *Reallocation of Police Inputs to Maximize Organizational Efficiency: Evidence from a Developing Country*. Research. Justice, Law and Criminology. American University.
- Alda, E. (2016). *Mejorar el Desempeño en Seguridad Ciudadana a través de la Eficiencia en el Gasto, in Peru: Gasto Publico*. Research/Policy. Washington, D.C.
- Alda, E. (2017). *Police performance and Impact in Mexico*. (PhD Dissertation), American University, Washington, D.C.
- Alpert, G. P., & Moore, M. H. (1993). Measuring police performance in the new paradigm of policing. *Performance measures for the criminal justice system*, 109, 111.
- Andersen, P., & Petersen, N. C. (1993). A procedure for ranking efficient units in data envelopment analysis. *Management science*, 39(10), 1261-1264.
- Barros, C. P. (2007). The city and the police force: analysing relative efficiency in city police precincts with data envelopment analysis. *International Journal of Police Science & Management*, 9(2), 164-182.
- Berman, E. M. (2006). *Performance and productivity in public and nonprofit organizations*: ME Sharpe.
- Cazals, C., Florens, J.-P., & Simar, L. (2002). Nonparametric frontier estimation: a robust approach. *Journal of econometrics*, 106(1), 1-25.
- Carrington, R., Puthuchery, N., & Rose, D. (1997). Performance Measurement in Government Service Provision: The Case of Police Services in New South Wales, *Journal of Productivity Analysis*, 8, 415-430.
- Council of Ministers (2016). Report on the State of the Administration.
- Dormer, Eoin and Thomas Gavin. Spending Review 2017. Challenges for Investment in Police Expenditure: A Public Expenditure Perspective. Prepared by staff in the Department of Public Expenditure & Reform in the context of the Spending Review 2017, July, www.per.gov.ie/wp-content/uploads/Policing-Investment.pdf
- Drake, L. M., & Simper, R. (2000). Productivity Estimation and the Size-Efficiency Relationship in English and Welsh Police Forces: An Application of DEA and Multiple Discriminant Analysis, *International Review of Law and Economics*, 20, 53-73.
- Drake, L. M., & Simper, R. (2002b). The Measurement of English and Welsh Police Force Efficiency: A Comparison of Distance Function Models, forthcoming *European Journal of Operational Research*.
- Dyson, R. G., & Thanassoulis, E. (1988). Reducing weight flexibility in data envelopment analysis. *Journal of the Operational Research Society*, 563-576.
- Färe, R., & Grosskopf, S. (2000). Theory and application of directional distance functions. *Journal of Productivity Analysis*, 13(2), 93-103.
- Fiorentino, E., Karmann, A., & Koetter, M. (2006). The cost efficiency of German banks: a comparison of SFA and DEA. Available at SSRN 947340.
- Fisher Associates (2012). Irish Coast Guard: Value for Money Review. Prepared by Fisher Associates on behalf of the Department of Transport, Tourism and Sport, Ireland. <http://www.dttas.ie/sites/default/files/publications/maritime/english/irish-coast-guard-publications/fishers-report-ircg-vfm-final-10-4-12.pdf>

- Fried, H. O., Schmidt, S. S., & Yaisawarng, S. (1999). Incorporating the operating environment into a nonparametric measure of technical efficiency. *Journal of Productivity Analysis*, 12(3), 249-267.
- Goltz, J. W. (2006). *Police organizational performance in the state of Florida: confirmatory analysis of the relationship of the environment and design structure to performance*. University of Central Florida Orlando, Florida.
- Kumar, S., & Kumar, S. (2013). Does modernization improve performance: evidence from Indian police. *European Journal of Law and Economics*, 1-21.
- Langworthy, R. H. (1986). *The structure of police organizations*: Praeger New York.
- Maguire, E. R. (2003). Measuring the performance of law enforcement agencies. *Calea Update*, 83, 84.
- Maguire, E. R. (2003). *Organizational structure in American police agencies: Context, complexity, and control*: SUNY Press.
- Nyhan, R. C., & Martin, L. M. (1999) Assessing the Performance of Municipal Police Service Using Data Envelopment Analysis: An Exploratory Study, *State and Local Government Review*, 31(1), 18-30.
- Ozcan, Y. A. (2008). *Health care benchmarking and performance evaluation: an assessment using Data Envelopment Analysis (DEA)*: Springer Berlin.
- Pascoe, S., Kirkley, J. E., Greboval, D., & Morrison-Paul, C. (2003). *Measuring and assessing capacity in fisheries: Issues and methods*: Food and Agriculture Organization of the United Nations.
- Sarkis, J. (2007). Preparing your data for DEA *Modeling data irregularities and structural complexities in data envelopment analysis* (pp. 305-320): Springer.
- Simar, L., & Wilson, P. W. (2011). Two-stage DEA: caveat emptor. *Journal of Productivity Analysis*, 36(2), 205-218.
- Sparrow, M. K. (2015). *Measuring Performance in a Modern Police Organization*.
- Thanassoulis, E. (2001). *Introduction to the theory and application of data envelopment analysis*: Springer.
- Thanassoulis, E. (1995) Assessing Police Forces in England and Wales using Data Envelopment Analysis, *European Journal of Operational Research*, 87, 641- 657.
- Treasury Committee (2010). Spending Review and Autumn Statement 2010. October. United Kingdom Government. <https://www.gov.uk/government/publications/spending-review-2010>
- Treasury Committee (2015). Spending Review and Autumn Statement 2015. November. United Kingdom Government. <https://www.gov.uk/government/publications/spending-review-and-autumn-statement-2015-documents>
- UN 2006. www.unodc.org/documents/crime-congress/12th-Crime-Congress/Documents/A_CONF.213_3/V1050608e.pdf
- Verma, A., & Gavirneni, S. (2006). Measuring police efficiency in India: an application of data envelopment analysis. *Policing: An international journal of police strategies & management*, 29(1), 125-145.
- Wilson, J. Q. (1978). *Varieties of police behavior*: Harvard University Press.
- World Bank (1994). Peru - Public expenditure review (English). Washington, D.C.: World Bank. <http://documents.worldbank.org/curated/en/766811468758342721/Peru-Public-expenditure-review>
- World Bank (2010). El Salvador - Public Expenditure Review : Enhancing the Efficiency and Targeting of Expenditures, Volume 1. Main Report. Public expenditure review (PER). Washington, D.C.: World Bank. <https://openknowledge.worldbank.org/handle/10986/12372>

World Bank (2016). Mexico - Public expenditure review (English). Washington, D.C. : World Bank Group.
<http://documents.worldbank.org/curated/en/284151472615491033/Mexico-Public-expenditure-review>

World Economic Forum's Global Competitiveness Index (GCI), 2017-18.

World Justice Project (2017). WJP Rule of Law Index 2017-2018, p. 36.
<https://worldjusticeproject.org/our-work/wjp-rule-law-index/wjp-rule-law-index-2017%E2%80%932018>

ANNEX 1. Insights from Police Spending Reviews in other countries

More often than not, it is not about spending more, but allocating resources better:

- SRs typically review if the allocation of policing budget across regions is based on an efficient criterion.
- The criteria usually employed by countries for regional budget allocation are levels of crime and violence (or poverty and inequality which are linked to crime) and population size.
- SRs also review the evolution of the crime rate over time to see if it supports budget increases or to understand changes in people's perceptions of police service (Peru¹³ and El Salvador¹⁴).
- SRs also compare crime statistics and police budget relative to other countries to assess if differences in budget allocation can be explained by differences in the extent of crime (Peru and El Salvador).
- SRs compare spending effectiveness relative to other countries, for instance in terms of share of crimes resolved per 1,000 police (Peru) or the response time (El Salvador).
- Some SRs (Ireland¹⁵ and Peru) recommend using a resource allocation model to distribute police forces to districts and departments based on needs and local efficiency.

The Peruvian case is a clear example that ensuring public order and safety does not imply spending more, it can be addressed reallocating resources more efficiently:

- The most efficient Peruvian district is 25 times more efficient in using its inputs than the most inefficient (in some districts resources are being underused).
- Reallocating resources (staff and inputs) across policing districts so they are linked to the extent of crime could improve services by 60 percent (in terms of crimes prevented).
- Reallocating resources away from districts were spending is less efficient would save 0.3 percent of GDP for other spending.

The allocation and cost of staffing is a common topic across SRs:

- Reducing overtime is an objective in several SRs (Ireland, Mexico¹⁶ and UK¹⁷). In the case of Ireland, the following objectives were set in its SR:
 - the reduction of overtime to sustainable levels (4-5 percent of pay)
 - establishing a system to budget for overtime by category (e.g. courts, crime investigation, etc.)
 - including a contingency for expected ad hoc events (e.g. State visits).

13 World Bank (1994).

14 World Bank (2010).

15 Dormer and Gavin (2017).

16 World Bank (2016).

17 Treasury Committee (2015).

- The use of more civilians to perform some police functions is considered to free up savings and reduce working hours. In the case of Ireland:
 - the Irish Garda estimates that if civilianization meets the 1,500 posts target, €45m would be saved annually, which could fund 2.5 million hours more of operational policing.
 - civilianization reduces pension payments (the employer contribution rate for police was 53 percent pre-2013 and 14 percent post -2013, but for civil servants it is 8 percent) and overtime.

Restructuring and consolidation of functions are also considered:

- Such restructuring and consolidation enables resources to be used more efficiently and reduce overtime.
- In the case of the Irish Coast Guard,¹⁸ the consolidation of units and centers was performed to free up staff to be redeployed to other duties.
- In the UK, as part of the 2010 reform, the National Crime Agency was set up to provide services best delivered at the national level. It also absorbed some functions of the National Policing Improvement Agency, which was abolished, saving an estimated £50 million (BGN 112 million).
- In Holland, 26 local police forces were merged into one national police to address inefficiencies caused by many layers in policy and governance.

Improved procurement is also considered to reduce costs:

The Mexico and UK SRs target improvements in procurement. In Mexico the recommendation was to ensure that the procurement of goods and services at the local level is fully transparent and public, which was expected to generate important cost savings.

18 Fisher Associates (2012).

ANNEX 2. Measuring public sector performance in delivering public order & safety services using frontier methodologies

1. Introduction

Both policymakers and citizens have scrutinized public-sector performance in delivering public order & safety services with increasing interest, and, occasionally, concern in recent years. Public order & safety, particularly policing and fire safety, are at the core of public service delivery particularly because both are highly visible to citizens. Consequently, establishing a robust and transparent mechanism to measure performance in public order & safety has become a government priority. Furthermore, as pressure on the use of fiscal resources increases, an increased need to ensure the highest levels of performance with the least waste of resources has developed (Langworthy, 1986; Maguire, 2003a, 2003b; Wilson, 1978).

Efforts to measure public sector performance in the areas of public order & safety include two key elements:

- A. **Effectiveness.** This concept determines the level of results achieved regardless of the amount of resources employed (Berman, 2006). For instance, in the case of the police, the crime clearance rate can be used as a measure of effectiveness since it is a comprehensive measure of the work performed by the police. In this example, it is the crime clearance that is measured rather than the number of inputs used to produce that crime clearance.
- B. **Efficiency.** This concept is a measurement of the ratio between outputs and inputs:

$$\text{Efficiency} = \frac{\text{output}}{\text{input}}$$

For example, a measure of efficiency would be how many crimes are cleared¹⁹ in relation to how many inputs the police uses (e.g. officers, vehicles, technology, infrastructure, etc.) (Kumar and Kumar, 2013). Efficiency is, therefore, a more comprehensive measure of performance because it measures both the effectiveness of the institution as well as how it employed its available resources (inputs) to achieve its objectives.

In practice, the objective of measuring efficiency is to maximize output with the minimum amount of inputs used. For example, a higher percentage of crimes cleared using the same amount of inputs would be considered to have improved efficiency. In contrast, a police station with a lower percentage of crimes cleared while using the same number of inputs relative to its peers, would be considered to be inefficient, and would need to either expand its outputs and/or contract its inputs to increase its efficiency.

Measuring efficiency is increasingly critical for public sector institutions like the police and fire safety services. Frequently, even though resources in public sector institutions are constrained, budgetary allocations are made regardless of whether resources are spent efficiently. For example, regardless of whether levels of violence remain steady or increase, budgetary allocations to the police forces are increased in an effort to curb the problem. Similarly, fire safety services may also experience budgetary increases to conduct their operations regardless of whether events increase or decrease. This raises a fundamental

question: how efficient are public order & safety forces in combating insecurity and providing fire safety services?

One approach to addressing these complex issues involves the use of frontier methodologies. Frontier methodologies are powerful tools to measure the efficiency of complex public-sector institutions like the police and the fire safety services. In this research, we employed two Data Envelopment Analysis (DEA) based techniques to measure the efficiency of the police and the fire emergency services. This report uses (1) an input-oriented DEA model to examine police efficiency and (2) a directional distance function (DDF) for the fire emergency services²⁰.

The remainder of this annex is structured as follows. Section 2 provides the intuition behind the DEA. Section 3 describes the DEA methodology used to assess the efficiency of the police in Bulgaria. Section 4 describes the DDF methodology used to assess the efficiency of fire safety services. Section 5 presents the main limitations of frontier methodologies and the final section concludes.

2. The intuition behind Data Envelopment Analysis

This section explains the intuition behind DEA making use of an example with one input, one output and multiple units of analysis (see Table A2.1 and Figure A2.1 a-c).

Table A2.1 Example of inputs and outputs

Decision Management Unit (DMU) ²¹	Input (Police Officers)	Output (Crime Clearance Rate)
A	100	80
B	300	80
C	300	300
D	500	400
E	600	400
F	100	70

In Figure A2.1.a, a police station uses one input (police officers on the horizontal axis) and one output (crime clearance rate on the vertical axis) based on the data in Table A2.1. Figure A2.1.b presents the efficiency frontier constructed by comparing the production of all observations in the sample.

This systematic comparison (benchmarking) facilitates the evaluation of the productivity of a unit because, instead of measuring productivity in the simplest possible way (output/input), the estimates are presented in relative terms. That is, all the units in the sample are compared. The resulting estimates provide a measure of the extent to which productivity must be improved to reach the efficiency levels of the best practice units in the sample.

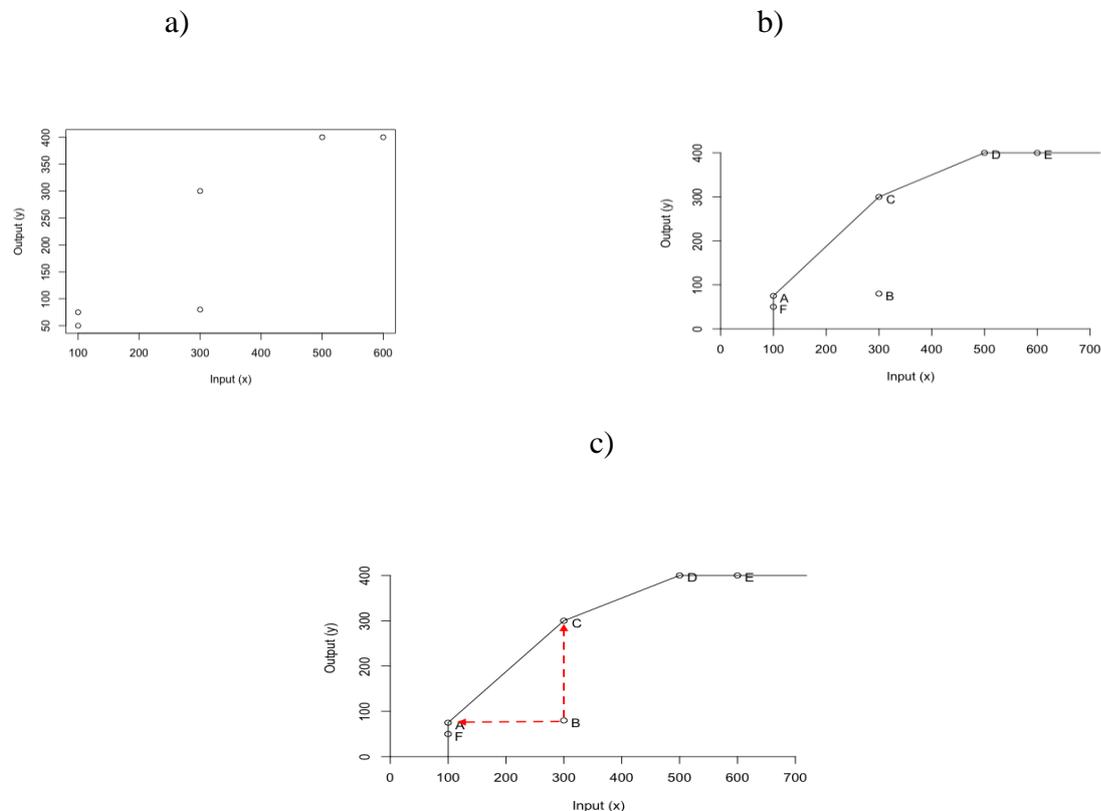
The best practice units comprising the efficiency frontier are illustrated in Figure A2.1.b. Units A, C, D, E, and F are considered efficient relative to unit B because unit B employed more inputs than units A, C, and F to produce its output. Therefore, unit B has two ways in which it can improve its performance (see Figure A2.1.c): it can either augment its output production

²⁰ As mentioned before, directional distance functions are commonly employed to examine efficiency in the presence of undesirable outputs. The objective of this technique is to simultaneously maximize desirable outputs and minimize undesirable outputs.

²¹ A DMU is the unit of analysis in DEA methodology. In the case of this study, DMUs are the regional directorates where the BNP operates.

to the levels of unit C using the same number of inputs, or it can produce the same level of output by reducing the number of inputs it employs.

Figure A2.1. Data Envelopment Analysis example²²



When trying to measure the efficiency of police forces or fire emergency services the DEA is a particularly useful because it allows accommodating multiple inputs and outputs in the same model.²³ The estimation of efficiency is a linear programming model that calculates the ratio of the weighted sum of outputs to the weighted sum of inputs.

3. Efficiency analysis of the police in Bulgaria using DEA

To estimate police efficiency, our analysis employed a multi-stage input-oriented DEA model with variable returns to scale.²⁴ An input-oriented model enabled us to examine how the Bulgaria National Police could maintain the same levels of performance, but using fewer inputs. We employed a variable returns to scale model because we assume that an increment in input results in a disproportionate increment in output.²⁵ Box A2.1 below explains the difference between an input and an output-oriented model; and Box A2.2 explains two types of returns to scale that can be used in a DEA model.

²² This example uses an input-output orientation to explain the intuition behind Data Envelopment Analysis.

²³ Police forces and fire emergency services use multiple inputs to produce multiple outputs.

²⁴ This analysis followed Fried et al. (1999)

²⁵ Conversely, a constant return to scale model (CRS) assumes that an increment of x inputs results in a proportional increment in outputs. Under this model, it doesn't take into consideration the size of the unit under analysis. This is not the case of the Bulgaria National Police or the Fire Safety Services as the size of the RDs varies substantially. Thus, it is important to consider this when conducting a DEA analysis. (Sarkis, 2007)

Box A2.1. Input vs. output oriented models in DEA

Input oriented models essentially measure the reduction needed in terms of inputs to have the same amount of outputs (Ozcan, 2008; Thanassoulis, 2001).

Figure A2.2. Input oriented model

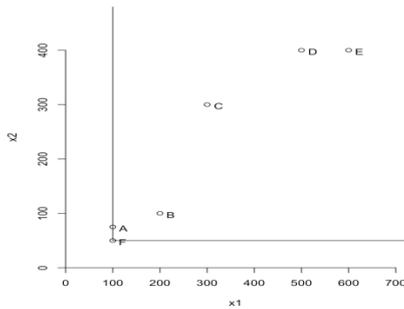
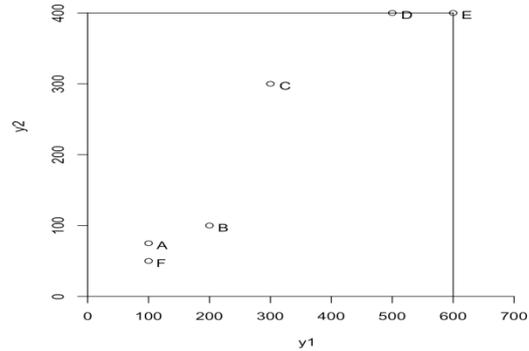


Figure A2.3. Output oriented model



Output oriented models measure the maximum output that a DMU can achieve with the available inputs (Thanassoulis, 2001).

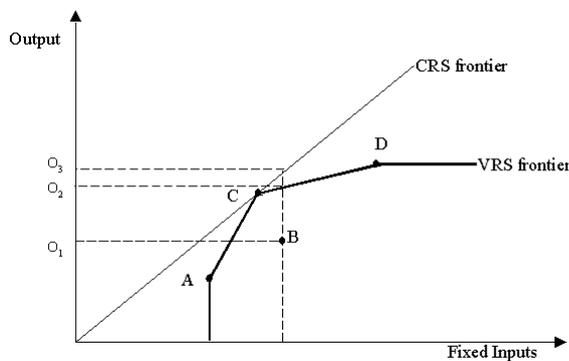
The difference between the input and the output oriented model (Figures A2.2 and A2.3) is the generation of the frontier. In the input orientation model, the best practice frontier is generated by those DMUs that minimize the input use to produce a given set of outputs; in contrast, in the output orientation model the best practice frontier is generated by those units that maximize output production for a given set of inputs.

Box A2.2.- Returns to scale in DEA – constant vs. variable returns to scale

The constant returns to scale (CRS) model assumes that an equal increase in inputs should be reflected in a proportional increase in outputs.

The variable returns to scale (VRS) model assumes that the number of outputs may vary regardless of the size of the inputs.

Figure A2.4. - CRS and VRS DEA frontiers



Source: Pascoe, Kirkley, Greboval, and Morrison-Paul, 2003.

To examine the efficiency of the Bulgarian National Police, we employed a four-stage process:

- A. The first stage estimated efficiency scores for each of the 27 districts in Bulgaria²⁶ using three inputs—the number of police officers, the number of vehicles, and an index of technology—and one output²⁷, the crime clearance rate²⁸ (Table A2.3). We then computed the number of excess inputs or slacks²⁹ for each regional directorate.

Table A2.3. Input Output combination of the Bulgarian police

RD	Police Officers	Vehicles	Technology Index	Crime Clearance Rate
Blagoevgrad	672	102	4109	0.56
Bourgas	1169	176	1709	0.41
Dobrich	411	72	2606	0.55
Gabrovo	295	55	1378	0.54
Haskovo	599	99	839	0.58
Kardjali	396	68	1313	0.63
Kjustendil	385	80	1074	0.46
Lovech	373	72	3280	0.54
Montana	386	75	1046	0.53
Pazardjik	594	106	825	0.56
Pernik	394	74	1540	0.41
Pleven	640	97	1240	0.5
Plovdiv	1455	198	987	0.53
Razgrad	269	58	690	0.71
Ruse	517	80	2225	0.58
Shumen	437	66	1433	0.6
Silistra	272	54	1405	0.72
Sliven	466	74	770	0.7
Smolian	343	68	1116	0.77
Sofia	697	108	1230	0.56
Sofia Capital	4123	444	910	0.31
StaraZagora	823	120	1377	0.58
Targovishte	290	60	851	0.7
Varna	1164	161	1183	0.39
VelikoTarnovo	561	102	552	0.57

²⁶ Sofia city was dropped from the analysis because it is an outlier in the sample and it severely biased the maximum predicted values in the second stage. As a result, the rest of the stages in the analyses would yield biased estimations.

²⁷ This study employed one output (Crime clearance rate) due to data limitations.

²⁸ The crime clearance rate is commonly employed in efficiency studies because it captures the work produced by police organizations from when a crime is reported until it enters the criminal justice system.

²⁹ These included both radial and non-radial slacks. Radial slacks are the percentage of the radial expansion (outputs) or contraction (inputs) that an inefficient unit has to do to become efficient. It is calculated using the following formula:

$$RS = (1 - \theta) * x$$

Where θ denotes the efficiency score and x denotes the input values.

The non-radial slacks are the remaining percentage of inputs that can still be reduced without sacrificing output once the unit becomes efficient. This reduction in inputs does not occur radially but along the frontier curve. These can be estimated using the following formula:

$$NRS = (1 - \theta) * x - s^+$$

Where θ denotes the efficiency score, x denotes the input values and s^+ denotes the input movement along the frontier (slack).

The sum of radial plus non-radial slacks become the total slacks.

Vidin	285	64	1110	0.63
Vratsa	450	100	791	0.61
Yambol	316	71	1207	0.65

Source: MoI.

- B. The second stage examined the effect of exogenous factors on the excess inputs. We regressed the total slacks for each of the inputs against a set of exogenous variables that are beyond the control of the organization. Box A2.3 below explains the type of models used to examine the influence of exogenous factors on efficiency. Because one of the objectives of this study was to investigate how socioeconomic and demographic characteristics³⁰ that are beyond the control of the BNP can affect input usage, we ran a regression model³¹ for each of the input slacks.

After running each regression, the predicted values indicated the expected input values given the set of exogenous variables employed in the model. In other words, these values indicate the total number of inputs needed to operate in that environment.

Box A2.3. Controlling for the Influence of Environmental Factors

Police organizations do not operate in isolation and are invariably exposed to the influence of a wide range of exogenous factors such as socio-economic, demographic, and political ones. These factors can and often do influence the performance of the police. Research evidence suggests the importance of controlling for exogenous factors when examining the efficiency of police forces (Barros, 2007; Goltz, 2006; Verma and Gavirneni, 2006). Depending on the environment in which the police operate, the effect of these exogenous factors may be larger in some areas than others. For example, recent evidence from developing countries in Latin America and the Caribbean show that socioeconomic and demographic measures, such as poverty, inequality, high levels of unemployment, and the size of the youth cohort, had, on average, negative effects on the levels of efficiency (Alda, 2013, 2014, 2016a, 2016b, 2017).

Usually, there are two ways in which efficiency scores can be adjusted and this is generally done using models with two or more stages³². The first stage estimates the levels of efficiency and in subsequent stages, the analysis would adjust the levels of efficiency to exogenous factors.

The first approach uses a second stage to regress the efficiency scores obtained in the first stage against a set of exogenous variables that are outside the control of the organization (Simar and Wilson, 2011). This approach is commonly used in police efficiency studies. A significant problem with this approach is that it only measures the effect of the exogenous factors on efficiency, and does not provide information on how the inputs could be adjusted to improve efficiency.

The second approach, which is the model employed in this review, addresses the issue of adjusting inputs to improve efficiency. The first stage of the analysis would estimate the

³⁰ These socioeconomic and demographic characteristics included the following variables for each RD: Population density, share of youth 15 to 29 years old, % of population at risk of poverty, GINI coefficient of income inequality, and the crime rate per 100,000 inhabitants. It is worth noting that these variables capture only a limited number of exogenous factors that could influence the BNP's input usage. Unfortunately, data limitations did not allow to control for more exogenous factors in the regression models.

³¹ In total, there were three regression models: one for police officers, one for police vehicles and one for technology.

³² There are exceptions where you can adjust the efficiency scores to exogenous factors using one stage. See for example the work done by Simar and Wilson (2008) and Cazals, Florens and Simar (2002).

efficiency scores and the slacks³³. The second stage would use each of the slacks³⁴ as the dependent variable in the regression model. The predicted values of the model would then be used to adjust the inputs to the exogenous factors.

Finally, the adjusted inputs would be used to estimate the levels of efficiency. The resulting (in)efficiency scores would be solely due to managerial (in)efficiencies and not to exogenous factors (Fried et al., 1999).³⁵

- C. The third stage of the analysis estimated the target input values for each police input in the analysis. This was done by subtracting each predicted input values obtained in stage 2 from its maximum predicted value³⁶ and then adding the original input value:
- a. $TI_j = x_j + [MAX\{\hat{S}_j\} - \hat{S}_j]$, where TI is the target input value, x_j is the original input, $MAX\{\hat{S}_j\}$ is the maximum predicted slack for each input obtained in the second stage regression, \hat{S}_j is the predicted slack for each input in each RD obtained in the second stage regression, and j denotes the RDs.
 - b. The target input values calculated using the formula above represent the inputs required to operate in the external environment, which have been adjusted for exogenous factors.
- D. The fourth and final stage of the DEA analysis estimated efficiency scores based on the original output values³⁷ and the target input values obtained in the third stage of the model. The resulting efficiency scores in this stage would be solely a result of managerial inefficiencies. For example, if a unit remains inefficient even after adjusting its inputs to the influence of the environment, it would indicate that factors exist related to the organizational structure and managerial decision making that are affecting its efficiency. To address this, an in-depth analysis of the organizational structure of the police would be needed to make the necessary adjustments/reforms that could lead to improved efficiency.

4. Efficiency analysis of fire safety services in Bulgaria using directional distance function

To determine the efficiency analysis of the fire safety services, this study employed a directional distance function with the presence of undesirable outputs. The presence of undesirable outputs produced by an organization requires the use of an alternative model to the traditional DEA. We chose to employ a DDF model to examine the efficiency of fire emergency services because the nature of their work—they respond to emergencies—and the outputs they

³³ Slacks are the additional improvement (increase in outputs and/or decrease in inputs) needed for a unit to become efficient.

³⁴ In this case, the analysis would use the input slacks because these are the ones that would require adjustment to improve efficiency

³⁵ The effect of the exogenous factors has been addressed in the second stage regression model.

³⁶ We use the maximum predicted input value because we want to create a leveled playing field for all units in the sample taking into consideration the most adverse environment in which police operate. It is easier for a unit to reduce inputs regardless of whether it operates in a more or less favorable environment. Conversely, if we use a more favorable environment as the base (minimum predicted value for each input), it may be difficult for a firm that operates in a more difficult environment to adjust its inputs. The ultimate objective of using the least favorable environment is that the operating environment should not be used as a reason for underperformance.

³⁷ These refer to the output values employed in the first stage of the four-stage methodology.

produce yield both desirable and undesirable outputs. Therefore, the objective is to measure how to improve efficiency by increasing/decreasing desirable/undesirable outputs. Box A2.4 below provides an explanation of this technique.

The DDF model employed three inputs and two outputs³⁸. The inputs used for the analysis included the number of fire safety officers, the number of vehicles and an index measure of the available technology in fire safety departments. The outputs included, the study employed one desirable output and two undesirable outputs. The desirable output employed in the model included the number of lives saved and the undesirable outputs included both the number of injured people and the number of dead people (see Table A2.4).

Box A2.4. Efficiency in the presence of Undesirable Outputs using a DDF

Figure A2.6 below illustrates the efficiency frontier of a DDF model using a single input-output example. The 0, T line depicts the efficiency frontier. Therefore, everything under that line (0, X) is considered inefficient. The directional vector under the directional distance function is depicted in the left quadrant of figure x and is represented by $G = (G_x, G_y)$. In this type of model, a unit of analysis is considered efficient if the estimated value equals zero, and it is considered inefficient if the values are larger than zero. Consequently, an efficiency score larger than zero indicates the percentage by which an inefficient unit would either have to expand its outputs or reduce its inputs, as well as reducing its undesirable outputs. For example, if a unit obtains an (in)efficiency score of 0.30, it would indicate that this unit could increase its outputs by 30 percent and reduce its undesirable outputs by 30 percent to become efficient.³⁹

Figure A2.6. DDF model

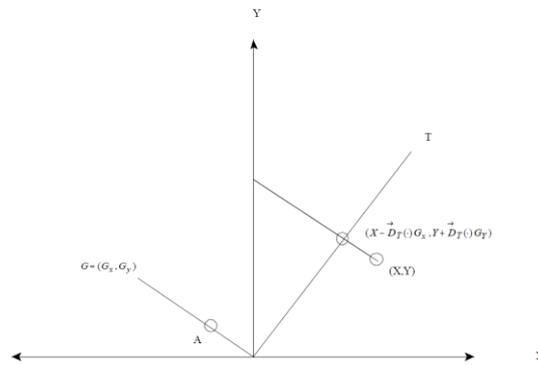


Figure 2.5 Directional Distance Technology

Source: Färe and Grosskopf (2000).

³⁸ The number of inputs and outputs used in the model was restricted due to data limitations.

³⁹ This interpretation reflects an output oriented model.

Table A2.4. Input-Output (desirable/undesirable) combination for fire safety services

RD	Firefighters	Vehicles	Technology Index	Undesirable Output 1	Undesirable Output 2	Desirable Output
Blagoevgrad	197	101	129	2	8	9
Burgas	327	141	176	5	9	9
Varna	295	132	38	8	37	30
Veliko Tarnovo	203	116	136	6	10	14
Vidin	103	55	84	1	5	5
Vratsa	232	88	50	1	11	1
Gabrovo	110	60	33	2	0	6
Dobrich	168	91	88	2	5	3
Kardjali	133	97	135	0	7	1
Kjustendil	125	71	92	8	8	7
Lovech	146	74	46	6	1	6
Montana	168	103	74	4	13	2
Pazardjik	183	102	55	2	4	11
Pernik	117	59	96	2	9	1
Pleven	171	101	102	8	8	6
Plovdiv	422	148	187	12	38	11
Razgrad	115	74	28	2	4	2
Ruse	161	108	148	5	12	3
Silistra	111	64	36	3	5	11
Sliven	115	72	52	5	6	14
Smolian	167	82	54	2	2	19
Sofia - city	665	219	161	16	43	12
Sofia Region	261	134	88	9	9	17
Stara Zagora	285	119	56	8	5	0
Targovishte	109	70	62	0	2	1
Haskovo	218	117	107	5	18	7
Shumen	124	85	35	2	11	2
Yambol	92	66	73	4	7	3

Source: World Bank staff calculations using MoI data.

5. Limitations of Frontier methodologies

Although frontier methodologies can be very powerful tools to examine and understand organizational performance, these methodologies also suffer from significant limitations. This section discusses some of the main limitations of frontier methodologies.

First, the non-parametric nature of frontier methodologies favors extreme point estimates (maximizing production), and, therefore, the methodologies are sensitive to "noise" in the data. When generating efficiency frontiers, any units below the frontier are deemed to be inefficient. As a result, any potential noise⁴⁰ in the data can lead to biased estimates. Furthermore, frontier methodologies are very sensitive to the presence of missing observations or observations with value zero.⁴¹

⁴⁰ These include measurement error, incorrect classification of the inputs or outputs or other stochastic factors.

⁴¹ Missing observations and values with zero can lead to a problem with no solution, which would result in missing efficiency score.

Second, when using frontier models to estimate efficiency, the choice of measures of inputs and outputs is paramount. The selection of variables for the analyses should be done employing multiple criteria based on: the knowledge of how the organization operates, previous studies and, most important, the available data. Given the paucity of data on organizational measures of police forces in developing countries, the choice of variables for the analysis will almost always be limited at the outset. For example, the number of inputs/outputs used in the current study was limited due to data restrictions. Despite these restrictions, however, it is feasible to measure the relative efficiency of these organizations using non-parametric methodologies like DEA and DDF.

A third factor to take into consideration when working with data from developing countries is the limited availability of data. The more granularity present in the data collected, the more accurate the analysis will be, thus permitting more precise inferences that can be made from the estimates. Data limitations can be addressed by using data at higher levels of administrative aggregation (by province or region, for example) with the appropriate explanation for the choice of strategy. The resulting efficiency estimates, however, require further explanation and a more in-depth understanding of how the organization is structured and how it operates. In this study, limitations in the data only allowed to do the study at the regional directorate level.

It is also necessary to consider some important methodological aspects before conducting an efficiency analysis. Because of its non-parametric nature, the number of units under analysis affects the number of inputs and outputs employed. DEA methodology requires that the number of DMUs must be at least three times larger than the number of inputs and outputs employed (Barros, 2007 in Alda, 2014). It is important to use measures that enable a more accurate reflection of the institution's organizational performance. In the case of the current study, for example, the efficiency analysis was limited both by the size of the sample and the number of input/output measures. When further analysis of this topic is undertaken, there would be multiple benefits from a larger sample size (higher level of administrative disaggregation) as well as more inputs and outputs produced by the police and the fire emergency services. Had more disaggregated data for this study been available, it would have been possible to include more inputs/outputs in the model.

Also, it is always important to identify potential outliers in any sample that can produce biased efficiency scores because DEA is sensitive to outliers and measurement error which expand the frontier outwards toward the extreme measures. One way to resolve this issue is to constrain the weights employed in the analysis. However, an arbitrary restriction of weights is not recommended because it would contribute additional bias to the analyses (Dyson and Thanassoulis, 1988).

Another way of addressing the issue of outliers is to eliminate one of the outliers from the analysis to correct the influence of extreme values⁴² (Andersen and Petersen, 1993; Fiorentino, Karmann, and Koetter, 2006). This method may be appropriate if we have a large number of DMUs. If, however, the number of DMUs is limited, reducing the number of observations might not be a feasible option and raises the question of how that reduction will affect the overall relative efficiency of the remaining DMUs. It is important to recognize this limitation and examine the data carefully when choosing DEA or other non-parametric methodologies such as DDF.

⁴² An additional methodology is to employ super-efficiency models in DEA. However, this is outside the scope of this study and this technical annex.

6. Conclusion

The performance of key institutions like the police and fire safety services, whose services protect and help save citizens' lives and property is central to governmental efforts to address efficiency issues in allocating resources. Therefore, the use of non-parametric methodologies like DEA and DDF, despite their limitations and methodological drawbacks, are powerful tools that can assist managers and policymakers in identifying areas of organizational improvement so resources can be employed efficiently and performance can be improved.

ANNEX 3. What is the proper output indicator for the police?

Studies in both developed and developing countries have employed the crime clearance rate as an output measure to examine the efficiency of police organizations (see for example, Darrough and Heineke, 1979; Thanassoulis, 1995, Nyhan and Martin, 1999; Drake and Simper, 2000; Drake and Simper, 2002b; Barros, 2007; and Alda, 2014). Studies in the US, Europe and Latin America and the Caribbean region have relied Also, spending reviews on police organizations have employed crime clearance rates as the preferred output measure (see for example the World Bank’s Mexico’s Public Expenditure Review⁴³. Other World Bank spending reviews employed alternative output measures in the absence of crime clearance rates. For example, the World Bank’s Peru PER used the total crime prevented as the main output measure because there were no data available to calculate the crime clearance rate.

Police scholars recommend the use of the crime clearance rate as a measure of police performance and efficiency. For example, Alpert and Moore (1997) suggest using “reported crime rates, arrests, clearance rates and response times” as measures of productivity and performance of police efficiency. Sparrow (2015) suggests using crime clearance rates, response times, arrests rates as measures of police performance.

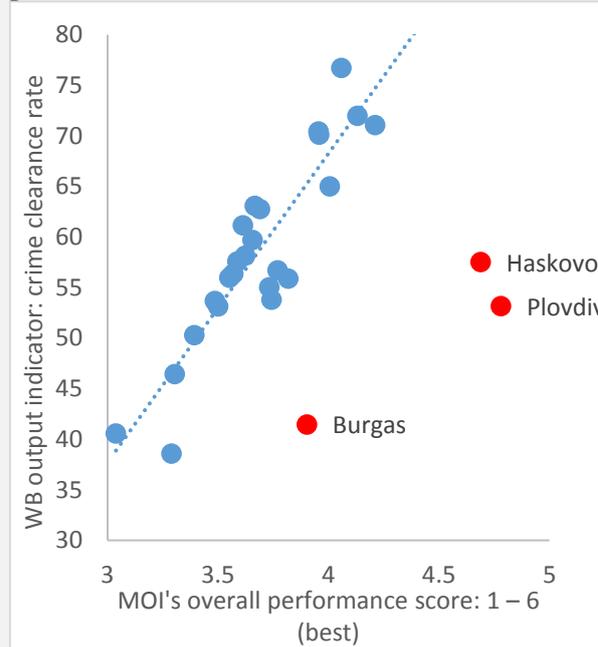
The underlying reason to use the crime clearance rate is that it captures more comprehensively the production process of police organizations, that is, when a crime is reported until a charge is laid (or not). The crime clearance process may, in some cases, include elements of the prosecutor’s office⁴⁴. However, in most cases, the bulk of the work is carried by police officers.

The proposed output measure in this analysis is highly correlated with MOI’s overall performance indicator (Figure A3.1) and with the crime detection rate, which precedes the clearance rate. (the indicator with highest weight in MOI’s overall performance estimate) (Figure A3.2). Note that the three outlier districts (Burgas, Haskovo, and Plovdiv) in Figure A3.1 are also outliers according to MOI’s second highest weighted effectiveness indicator—number of statements filed.

⁴³ <http://documents.worldbank.org/curated/en/284151472615491033/Mexico-Public-expenditure-review>

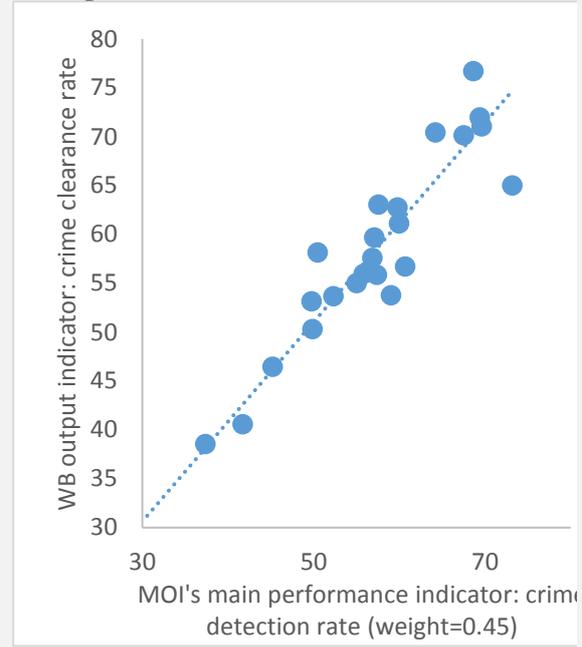
⁴⁴ The involvement of the prosecutor’s office may depend on the type of crime.

Figure A3.1. The World Bank's output indicator is correlated with MOI's overall performance indicator



Source: World Bank calculations based on MoI data.

Figure A3.2. The World Bank's output indicator is strongly correlated with MOI's main performance indicator



Source: World Bank calculations based on MoI data.

The high correlation suggests that the findings of this study are unlikely to change significantly if the overall performance indicator of the crime detection rate were used instead of crime clearance rate.