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Effects of Limited Access Orders on Science Policy and Scientific Cooperation

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Abstract

The European Union (EU) and the countries in the Eastern Partnership (EaP) framework have developed ambitious and comprehensive programmes for scientific cooperation that provide a major source of funding for science institutes and crucial support for science policies in the region. However, science policies and scientific cooperation are embedded in broader political and governance institutional structures. This paper explores the idea that in limited access orders (LAOs), institutions and powerful actors can constrain the design and implementation of scientific cooperation projects in a way that limits their broader transformative potential and societal effects. Empirically, the paper is focused on three EaP countries – Belarus, Moldova, and Ukraine – that differ in the forms and intensity of their scientific cooperation with the EU, but also in the types of regimes they have. The paper develops theoretically the possible and likely effects of LAOs on science policies and scientific cooperation and seeks evidence for such effects using sets of interviews with policy experts and scientists. Our empirical analysis shows that the results of scientific cooperation projects rarely spillover to broader society. It is unclear, however, to what extent this is a result of the generally limited capacity of EaP governments for strategic policy making and policy implementation, and to what extent it stems from features characteristic of LAOs. Overall, we find that, in line with our theoretical reasoning, the less open the regime, the more stringent the constraints on science and scientific cooperation it imposes.

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Contents

1. Introduction

The European Union (EU) and the countries in the Eastern Partnership (EaP) framework have developed ambitious and comprehensive programmes for scientific cooperation. These programmes maintain cooperation in a variety of scientific fields and support numerous activities, from training and exchange of scientific staff to joint research projects and the development of research networks and infrastructure. For many of the countries in the EaP, these scientific cooperation programmes provide a major source of funding for their science institutes and crucial support for their science policies: a lifeline that keeps science in these countries afloat (Mazepus et al. 2017). However, the degree of involvement into these programmes differs from country to country. For the EU, the ambitions of scientific cooperation with the EaP region transcend the purely scientific goals of excellence. The EU hopes to grow scientific cooperation as a tool of science diplomacy (López de San Román and Schunz 2017). Science could have transformative effects on broader society, and the results from scientific cooperation projects could inform public policies and have beneficial effects on the economies and societies in the EaP region.

To realize their broader potential, however, science policies[1] and scientific cooperation might need to be embedded in a broader political and governance institutional structure that is open, transparent, and accountable to society. Social orders that limit competition in the economic and political spheres (Limited Access Orders, LAOs) (North et al. 2007, 2009) might significantly limit the design and implementation of scientific cooperation programmes, even if in general these regimes might seek scientific cooperation as such. The closed networks of actors that hold power in LAOs might benefit from specific results from scientific cooperation projects, but might also be able to filter any undesired, intentional or unintentional, effects of the projects that could influence public policies and the broader public.

It is the purpose of this paper to develop and explore the idea that in LAOs, institutions and powerful actors can constrain the design and implementation of scientific cooperation projects in a way that limits their broader transformative potential and societal effects. We focus on three countries that are part of the EaP – Belarus, Moldova, and Ukraine – that differ in the forms and intensity of their scientific cooperation with the EU, but also in the types of regimes they have. While all three countries can be classified as varieties of LAOs (Ademmer et al. 2018), the way political and economic power is concentrated and utilized varies significantly.

First, we develop theoretically the possible and likely effects of LAOs on science policies and scientific cooperation. Then, we seek evidence for such effects using sets of interviews with policy experts and scientists in each of the three countries: Belarus, Moldova, and Ukraine.

Theoretically, we identify numerous mechanisms through which LAOs could influence the development and implementation of science policy and the nature of scientific cooperation. LAOs need the fruits of scientific and

[1] The qualitative questionnaires were designed by Dimiter Toshkov, Ina Ramasheuskaya, and Tatsiana Chulitskaya with the help of Honorata Mazepus. The qualitative interviews were conducted by Ina Ramasheuskaya and Tatsiana Chulitskaya (Belarus), Tatiana Parvan (Moldova), Oleg Grytsenko (Ukraine), and Dimiter Toshkov and Suzan Saris (EU member states). Ina Ramasheuskaya coordinated the data collection in the EaP countries and organized the analysis of the data. The bibliometric data was collected by Suzan Saris and analysed by Dimiter Toshkov. The final text was written by Honorata Mazepus and Dimiter Toshkov. We thank Antoaneta Dimitrova, Elyssa Shea, and Matthew Frear for their useful comments, as well as the audience of the EaP Plus conference in Chișinău, Moldova (30-31 May 2017).

technological innovation to support the ruling regimes, especially in economic and military terms. While formally LAOs might support scientific development, in practice the dominant coalition of elites would not be able to commit sufficient resources and attention for strategic, long-term development of science policy. To gain access to new technologies, LAOs will tolerate, and even encourage, scientific cooperation with other regimes, including Open Access Orders (OAOs), but will try to control scientific mobility and exchange and to contain the potential for broader societal impact of the scientific cooperation projects. Moreover, since the extraction of rents from the state by the dominant coalition is the *modus operandi* of LAOs, there is always the danger that the products of science and scientific cooperation will be appropriated and the gains will be privatized by the ruling elites.

Our empirical analysis is broadly consistent with these theoretical expectations. The major feature of science policies in Belarus, Moldova, and Ukraine emphasized by our respondents is the lack of strategic vision and sufficient resources devoted to science and scientific cooperation. While numerous international scientific programmes and projects exist, the results rarely spillover to broader society. It is unclear, however, to what extent this lack of strategy and resources is a result of the generally limited capacity of governments in Belarus, Moldova, and Ukraine for strategic policy making and policy implementation, and to what extent it stems from features characteristic of LAOs. Overall, it seems that science and scientific cooperation are not salient enough to attract much attention from the ruling elites in these countries.

We also find significant cross-country differences. Moldova and Ukraine are in the midst of institutional reforms of their science sectors. While it is too early to judge the effectiveness of these reforms, there is clear potential for the establishment of a more stable legal and institutional environment conducive to scientific development and supportive of international cooperation programmes. In Belarus, such reforms are missing altogether, despite some early initiatives, and the way science policy is organized is little different than it was during Soviet times. Belarus is also the country where individual researchers and research institutes have the lowest independence and face most control over mobility and scientific exchanges. Hence, we find that in line with our theoretical reasoning, the less open the regime, the more stringent the constraints on science and scientific cooperation it imposes.

The paper proceeds as follows. First, we discuss the concepts of open and limited access orders and we draw some theoretical considerations about the possible effects of the regime characteristics on science and scientific cooperation. Next, we detail our research strategy and data collection methodology. Following that, we briefly review the institutional background of science policy in Belarus, Moldova, and Ukraine and the programmes for cooperation with the EU they are part of. Then, we present the three sets of empirical findings for each country. The final section concludes and discusses the implications of our results.

2. Limited Access Orders and their effects: Theoretical considerations

2.1. Definitions of open and limited access orders

In their influential conceptual framework, North, Wallis, and Weingast (2009, see also North et al. 2007) classify social orders into primitive, LAOs, and OAOs. OAOs are defined as allowing open, universal, and impersonal access to both political and economic resources. LAOs are defined as those social orders that restrict access in these two

domains. The political and economic domains are thought to be tightly linked, so that it is impossible to have open access in the economic sphere but highly restricted access in the political one.

In LAOs, dominant coalitions of elites stall economic and political competition and use the state institutions to extract private rents. Within the broad class of LAOs, mature LAOs can exhibit a relatively high degree of organizational differentiation. That is, they can allow for a high number of formal organizations to coexist within the state. However, these organizations remain within the reach of state control. Mature LAOs can also support a complex set of formal institutions, including a form of legal system with some rudimentary form of protection for private organizations from expropriation by the state and the dominant coalitions that have captured it. The legal system, however, can also be abused by the elites, and the rule of law as such is missing.

All three countries in our study can be classified as cases of mature LAOs (Ademmer et al. 2018). All of them lack the breadth and depth of access to economic and political resources for most, if not all, parts of the population, that characterize OAOs. At the same time, they have relatively high levels of organizational differentiation, allowing a variety of formal organizations to coexist with the state, and have established basic formal institutions.

2.2. Theoretical expectations: Effects on science and science policy

LAOs are not necessarily negatively predisposed to the development of science and science cooperation. Since the innovation potential of LAOs is generally lower, scientific cooperation with other states and OAOs in particular can bring much-needed access to new technologies. Such technologies cannot be developed internally due to both the closed, limited-scale nature of LAO regimes and the disincentives to science and innovation that such regimes impose. Yet technological innovation is quite important for sustaining the regime's economic and military capabilities. While LAOs can successfully develop science and technology when backed with significant resources and commitment, as the example of the former Soviet Union shows, such development remains concentrated in a small number of areas (mostly natural sciences) where the attention of the state is focused (see Chulitskaya et al. 2017: 7-9).

While a LAO regime will attempt to reap the benefits of scientific cooperation, it will still try to avoid any societal spillovers that can encourage diffusion of ideas, promotion of freedoms of thought and expression, social mobilization, and calls for economic and political opening. Hence, the expected pattern of engagement is one where scientific cooperation is tolerated, but limited to areas where science and technological transfer is sought after by the LAO and severely constrained when it comes to more general ideational and societal exchanges.[2]

What effects on the development of science policy can we expect to see in LAOs? First and foremost, we would expect science policy to be firmly concentrated in the hands of the state, which would give the ruling elites the mechanisms to control the direction of science policy and limit its broader effects. While LAOs can devote considerable resources and attention to science, they will do so in an organizational setup where the ruler or the governing coalition of elites retains control. The development of science policy will be done in a top-down fashion, with the priorities and strategies set by the state (and within the state institutions, from those close to the centre of power), without much input and coordination from universities, individual research centres, NGOs, or other

[2] Of course, the extent to which LAOs can limit the effects of scientific cooperation in practice is an empirical question.

societal actors. Consultations about the long-term development of the science policy will be minimal or entirely formal.

In LAOs, science policy is expected to be completely subordinated to other government objectives, such as economic development or the upgrading of military capabilities. As such, the policy will be volatile, with the scientific priorities changing with the shifting economic and security priorities and strategies of the state. As a result, stability and long-term commitment to scientific development will be lacking. Since input from the different organizations and people actually doing the science is expected to be minimal, the official policy will exhibit a significant disconnect from the problems that the actual implementation of science in the country experiences. This will lead to a wide gap between strategies and formal legislation, on the one hand, and day-to-day scientific practices and short-term management priorities of scientific institutes, on the other.

Science policy priorities will be chosen by a small, networked circle of elites. Accordingly, the science budget will be distributed directly by the state. Few opportunities for competition between scientific institutes and merit-based resources allocation will exist. The budgeting process itself will be heavily top-down, with little consultation from below. Long-term investment in scientific infrastructures and networks will be low because the governing elites will not be able to muster the commitment and resources for long-term planning and development.[3] Since in LAOs the major interest of the governing coalition of elites is in extracting resources, investment in science is in their interest only in the areas where return is immediate and where investment is needed to sustain the stability of the regime (e.g. military technologies, internal security). Similarly, risk management will be nonexistent as it requires long-term thinking and coordination capabilities that LAOs regimes lack.

In LAOs, we can expect that there will be no external evaluation of science policy and its implementation. Formal evaluation will be used as a mechanism for control of scientists and institutes. To this end, criteria can be either very rigid and formalized and impossible to fulfil, or very vague and open for interpretation by the evaluation authorities, which will be held on a short leash by the state. Evaluations will not be public, unless when used to punish dissenting scientists and universities. A major hurdle for the attainment of the LAOs goals are universities that enjoy autonomy. Therefore, the state will limit or altogether abolish the autonomy of universities and disregard universities altogether as hubs for scientific development (thus transforming them into purely teaching institutions).

When it comes to the implementation of science policy, scientists and institutes will face numerous practical problems, such as shortage of resources, an unstable strategic framework, limited contact with society at large and other countries, rigid and formalistic evaluation, lack of merit-based hiring and promotion, and concentration of state resources in a small number of areas that will create significant disparities in the quality of scientific institutions within the country.

[3] These are theoretical points that are based on the conceptualization of LAOs that North et al. (2007, 2009) provide. In recent years, China (and to some extent the Soviet Union in the past) has demonstrated that LAOs can, under certain conditions, successfully develop science and exhibit a very high level of technological innovativeness. However, China does not fit the OAOs/LAOs classification very well, as it combines a relatively high openness in the economic domain with a relatively restrictive access in the political domain. And even if we consider China an important exception, the general theoretical points about the limited capability of LAO regimes to muster resources and strategic commitment to science policy remain.

Horizontal interactions between scientific institutes and independent contacts with social and economic agents will be limited. Competition between institutes will be based on signalling loyalty to the regime rather than scientific quality. Unionization of scientists and the development of strong professional organizations will be held in check by the state. The state will interfere not only in setting the long-term goals but also in daily management of those goals in order to exert control.

Considerations related to the logic of the dominant coalitions in LAOs lead to the expectation that parts of the ruling networks of elites will try to appropriate scientific results and extract private rents from publicly-funded science. This can take different forms, from stealing technologies to registering patents in their own names to privatizing profits from scientific and technological developments. On a more prosaic level, this tendency can manifest itself as the ruling elites and their agents taking advantage of the opportunities to travel abroad and to gain small financial and symbolic benefits that scientific cooperation projects offer.

2.3. Theoretical expectations: Effects on scientific cooperation

When it comes to scientific cooperation in particular, we can expect decisions to be concentrated in the state institutions that are closest and most directly controlled by the ruling elites. The choice of objectives, partners, and forms of cooperation will be directly decided upon by these institutions, with little to no input from below and from actors in broader society. Again, this does not mean that international cooperation as such will be blocked or discouraged: it only means that the objectives of cooperation will be picked autonomously by the state, without much input from individual scientists and institutes, and every effort will be made to contain the broader potential effects of cooperation.

Decisions on cooperation will be *ad hoc* and lacking a long-term strategy. Scientific cooperation will be used to substitute rather than complement national scientific strategies and resource allocation. Choice of partners will be opportunistic and guided by the current priorities in the economic and military spheres. The focus on cooperation will be on applied projects in scientific domains that have clear links with industry. Social sciences will be excluded. Humanities will not be of interest.

The dissemination of scientific results will be constrained. This will not only enable privatizations of benefits and appropriation of the resulting technologies, but will also block broader societal effects that could potentially lead to calls for freedoms of thought and expression and social mobilization in favour of democracy and open access.

When it comes to effects on the implementation of scientific cooperation projects, we can expect that LAOs will try to limit and control the mobility of scientists that cooperation projects entail. This relates both to scientists from LAOs going abroad and to their counterparts from OAOs visiting the LAO countries. Different mechanisms of control can be exercised, including sending representatives of the state apparatus along with scientists on visits abroad, hand-picking trusted and loyal scientists to participate in the cooperation projects, and imposing visas and other travel restrictions.

LAOs will be concerned about both a brain-drain of scientists to OAOs, but also the import of ‘dangerous’ ideas and experiences. This can go hand in hand with heavy bureaucratization of the cooperation process.

At the same time, bureaucratization of project management alone cannot guarantee the long-term viability of cooperation projects. Since LAOs exhibit weak rule of law, this will constrain long-term cooperation and technological transfer, because partners could not be trusted when it comes to data protection, privacy, copyrights protection, etc.

Altogether, we can expect that in LAOs the impact of scientific cooperation will be localized in the institutions directly participating in cooperation projects and in areas picked by the government. Spillover of ideas to broader society will be contained, impact on public policy will be minimal, and science cooperation will not live up to its transformative potential.

Overall, the promise of scientific cooperation as a tool of science diplomacy seems hard to realize in LAOs, at least in theoretical terms. In the rest of this paper, we empirically analyse three cases that all exhibit the characteristic features of mature LAOs, although the degree of open access to both economic resources and politics in the three countries differs in important ways, being most restricted in Belarus and less so in Moldova and Ukraine.

3. Research approach

We study the theoretical propositions discussed above empirically in three countries in Eastern Europe: Belarus, Moldova, and Ukraine. These three countries all partake in the scientific cooperation programmes of the EU, but the precise forms and intensity of cooperation differ. While Moldova and Ukraine are associated with the EU's scientific cooperation programmes and have the same full rights as any EU member state, Belarus can participate in projects only as a third country – a status which provides for access under more restrictive conditions.

The three countries also differ in their types of political regimes. All three can be classified as varieties of LAOs, but the degree of openness in the economic and political spheres differs. While Moldova and Ukraine demonstrate a considerable degree of political competition, even if it falls short of the standards of consolidated Western liberal democracies, there is very limited political pluralism in Belarus, and access to political resources is severely restricted for new actors and organizations. In the economic domain, access to economic resources is also more open (albeit far from being perfect) in Moldova and Ukraine than in Belarus. These differences in the types of LAOs we study are important for the research design of our empirical analysis, as they provide for variation in the major explanatory variable of interest, namely the LAO regime (Ademmer et al. 2018).

In each of the three countries, we employed semi-structured elite interviews with policy experts and active scientists to explore the plausibility of the theoretical ideas sketched above. In this sense, our analysis can be considered an exploratory first-step plausibility probe that can become the basis of a more systematic and comprehensive evaluation in the future. We have been constrained in providing such evaluation ourselves by the novelty of the theoretical ideas, practical resources, and the nature of the evidence that would be required to deliver a definite proof or refutation of the existence of the mechanisms linking LAOs and scientific cooperation that we outlined in the previous section.

The interviews were conducted on the basis of a previously prepared questionnaire (see section 7.1. in the Appendix). The items in the questionnaire mirror the theoretical ideas expressed above and deal with possible effects on science policy formulation, budgeting, implementation, and evaluation, as well as on the strategies

and choice of partners for scientific cooperation, the implementation of scientific cooperation programmes and projects, and on their evaluation and the utilization of the results.

The choice of interview partners in each country was directed by the desire to converse with experts who have knowledge both of the formal side of science policy and scientific cooperation and the more informal side of policy and project implementation. To this end, we contacted policy experts working for government units and non-governmental organizations in the field of science policy and cooperation, but also active scientists who have been involved in the cooperation projects themselves. In total, we interviewed 14 experts (four in Belarus, five in Moldova, and five in Ukraine). The list of interviews is available in section 7.2. in the Appendix.

We interpret the data from the interviews in a qualitative way, without explicit coding and quantification of the answers. We do so because our intention is to derive an exploratory analysis of the plausibility of the theoretical ideas, rather than rigorous tests of well-defined hypotheses operationalized into a set of clearly specified and systematically measured variables.

4. Empirical findings

We present the empirical results per country, while some comparisons and a discussion of the broader implications are offered in the concluding part of the paper. Each country section first offers a short overview of the institutional structure for science policy and international science cooperation, and then proceeds to present the empirical material from the interviews.

4.1. Belarus

4.1.1. Institutional background

Science policy in Belarus is characterized by a high level of centralization and dependence on the state inherited from the USSR time. This can be seen in the high level of legislative regulation, funding, and institutional hierarchy, and also in the dominant position of the National Academy of Science (NAS), while the role of universities is relatively small (Chulitskaya et al. 2017).

The main governmental institutions responsible for the national scientific and research and development (R&D) policy in Belarus[4] are the President of the Republic and the government (Council of Ministers). On the ministerial level, several line ministries oversee the spheres that have an R&D component (Ministry of Education, Ministry of Industry, etc.), the State Committee of Science and Technologies (SCST), the NAS, and the High Certifying Commission.

[4] Interestingly, at the official level the very term “science policy” is divided into three subcategories: science policy itself (so-called “fundamental research”); scientific-technical policy (for applied research, coordination, management etc.); and innovation policy. The NAS deals with the first one and the SCST with the second and the third. National experts usually use this definition and institutional division to describe their activities.

On the legislative level, science policy in Belarus is regulated by numerous laws, presidential decrees, and governmental regulations, which set general, mostly formal objectives, priorities, and frameworks.[5] The basis for science policy formulation is a document called "Complex Prognosis of Scientific-Technical Progress". This planning document is developed by the SCST in cooperation with the NAS and in agreement with other governmental institutions and some state corporations. According to the Regulations of the Council of Ministers of Republic of Belarus (N 945 17 June 1998), the Prognosis should be developed every five years. National experts claim that there were four such documents since 2001, and currently the Prognosis for 2021-2025 is being developed. However, we could not find these documents in the openly available governmental databases, although different official sources refer to them.[6]

The first attempt to create a long-term national science strategy was made in 2017 at the II Congress of Scientists of the Republic of Belarus where a draft document called "Strategy 'Science and Technologies: 2018-2040'" (The NAS 2017) was adopted (approved by the NAS in March 2018). Unlike many other official documents, it was made available for public discussion.

When it comes to implementation, science and R&D activities in Belarus are supported by two types of funding programmes: (1) state programmes for scientific research ("fundamental research"), and (2) state science and technology programmes ("applied research").

The leading role of policy implementer is played by the NAS. The Academy has the double status of a research institution and a public agency, as its head is appointed by the president (Chulitskaya et al. 2017). Within the NAS, the role of the distributor of funds allocated to fundamental research is played by the Belarusian Republican Fund for Fundamental Research (BRFFR; see BRFFR 2018). It provides financial support on the competitive base for selected projects and events/visits. Its annual budget is ca. €4 million.

Belarusian science policy is funded from the state budget with some contributions from the private sector. Currently, private sources include the funds of companies and organizations (26.6 %), foreign sources (9.5 %), and sources of other organizations (19.8 %) (incrEAST 2014; Mazepus et al. 2017). As national statistics show (incrEast 2014), in 2014 Belarus spent 0.52 % of its GDP on science and R&D, which is less than in 2013 (0.67 %) of the GDP. According to authors' calculations (Law of the Republic of Belarus № 431-3 2016), in 2017 there was a further decrease in the public funds: the approximate share of funding from the central budget was 0.2 % of the GDP[7] and approximately the same amount was provided from other sources, which makes the total share of science and R&D funding approximately 0.4 % of the GDP. The funds for the state science and technology programmes are distributed mostly by the SCST in accordance with the programmes. Some ministries also have their own small budgets to support their scientific activities.

[5] For an overview of the relevant legislative acts of the Republic of Belarus in the spheres of science, technology, and innovation, see the website of the State Committee of Science and Technologies of the Republic of Belarus (in Russian), available at http://www.gknt.gov.by/rules/pravovye-akty-respubliki-belarus-v-sferakh-nauchnoy-nauchno-tekhnicheskoy-i-innovatsionnoy-deyatelno/ (accessed 20 February 2018).
[6] For example, on the website of the Ministry of the Economy of Belarus (2018, see references), the prognosis for the year 2018 has been mentioned.
[7] Around €105-120 million or 230-260 million of Belarusian roubles.

In the sphere of international cooperation in science and R&D, there is no specific programme or strategy that structures the relations of Belarus with other countries. International cooperation is viewed in a very instrumental way, mostly as a means for achieving the goals of national social and economic development (incrEAST 2014; Chulitskaya et al. 2017) rather than development of people-to-people contacts or science diplomacy.

Meanwhile, Belarus develops bilateral relations with institutions in various countries. According to the SCST data, as of 2018, Belarus has 64 bilateral agreements[8] in the sphere of scientific and R&D cooperation (National Science Portal 2018a). However, it is unclear how extensive bilateral scientific cooperation with EU countries really is, or whether it just exists on paper in formal agreements. According to the experts' statements, cooperation between Belarus and the EU in the scientific sphere declined during the period of extensive EU sanctions on Belarus (from 2010 to 2016), but the situation is currently changing.[9]

Unlike Moldova and Ukraine, Belarus is not officially associated with the EU's Horizon 2020 (H2020) programme. At the same time, the Delegation of the EU to Belarus positively evaluates the involvement of the country in H2020, referring to it as "one of the strongest-performing Eastern Partnership countries" (EEAS 2017)[10].

On the institutional level, the Belarus National Information Point for EU Framework Programmes (FP7) was created in 2004. It was supported by the SCST and by the Belarusian Institute of System Analysis and Information Support of S&T Sphere (BelISA). After the launch of the FP7, the national contact points (NCP) system was developed (Sonnenburg et al. 2012: 117; UNECE 2017).

However, in spite of the declaration of the intensification of EU-Belarus relations in the scientific sphere and the relatively good performance of Belarusian researchers in the EU-funded projects and exchanges (Chulitskaya et al. 2017: 34f), Russia is still the main partner for Belarus. There are also separate programmes for cooperation with the Russian Federation that are supported on the national level, for example the "Programmes of the Union State of Belarus and Russia" funded by a joint budget (Chulitskaya et al. 2017; Sonnenburg et al. 2012: 116). Plans to create a common scientific-technical space in the Union State of Belarus and Russia, together with designing a joint prognosis of scientific-technical progress, were announced in 1996, and the main directions of its development were approved on the level of the Union State in 2006 (Regulations of the Council of Ministers of the Union State No. 9, 4 April 1996; reapproved in 2017) (Naviny.org 2014). Currently, there is only limited information about the progress towards realization of this goal, which is not sufficient for a proper evaluation.

Out of the budget allocated to science from the national budget, three to five per cent are used to support the international scientific cooperation (National Science Portal 2018b). Within the framework of international treaties of the country, budget support is provided for international R&D projects, hospitality for foreign delegations, and payment of the country's contributions to international organizations (incrEAST 2014).

[8] See the full list of agreements on SCTC website.
[9] This statement was made during an expert interview conducted for the Horizon 2020 project EU-STRAT in preparation of the working paper for Deliverable 7.2.
[10] For an overview of EU projects with Belarus, see EEAS 2017.

4.1.2. Assessments from the interviews

The interviews provided us with a deeper view on the national policy process in the sphere of science and scientific cooperation. The science policy process in Belarus is heavily centralized and provides very limited opportunities for participation for the governmental institutions (ministries, committees) and no opportunities for participation for the non-governmental actors or broader public. In describing this situation, one of the interviewees mentioned that neither the SCST, nor other committees and ministries, nor the NAS "*de facto make any serious decisions in this sphere. The decisions are made either by the Council of Ministers or in some cases even by the President himself. It is strange*". International organizations are also not contacted or consulted on the issues of science policy. However, on the practical level, some minor involvement is possible. For example, one respondent referred to "*consultations*" between the Delegation of the European Union in Belarus and Belarusian institutions responsible for science policy, but these consultations are limited and non-public, and predominantly focused on innovation policy, not science policy as such.

Simultaneously, other experts evaluated the process of science policy formulation in the country as reasonable and structured. In their opinion, scientific institutions are to a certain extent involved in this process from the very beginning of the policy cycle (the stage of formulation of prognosis and priorities). The interviewees accepted that the broader public does not participate in this process, but they do not evaluate this situation as a disadvantage. In general, science policy is considered by the interviewees more or less as "*their*" field or area, governed by the state, and not as a subject of interest for the broader society, independent institutions, or other stakeholders. As one of the interviewees put it: "*It is the state that should set tasks for the scientists, not the scientists themselves*". At the same time, as another interviewee stated, "*at the official level all formal requirements of harmonization of the documents and public access to them are followed*". This public access is seen as a kind of participation in the policy formulation.

Although the interviewees do not believe that the policy cycle in their field should be more open, they admit that recently it has been becoming more transparent. Some official documents are published before their official approval (for example, the draft of the Strategy "Science and Technology"), providing a sort of a window of opportunity for broader discussions and public participation. Among the published documents are also the reports on outcomes of the science policy, information about the spending of the BRFFR, analytical reports in the sphere of science, as well as other related documents.

The priorities and strategies of the national science policy are perceived by the interviewees generally as logical and sustainable, but too general. They are formulated according to the positions of different stakeholders: ministries and other governmental institutions, but also by the academics. However, in practice, the priorities and strategies are not formulated in the form suitable for assessment (i.e. they do not have any quantitative indicators), and the new national strategies are developed on the basis of the old ones. One of the interviewees mentioned the idea of involving international (European, in particular) experts in the evaluation of the methodology of scientific strategy formulation. They could not, however, predict the government's response to it: "*Would they accept this proposal or not is very difficult to say, very complicated*".

The interviewees stress commercialization as a general priority for Belarusian science. In the interviews they admitted several times that science in Belarus is pushed to be "*commercialized*", meaning that it should bring in rather than spend money. Thus, scientific activity is not a matter of personal research interests of a scientist, but

rather a means to invent or innovate something in order to sell the results afterwards. However, scientists are not motivated personally to pursue this strategy: in the case of success, they would not get much profit, and in the case of failure, they would have to pay back the budget spent on their activities.

The sustainability of science policy is supposed to be assured through the system of (centralized) financial support. Interviewees explained that the overwhelming majority of the research activities are financed through state programmes at different levels, which support individual and collective projects on a competitive basis. The draft science budget is designed by the SCST in accordance with the suggestions of the NAS and other governmental institutions, and then negotiated with the Ministry of Economy and the Ministry of Finance. The latter, in experts' opinions, always cuts the proposed budget spending. Answering the question as to whether scientific institutions could influence budgetary decision making, one of the interviewees explained: "*We can ask for more* [money] *but we won't get it*".

Overall, the interviewees believe that insufficient financing is the main problem for science policy in Belarus (primarily state financing, as the state assumes the leading role in its distribution). They recognize that the situation in science is connected with the general state of affairs in the national economy and accept that it is not just science that is "*suffering*" from the lack of finances. Out of the limited funding provided by the state, the biggest share, according to experts' evaluations, goes to technical programmes or laboratories, not to the fundamental research. The respondents express their dissatisfaction when it comes to the question of the salaries in the research institutions, which are decreasing as a result of the general reduction of budget spending on the sciences.

In the logic of "*commercialization*", scientific organizations are often forced to look for additional partners (for example, businesses or state-run enterprises). It is usually big state enterprises, and more rarely private companies, that are selected as partners. The interviewees do not believe that such partners are useful or reliable: on many occasions, the enterprises leave the project due to various reasons, and scientific organization takes all the risks itself. Often the agreements are not realized, or the projects are not implemented at all because of the absence of partners. At the same time, risk management is absent in Belarusian scientific organizations. One of the respondents said that it is necessary to include this component, for example, in order to eliminate possible negative macroeconomic factors that cannot be predicted (high inflation, rapid and significant changes of national currency rates etc.).

Another weak point of the implementation of science policy in Belarus is a lack of institutional autonomy and self-governance in the scientific organizations. The reasons for these problems are seen as a lack of private, non-state scientific institutions, and a centralized system of governance, funding, and control of institutions' activities. On the other hand, the latter circumstance, in the opinion of interviewees, helps Belarusian institutions to avoid public scandals and corruption. Moreover, another interviewee pointed out that there is no real need for the institutional autonomy, because when "*a scientific organization is a state one, it is obliged to cooperate with the state, to take the interests of the state into consideration*".

Describing other practical problems and constraints in scientific work, the interviewees named a lack of prestige for the scientific sphere and scientific career, and a lack of motivation for the younger generation to follow the academic path. "*A very limited amount of young people dream about a scientific career… They lack ambitions. I don't know if it is a national problem or a demographic one*…".

Regarding the international scientific cooperation, the interviewees said that there is no strategy for it, it just follows the existing patterns of political and/or economic cooperation. One interviewee put it in the following way: "*Our scientific cooperation is going in parallel to the economic development, which is defined by the Ministry of Foreign Affairs*". Although there are no officially formulated Belarusian priorities in this sphere, this approach results in an increasing number of projects and links with Russian and Chinese institutions, and less so with European and American ones. Countries of the Commonwealth of Independent States (CIS) and the Eurasian Economic Union (EAEU) are also seen by the interviewees as desirable partners for scientific cooperation. The share of common projects with Russia, in the view of interviewees, has increased during last years[11], including the projects financed from the budget of the Union State of Russia and Belarus. Describing the situation with the absence of a formal strategy for international scientific cooperation, one of the interviewees formulated it as: "*We make friends with those who make friends with us*". Meanwhile, the national legal environment for the international scientific cooperation in the opinions of the experts is well-designed and developed.

In general, interviewees positively evaluated the outcomes and effects of scientific cooperation. The effects of the international scientific cooperation mentioned include an increase in the amount of scientific publications, the professional development of Belarusian scientists (i.e. improvement of their qualifications), the strengthening of the international recognition of the country, and harmonization (to a certain extent) of the Belarusian national and international standards. Brain drain was mentioned among the negative effects.

The administrations of the scientific institutions, in the opinions of the interviewees, are in general "*interested*" in participation in the international projects. However, the interest here has a pragmatic background of attracting funds from abroad for the direct financing of the institutions, not the scientists themselves. This is seen as a "*conflict of interests*" between individual researchers and institutions, whereby the former perform all the activities within the projects and the latter reap the benefits from them.

The communication of the outcomes of the scientific cooperation to the public, similar to communication in the field of science policy, does not receive special attention. One interviewee explained the lack of dissemination efforts and the absence of general communication practices as follows: "*We don't pay so much attention to the dissemination* [of the outcomes of scientific cooperation] *not just among colleagues, but also among general public as it is done, for example, in the EU*". Popularizing science and raising the prestige of scientific activities are seen as possible tools to overcome the lack of dissemination.

When it comes to the evaluation of the international scientific cooperation, there is no particular methodology or approach to it in Belarus nowadays.

[11] The interviewee estimates that this increase is approximately from 50 % of international projects with Russia ten years ago to 70 % nowadays.

4.2. Moldova

4.2.1. Institutional background

The year 2018 is a transition year for Moldova in the sphere of science policy. Since 2004, the Academy of Sciences of Moldova (ASM) has been the centre for development of science policy. In 2018, this responsibility is going to be transferred to the Ministry of Education. The ASM was the body mainly responsible for both development and implementation of the science policy, but in 2017, the new Code on Innovation and Science was introduced, one of the two main governing documents in this sphere (European Commission 2016a). The new model for the development and implementation of science policy in Moldova is yet to be tested.

Under the previous model, the parliament had to approve strategic research directions suggested by the ASM and allocate funding for this purpose. Then, the Government of Moldova concluded the Agreement with the ASM as a principal implementer (Chulitskaya et al. 2017: 16). The ASM President is a member of the Cabinet of Ministers of the Republic of Moldova and this position is equivalent to a ministerial position. Therefore, the ASM played the role of a *de facto* Ministry of Science (European Commission 2016a: 27).

The reform that started in 2015 was preceded by extensive consultations with various actors, including the European Commission (EC). These consultations followed Moldova's joining the Horizon 2020 programme in 2014. Moldova became the first country in the EaP region to sign an association agreement to H2020.

Within the Horizon framework, the EC funded a Peer Review of the Moldovan Research and Innovation (R&I) system which was completed in 2016 (European Commission 2016a). Among the recommendations made, several deal directly with increasing the efficiency of the bodies and instruments performing R&I, and with the public funding of R&I. For example, Recommendation 7 suggests establishing an independent R&I Agency under the Ministry(ies), Recommendation 8 is to establish a single funding body for all R&D activities, Recommendation 9 is to make the process of applying for funding competitive, and Recommendation 10 is to increase the intensity of R&D activities in Moldova.

According to the new Code on Science and Innovations which incorporated these recommendations, a new agency jointly supervised by the Ministry of Education and the Ministry of Economy was established in 2017, the National Agency for Research, Development, Innovation and Technological Transfer (Government of Republic of Moldova 2017). This agency is to become the main developer and implementer of science in Moldova, as well as the main funding agency. The organization's activity will be coordinated by a Management Board of 11 persons, including representatives of the authorities, the Academy of Sciences, and civil society.

The new Code also stipulates that the funding for R&D projects is to be allocated on a competitive basis and that all researchers, regardless of the organization they work for (be it state-run, private, or non-commercial), will be able to apply for funding. To ensure a degree of impartiality, the head of the Agency is to be appointed jointly by the ministers of education and economy.

The funding for R&D activities in the recent years has been fluctuating around the figure of 0.3-0.5 % of the GDP (€20-30 million) (Cojocaru and Cosuleanu 2017). This is far below the level of three per cent that the EU countries

strive to achieve by 2030, as per Europe 2020 Strategy (European Commission 2018). The scientific community is also expected to increase the use of the funding available through the EU and other funding schemes.

The main policy document in the science policy sphere is the "National R&D Strategy until 2020", approved by the government's Decision No. 920 of 7 November 2014. This document states that the main goal of state policy in the field of science and R&D is to provide stable socio-economic and human development in the Republic of Moldova. The Strategy calls for more integration in science, technology, and innovation (the "real" sector of the economy) to support Moldovan industry (National R&D Strategy of the Republic of Moldova 2014: 4) and to provide efficient interaction with society and the business sector. Other priorities outlined in the documents include the internationalization of Moldovan research and its integration into the European Research Area (ERA).

To achieve the objectives of the Strategy, five priority areas for action have been identified: (1) governance of the R&D sector should be based on a consensual model and focused on performance and excellence; (2) human, institutional, and infrastructure capacities of Moldova are to be developed; (3) national research priorities should be identified, agreed on, and managed; (4) there should be a continuous dialogue between science and society, including dissemination of knowledge and implementation of research results; and (5) internationalization of research, ensuring integration in the ERA and enhancing international visibility.

Overall, it is clear that more efficient usage of domestic and EU funding and integration in the ERA remain important drivers for reforms in the sphere of science policy in Moldova. Experts believe that EU funding plays a significantly more important role in the science sphere in Moldova than cooperation with the CIS, despite the significant number of CIS programmes for R&D and the numerous projects that have been implemented. The financial aspect alone is proof of this, with the total financing through EU-coordinated programmes since 2008 being five times higher than the financing through CIS-coordinated projects (Duka 2016). Other aspects of EU-Moldovan scientific cooperation also have positive impact on the development of the R&D sphere in Moldova, including the integration of young scientists into the international academic community, the adoption of efficient management practices, and the combating of brain drain (Chulitskaya et al. 2017: 46).

Another important aspect of the reform is a wide recognition of the fact that the R&D sphere needs closer integration with the business sector to achieve the technological development and innovations needed to drive the growth of the Moldovan economy.

4.2.2. Assessments from the interviews

Our interviewees noted the recent changes in the scientific policy introduced by the government. The consultations about the new policy were not required, but the draft was subject to public discussion. It was also clear to the interviewees that the new law from 2017 changed the policy-making authority from the ASM to the Ministry of Education and Research. For this reason, they mentioned 2018 as a transition year for Moldovan science. At the same time, the expectation of our experts is that Moldova will continue on the path towards scientific integration with the EU and modernization of science.

According to our interviewees, the policy priorities are set centrally by the ASM, and on the basis of these goals universities establish their own scientific policy directions, implementing the proposals from the ASM and the

government. The interviewed experts believe that the priorities for science and technology are established under the influence of international partners on the Moldovan government and with the initiatives from scientists. In this way, two sets of priorities are linked with two dimensions of policy change. One dimension is vertical and comes from the EU through the government to the scientists and results in priorities such as competition for grants in the EU programmes. The other dimension is horizontal and demands changes in the quality of work, human resources, and rules about intellectual property. There seems to be a large discrepancy in the implementation of these two sets of priorities.

In terms of ensuring the sustainability of the development of science in the country, there is a legal framework on the one hand and the annual distribution of budget on the other. The latter in particular seems to prevent the long-term planning needed for larger research projects. The scientific strategy is evaluated by the government with the help of the ASM's reports. Our interviewees were not aware of evaluations conducted by independent experts.

According to the new regulation, the budgeting is now decided upon entirely by the Ministry of Education, Culture, and Research through the National Agency for Research and Development, which responds to the Ministry. The main funding problems noted by our interviewees are the fact that universities do not receive any separate budget for research apart from small temporary project grants that are often approved late by the government, and the insufficient size of the allocated funding for science more generally. This results in the very poor evaluation of the implementation of scientific development by our interviewees. They all agree that the funding is insufficient and results from the lack of long-term commitment by the authorities to develop science in Moldova. The lack of funding has resulted in a sharp decline of the number of researchers (from 7000 at the beginning of the 1990s to 2900 today according to the interviewees' evaluation).

The interviewees do not see the work of different scientific organizations in terms of competition. From the interviews it became apparent that cooperation is practiced, but mainly to organize joint scientific events or publish monographs. Only one of our interviewees mentioned cooperation in the field of research, albeit with foreign involvement. The cooperation between researchers at universities on the one hand and industry and businesses on the other looks similarly bleak. The ASM, however, has several collaborative projects with the business sector, for example in the field of renewable energy.

Scientific organizations seem to enjoy bounded independence. On the one hand, their research is not restricted by policies and they do not experience pressure from the authorities. On the other hand, the very limited funding does not allow scientists to conduct research, so that they cannot realize their scientific agenda. The interviewees noted that the recent change in the law that grants the decision-making power on science and technology development to the government might come with a shift in the relations between the researchers and authorities. However, as it stands now, the interviewees could not name any cases where either the political or economic elites tried to privatize scientific results. If anything, it is the researchers who try to fit in with the political agenda.

The majority of our interviewees did not know of any risk-management strategies applied by scientific organizations. A couple of them mentioned internal and external audits, but did not elaborate on how systematic these strategies are. What is in place, according to our experts, is a large body of reports required by the

Moldovan authorities (the ASM and ministries) and performance evaluation forms that score the institutions and researchers on multiple points.

The feedback of researchers is rarely taken into account, and when it happens, it is highly dependent on the research field. One of the interviewees mentioned that the Academy uses the feedback of researchers for very particular projects, for example, in the case of hydrocarbon extraction or the construction of the Dniester river power plants. In combination with small demand for feedback from the scientists, they are demotivated to conduct their work because of a high degree of bureaucracy (reporting mentioned above), low wages, and lack of funding. What is perceived as a positive stimulus are bilateral projects and international collaboration.

International cooperation in science and technology is regulated centrally. The ASM used to be the body responsible for it, but since 2018 the government took over the task of setting the national strategy. However, most of our interviewees think that rather than following a strategy, international cooperation is established on an *ad hoc* basis and through the individual initiatives of researchers. One of the interviewees noted that joining the EU scientific cooperation space was a major development and that researchers are rewarded for submitting successful proposals to European competitions.

Moreover, only a relatively small number of researchers participate in international cooperation, and our interviewees agreed that the effects of cooperation are rather modest on the national level. Researchers are encouraged to participate in collaborations and exchanges within the EU space because of the better funding opportunities. However, the requirements for such cooperation are very high. International cooperation seems to have effects on intra-organizational hierarchy and can lead to tensions between younger and older researchers, and between those researchers who speak English and those who do not. Importantly, one of the interviewees emphasized that international funding constitutes a very small chunk and cannot substitute scarce domestic funding. Also, even though a legal framework for international cooperation exists, it does not work in practice and cannot be implemented. The results of international collaborative projects are presented in a limited way through press releases, and more generally, scientific work is not very well promoted and accessible to larger audiences. Therefore, the recognition of research is very limited. The main type of rewards offered to scientists for participation in international projects are higher scores for their institutions in periodic evaluations and accreditations, diplomas, and for several individual scholars who get the title of the investigator of the year in their field, a prize amounting to around €5000. The incentives for researchers to participate in the projects are rather low, especially because entering into international collaboration demands completing a relatively difficult centralized bureaucratic process. One of our interviewees suggested that "*It would be best to create a legal framework that allows researchers to identify opportunities without passing through certain platforms*".

4.3. Ukraine

4.3.1. Institutional background

The Ukrainian science and technology sector comprises four main types of actors: the National Academy of Sciences of Ukraine (NASU), universities, state research and development, and corporate research and development (Strikha 2016). The state has a lot of power in shaping scientific policy and is the main funding body of research and development. The NASU is the main research institution, while only half of the universities perform any kind of research and most of them focus primarily on education. The main legal act that currently

regulates science and innovation in Ukraine is the Law on Scientific and Technical Activities (Verkhovna Rada 2016) that came into force in its current shape in 2016.

This document reaffirms the leading role of the NASU in Article 17, stating that it is the main institution responsible for "fundamental and applied research on the most important problems of natural, technical and humane sciences". Moreover, legally the NASU is the body responsible for evaluating scientific development and proposing science policy on its own initiative or in response to a call by the President of Ukraine, the Verkhovna Rada of Ukraine, or the Cabinet of Ministers of Ukraine. However, the Academy is also in need of reform, according to the Peer Review of Ukrainian science and technology completed in 2016 under the European Union's H2020 Policy Support Facility. The approximately 120 institutions and 200 research establishments that make up the NASU (Schuch et al. 2016: 32) and specialized Academies are not efficient bodies. They consume nearly 80 % of the state budget allocated for R&D (Cirera et al. 2017: 5) and need to be restructured to focus more on the stimulation of innovation and core goals set for the Ukrainian R&D (European Commission 2016b).

At the same time, this updated legal act is meant to reform Ukrainian science and technology innovation policy. The largest visible change is the establishment of two new bodies. The first one is a permanent advisory body called National Council of Ukraine on Science and Technology under the Cabinet of Ministers of Ukraine (Article 20), and the second one is the National Research Foundation (Article 49). The National Council of Ukraine on Science and Technology is a body chaired by the prime minister, who is supported by two deputy chairmen: the minister of education and the chairman of the Scientific Committee. The National Council comprises the Scientific Committee (the best Ukrainian scientists) and Administrative Committee (representatives of central executive authorities, the NASU, large scientific enterprises, universities and research institutions). It is meant to serve as a link between scientists, policy-makers, and industry (Cabinet of Ministers of Ukraine 2018). Moreover, it is supposed to be the main body advising the government on the formation of the principles of state policy in the field of scientific and technical activities and submitting recommendations regarding the formation of the state budget "determining the total amount of financing of scientific and scientific-technical activities and its distribution between the basic and competitive financing of scientific research" (Cabinet of Ministers of Ukraine 2017). The first meeting of this new body took place on 16 January 2018, and its work was opened by the Prime Minister of Ukraine and chairman of the National Council, Volodymyr Groysman (The NASU 2018). The participants of the meeting discussed extensively the way in which the relations between science and industry should work and emphasized the importance of the new rules for funding science, with the central role given to the National Research Foundation.

As noted in the Peer Review, the role of these two new institutions – the National Council and the National Research Foundation – will be crucial in determining the direction of the development of science and technology and success of the reform. Some of the recommendations from the Peer Review pointed to the importance of transparency of the grant allocation and the need for assistance of international experts in the process of grant allocation to ensure real competitiveness (European Commission 2016b) of the grant allocation process. The coming years will show to what extent these new institutions can improve the research environment in Ukraine and the level of the government's commitment to supporting scientists.

Apart from the attempt at restructuring the relations between scientists and policy makers with the new law from 2016, the Deputy Minister of Education and Science of Ukraine presented a new set of priorities for R&D

until 2020 (Strikha 2016) and reformulated the priorities set in the law from 2001 (Law of Ukraine No. 2623-III – for full text in English, see CIS Legislation 2018; see also Chulitskaya et al. 2017: 21f). These priorities are: (1) fundamental research, (2) information and communication technologies, (3) energy and energy efficiency, (4) rational environmental management, (5) life sciences, new technologies on prevention and treatment of the most common diseases, and (6) new substances and materials.

The science and technology cooperation between Ukraine and the EU is based on the Agreement on Science and Technology Cooperation signed on 4 July 2002. Ukraine has participated in the European Commission's FP7 research framework as a third country and became a full member of the H2020 programme in March 2015. This means that Ukrainian researchers can participate in competitions for grants under the same rules as researchers from the EU member states. In the first two years of the H2020 programme, 429 Ukrainian organizations have participated in the preparation of 715 project proposals. Ukrainian institutions have been acting as co-coordinators of five projects that have secured funding amounting to €1.82 million. Cooperation with scholars from the EU and the possibility of receiving funding from the European Commission are vital for the survival of research institutes and the development of science in Ukraine (Mazepus et al. 2017).

4.3.2. Assessments from the interviews

According to our interviewees, in Ukraine the development of science policy, to the extent that it exists, occurs only at the central level. Our interviewees perceive, in line with the formal structures discussed above, that the Ministry of Education and Science is the main actor in charge of scientific policy. However, the recent plans for the creation of new organizations, such as the National Science and Technology Council, are expected to shift the power away from the ministry. This council would consist of scientific and administrative committees. The prime minister is to head an administrative committee, while the scientific committee members are to be elected. Another structure that should influence scientific policy is the Committee of the Supreme Council on Education, Science, and Innovations. The National Science and Technology Council is where expert groups should be created to evaluate every project.

It is easy to see that the institutions for the formulation of science policy are both very close to the centre of government (even more so under the new system) and quite fragmented. So, our respondents see a problem in the fact that there is no single place where decisions are taken. In their perception, nobody knows whether recommendations for promising research areas submitted by individual institutes are taken into account. There is also uncertainty as to the role of the NASU in the process of science policy formulation and its interactions with the Ministry of Education.

Altogether, the assessment is that there is no solid and long-term strategy for developing science. The policy documents that are occasionally adopted address specific issues, but do not have much impact and remain declarative. In the words of one of the respondents, "*scientific policy is fragmentary, inconsistent, and often it sets goals that do not correlate well with previous priorities*". These sentiments seem to be shared among the experts and scientists: even when input from individual institutes is requested, there is no follow up; there is no continuity in policy documents, nor a single vision. Policy commentaries in the media reflect the attempts by broader segments of society to influence the policy but have no impact on the development of science policy documents.

When it comes to the setting of priorities, respondents noted the disconnect between these and the funding decisions: even when set, priorities remain declarative "slogans" that are not backed with funding for development. Our interviewees suspect that there are problems with the coordination of this process at the central level, as researchers receive numerous and inconsistent demands for information that they should deliver to the authorities. There have been a few attempts to create some long-term documents to coordinate strategies, for example the one created by the professionals from the Kyiv Polytechnic Institute, but of no effect.

Unsurprisingly, in light of these considerations, our interviewees share the assessment that there is no stable and strategic perspective on science policy in Ukraine and no provisions for the sustainability of the policy. Risk management in particular is also unknown, at least in the public institutions.

Opinions differ when it comes to the assessment of the evaluation of the strategic science documents. While some argue that such assessment is non-existent and no culture of strategy evaluation exists, others notice that joining Horizon 2020 has been helpful in this regard. In particular, one interviewee noted the following:

> "*Businesses, which are engaging with science (agriculture, pharmaceuticals) provide some feedback (kind of evaluation) in the related fields. Also, there are a number of platforms, for example, the Innovative House, which organizes various discussions, round tables on scientific issues. A few media pay attention to science. Also there are some NGOs, which provide some feedback on what is happening in Ukrainian science. Each of these players provides its own evaluation... The problem is that there is no single evaluation platform.*"

Yet, according to others, the rare episodes when evaluation is performed are for "*political reasons, to showcase success in a particular area*."

When it comes to budgeting, the process of resource allocation is quite top-down and centred at the central government institutions: First, the Verkhovna Rada allocates some funds. Next, the Ministry of Finance defines where to send the money. After that, the Ministry of Education and Science gets the funds. The NASU receives the money separately from the Ministry of Education and Science, directly at the central level. The State Treasury decides when to provide the finding. Overall, the Ministry of Finance plays the main role in this process ("*Attempts to appeal to the Ministry of Finance, which develops and corrects budgetary allocations, usually result in negative responses*").

Some sciences are funded on a "leftover" basis: "*Every year an institution writes requests to get funding for important projects, but that does not help and the amount of funding is getting less and less.*" Budget funds for scientific research are non-existent (at least for our respondents): even if there is money at the "upper levels", it does not reach individual researchers.

The chronic systemic underfunding of science leads to a situation where "*the only way to get funding are appeals to political actors or heads of scientific institutions, which sometimes helps to get additional funding or other benefits*."

For decisions on long-term financial commitments (e.g. for investments into infrastructure, long-term projects, participation in international research frameworks requiring financial contributions), there are 2-3-year plans, of which the Cabinet of Ministers is in charge. There are a few long-term investment projects that our respondents could mention, for example the Igor Sikorsky Kyiv Polytechnic Institute and the Shevchenko National University, but these remain isolated. Overall, the impression is again one of a lack of long-term planning, investments, and budgetary commitments.

These problems are clearly manifested in the implementation phase as well. The most frequently mentioned problems are lack of funding, lack of access to scientific publications, and lack of modern equipment. It is worth noting that one reason for the last point is deemed to be the high taxes on importing such equipment, even when it is a gift.

When scientists visit a conference abroad, they usually have to cover the expenses themselves, rather than being able to rely on funding from their institution. They also need to cover research with their own funds and even find a workspace themselves.

Cooperation between and within science institutes and universities is rare and very poor: "*Different faculties do not know what their neighbours do. Even inside a single institute (inside the university) coordination is very poor, which is a result of bad management*." The lack of cooperation also stems from the competition for resources between these institutes. On the positive side, a university consortium has been created recently that includes a lot of universities, academies, and other high schools and has the potential to foster cooperation.

When it comes to interactions between science institutions, businesses, and the broader society, some scientific institutions have supervisory boards that include "businessmen". But overall, there is very little interaction, even though there is interest from the science side:

> "*Scientific organizations make attempts to offer their products to businesses. Often these products are based on a creator's interest, which does not correlate with business interests (e.g. offering products or services that businesses do not need or inventors do not want to create products that businesses need). Businesses prefer procuring ready (turn-key) technologies from abroad rather than investing in their development in Ukraine.*"

The assessment of the autonomy of scientific institutions is somewhat mixed. In the words of one respondent, the relative autonomy results from the fact that "*nobody provides funding and nobody cares or checks what you are doing and writing*." This is echoed by another statement by a different respondent: "*Some state-owned organizations and the ones under the National Academy of Sciences are actually quite autonomous, but for a different reason: they do not receive sufficient state funding, so researchers are not engaged full time and do what they want*."

Some respondents had concrete examples of ways in which politicians and businesses try to privatize the results of scientific research for their own profit and benefit from them in other ways: "*One such way to privatize is plagiarism: for example, the case of Kateryna Kyrylenko* [Note: Ms. Kyrylenko is the wife of the Vice Prime Minister on humanitarian affairs, Minister of Culture (2014-current). *Ms. Kyrylenko got her PhD in 2015 which was found to contain plagiarized material (one-third of the text).]".* Respondents also mentioned that businesses

sometimes bribe scientists to get favourable results, and that business representatives (those who order the research) add their names to the authors' lists. As mentioned above, in Ukraine business elites are mostly importing technology from the West to replace old Soviet technologies. This tendency is driven by the fact that Ukrainian scientific products are not competitive in economically-important areas, such as steel, agriculture, and (for the most part) machine building. In some cases, business elites get control over a few highly specialized research institutes to develop their own R&D, but this occurs in very few cases. More often, control is exercised via a company benefiting from monopsony – i.e. being the institute's only client in the country.

Political elites are not interested in science at all, according to one respondent, but sometimes political parties include famous scientists in their party list. Occasionally, political elites get fake scientific degrees or become a patron of a certain research institute to boost their own (pseudo)scientific interests.

Turning to the assessments of the effects on scientific cooperation, our respondents note that there is no national scientific cooperation strategy. The National Council on Science and Technology is expected to start operating soon, which might support such a strategy, but it is too early to evaluate its possible effects. In the absence of a strategy and broad vision, decisions on cooperation are ad hoc.

Communication of the results of cooperation projects is done via the usual scientific communication activities (annual congresses, conferences, etc.). However, in the assessment of our respondents, there is not enough (public) funding even for such events. One interviewee also mentioned that the results are communicated through parliamentary committee meetings.

Our respondents praise international cooperation but consider that it is used as a substitute rather than a complement to national support for science. When it comes to the legal environment in which cooperation works, opinions are split. For some, the legal environment is good and appropriate standards and procedures exist. For others, this hardly matters in the absence of well-functioning courts, security, and property protection. It is also noted that the recent legislation on education and scientific activities might be inconsistent with laws that regulate the financial aspects of scientific activities.

Many of the problems with conducting science in Ukraine concern international projects as well: limited mobility, brain drain, disappearing autonomy of the scientific institutions, an unstable institutional environment, and deficient legal protection for property and patents.

There is little societal interest in the results of the projects:

> "*The majority of the Ukrainian population is not interested in science and scientific cooperation due to the low standard of living. Scientific magazines have low circulation and are available only for those who are inside the scientific community. They do not influence the country's scientific life. Popular magazines are usually not interested in (science) - only in scandals and success stories (linked with science or scientists)*."

The evaluation of the results of cooperation projects is done by the NASU, to which institutes have to report their findings to receive state funding in the future. Evaluation in the education field is done by the Ministry of

Education and Science (other ministries evaluate work in particular fields as well). In practice, these reports do not appear to have much influence. Mostly, evaluation is performed through internal bureaucratic and administrative networks and lines of command. Independent (external) evaluation does not exist.

Participation in research cooperation projects is not given high recognition. International publications are one of the few awards for cooperation but are not highly valued within the country.

5. Conclusion

In this paper, we developed in theoretical terms the possible effects of LAOs on science policy and scientific cooperation. We identified a number of possible ways in which features of limited access regimes can structure and constrain the design and implementation of these policies. Our empirical exploration of these ideas in three countries in Eastern Europe based on semi-structured elite interviews led to the following main results.

The one theoretical hypothesis that is matched with strong empirical support is the predicted lack of long-term vision and commitment to science policy and the lack of strategy for international scientific cooperation. In all three countries, our respondents assessed that science policy, including decisions for cooperation, is made in a piecemeal fashion: it is formulated in a heavily top-down fashion with little input from below, while at the same time struggling with fragmentation and over-formalization. Lack of resources, including basic funding, equipment, access to scientific literature, and so on, is endemic. Unfortunately for our analytic purposes, this lack of strategy, commitments and resources for science policy would be expected in any regime with limited capacity, and not only from LAOs. This means that a regime might be economically, politically, and socially open, but unable to deliver high quality scientific output simply because of a lack of resources (e.g. low GDP per capita, underdeveloped education system, low social capital, regulation, etc.). Moreover, among open political systems (liberal democracies) there is a great variance in the level of scientific performance. Hence, the openness of a regime does not explain the level of scientific performance on its own. So, while the result of this study is consistent with our theoretical account, it could also be observed under different regimes.

We found little direct evidence for politicians and business elites appropriating and privatizing results from scientific projects and cooperation. Of course, the absence of evidence is not the same as the evidence of absence of such effects: such attempts at expropriation will not be public and respondents might be unwilling to share knowledge of theft or corruption. There was more evidence for petty benefits from international cooperation projects flowing to politicians and “businessmen”, such as trips abroad, co-authorship of academic publications, and plagiarism. In any case, in the absence of the rule of law and effective independent courts, appropriation of publicly-funded research results and products remains a threat.

When it comes to the expectation that LAO regimes will limit academic mobility and spillovers from scientific cooperation to broader society, the picture is more nuanced than hypothesized. The major obstacle to broader societal effects from scientific projects seems to be disinterestedness on the part of the public and a mismatch between what economic agents expect and what scientific institutes deliver. In this context, the state does not have to do much explicitly in order to limit societal and policy effects, as their potential is low altogether. Of course, this lack of relevant findings is driven in part by the areas where LAO regimes choose to cooperate in, with the social sciences being either excluded or of lowest priority. Efforts to constrain, control, and monitor the

mobility of researchers are mostly visible in Belarus, and are applied half-heartedly even there. In the context of significant societal exchanges between the countries in the EU's Eastern neighbourhood and the EU member states, the mobility of researchers is a relatively small and unimportant component that does not warrant close scrutiny by the regimes.

Our empirical research finds the institutional frameworks for science policy and cooperation in the three countries to be in flux. Numerous reforms have been initiated but not yet implemented to an extent that their effects can be assessed. However, significant changes might be forthcoming in Ukraine and Moldova. Both countries have introduced comprehensive reforms of their science and technology policy. Ukraine established a new body that aims to facilitate the exchange between the government, scientists, and businesses. Moreover, new regulations in Ukraine show its high ambitions in terms of advancing science and transparency of funding. Moldova, in turn, shifted the institutional balance in scientific policy formulation from the conservative Academy of Sciences of Moldova to the government. The results of these formal changes, however, will not be visible for several years. What our interviews taught us is that there is a large discrepancy between the laws, strategies, and pronounced goals on the one side, and actual implementation on the other.

In Belarus, both policy formulation and policy implementation are not much different from the ones established during Soviet times. Since no significant reforms in the country have been implemented in the sphere of science, the scientific process remains essentially the same, albeit sometimes accompanied by more openness (e.g. some documents are made publicly available). In addition, the main international partner for Belarus is still Russia.

The crucial difference between the LAOs that we have analysed is the independence of researchers. While in Ukraine and Moldova, academics do not experience a lot of political pressure on what they should research and how they should conduct research, in Belarus scientific activity is completely subjected to the goals of the president and the government. Moreover, some of our experts from Belarus do not see a problem with this, as they believe the government should dictate what the academics should do. This is in line with the Soviet idea about the role of science.

The relative independence of Ukrainian and Moldovan scholars from political pressure does not mean that they have the freedom to pursue their research activities. They are highly limited by the scarce governmental funding and difficulties with obtaining international grants. This, in turn, leads to an increasing gap in quality and focus of scientific research in the EaP countries on the one hand and in the EU member states on the other. This gap limits the potential for future international cooperation, potentially leading to a vicious circle. As an unintended side effect of this dynamic, rent-seeking ruling elites lose interest in science and scientific cooperation, as there is little to be appropriated.

Future research can examine these results in a more systematic manner. Having established the plausibility of a number of mechanisms through which LAOs influence the development of science policy and scientific cooperation and limit their possible broader societal effects, it becomes imperative to test to what extent these mechanisms are pervasive and to quantify the scale of their impact. A significant hurdle for such tests would be the fact that they would need to measure effects that are by their nature subtle, often anticipatory (i.e. the effects work through their anticipation from actors and not through their active use), and hidden from public view, which is a major feature of the way public policies work in LAOs.

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7. Appendix

7.1. Questionnaire

I. Effects on science policy

A. For formulation

1. How the scientific policy is developed in your country? Who is in charge of drafting it? Which organizations/agencies/individuals are consulted? Are consultations public? Are they mandatory or just encouraged ("a nice thing to have")? How is it adopted?
2. Who coordinates the input by different organizations at the state level (ministries, universities, academies, etc.)?
3. How the priorities (research field, international research partners, international programmes) are chosen?
4. What provisions are made for the sustainability of the science policy in your country?
5. Who evaluates the strategy? Is there independent evaluation? What are the criteria? Is the evaluation report public? Who is in charge of responding to the evaluation report?

B. Budgeting

1. What is the process of budgetary decision making with regard to scientific policy? - who has influence and who has the final say? Are the main stakeholders satisfied with the decision-making process? Has there been any attempts to change it? Why or why not successful?
2. How the decisions about long-term financing commitments are made (investments into infrastructure, long-term projects, participation in international research frameworks requiring financial contributions)?

C. Implementation

1. In scientific work of yours and your colleagues, what practical problems and constraints are the most common and the most important?
2. How do scientific organizations interact with each other (or do not interact)? Is there cooperation or competition, or both?
3. How do scientific organizations interact with industry/business? Is it a part of policy or an initiative of science institution/business?
4. How independent and autonomous are scientific organizations in their work? How often and what types of interference occur?
5. Are political or economic elites trying to privatize scientific results for their own profit? Can you memorize cases when benefits and perks from cooperation projects are captured?

Is there any risk management in scientific organizations? How does it work in practice?

D. Evaluation

1. How the science input is evaluated? Who and how often does it, how does it work in practice? What are the criteria of success, to what extent are they formalized?
2. In your opinion is the feedback of individual researchers and scientific organization is taken into account? How?
3. Does it happen that a scandal (in media or inside the organization) happens to be the major mechanism to uncover problems and fraud? Can you say that control is exercised only when a scandal breaks?
4. What is the positive and negative motivation (incentives) for individual researchers? Are they interested, for example, in fraud detection , Potemkin style science, keeping up unproductive scientific sectors?

II. Effects of science cooperation

A. Strategy and choice of partners

1. Who (which officials, institutions) is responsible/ is in charge for the development of the national scientific cooperation strategy in your country, e.g. choice of the objectives, partners, directions?
2. In your opinion, to what extent existing practices of science cooperation are part of the broader national

strategy? Or maybe international cooperation projects are just realised ad-hoc by different institutions without a broader vision?

3. How would the goals, activities and results of the international science cooperation in your country are communicated to government counterparts, civil society actors and other key stakeholders at national and sub-national level.
4. How would you evaluate international projects of science cooperation in your country? Do they complement or vice versa substitute national support of science?

B. Implementation

1. In your opinion what are the main effects of the implementation/ realization of the national strategy and practices of international science cooperation? How does it influence on the level of mobility? On the shape and stability of the national research organisations/ institutions and their staff?
2. How do you evaluate legal environment for the international scientific cooperation in your country? Does it provide you with a comprehensive framework for its realisation including reporting, budgeting, accounting etc.?
3. What mechanisms/ tools/ ways exist in your country for the societal dissemination of the outcomes of the international science cooperation? What challenges for the dissemination of results do you see?
4. How would you characterize policy impact of international science cooperation in your country?
   - *travel of scientists*
   - *brain-drain*
   - *autonomy and non-interference*
   - *effects on intra-organization hierarchies (old vs young, English speaking vs. not, some scientists getting more resources,. etc)*
   - *stability of institutional environment*
   - *legal complications - unclear and underdeveloped legal framework for patents and copyrights, etc.*
   - *different systems for reporting , budgeting, accounting, etc.*
   - *trust and long-term relationships with partners*
   - *centralization of project acquisition and islands of excellence*
   - *mechanisms and challenges for societal dissemination, policy impact and valorization*

C. Evaluation

1. What are rewards/ signs of recognition for the participation in the international science cooperation in your country?
2. What are the main feedbacks regarding national framework of the realisation of international science cooperation projects in your country from the partners and funding agencies?
3. Who and how evaluate the international science cooperation in your country; what is the budget for the evaluation?

7.2. List of interviews

A. Belarus

BY1 - state official in the sphere of science policy

BY2 - academic, professor, head of state scientific fund

BY3 - top manager of state enterprise and state university

BY4 - representative of the Delegation of the EU to Belarus

B. Moldova

M1 – professor, dean of a faculty, university

M2 – senior policy expert, Academy of Sciences of Moldova

M3 – senior policy expert, public university

M4 – researcher, public university

M5 - M4 – researcher, public university

C. Ukraine

U1 – senior expert, NGO

U2 – professor, applied science, public university

U3 – professor, public university

U4 – expert, NGO “Ukrainian Institute for the Future”

U5 – corresponding member of the National Academy of Science of Ukraine

The EU and Eastern Partnership Countries
An Inside-Out Analysis and Strategic Assessment

Against the background of the war in Ukraine and the rising tensions with Russia, a reassessment of the European Neighborhood Policy has become both more urgent and more challenging. Adopting an inside-out perspective on the challenges of transformation the Eastern Partnership (EaP) countries and the European Union face, the research project EU-STRAT seeks to understand varieties of social orders in EaP countries and to explain the propensity of domestic actors to engage in change. EU-STRAT also investigates how bilateral, regional and global interdependencies shape domestic actors' preferences and scope of action. Featuring an eleven-partner consortium of academic, policy, and management excellence, EU-STRAT creates new and strengthens existing links within and between the academic and the policy world on matters relating to current and future relations with EaP countries.