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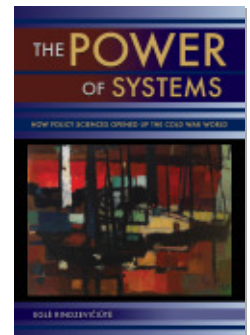
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Epilogue

THE AVANT-GARDE OF SYSTEM-CYBERNETIC GOVERNMENTALITY

This book has outlined the transnational career of systems analysis as a science of governance as it was coproduced by liberal democratic and authoritarian regimes. Developed by East and West scientists, the systems approach evolved from military operations research (OR) into a set of governmental techniques and was used across different sectors, in particular for global governance concerned with the issues of energy, population, and the environment. Easy to understand even for nonspecialists, systems analysis rendered disparate practices meaningful, offering a framework for the understanding and control of a complex and fast-changing world. As such, I argue, systems analysis formed a vitally important resource for the emergence of global governance, where Cold War tension appeared to be an opportunity and not an obstacle. Cold War confrontation led the US and Soviet governments to look for apolitical channels of communication, and, as a result, some areas of technoscience were deemed suitable to be used as a tool for East-West diplomacy. Influential communities of OR scholars used the diplomatic momentum to position the emergent field of systems analysis as a priority area, thus gaining resources for the intellectual advancement and institutionalization of what would become known as the systems approach.

But, as I have shown in this book, the history of systems analysis was not just about intellectual innovation or academic power grabbing. Because the systems approach was developed through East-West cooperation, it led to many crucial innovations that changed not only the conceptual, but also the institutional composition of the governmental worlds on both sides of the Iron Curtain. Such innovations include, but are not limited to, the new idea of apolitical steering that

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drew on systems analysis (later, policy analysis); new institutions such as an international think tank (IIASA); new tools such as regional and global computer-based models of intertwined economic, social, and geophysical processes; new objects of governance such as the biosphere; and, most importantly, a new language and conceptual principles of steering, building on the ideas of complex systems, self-regulation, uncertainty, and reflexivity, all of which posited the fundamental intertwining of scientific expertise and government.

I have demonstrated that these new ideas emerged in relation to particular scientific, organizational, social, and political contexts. One such context was the emergence of a group of Soviet governmental elites who acknowledged the importance of scientific expertise and East-West transfer for the future of the Soviet system. Another context entailed the establishment of IIASA as a "bridge between East and West." A third context involved the everyday tactics of the making of systems analysis as an apolitical science of governance inside IIASA. I argued that the impact of systems analysis was not limited to its end products, such as the scientific expertise expressed in reports, data, or images. All of these were, of course, significant, but my point is that the very *process* of the production of systems analysis mattered, because it was during this process that transformation was generated.

As a transformative instrument of governance, systems analysis was deeply ambivalent: this became particularly evident in the case of Soviet governance. Top Soviet government officials, such as Dzhermen Gvishiani, promoted East-West cooperation in the area of systems analysis, because they saw systems analysis as a legitimate channel for transferring high-tech expertise and know-how from the West. This transfer was expected to be fully controllable, leading to the strengthening of the Soviet economy and thus maintaining the existing power structure inside the Soviet Union. Yet other Soviet actors had rather different expectations for the East-West coproduction of systems analysis. I showed, for instance, that the mathematician Nikita Moiseev drew on systems analysis to articulate fundamentally different epistemological principles and an ethos of government as guidance (in Russian, *napravlenie*) of complex systems that, underscoring uncertainty, rejected the idea of the human control of the nature.

In this epilogue, I expand on the ambivalent role of systems analysis and consider its legacy in the post-Soviet period. I begin by discussing the implications of transnational system-cybernetic governmentality for the understanding of the bipolar Cold War world, proposing the idea of the system-cybernetic avant-garde of governance. Following this, I address the complex question of the link between system-cybernetic governmentality and the neoliberal transformation of post-Soviet Russia. I argue that although the system-cybernetic governmentality and economic neoliberalism did not share institutional origins, they were linked

during the post-Soviet transformation as a result of historical momentum: the members of the Soviet systems approach community were best positioned to conduct the transfer of the models of the market economy from the West at a time when neoliberal ideas on the free market economy were gaining popularity. However, I also suggest that this should not mean that the pre-1980 history of system-cybernetic governmentality should be tainted as neoliberal; rather, I argue that this reveals the extent to which scientific governance can be appropriated by different economic and political regimes. If anything, the pre-1980 history of system-cybernetic governmentality is a history of a rather liberal, in the classic sense, governmental technology, underscoring the conditions of autonomy, self-regulation, and government at a distance. I wrap up my argument with consideration of the implications of my case of East-West system-cybernetic governmentality for studies of governance and sociopolitical change, proposing that the seeds for transformation can be found both at the margins and at the center of power.

Beyond the Cold War Panopticon: The System-Cybernetic Avant-Garde

In his influential account of the technical infrastructure of globality, Paul Edwards argues that computer technology was a constitutive part of the Cold War "closed world," because it enabled a political system relying on practices of surveillance and control.[1] In the same way many scholars explained the worldwide appeal of the systems approach by its military roots, interpreting the spread of the systems approach as a symptom of a pan-military, elitist mentality that, following paranoid Cold War logic, sought to render the population visible and amenable to perfect control.

But this view does not exhaust the reasons behind the international spread of the systems approach. Strongly dependent on computer technology, systems analysis was not just a tool of military competition. The values and the politics that the systems approach contained were not limited to the pan-military mentality. As I show in chapters 2, 3, and 4, it was due to a particular episode in Cold War diplomacy that policy sciences such as the systems approach assumed the particular role of a bridge between East and West. However, neither its military origins nor this diplomatic role solely determined the contents and uses of the systems approach as a policy science. Rooted in the OR tradition, the systems approach was used as a tool for East-West diplomacy and technology transfer, but then it morphed into a more ambitious venture for policy argumentation. The systems approach did not merely solve existing governmental problems, but *con-*

structed problems. As I show in chapter 4, systems analysts were as much problem *makers* as problem *solvers*. Their original contribution was the invention of "common problems" requiring new modes of sharing data, coproducing expert knowledge and new institutional frameworks for action. The very idea of common problems invites us to question the hypothesis of a paranoid, closed Cold War world.

Furthermore, system-cybernetic governmentality does not fit the image of the global panopticon.[2] I detail in chapters 3 and 4 that the shift to common problems was not mere diplomatic rhetoric. The production of common problems was only made possible by a complex organizational effort that carefully made and remade boundaries between technoscience and the political, a process which was a matter of everyday, pragmatic negotiation. Soviet policy sciences, based on cybernetics and systems analysis, were depoliticized with the aim of propelling Soviet military and industrial might to a bright future. But the system-cybernetic governmentality smuggled into Soviet governance a new epistemology, a new understanding of both the world and control.[3] This new epistemology undermined both the Marxist-Leninist view of stage-driven development and high modernist beliefs in control. According to the classical definition, liberal governance is "a limited government that operates through theoretical and scientific knowledge of immanent social and other processes external to the institutions of formal political authority."[4] Imposing limits on governmental optimism, system-cybernetic governmentality could be interpreted as a version of an organized skepticism which, in turn, liberalized Soviet governance.

How can a science of control have a liberalizing effect? According to Andrew Pickering, the ontology of cybernetics builds on "nonknowability," that is, an assumption that we can never fully represent and thus understand a complex system. This idea can be extended to describe both the content and the form of the organization of systems analysis as a field of international transfer. For instance, at IIASA pretentions to omniscience were rejected in the internal debate on the use of mathematical methods in scientific governance.[5] In its plan for the 1990s, IIASA acknowledged the limitations of its initial optimism toward the ability to solve policy issues with the help of mathematical decision aid tools and called for greater use of qualitative approaches.[6] Furthermore, cybernetic governmentality presupposes not a perfect knowledge of the world out there, but rather performativity: even under conditions of uncertainty, we can still figure out how the complex systems behave and interact with them.[7] Pickering also notes that the cybernetic notion of control did not historically develop as an instrument enabling straightforward domination or surveillance, although cybernetic control defines control as an informational, feedback-based process. Instead, argues Pickering,

> The entire task of cybernetics was to figure out how to get along in a
> world that was not enframable, that could not be subjugated to human
> designs—how to build machines and construct systems that could adapt
> performatively to whatever happened to come their way.[8]

In this way, the notion of cybernetic control allows for the areas of opacity and
self-regulation. Applied to the Soviet context, this deeply challenges the notion
of totalitarian control. Pickering's thesis of nonknowability as a central premise of
cybernetic ontology is helpful to understand the central mechanism driving the
East-West exchange in policy sciences. At IIASA, East-West scientists did not
strive to accumulate detailed knowledge about each other. It was not a precise
representation that both sides were striving after, for had one gone too deeply
into details, the risk of espionage emerged. Instead of *knowing*, East-West scien-
tists were *doing*: creating an environment that enabled them to perform, to work
together. It is in this process that a new world emerged, one of global problems
and complex interdependence, IIASA being, to be sure, just one site out of many,
but a very important one nonetheless. It is on this basis that I insist on the idea
of East-West coproduction of governance and not a mere "exchange" of preex-
isting models and ideas.

Moreover, the system-cybernetic emphasis on performative adaptability
strongly disagrees with what scholars describe as the high modernist approach to
governance, expressed in the large technological projects pursued by Soviet and
US planners. It is widely documented that Soviet experts implemented some ill-
conceived large-scale projects at enormous human and environmental cost, many
of which dated back to Stalin's period, such as Magnitogorsk, the White Sea Ca-
nal, and Norilsk. It is on the basis of these examples, as described in the work of
Stephen Kotkin, Sheila Fitzpatrick, and Orlando Figes, that Scott builds his thesis
of high modernist expertise-based governance, equally blind to the principle of
uncertainty and localized forms of knowledge. But as long as we restrict ourselves
to this demonized view of Soviet technocracy, we cannot explain why Soviet rule
lasted as long as it did and, furthermore, enjoyed a considerable degree of do-
mestic and international legitimacy. I propose that a missing part of the explana-
tion is Soviet system-cybernetic governmentality, which offered the hope of more
enlightened governance, both for the governors and the governed, as well as an
equally important promise of adaptability.

In this way, system-cybernetic governmentality entailed both revolutionary
and conservative effects, where different actors mobilized it to achieve different
goals. Indeed, it is thanks to this ambivalence that the systems approach could be
presented as a "mere" instrument that did not threaten but reinforced the Com-

munist Party's monopoly of power. Accordingly, new systems of control and even scientific expertise would performatively adapt to the existing hierarchies and conserve them by serving as their extensions.

The relationship between these two qualities, limiting and conserving the existing power structures, I propose, can be explained through a particular dynamic relation between the mainstream and the avant-garde. Back in the 1950s, and with reference to the artistic world, the French semiotician Roland Barthes observed that the avant-garde subsists on mainstream elite power and consumption networks, albeit at the same time avant-garde production seeks explicitly to overthrow elite mainstream habits.[9] I suggest that Barthes's notion of the interdependence of the avant-garde and mainstream can be used to understand the double role of system-cybernetic governmentality in the Soviet Union. Although seeking to fundamentally transform Soviet governance, systems analysis could not be practiced without organizational and financial support from the Soviet government. This mode of expertise required powerful computers, large data sets and, most importantly, the pooling of multidisciplinary expertise; thus it depended upon well-established scientific milieus with institutionalized links among them. All of these could not exist without state approval and support. In turn, the very existence of the system-cybernetic community conferred legitimacy on the otherwise bureaucratic and inefficient Soviet governmental system, as this community literally embodied the promise for a better future as well as symbolized a commitment to participate in the global networks of cutting-edge policy sciences. But I want to add that as an avant-garde approach, system-cybernetic governmentality conferred a degree of legitimacy on the Soviet government, only as long as it was seen as actively supporting efforts to think beyond national borders and narrow instrumentalism. Matthew Evangelista and Walter Clemens describe the significant efforts of Soviet antinuclear arms control scientists to reduce the world nuclear arsenal. In a similar way, the system-cybernetic research community of Soviet scientists actively participated in the development of global governance, which they saw as an antidote to short-term government concerned with quick fixes.

Indeed, the legitimizing role of the system-cybernetic avant-garde is confirmed by Russia's approach to IIASA after the collapse of the Soviet Union, when many Western countries, such as the Britain, France, and Italy, left IIASA in the 1980s—Russia continued paying its IIASA membership dues. On the other hand, considering the post-1990 period, there was also an evident discrepancy in Russian policy between "keeping face" before foreign partners and at the same time neglecting domestic communities of systems analysis to such an extent that they largely disintegrated.

The Decline of the System-Cybernetic Avant-Garde

The systems approach reached maturity in the Soviet Union in the second half of the 1980s, that is, just before the Soviet empire began to crumble. The volume of specialized academic journals, teaching programs, institutes, and academic literature on the systems approach was growing, and some of the affiliates of the movement finally entered the ranks of top decision makers, such as the econometrician Abel' Aganbegian, who participated in the drafting of Gorbachev's program for restructuring the Soviet economic system. Was this a chance for the avant-garde to become mainstream? Apparently not: Foucault's observation that "the art of government can only spread, be reflected, and take on and increase its dimensions in a period of expansion free from the great military, economic and political emergencies" applies well to the case of Soviet system-cybernetic governmentality, which appeared to thrive during the period normally described as "the stagnation," from the mid-1960s to the late 1980s.[10] But post-Soviet Russia in the 1990s was torn by many political and economic emergencies, which effectively disrupted the established networks of system-cybernetic expertise.

The success of the Soviet systems approach was entrenched in a particular social setting, that, on the one hand was dependent on stable access to generous governmental funding and, on the other hand, was a rather autonomous collective that fostered an ethos of responsibility for global issues that went beyond the boundaries of a discipline, a branch, or a polity. The Cold War divide was crucial to assuring the former and, probably, it was a generational cohort that ensured the latter. Both factors appeared to wither away during the 1980s. Prime Minister Kosygin retired in 1980 and died soon thereafter. During the next seven years, Kosygin's son-in-law, Gvishiani, continued to occupy important posts, retiring as a vice chairman of IIASA only in 1987. Briefly appointed to the State Planning Committee in 1985, Gvishiani disagreed with Mikhail Gorbachev's agenda and, judging from his memoirs, was neither invited nor wished to become deeper involved in the reconstruction.[11] It is likely that Gvishiani's political importance also diminished for health reasons (only in his fifties, he reported frequent illness) and the changing political climate. Following Kosygin's death, the GKNT's chairman Kirillin immediately retired. The axis of Kosygin-Kirillin-Gvishiani was therefore broken and many new actors, who did not necessarily share the same vision and mission, stepped in. Furthermore, in the late 1980s the Soviet Union was increasingly opening up to Western trade, establishing direct links between Western and Soviet companies. Accordingly, the GKNT had been losing its exceptional status as the East-West gatekeeper. In turn, the Soviet systems community was also losing the rationale to justify its priority status in East-West transfer.

Changes—some political others purely inexplicable—were also affecting the lower levels of the Soviet systems community. The Soviet nuclear winter scholars were struggling to come to terms with the mysterious disappearance of the atmospheric scientist Vladimir Aleksandrov, who went missing during his trip to an urban governance conference in Cordoba, Spain, in April 1985. Last seen in Madrid, from where he was supposed to fly back to Moscow to defend his doctoral dissertation in twenty days' time, Aleksandrov never boarded the aircraft and was never seen again. (At the moment of writing in 2015 his wife was still hoping to hear about him).[12] Despite the many unknowns and allegations, some alluding that the sociable Aleksandrov was involved in espionage, Aleksandrov's colleagues stayed loyal him: his tragic disappearance and scientific contribution was acknowledged in the 1987 edition of Velikhov's volume, dedicated to the study of the environmental consequences of nuclear war.[13] However, it is arguable that this unfortunate event did cast a shadow over the so far rather strikingly smooth transnational cooperation among East-West global modelers.

If political and security issues were understandably important, it was the state of the economy that posed insurmountable difficulties. As the economic situation continued deteriorating, the Soviet funding for science shrank, to almost completely vanish following the dissolution of the Soviet Union in 1991. Nikita Moiseev left his post as research director of the Computer Center in 1986, directing his efforts to publishing prolifically on the idea of the noosphere that set limits to government and the need for a new approach to government, emphasizing guidance and not control. In his memoir, published in 1993, Moiseev expressed bitter disappointment with the fate of the Academy of Sciences. Personally, he saw his livelihood drastically reduced by the collapsing economy and, once again, just like in the late 1940s, the eminent scientist could not afford to buy a decent suit.[14] Moiseev published his memoir before the US government, in partnership with several foundations and the philanthropist George Soros, launched their program intended to soften the hard landing of Soviet scientists during the transformation into a market economy. In the last pages, Moiseev documented the deep disappointment of the leading Soviet scientists, seeing their lifetime work going down the drain.[15] Sadly, Moiseev did not live to see the rise of the concept of the Anthropocene, of which he would have approved, as the governmental implications of the Anthropocene were in many ways so close to Moiseev's own theory of the noosphere.[16]

If the older scientists lamented the past, the younger scholars were facing an uncertain future. The Soviet nuclear winter group fragmented during the post-Soviet transformation. The head of the ecological modeling team, Iurii Svirezhev, left Moscow first for Hungary and then, in 1992, to take up a leading position at the Potsdam Institute for Climate Impact Research in Germany. A workaholic who

did not stop even after retirement, Svirezhev would die on his way home from the office in 2007.[17] The designer of the general circulation model, Georgiy Stenchikov, also left the Computer Center in 1992. He recalled having decided to emigrate when his car was stolen from the center's car parking lot, this being "the last drop."[18] Stenchikov first went to work at Maryland and Rutgers universities and later to the King Abdullah University of Science and Technology in Saudi Arabia. However, some members of the team stayed in Moscow, such as the modeler of ecological systems, Aleksander Tarko, who enjoys cross-country skiing and photography when he does not teach and research at the Computer Center and runs the virtual museum dedicated to Nikita Moiseev. Although Tarko also replaced Skriabin as the scientific secretary of the Russian national committee at SCOPE and participated in the US-Russian modeling of the environmental consequences of a hypothetical nuclear conflict between India and Pakistan, one gets the feeling that the status of this research does not play quite the same significant role as it did in the early 1980s.

This somewhat depressing end illustrates the importance of the symbiotic relationship between informal, transnational scientists' collectives, strong governmental agencies, and well-funded organizational platforms for the international transfer of knowledge. The system-cybernetic ethos fell to pieces only when the storm died—when the Cold War ended following the collapse of the Soviet Union and the Russian economy. Although Gvishiani was mainly concerned with international trade, he also provided an institutional shelter for system-cybernetic scholarship, particularly for nonmilitary applications. The excessive, high modernist belief of the Soviet government in scientific fixes also led to the development of the institutional framework that enabled systems scientists to work at arm's length from the Party. The archival documents pertaining to Dzhermen Gvishiani's activities in the government cannot be accessed, so we are not able to fully evaluate personal contributions behind the stage. Nevertheless, it is important that, as one of my interlocutors told me, Gvishiani "genuinely respected science." Their proximity to the government, as my sources show, was indeed valued, even by the reformist Soviet systems scholars.

There was, in this way, a special social contract between the mainstream Soviet political bureaucracy and the system-cybernetic avant-garde. Whereas the original intentions of the Soviet leaders of the trade and military complex could well have been exploitative and limited to the short-term needs of their departments, these top leaders at least were politically intelligent enough to grant a carefully managed autonomy to system-cybernetic scholars. In turn, these scholars directed their efforts to global and pragmatic issues, the ones which were

expected not to raise controversy inside the Soviet Union, thus neglecting such topics as human rights. The setup was seen as practical by both sides. In 1998 Nikita Moiseev wrote that both the United States and the Soviet Union benefited from the "hostile unity," but by this he did not simply refer to the bipolar geopolitical stability, but also to a joint commitment to shape the world beyond the Cold War divide.[19]

System-Cybernetic Governmentality and Neoliberalism

Looking back at the development of system-cybernetic governance from the perspective of the current debate on neoliberal technologies of government, an obvious question is how we can understand the link between the decline of the Soviet system-cybernetic governmentality and the onset of neoliberal reforms and globalization that followed the collapse of the Soviet regime. There is, as I mentioned earlier, a certain chronological overlap between the emergence of the Foucauldian studies of (neo)liberal governance and the rise of the systems approach in policy sciences. Furthermore, neoliberal economic ideas about the market and privatization entered high governmental circles in the early 1980s, precisely at the time when the systems approach—then increasingly framed as policy analysis— was becoming a mainstream subject in management education.[20] The two— neoliberal economic principles and policy analysis—became entangled in what would be called neoliberal governmentality.[21]

There is no consensus about the definition of neoliberalism; however, commentators appear to agree on at least one point—that neoliberal governance seeks to depoliticize governmental processes and keenly relies on techniques of calculation in doing this.[22] From this perspective, policy sciences might appear as obvious components of neoliberal governance. As I show in this book, policy scientists explicitly depoliticized systems analysis and developed approaches that could be viewed as predecessors to the evidence-based policy that drew on quantitative methods of evaluation in the 1990s.[23] However, the link between the systems approach and neoliberal governance is not straightforward: in the next section I suggest that the East-West partnership in the making of system-cybernetic governmentality complicates the interpretation of the systems approach as neoliberal.

There is an influential conversation going on among historians of Soviet political economy about its links with neoliberalism, the first and most distinct studies in this direction being conducted by Johanna Bockman and Gil Eyal. According to Bockman, the networks of neoliberal economic thinkers exploited the institutional and intellectual resources produced by left-oriented economists.[24] In her

study of East European economic thought, Bockman argues that state socialist economic thinking was not limited to Marxist political economy, but also engaged with neoclassical economic thought, a development that took place under the conceptual umbrella of mathematical economics (econometrics). As East European economists were familiar with theories of market systems, the post-1989 transformation did not entirely catch them by surprise.[25] A more surprising moment was that the actual implementation of the transformation of the centrally commanded economy to a market economy was limited to a package of neoliberal reforms. This choice, according to Bockman, happened because the transnational right had effectively decoupled the idea of the socialist system from the idea of the market, thus rendering the combination of these two ideas politically bankrupt.[26]

Now, the systems-approach in policy sciences was developed outside neoliberal circles, originating instead in the circles of the Cowles Commission and Keynesian economists, who closely cooperated with the Soviet mathematical economists. This specific origin, to be sure, did not render system-cybernetic governmentality immune to different political appropriations: history shows that system-cybernetic governmentality appealed equally to liberal democratic capitalists, Soviet state socialists and, as we have seen over recent decades, neoliberals. How can we explain this? One possible explanation is that there is an inflexible supply of policy sciences and the system-cybernetic assemblage was simply understood as "the best available." Toward the end of the 1980s system-cybernetic governmentality became widespread globally and institutionalized in the fast-growing fields of management and policy studies and education, as well as private consulting. Positioned as a toolbox—and thus *not* a general, consistent theory—for planning at the international, state, and firm levels, systems analysis was equally welcome in centrally planned systems but also included in the repertoire of neoliberal governance, which put a premium on quantitative methods.

But also, one should be careful not to fall into the trap of epistemological realism. I am therefore skeptical about the usefulness of the attempt to search for the "roots" or "origins" of neoliberal governmental techniques. One reason is, as I demonstrate in this book, it does not make sense to talk about an intrinsic meaning of policy sciences, for meanings and outcomes differ in different contexts, being the subject of a laborious semiotic and institutional construction. The use of neoliberalism as an "–ism" word is misleading in itself, because it suggests a consistent and durable phenomenon. In contrast, the meanings and practices of systems analysis as a governmental technique were locally negotiated, heterogeneous, ambiguous, and more often than not contradictory.

A more fitting way of approaching this complex situation is to acknowledge the importance of the changing contexts of the articulation, institutionalization,

and application of policy sciences. Linking system-cybernetic governance with neoliberal reforms was due to one such historically contingent context. The transnational East-West networks of system-cybernetic policy scientists began to overlap with the evolving networks of so-called neoliberal economists toward the late 1980s. When in 1986 Robert McNamara, former director of the World Bank, delivered the second distinguished lecture in IIASA's Kreisky lecture series, he spoke not about the economy but about nuclear security, as its condition was transformed by the study of nuclear winter.[27] The change took place in a few years, when in 1989 the prominent Russian economist Stanislav Shatalin nominated IIASA to be the platform for devising a program for economic restructuring of the Soviet Union. Starting in 1990 IIASA hosted a series of workshops for the development of a blueprint of East European transition to a market economy, which gathered the future minister of foreign economic relations and the influential oligarch, Petr Aven, future minister of economics, Evgenii Iasin, Gregorii Iavlinskii, and Stanislav Shatalin, among others.

It was at these events that the IIASA community established direct links with the organizations and individuals associated with neoliberal market ideology, espousing the values of a lean state, market economy, and "structural adjustment" policies.[28] From the West, Jacques Attali, then François Mitterand's advisor, and Jérôme Vignon, the director of the European Commission's Department for Prospective Studies, assured their support.[29] Some of these workshops were arranged with the support of the key British liberal think-tank, the Institute of Economic Affairs in London.[30] Also, Jeffrey Sachs, who devised shock therapy economic policies for Poland and Russia, was involved. The program, "500 Days," which involved privatization, liberalization of prices, and stabilization of the market, all followed with economic growth, was developed at IIASA. This program combined transformation with conservation as it retained the idea of the political integrity of the Soviet Union, but was never adopted by the Central Committee.

This is just a sketch of this turbulent period and the actual mechanism linking systems analysis and neoliberal reform of the Russian economy remains to be explored. Future research is needed to examine the role of long-term planning, the branch with which global modeling was most readily associated, during the volatile process of privatization in Russia in the first half of the 1990s, where leading industries were transferred from the state to private ownership and when economic decline prevented any commitment to large infrastructure projects.

On the other hand, during the same period Russia was entering the world of international finance. Here, long-term planning and systematic studies were delegated to the established international organizations, such as the World Bank and the International Monetary Fund, and to IIASA, where regional programs for transitioning from centrally commanded to market economies were developed.

Yet local agency should not be discarded beforehand. It would be interesting, for instance, to trace the knowledge and experience transfer from Soviet systems research communities to post-Soviet management consultants.[31] For a Western investor, the Russian industries that emerged in the 1990s were probably even less comprehensible than the old Soviet enterprises: in the 1990s ex-Soviet companies continued barter exchanges, but now the ownership of many was unclear, with some companies changing hands through armed takeovers. In this context, as Susanne Wengle shows, the importance of managerially trained experts was paramount in the privatization of Russian companies, because these managerial experts made the ex-Soviet industries legible for Western investors.[32] Thus, during the post-Soviet transformation, policy sciences once again provided a common language and linked East and West.

One thing is clear: the institutional landscape, where system-cybernetic governmentality was developed, was changing. After 1991 the production of policy expertise was no longer limited to the former members of the Soviet Academy of Sciences, but was instead fragmented into the hybrid and private field of management training and consultancy.[33] It is quite remarkable that the old research institutes were retained, but it was also obvious that the power shifted elsewhere. During my visit to the Computer Center and the Institute for Systems Research in Moscow in 2013, I noticed obvious signs of struggling organizations: dilapidated corridors and large office spaces that housed fewer scientists than originally intended. Professors complained about the difficulty of attracting doctoral students, as talented scientists often embarked on lucrative commercial careers rather than toiling, underpaid, in academia. However, the pride in the past was still present and the staff fondly remembered the pioneers in their field. The Computer Center, now named after its director Anatolii Dorodnitsyn, kept Moiseev's office as a memorial museum. Similarly, Gvishiani's office was maintained in the Institute for Systems Analysis (formerly VNIISI, now ISA): his coat had been left on a hanger, a pack of his favorite blue Pall Malls lay waiting, and neatly dusted book shelves displayed Western publications on policy analysis.

But the center of power in Russian scientific expertise on the future appeared to have shifted to other institutional environments, such as Rosnano, the agency in charge of the development of nanotechnologies, established in 2011 and situated just a stone's throw from ISA, and the Skolkovo innovation center, established in 2009, a controversial project that directly cooperates with MIT and IBM, among others. Although there is no space to expand on these developments, I would like to add that the ascension to power of Vladimir Putin in 2000 coincided with the return of macro planning, new infrastructure projects, and eventually a new expansionism in foreign policy. Whereas currently it seems completely unlikely that the Russian elites will embark on the route to democratization, they once again

rely heavily on policy sciences and intellectual military technologies, such as reflexive control, in the conduct of so-called hybrid warfare.[34] Industries and technologies, though described as "just business" in the 1990s and the early 2000s, have once again become a matter of political prestige, particularly in the domestic context.[35] Recently the Polytechnic Museum, a venerable institution established in the nineteenth century in Moscow, mounted a new exposition entitled "Russia Can Do It Herself" (*Rossia delaet sama*). Furthermore, according to some conservative critics, the Russian foreign policy mobilized the very idea of global interdependence to set the new rules of international relations, seeking to claim back its great power status.[36] In this context, the ideas of uncertainty and the utopia of control, which played an important critical role during the Cold War, might once again hold significant critical potential.

Should we conclude, then, that the system-cybernetic avant-garde was ultimately a failure to liberalize government, both in East and West, ridden by their own versions of authoritarianisms, what Alena Ledeneva describes as the Putin *sistema* and what is described as neoliberalism? If anything, I hope to have shown in this book that that the liberalizing effect of system-cybernetic governmentality is always context specific. At IIASA, the systems approach to governance evolved toward the incorporation of qualitative methods in policy sciences, at the same time emphasizing informality, reflexivity, and social aspects of science and technology. Furthermore, during the Cold War the process of East-West coproduction of scientific expertise mattered at least as much as its end products, because in this process new, unanticipated practices, networks, ideas, and projects, some of which radically departed from the initial rationale, were generated. Finally, the history of system-cybernetic governmentality shows that sources for critical thinking and action can be found not only in what is described as the margins or practices of resistance, but also rooted in the very center of power and, furthermore, narrow, functionalist applications. The instrumental can become the critical and vice versa. Perhaps the system-cybernetic avant-garde has not been exhausted yet.