

Serbia: A High-Tech leader or a mining colony?

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Against the backdrop of a seemingly perpetual electoral campaign, and in anticipation of elections that the ruling regime in Serbia appears determined to win at any cost, the government has triumphantly announced an expansion of cooperation with the People's Republic of China in the field of humanoid robotics. These announcements include the ambitious claim that Serbia could become one of the major producers of robots. Following a brief overview of robotics and a clarification of the distinction between humanoid and industrial robots, this text takes a broader analytical perspective on developments in Serbia, China, and the European Union, as well as on some relevant interactions and interdependencies among them.

Robotics

Robotics represents a natural evolution of humanity's effort to overcome its mechanical and cognitive limitations. Humanoid robots attract considerable public attention, although the number of their actual installations remains very small. The number of specialized military, industrial, medical, and agricultural robots is approximately ten thousand times greater than the number of humanoid robots. Nevertheless, almost 2% of the money invested in robotics development is directed toward humanoid robots.

Humanoid versus industrial

In most applications, non-humanoid robots are considerably more efficient. Industrial robots on production lines are faster, more precise, and less expensive. Robotic vacuum cleaners are far more effective than walking robots carrying vacuum cleaners. Surgical systems such as the da Vinci Surgical System have a non-humanoid form specifically adapted to surgical procedures. The human body is not an optimal engineering design for most applications. Consequently, military robots used to deliver ammunition most commonly take the form of

quadrupeds, while drones do not imitate either humans or birds but are more commonly designed as helicopters.

Despite their shortcomings, humanoid robots are attracting increasing attention from the public and investors, as well as from populist-minded politicians who use them as part of political marketing. Announcements of high-tech projects can conceal violations of the law, divert public attention from threats to the public interest, and contribute to preserving the power and profits of those in government. From a technical perspective, humanoid robots possess specific characteristics that may give them an advantage in certain applications. Employers are constantly seeking cheaper labor, while the military and rescue services seek to replace humans in dangerous missions. At the same time, modern artificial intelligence (AI) systems require a hardware platform capable of improving human-machine interaction. If AI systems can understand and synthesize speech, recognize objects, and plan actions, then a humanoid body becomes a universal platform for their deployment.

Despite the high degree of automation already achieved, there are tasks that cannot be entrusted to specialized industrial robots. Such tasks require human-like labor. Many companies relocate material production to countries with lower living standards and cheaper labor. Rising living standards in developing countries further increase the cost of human labor, thereby contributing to the broader adoption of humanoid robots.

The greatest advantage of humanoid robots is their human-like form. It allows them to move and operate in spaces designed for humans and to use infrastructure intended for human use. A humanoid robot can, without major modifications, use stairs, doors, light switches, tools, and vehicles designed for humans. It can also operate in warehouses, offices, and other human environments. If the same robot is required to work in a factory today, in a warehouse tomorrow, and subsequently in a nursing home, its humanoid form enables automation without modifications to the surrounding environment or infrastructure. With appropriate software configurations, a humanoid robot can arrange goods, carry packages, assist elderly people, work night shifts, and perform a wide range of repetitive tasks.

When considering a specific work process, a humanoid robot is inferior to a specialized robot: it is slower, less precise, and more difficult to maintain. However, it can replace humans across a wide range of tasks, often requiring only software adaptations. Industry already possesses a large number of specialized robots. What employers need, however, are humanoid robots capable of replacing expensive and inherently unreliable human labor in sporadic activities that cannot be predicted in advance and that take place in environments designed for human workers. The exploitation of human labor is subject to legal restrictions, ethical standards, and human-rights protections. Consequently, employers increasingly seek to reduce the number of employees and automate portions of their operations using robots. The resulting loss of jobs, as well as the broader consequences for the social role and future of particular social groups, represents a problem that requires separate and systematic discussion.

Although more expensive, less efficient, and less precise than specialized robots, humanoid robots can perform a variety of tasks without hardware modifications. While material production will continue to rely primarily on specialized robots, the development of humanoid

robots will continue. They will undoubtedly have a role in industry, the military, medicine, agriculture, and other fields.

Humanoid robots, Politicians and Election Campaigns

There are also non-technical reasons for promoting humanoid robots. Public opinion is often shaped by the tendency of the general population to perceive any indication of high-tech projects as evidence of success and progress. This tendency is frequently exploited for media manipulation and to redirect public attention. The sight of a humanoid robot walking, carrying boxes, greeting people, or talking to them creates an impression of a science-fiction future. Consequently, humanoid robots attract considerably more media attention than much more productive specialized robots.

At a time of rising populism and a dramatic decline in the expertise and integrity of decision-makers, investment in science is often not guided by a coherent strategy, long-term planning, or meritocratic criteria. Funding is frequently directed toward projects whose titles contain fashionable terms such as AI or humanoid robotics. Under such circumstances, many laboratories are compelled to program and demonstrate humanoid robots in order to increase their visibility and secure funding.

Chinese promises

Following a visit to the People's Republic of China, Serbian politicians announced cooperation with Chinese companies on the production of humanoid robots. It was stated that Serbian engineers and young professionals had already visited China and had discussed training robots to prepare coffee, breakfast, or cocktails. However, media statements are not sufficient for the development of a domestic industry. The development of indigenous high-tech manufacturing depends on human capital and adequate industrial infrastructure, neither of which can currently be considered Serbia's strength.

Serbia - A High-Tech Hub or a Mining Colony

Several internationally recognized figures in Serbian robotics are no longer with us. In 1963, Professors Miodrag Rakić and Rajko Tomović developed the "Belgrade Hand," the first functional robotic prosthetic hand in the world. Academician Miodrag Vukobratović developed the "zero-moment point" principle, a key concept that remains fundamental to the control of humanoid robots. Professor Veljko Potkonjak of the Faculty of Electrical Engineering also

passed away; he was the author of significant contributions to humanoid robotics and biomechanics.

From 1980. to 2000, research laboratories at the University of Belgrade's School of Electrical Engineering developed industrial robotics solutions that have resulted in more than 80,000 installations in the automotive industry in the European Union. During the same period, the domestically developed electric vehicle Elektra was developed and put into operation. It attracted considerable attention from visitors at the Belgrade Motor Show and was successfully driven from Belgrade to Kragujevac. The vehicle was based on the capabilities of Serbia's domestic automotive, power electronics, battery, and electric machinery industries. Unfortunately, such an industrial base no longer exists, and many of the experts who built it are no longer with us.

Since 2010, decisions concerning the development of science and industry were made by politicians lacking the necessary expertise and primarily motivated by personal interests. As a result, Serbia's potential in robotics remained largely untapped. Inactivity led to the loss of personnel and the decline of projects. At a time of accelerating scientific and technological development, the number and expertise of the remaining professionals may be sufficient to follow global trends, but not to establish an indigenous high-tech industry.

Such an industry also requires industrial infrastructure in electronics, power engineering, mechanical engineering, sensors, actuators, and other supporting sectors. Serbia once possessed industrial infrastructure of this kind, but it has been significantly degraded over the past decade as a result of a misguided preference for low-tech factories operated by transient foreign investors, which remain in Serbia only as long as they benefit from state subsidies, access to the European market, cheap energy, low-cost labor working under inadequate conditions, and the opportunity to reduce operating costs at the expense of greater environmental pollution. Increasingly, they also import workers from the Far East to staff their factories in Serbia.

Serbia is gradually turning into a mining colony, following the model of Third World countries where mining profits come at the expense of environmental protection, with toxic waste deposits and with wastewater discharge which poses a threat to waterways, water supply systems, and sources of drinking water. Although copper is a strategically important metal whose price has tripled over the past decade, Serbia allow Chinese companies to take copper from Bor and Majdanpek at a fraction of its value. In addition to copper, gold-rich concentrate is also exported from Serbia and taken to China, along with other valuable chemical elements from the Periodic Table.

A catalogue of unfulfilled promises

It is difficult to expect the development of a high-tech industry in a country characterized by systemic corruption, a clientelistic system, the high penetration of organized crime, and the selective enforcement of the law. While the laws are violated, mineral resources are exploited at the expense of the environment and citizens' health, and pollution reduction

depends on the goodwill of multinational companies and foreign politicians. The announced development of humanoid robots is reminiscent of numerous populist promises that have quickly been forgotten: EU accession / closing EU negotiating chapters by 2019, promises to stand for the basic human rights of the remaining Serbian population of Kosovo and Metohija, Mubadala semiconductor/chip factory, FAP production revival, Ikarbus, domestic high-tech/aircraft-component manufacturing, Leoni, Geox, Benetton, the fight against corruption, the referendum on Jadar, delivery robots by 2023, and many others. Relying on the willingness of the general public to quickly forget past promises political attention is again being directed toward spectacular high-tech announcements, this time involving humanoid robots.

China's interests extend far beyond

The People's Republic of China may have an interest in carrying out the assembly, finalization, and testing of its products in Serbia. Compliance with European Union standards and preparation for delivery to the EU market could also be carried out in Serbia. These steps could help Chinese companies overcome formal restrictions on placing their products on EU markets. However, relocating assembly and packaging operations from China to Serbia would not constitute a substantive revival of domestic robotics or contribute to the development of an indigenous high-tech industry.

The Chinese state effectively leverages its diplomatic and economic capabilities to overcome numerous challenges. According to statements by U.S. Customs and Border Protection, there are allegations that certain Chinese enterprises operating in Serbia rely on forced labor, resulting in bans on the import of their products. Concerns regarding Chinese investors are further heightened by air, water, and soil pollution in Bor, including dust containing heavy metals such as arsenic and lead. Instead of enforcing existing laws and shutting down facilities whose pollution consistently threatens citizens, an appeal was made by Serbian top politicians to the Chinese political leadership to reduce air pollution in Bor. None of the aforementioned obstacles, nor any of the others, has withstood Chinese efforts and pressure.

The toolkit used to expand Chinese influence globally includes offering credit lines, the involvement of Chinese companies in major infrastructure projects, the acquisition of port infrastructure, the takeover of mines (example - Africa), as well as political, economic, and media support for local autocratic rulers who are willing to place the interests of their societies in the background in exchange for personal gain and the preservation of their power.

Although more favorable European financing is available, autocratic governments often rely on Chinese loans. European institutional lending typically includes oversight and control procedures designed to prevent corruption and the misuse of funds. China takes a fundamentally different approach in this regard. Although corruption is a criminal offense in China and is prosecuted rigorously and punished severely, Chinese actors do not necessarily discourage their foreign partners from engaging in corrupt practices, particularly when such practices result in more favorable contracts, higher profits, and the advancement of strategic objectives for Chinese interests.

Chinese lenders are generous and willing to give their foreign partners greater freedom in the use of borrowed funds. There is no indication that this freedom necessarily excludes non-transparent, improper, or even outright corrupt practices. When a small country governed by an irresponsible autocracy becomes heavily indebted to China, this may create an opportunity for natural resources, land, major infrastructure assets, or other strategic assets to be transferred into Chinese ownership in settlement of the debt.

The Republic of Serbia possesses extensive forested areas, significant agricultural land, valuable mineral resources, exceptionally important groundwater systems, major infrastructure assets, road and railway networks, hydroelectric and thermal power plants, transmission systems, and other assets of vital importance. Recent legislative amendments and changes in ownership structures have made it easier to use such assets as collateral for loans. In light of the experience of other countries that have fallen into debt to China, the situation is deeply concerning.

Significant copper-mining activities are performed in eastern Serbia, by Chinese companies. The Bor and Majdanpek areas are exposed to significant air, water, and soil pollution as a result of mining and processing activities. Serbian citizens are unable to access certain parts of the territory of the Republic of Serbia because they are prevented from doing so by security personnel hired by Chinese companies, including Zijin. The expansion of mining activities has also placed increasing pressure on local water resources, raising concerns about the availability and security of drinking water for communities living in the affected areas. Many settlements are being completely relocated, forests are disappearing, rivers are being polluted, and living conditions are being significantly degraded. The announcements of a significant expansion of mining activities towards Zaječar, and potentially to other areas as well, are a matter of serious concern. The Chinese company Chinalco is the largest single shareholder in Rio Tinto, which plans to carry out mining activities in western Serbia as part of the Jadar project. Like the copper mining operations in Bor and Majdanpek, the Jadar project is also planned to include mining disposal facilities for the waste which also contains toxic substances, as well as the discharge of water from their facilities into the surrounding environment. There are serious concerns that the Jadar Project, as currently designed and assessed, does not meet the environmental and social sustainability requirements applicable to Strategic Projects under the EU Critical Raw Materials Act, particularly regarding water and soil protection, extractive waste management, biodiversity, public participation, and the potential resettlement of affected communities. Nevertheless, EU leaders Ursula von der Leyen and António Costa have strongly advocated for the Jadar Project to move forward despite these concerns. At the same time, these leaders have not advocated measures to prevent strategic metals such as copper from being transferred from European territory to Chinese partners without adequate safeguards and at excessively low prices.

Today in the Balkans, tomorrow in your backyard

As of today, European citizens can watch the troubling developments in Serbia from the comfort of their own homes. Beyond the adverse effects of cooperation with China, which

represent only one manifestation of a broader problem, these developments encompass systemic corruption; clientelism, with its corrosive impact on the public interest; the erosion of the social fabric and the deliberate cultivation of divisions; the selective application of the law under strong political influence; the neglect of cultural and identity-based values; and the dismantling of all pillars of society that refuse to submit to the autocratic regime—apparently showing no mercy even toward the Church, universities, healthcare, schools, or key institutions of the state. This process is also fostering growing distrust within society—distrust of the community and of fellow citizens—while simultaneously spreading distrust toward the citizens of neighbouring countries.

The media space in Serbia has, to a large extent, been taken over, directly or indirectly, by the ruling regime. As a result of the degradation and dysfunction of the institutions responsible for oversight, control, and regulation, the Public Broadcasting Service airs little beyond the regime's official narrative. This narrative entails suppressing civic initiatives aimed at articulating and defending the public interest, while branding as traitors and foreign agents—Russian, Western, and even Chinese—anyone who resists arbitrariness, greed, the pursuit of power, and the erosion of the state and society. Private media outlets are largely dependent on advertising revenue. Given the advanced criminalization of many spheres of social life, including the economy, major advertising clients are once again often individuals or companies connected to the regime. As a result, editors of private media outlets are under pressure to practise self-censorship in order to survive in the market.

For citizens, social media have become one of the few remaining sources of information outside the dominant media system. However, the regime does not hesitate to persecute, arrest, and imprison prominent voices on social media. As a consequence, a citizen of Serbia may hear that the students are, in fact, terrorists who want to destroy the state. For 21 months, students have been demanding that those responsible for the deaths of people beneath the canopy of the unsafe railway station be prosecuted in accordance with the law.

The station was still in the status of an unfinished construction site, yet, the people had been summoned by leading Serbian politicians to come there and use the station. In addition, regime-aligned media deny that cars driven by regime hardliners have repeatedly rammed into protesting students at full speed and that students have suffered serious injuries, including fractures of the skull and jaw. The accusations by a female student that a senior police officer in the Government of Serbia building threatened her with rape, as well as reports of students providing crucial assistance to firefighters in extinguishing fires, have received little media attention (except of rare cases such as Insajder and N1).

It would be a serious mistake to assume that the specific situation in Serbia is merely local in nature, of exclusively local significance, or isolated from the rest of the world. The adviser working in the building of the Presidency of Serbia and advising the President of Serbia is German and is paid by Germany. The media and campaign consultants of Serbian President include prominent Israelis. Other political, media, economic, campaign, and public-relations advisers include Dominique Strauss-Kahn, former Director of the International Monetary Fund; Alfred Gusenbauer, former Chancellor of Austria; Franco Frattini, former Italian Minister of Foreign Affairs; Tony Blair, through his consulting firm, Blair; and Alastair

Campbell, Blair's former Director of Communications, who lectured regime representatives and was part of the Blair Serbia team. At present, the influence of Chinese media, communications, and campaign experts remains unknown. However, it is clear that the machinery and components of Serbia's autocratic regime constitute a global enterprise.

Political support for the Serbian autocracy is provided by European, American, Chinese, and Russian politicians alike, all of whom benefit from the ruling regime. The only ones who are suffering are the citizens of Serbia, whose society and state are facing the threat of plunging into an abyss of disappearance.

A concise summary of the processes of democratic degradation that lead to similar outcomes can be described as follows. Growing individualism, the decline of the family values, diminished civic attention to the common interest, and an increasing focus on immediate personal interests reduce people's willingness to see through the underlying dynamics of social and economic developments, while opportunism makes them reluctant to step outside their current comfort zone and take risks for the sake of the common good.

The immediate decisions of individuals increasingly depend on information that does not come from friends, neighbours, and colleagues, but is instead acquired through media content. Under such circumstances, political power is gained by whoever controls the media. At the same time, media organizations are mostly profit-oriented enterprises seeking to survive under conditions of market competition. Media outlets that adhere to established professional principles and refuse to reproduce the narratives of dominant political actors inevitably receive less advertising and encounter greater formal and informal obstacles from the state. They cannot withstand the competition and eventually disappear.

Since the media operate within a commercial environment, one simplified way of describing the situation is to say that political influence tends to accrue to those who possess substantial financial resources. Since money and new economic value are generated primarily by companies, and above all by large corporations, their influence on political developments continues to grow. Our democracy, once considered exemplary, although never without shortcomings, appears increasingly to have been transformed into a system that neither adequately articulates the interests of society nor consistently pursues broader social objectives, but instead responds to an increasing degree to the interests and preferences of large corporations.

It is important to emphasize that the companies themselves cannot necessarily be blamed for this development. Their fundamental purpose is generally defined in terms of maximizing profit while operating within the framework of applicable laws. But do company directors ultimately make all the relevant decisions? I would argue that they do not, because their freedom of action is structurally constrained. If, for ethical reasons—for example, by halting mining projects that cause substantial environmental damage—they were to make a decision that significantly reduced the company's profits, there is a considerable possibility that they would eventually be replaced by the owners or shareholders whose interests had been adversely affected.

Let us assume, however, that the shareholders themselves are philanthropic and willing to sacrifice part of their profits in order to protect the environment and local communities. The company could then face a competitive disadvantage, because companies operate within competitive markets, and there will almost inevitably be at least some actors willing to accept a greater degree of environmental or social harm in pursuit of higher returns. In this sense, one might conclude that it is not necessarily individual decision-makers, but rather the impersonal logic of capital and the pursuit of profit that ultimately exerts the strongest influence on the decisions being made.

Is this necessarily bad for humanity as a whole? Not necessarily. There may be circumstances in which societies have to accept environmental costs in one part of the world in order to achieve benefits elsewhere, and difficult trade-offs may sometimes be unavoidable. The problem, however, may lie in the fact that major and consequential strategic decisions require long-term planning—sometimes over a century or even more—while the time horizon associated with the pursuit of profit is often considerably shorter, frequently limited to a few years.

If this assessment is not entirely misguided, the situation might be described metaphorically as follows: we are travelling on a bus moving at very high speed through a series of sharp turns, while the driver is short-sighted and is not wearing glasses. The metaphor may be exaggerated, but it captures the potential danger of combining enormous collective power with a limited capacity—or willingness—to consider long-term consequences. The number of strategic decisions and policy choices made by the EU that have subsequently proved to be highly problematic is steadily increasing. For many of the more recent decisions taken by Trump's America, it remains uncertain whether they will achieve the desired effects. However, the effects of earlier decisions have fallen far short of expectations. There is a strong impression that there is an urgent need to change the way decisions are made at the highest level, and to make use as soon as possible of long-term projections, which surely already exist

“I know I'm paranoid, but that does not mean they're not following me.” What concerns me particularly is the possibility that, in terms of their moral and ethical choices, their conception of political objectives, their relationship to the common interest, and their use of political communication and influence, some top ranking EU officials, such as Ursula von der Leyen and António Costa may have reached the state of mind of the President of Serbia some five or six years ago. If they continue along this path, there are reasons to be concerned. Too many European politicians support Serbia's autocratic leadership and seek to preserve its political stability, treating an apparent political victory—achieved through rigged and forcibly imposed elections—as legitimate, despite growing tensions between the government and younger generations in Serbia. With their help, the Serbian autocrat might well manage to win over his own youth, but I find it difficult not to be concerned about what this could mean for Europe in the relatively near future.

At the same time, catastrophic or quasi-paranoid interpretations are unlikely to help us find a solution. What we need instead is a way out. It seems clear that we need to strengthen each individual's inclination toward deeper reflection, maintain a consistently critical attitude toward media content, and develop greater resilience to media manipulation and politicians

populism. We should also encourage greater tolerance in our immediate interactions with others. Conversations should not serve merely as opportunities for personal emotional venting. Instead, with genuine goodwill and a willingness to contribute something constructive, we should try to communicate to our interlocutors what we believe they may be overlooking and what is genuinely relevant to the issue under discussion. We should be prepared to listen to opposing views, consider the arguments presented, and even change our own position when there are good reasons to do so. Above all, however, we need to help people see beyond immediate circumstances, consider the more distant future, and understand that one of the most effective ways of pursuing legitimate personal interests is through the long-term success and stability of the community as a whole.

It is also important to understand that collective goals can be worth pursuing and that defending them may sometimes require accepting reasonable risks and stepping beyond one's immediate comfort zone. There was a time when many of these ideas were communicated to us by our elders and through religious institutions. Religion functioned, among other things, as a form of social cohesion, a kind of "glue," despite its many shortcomings and contradictions. Many of us have gradually lost that source of cohesion. At the same time, some of our fellow citizens—the new citizens of Europe who have arrived over the past several decades—may still retain their own "glue": either religious or other forms of social and communal solidarity that many established European societies have weakened or lost. I hope that it is possible to find some form of "glue" of our own: a shared set of values and principles capable of connecting individual interests with the long-term interests of society. Perhaps a careful reader will examine the arguments presented above and convince me, through sound counterarguments, that they are unfounded and that there is, in fact, little reason for concern. If that were to happen, I would be genuinely happy.