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From Iron Curtains to Digital Frontiers: Geopolitical Transformations in Central and Eastern Europe amidst the Fourth Industrial Revolution

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ABSTRACT: This paper focuses on the geopolitical perspectives regarding the spread of the Fourth Industrial Revolution (IR 4.0) in Central and Eastern European countries in the years to come. This research paper aims to explore the geopolitical dimensions that are unfolding at the "periphery of Europe" in the context of new technological advancements which are prone to radically change the economic landscape of Europe. Central and Eastern European countries possess unique economic traits making the region worth researching, especially given the disruptive capacities of technological innovation and the eventual proliferation of the Fourth Industrial Revolution. In light of the war in nearby Ukraine, regional security, cooperation and economic development, represented by organizations such as the EU, NATO, or the Three Seas Initiative, are prone to influence the technological areas as well, with the proliferation of Industry 4.0 representing a central element in the debate alongside changes in terms of geopolitical thinking.

KEYWORDS: Fourth Industrial Revolution, geopolitics, geoeconomics, economics, Central and Eastern Europe, energy, security

Introduction

In the wave of fast technological advancements and unprecedented connectivity, the Fourth Industrial Revolution (IR 4.0) has emerged as a disruptive force, reshaping global economic landscapes, and societal and political structures. As the world hurtles towards an era marked by the merging of digital, biological, and physical dimensions, the geopolitical implications of this paradigm shift are increasingly important to discuss. This article aims to unravel the intricate tapestry of the geopolitical environment in Central and Eastern Europe concerning the Fourth Industrial Revolution.

Central and Eastern Europe, a region characterized by rich history, cultures, and geopolitical complexities, stands at the crossroads of Industry 4.0's

proliferation. The interchange between technological innovation and geopolitical dynamics has become a defining feature, influencing the economic trajectories, political alignments, and national security paradigms of countries within this region. This paper explores the nuanced ways in which Central and Eastern European (CEE) nations navigate the challenges and opportunities presented by IR 4.0, delving into the geopolitical implications that arise as these countries harness emerging technologies which come to alter contemporary geopolitical thinking altogether. This article aims to shed light on how nations in this region are strategically positioning themselves within the global technological landscape, and how these choices reverberate across geopolitical fault lines.

The intersection of global economic interdependence and regional security concerns further complicates the regional geopolitical dilemma. By surveying the intricate interplay between technology and geopolitics, this article provides insights into the evolving power dynamics in Post-Communism Europe, offering an extensive approach regarding the challenges and opportunities that arise at the intersection of IR 4.0 and geopolitical, geoeconomic and geotechnological considerations.

Methodology

A comprehensive literature review was used in order to conduct the research. Therefore, rigorously researching, selecting and systematizing the relevant works concerning the economics, geopolitics and geoeconomics of Central and Eastern European countries in regard to the proliferation of Industry 4.0 represents the backbone of this paper. The relevant literature was chosen favoring the more recent works, as the concept of the Fourth Industrial Revolution can be viewed as a novelty. However, attention was paid to major works in the area of geopolitical thought, no matter the publication year, to show the constant change regarding theories and schools of thought. Moreover, the paper focuses on the Central and Eastern European countries which are part of the European Union, the North Atlantic Treaty Organization and the Three Seas Initiative, in order to maintain a cohesive approach in the research.

The Fourth Industrial Revolution

The Fourth Industrial Revolution represents an unprecedented wave of technological innovation that can influence all aspects of society. The concept, popularised by the German economist Klaus Schwab (2019), envisions an economic landscape that is automated and connected like anything humanity has ever witnessed. Industry 4.0 will radically change the way we perceive agriculture, industry, services and even unemployment, with an increasing level of automation being a key element in the discussion (Philbeck and Davis 2018).

Along with increasing connectivity and automation, another important element in the disruptive techno-economical transition is the fusion of different areas, such as that between the digital and biological worlds (Figure 1) (Schwab 2019). Furthermore, one of the main areas which will likely be disrupted by IR 4.0 is the manufacturing sector, as the new technologies will likely lead to the emergence of smart factories, autonomous facilities that will be able to auto-manage themselves, including self-maintenance, with the help of advanced robotics, sensors, Artificial Intelligence and more (Qin, Liu and Grosvenor 2016)

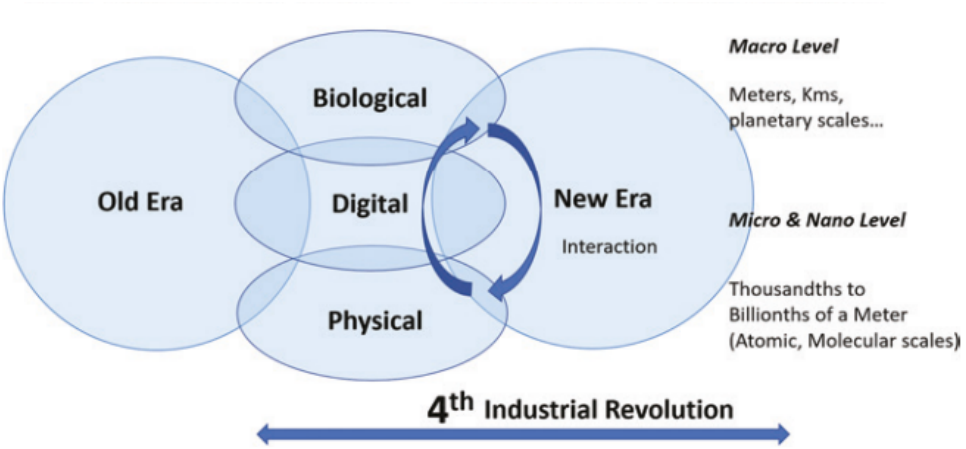

Figure 1. The technological fusion of the Fourth Industrial Revolution
Source: Skilton and Hovsepian (2017)

However, just like with any other Industrial Revolution, the context, the implications and, most importantly, the effects, are on a global scale, the disruptive character of IR 4.0 bringing into discussion unseen geopolitical and geoeconomic dynamics, much different from the ones witnessed in the past (Figure 2).

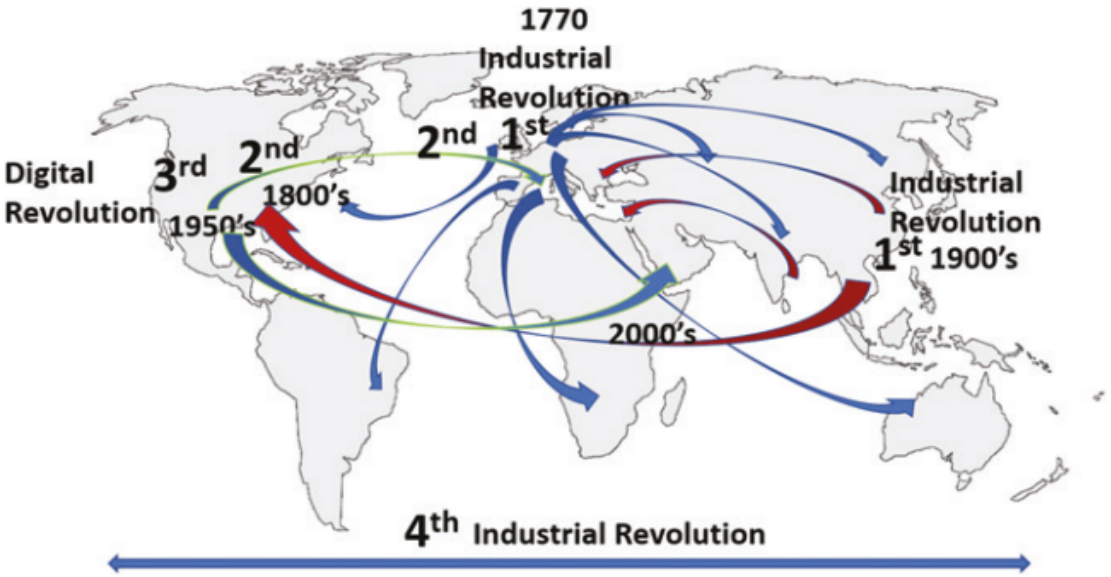

Figure 2. West–East dynamics of the Industrial Revolutions
Source: Skilton and Hovsepian (2017)

The economic particularities of Central and Eastern Europe

The Central and Eastern European geographic space presents elements of contemporary interest that can be linked to the possible spread of new technologies. Thus, the phenomenon of industrial relocation to this region can be discussed. The process of relocating production to Eastern Europe began with the entry of the respective states into the European Union, leading to the creation of new jobs in industries such as the automotive sector (Naudé, Surdej and Cameron 2019).

In the European Union, this process has meant, in the last 20 years, relocation of the manufacturing processes to the states that joined the organization in the 2004-2007 period (Neumann 1997), with the economic basis for these moves being the low cost associated with production, best illustrated by lower wages (Marin 2006). Although the relocation of production to Eastern Europe has been a key point in the last two decades, this phenomenon may be subject to further change, with the "reshoring" process (relocating industries, for example, from the Far East back to Europe) being increasingly discussed, especially in the post-pandemic context. Furthermore, industrial sectors that have grown in Eastern Europe (such as the automotive sector) have the opportunity to quickly adopt technologies specific to the new industrial revolution, while losing sectors (such as textiles) do not (Naudé, Surdej, and Cameron 2019). Additionally, "Global Reshoring & Footprint Strategy" shows that 60% of executives in the global supply chain expect to relocate some production back to their home country (the American or European continent) (Consultancy.eu 2022). Therefore, the context of a developing manufacturing landscape in the CEE countries and the subsequent proliferation of the Fourth Industrial Revolution in the region marks the relevance of discussing the evolving geopolitics in the region which may further influence these processes.

A shift in geopolitical thinking

Geopolitical thinking is constantly evolving to cope with the technological transformations which further influence economics and international relations. Furthermore, as technology further progresses prezenting itself as the Fourth Industrial Revolution, slowly eroding the spatial dimensions that separated humanity for most of its history, the debate between the importance of space (geographical space that is) versus the importance of ideologies in the grand picture of geopolitical thinking becomes more important than ever. In addition, the place of Central and Eastern European countries in this context is an important element in the discussion. Starting from Mackinder's Heartland theory, we can already see the geostrategic traits of CEE, as his theory states the utmost importance of one's control over the region. As Mackinder himself wrote: "Who rules East Europe commands the Heartland, Who rules the Heartland commands the World-Island, Who rules the World-Island commands the World" (Mackinder 1919, 105–107).

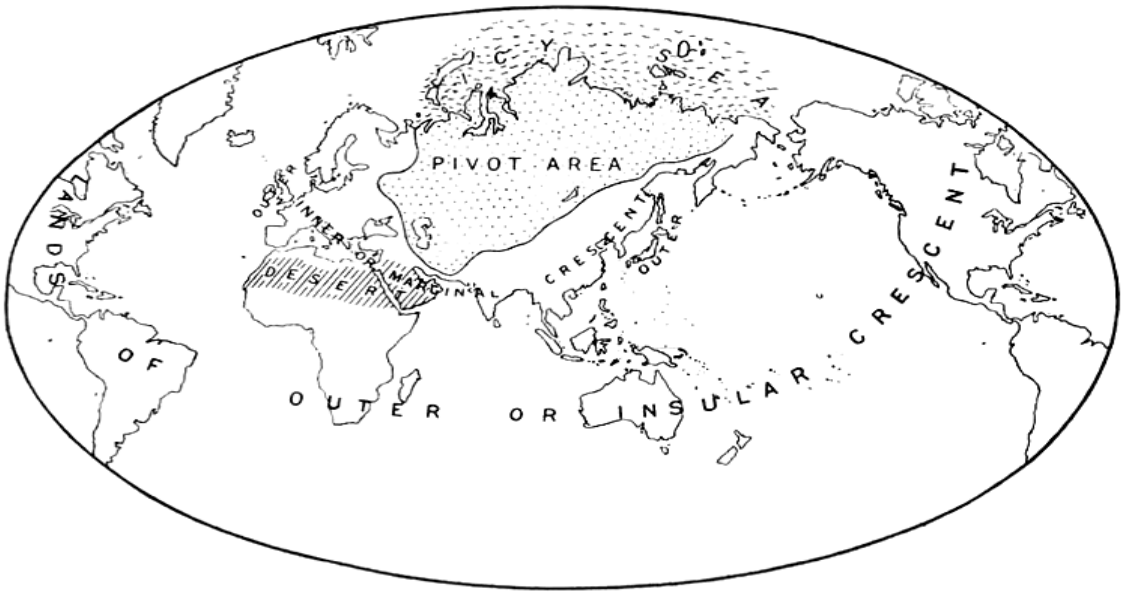

Figure 3. World map according to Mackinder's theory
Source: Mackinder (1904)

Therefore, this geographical-centred theory iterates the importance of Central and Eastern Europe, as it can be viewed as a 'gateway' to the Heartland, with the Heartland being a key component in the geopolitical dominance of the whole world (Figure 3). However, it should be noted that this way of thinking can be interpreted as geographical determinism. Technology plays a key role in the critique of Mackinder's Heartland theory as he over-appreciated developments in railway transport at the expense of maritime networks which are still dominant to this day (Dugan 1962). Moreover, the technological changes which the world is experiencing are slowly eroding the physical boundaries which characterized human interaction for most of our history. Therefore, space-oriented geopolitical thinking, such as the Heartland theory, tends to lose relevance in the modern world.

A fundamental part of the discussion regarding modern geopolitical thinking is the diminishing influence of nation-states as today's international relations are populated by various organizations, institutions or even individuals, with all these actors shaping the international landscape. For this reason, we might even witness a complete transition which focuses on these actors and less on the Westphalian system characterized by nation-states and their respective geographical boundaries. Moreover, the increasing influence on international affairs of supra-national and sub-national entities, as well as the interconnectedness of the modern world, especially in financial terms, is leading to an increase in the popularity of geoeconomics, marking a shift from politics-oriented to economic-oriented thinking (Bánkuty-Balogh 2023). Another key feature here is the shift from competition between states to cooperation between states, solving increasingly international problems, such as terrorism, climate change or natural resource scarcity becoming

imperious (Tuathail 1998). Castells (1996) views technological advancements as the main determinant in this shift as the new actors are constantly aligning and realigning, the international system becoming more decentralized, organizing itself into economic and/or political spheres. Even if geoeconomics brings into discussion a more commercial or economic-centered view compared to geopolitics, they are both integrated into the geostrategic discourse (Sparke 2007). It is largely considered that technological advances have led us away from geography-centred models in international affairs, and we can only imagine what will emerge after the Fourth Industrial Revolution. That being the case, geotechnology tends to merge some features of the two vectors (geopolitics and geoeconomics) while stressing the importance of technological advancements (past, present or future), being regarded as a reason for a nation's or organization's succes in the world stage (Goodman and Khanna 2013). Even if geography has played a lesser role in recent years, conflict, proximity to conflict or natural resources competition and energy supplies are still heavily geographic factors in nature. When we add into discussion future technological advancements which will radically change the world, or the economic spheres or ideology, it seems that Central and Eastern European countries are of utmost geostrategic relevance which seems to exceed disciplinary boundaries.

Bennett (2007) mentions the whole Anglosphere as an important actor of contemporary geopolitics, being made up of English-speaking countries, resembling an archipelago with islands scattered all over the world, with its main representatives being the United States, the United Kingdom, Canada and Australia, these nations forming a network, their cultural, legal or economic similarities forming the basis of this civilizational project. Therefore, this approach, in contrast with the geography-centred dogma from the last century, relies on the current state of affairs. Consequently, the increased interdependency on the world stage is paving the way toward a new level of multilateralism, redefining power on a supranational level (Vihma and Turksen 2015), the European Union is an example of such supranational endeavours.

The Three Seas Initiative in the IR 4.0 Dynamics: Energy and Security

All the shifts mentioned above are prone to influence the geostrategic status of CEE countries, even more so when the strategic traits of the Fourth Industrial Revolution and its proliferation are brought into discussion. Factors such as a possible relocation of European Industry in the CEE countries which would translate to such a proliferation would contribute to the strategic importance of the region in geoeconomic terms. On the other hand, in more traditional terms, following Mackinder's approach, the CEE countries still possess that strategic importance, in this case a more geographical-centred importance. Therefore, judging by the recent shifts in geopolitical thinking but also keeping an eye on more traditional ideas, we see the strategic relevance of the region as a constant. The region's place in the

world's international relations can be interpreted based on all evolving and revolving paradigms mentioned above, as a geographical pivot of strategic importance to the international actors (national, sub-national or supra-national), as a region integrated into the economic sphere of the EU or closely aligned to the Anglosphere through the Three Seas Initiative, an organization largely seen as being under American patronage, with the latter having complex implications.

Along with the European economic and political integration of the CEE countries, the security dilemma possesses great importance, taking shape in NATO membership. All CEE countries on which this paper focuses are both EU and NATO members, with regional security playing a larger role since the War in Ukraine. However, these countries (Poland, Czechia, Slovakia, Hungary, Romania and Bulgaria, along with the Baltics, Austria, Slovenia, Croatia and Greece) are members of the Three Seas Initiative, a complex regional organization with economic, political and security implications which may have an impact on the proliferation of IR 4.0

The Three Seas Initiative, launched in 2016 to foster regional cooperation and economic development, particularly in infrastructure and energy sectors, has twelve members, with Greece set to join after the 2023 Bucharest Summit (Górka 2018; Wilczek 2023). The Initiative gained momentum following Donald Trump's participation in the 2017 summit, signifying greater geopolitical implications for Euro-Atlantic cooperation in Central and Eastern Europe (Górka 2018). Named after the Adriatic, Baltic, and Black Seas, which define its geographic boundaries, the Initiative traces its roots to the interwar concept of Intermarium. This proposed federation aimed to unite newly independent states post the Great War for regional security against potential threats from the East (Soviet Union) or West (Germany), originating from the Polish-Lithuanian Commonwealth (Ryszard Zięba 2023, 261-273).

While serving as a platform for subregional politics and strengthening economic ties among its partners, the Initiative is geopolitically perceived as a bridge between Washington D.C. and Europe, particularly amidst strained relations between Brussels and the White House during the Trump Presidency (Grgić 2021). It operates within the European framework, akin to the Visegrád Group (Ryszard Zięba 2023, 261-273). Here we see the connection to the newer trends in geopolitical thinking focused on sub or supra-national actors. The security focus of Central and Eastern Europe extends beyond military concerns to encompass various levels, notably the energy and infrastructure sectors. The Three Seas Initiative aims to enhance security through expanded cooperation in energy, transportation, digital communication, and economic sectors, contributing to the resilience of the European Union as a whole (The Joint Statement 2016).

A primary objective is to improve connectivity by establishing a network of economic arteries, including pipelines, railways, highways (Via Baltica), and telecommunication lines on the North-South Axis (Grgić 2021).

In the current geopolitical landscape, the energy sector holds paramount importance in Central and Eastern Europe due to its rapid economic growth. The region's stable energy supply is crucial, especially considering its reliance on conventional energy sources, posing challenges to EU environmental objectives (Tutak and Brodny 2022). Chow (2014) emphasizes the importance of economic cooperation for energy security, given the influence of economies of scale. Integration and connection to the larger European market are key features for securing a stable energy supply, aligning with one of the main objectives of the Three Seas Initiative. Moreover, the invasion of Ukraine in 2022 has altered regional actors' agendas regarding Russian energy imports. Policies and investments in LNG terminals, technologies, and transnational energy connections have become vital, with potential conflicts arising with European environmental objectives (Ryszard Zięba 2023, 229-230). Energy infrastructure investments are transforming Southeastern Europe into a regional gas market. Projects like the LNG terminal in Alexandroupolis, Turkey's Sakarya, and Romania's Neptun Deep play a role in reducing dependence on Russian imports. LNG's increased role and upstream production advancements are expected to contribute to regional energy independence by 2025-2028 (Bowden 2022).

The North-South Axis, central to most Three Seas Initiative projects, is reshaping the geopolitical landscape. These projects, along with European funding, create a complex network of energy connections, potentially changing the energy dimension in Central and Eastern European countries. Cooperation remains key.

Before the Russian Invasion of Ukraine, energy security was a divisive subject within the Three Seas Initiative as two factions emerged: the "New Cold Warriors" (Romania, Poland, Croatia and the Baltics), with a more aggressive stance towards Russia and the "Pragmatics" (Hungary, Austria, Slovenia, Slovakia and Bulgaria) favouring a friendlier approach (Kurečić 2018). The invasion likely shifted perceptions of collective security, fostering greater cooperation.

These investments in the energy and infrastructure sectors may bolster the economic advantages in the region. While starting as investments meant to enhance the security of the region (especially the energy security amidst the War in Ukraine) and to reduce the economic gap between Eastern and Western Europe, these investments are prone to take shape into opportunities regarding the proliferation of the Fourth Industrial Revolution in the region, even more so as IR 4.0 will likely be seen as a priority in terms of regional security. As complex as the technology itself, the context, here represented by the Three Seas Initiative, is set to encompass economic layers of complexity which come into contact with the region's native geostrategic traits. It is here where we witness the intricate elements that come into play when discussing the future spread of Industry 4.0 in the former Eastern Bloc, a phenomenon so complex it is likely to transcend disciplinary boundaries.

Conclusion

The desire for modernization and catching up with more developed EU regions connects the Three Seas Initiative countries. Therefore, when we consider the security of the region which translates into a multitude of fields, such as energy security, the 3SI is likely to play a larger role not only in the geopolitics or geoeconomics in the region but also in the geotechnology landscape. The nature of the Three Seas Initiative in terms of geopolitical thinking may still be up to debate as it can be seen as an interpretation of the Intermarrium idea and a display of Mackinder's geographic-centric model but also as a display of modern geopolitical thinking, as it can be interpreted as a regional bloc, a supra-national actor, an organization under the larger European project, or even as an extension to Bennett's Anglosphere theory. All these possibilities bring further complexion to the debate which only emphasises the importance of Central and Eastern Europe in terms of security. Furthermore, security as a concept is starting to encompass other fields as well, not just the purely military view, with energy, technology and even manufacturing security (as the Pandemic showed us how global supply chains can be easily disrupted) being mentioned more often in recent times. Therefore, these elements translate into the Fourth Industrial Revolution becoming a central topic in complex contemporary affairs in the Central and Eastern European countries no matter the predominant geopolitical school of thought. Whether under an American or European (or under both) Framework, the Three Seas Initiative is set to offer multiple opportunities in the context of future disruptive technological changes that we call the Fourth Industrial Revolution.

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