

Energy Security on a Tightrope

A geoeconomics analysis on the green transition's impact on
the EU's relations to China.

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Abstract

This study questions how the European green transition impacts the EU's relations to China, from a geoeconomics perspective. The basis of the study lies in the global political climate caused by the rules-based international order being challenged by China (and Russia), opposing the EU. Simultaneously, the EU sources a large percentage of the materials needed for the green transition from China. The study makes use of the EU's own list of Critical Raw Materials (CRMs) and the REPowerEU plan to identify the CRMs most connected to the green transition, looking at where they are sources, how dependent the EU is on China for supplying them, and where deposits can be found globally. Through analysing this, it is found that the EU is dependent on the CRMs to different degrees, but overall has a dependency on China to be able to realise the green transition in Europe. As such, the geoeconomics analysis conclude that the dependency on materials vital for the green transition impact the EU's autonomy negatively, causing China to gain relative power over the EU and consequently making the EU less secure in relation to China.

Key words: geoeconomics, green transition, European Union, China, international relations

Words: 18479

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1 Introduction and Background

This section will introduce the topic of this thesis, going through background information on the case, what the purpose of the research is which together with the section of previous research will position it in relation to other studies both theoretically and topically. At the end, the research question will be introduced as well. Continuing on to the rest of the thesis, the purpose of this section is to give a good foundation for the rest of the paper to stand on, through placing it into a context with a solid background, links to the overall field of research, and motivation of why this is a problem worth researching further. With that said, nothing is left but to continue on to the background.

1.1 Europe and China in a changing world

The background to this thesis can be divided into three parts: the overall global security order, the green transition and Critical Raw Materials (CRMs), and then finally the relationship between the European Union (EU) and China. There are no stark and clear lines to be drawn between these divisions; inevitably, they are all closely related to and impact each other. The reason for dividing them up in the first place is in order to be able to devote approximately equal attention to each before delving into the blurred lines and connections between them. First out is the global security order.

The recent, depending on definition perhaps, war in Ukraine as a result of the Russian illegal invasion of the state makes evident a change in the positioning of states in the global system. Between the big powers, there are sides in a conflict where most align themselves with one or the other in an increasingly hostile environment. The older, so called “rules-based international order” that powers like the EU and NATO value and strive towards is being challenged and dismantled by this process, putting the EU and NATO on one side opposed to

Russia (Alexandru, 2022: 30-31), that in the challenge of the world order has China on its side (Xing, 2023: 26-29).

In Europe, given that it is the location of the physical manifestation of this conflict, the invasion put pressure on areas that previously has had close ties to Russia. One of these is the energy supply, with much of Europe and the EU depending on Russian gas imports to meet the demands of societal functions (Gheorghe, 2022: 84, 88). One of the mitigation efforts to limit the impact of the transition from Russian gas is the green transition. While it does not originate from the energy crisis, but rather a decade long project to move towards sustainable energy production, it is clear that the invasion put extra incentives for the EU to increase the green sources of energy, as seen in the European Commission's "REPowerEU" proposal to be fully independent from Russian gas imports by 2030 and increase the clean and renewable energy ratio significantly (European Commission, 2022a). The green transition, apart from the production of energy, is in need of ways to store the energy to reliably be able to supply it. There is also the transportation sector, that emits large amounts of greenhouse gasses, which needs to be electrified to meet the goals. The answer to this comes in the shape of batteries, lithium batteries (da Silva Lima et al, 2022: 2).

One crucial factor in realising these plans for the EU is CRMs. On how to define what CRMs are, the EU defines it as raw materials which are "indispensable inputs for a wide set of strategic sectors including renewable energy, the digital industry, the space and defence sectors and the health sector" (European Commission, 2023). A "raw material" has the dictionary definition of a yet unprocessed material extracted from nature (Cambridge Dictionary), but by adding the "critical" it is understood as largely unreplaceable in a strategically important industry.

Moving on to the EU-China relationship, it is characterised by being multifaceted. On the one hand, there is an economic relationship with trade and investments on both sides also with the production in China supplying European businesses with their goods (Eurostat, 2023). On another hand, there is the global political power struggle mentioned above, with China and the EU opposed each other with different ideas of how the global structure should be shaped. China also produces a considerable amount of the CRMs needed for the European green transition (European Commission, 2020), rendering this a potential vulnerability.

In the end, the degradation of the current world order, the green transition and the EU-China relations are all connected. The world order shapes insecurities, shifting the relationships between the powers in it.

1.2 Purpose

The previous sections tie neatly into the purpose of this paper. For, in the conjunction of the upheaval of the world order, the interconnectedness of states, and the modern world's energy demand, there is a problem that needs to be understood. There is a clear shift in the relations between states and powers in the international arena, with the struggle from one side to induce a change in the overall structure and the other side working to keep the current order in place. The EU, as shown above, is trying to detach itself from its ties to Russia as a result of Russia's overt illegal invasion of Ukraine. The demand from energy remains, however, and the gas needs to be replaced. This, too, comes with implications.

While there is discontent with how to mitigate the EU's energy crisis from within the union, where some states prefer a short-term return to burning coal (Borowski, 2022: 1-3), there is many indications that the path forward is to increase the share of clean and renewable energy sources. For example, the plan to reduce the EU's emission by 55% by 2030 is set go through the legislative process the first half of 2023 and the 2050 goal for full climate-neutrality still stands (European Council, 2023, European Commission, 2019a). Moreover, an agreement to ban the selling of petrol and diesel cars was reached (Posaner, 2023), also in early 2023, further establishing which energy sources that the EU will need to meet the demands of its citizens in the future.

As a large quantity of the materials needed for the production of the components of the green transition technologies come from China, a state already established as an "systemtatic rival" (European Commission, 2019b, European External Action Service, 2022) the problem is given a new dimension. In a world with increasing tensions, it is important to understand how connections other than, for example, political and military, can affect the international relations and even security. With the interconnectedness currently defining the global society, even

changes implemented only in one geographical area impact how that area interacts with the rest of the world, given that many industries need material produced in another state (Eckhardt & Poletti, 2016: 2).

With that said, the overarching purpose of this paper is to investigate how the green transition might impact the EU's relation to China, specifically in terms of power. The concept of power here will be elaborated on in the upcoming theory and method sections, but it is primarily centred on trade balance and how one state can use this to be able to stretch its influence across borders. With the changes in the dynamics of the world stage, it is important to be able to understand the consequences and the networks of power even when the subject might not often be associated to these, which is why the EU-China relations related to the green transition is of interest. In the end, to summarise, the purpose is to understand the possible consequences, the impact, of the green transition of the EU in terms of its power relations to China.

1.3 Previous research

This paper is certainly not springing up from a vacuum. There is a rich literature both on the theory as well as topically, which apart from being showcased in this section will appear throughout the paper. As a start, the theoretical literature:

The theory of geoeconomics is not a very new theory but did emerge from the related theory geopolitics in the 1990s and have since had its own tradition. Initially, it was developed by Edward Luttwak, who saw a gap between the growing influence of economic means through the globalisation and theories largely focusing on other types of power (Luttwak, 1990: 17-19). This paper in particular take inspiration from Choer Moraes & Wigell (2022) in the anthology *The Political Economy of Geoeconomics: Europe in a Changing World* edited by Bobic et al (2022), that overall gives a good overview of the field and the opportunities for application there is. While this paper has a clear focus on states as actors, the anthology highlights how geoeconomics have evolved to, for example, include companies in the analysis, something not possible in geopolitics. Wigell has also, together with Vihma, authored an article which conceptualise

how overt and covert displays of power can be understood in geoeconomics (Wigell & Vihma, 2016). This contribution makes it possible to look at the different kinds of economic ties that connect actors and how there can both be more and less detectable ways for states to influence one another.

Bridging the gap between the solely topically related literature, Tobias Ghereke (2022) analyses the EU's recent policy on Strategic Autonomy from a geoeconomics perspective. He also puts the EU and the policy into context with the recent global development, explaining the changes and providing a comprehensive overview of the EU's geoeconomic position. For China and its role in Russia's war and attempt to restructure the global order, Carola Frey (2022) analyses China's positioning in regards to the Russian invasion, Stephen Blank (2022) looks at the Sino-Russian relations in the light of the invasion, and Xing (2023) looks at both the Sino-Russia alliance and the Sino-American rivalry.

Looking at literature specifically on the topic of CRMs, da Silvia Lima et al (2022) map out supply chains of important minerals to Europe, and for an additional more overview of a perspective, Černý et al (2021) predict the general future need of CRMs. On the dependence of Chinese CRMs in particular, Rabe et al (2017) show how the sustainable energy industries of wind and solar power are, and were, dependent on Chinese supply already last decade. More on China's role in the supply of natural graphite, one of the most important CRMs, can be found in Wang et al (2018), giving a perspective on the role of China in the supply chains and what affect it would have on other states and the EU if the flow would cease.

All in all, there is a rich source of literature and theoretical tradition that this paper builds on. The hope is also that the research done here will contribute to the field and further the understanding of what the geoeconomic implications of the green transition, given the current global political climate, is for the Sino-European relations.

1.4 Research question

So, with the purpose and background in mind, what is left is to finalise the actual research question that works as the basis for this paper:

What are the geoeconomic implications of the EU's relations to China, with the impact of the green transition?

2 Theory

2.1 Geoeconomics

2.1.1 The theory and its intellectual foundations

Geoeconomics is a theory that builds on the same logic as *geopolitics*, which focuses on states as the unit of analysis and how these states use their power across their borders, why, and for what purpose (Babić et al, 2022: 5). It is concerned with security, specifically national security, and sees the world as a zero-sum game where maximising resources equalises to increasing one's own security comparatively to other states. In essence, the more power a state has, the more secure it is (Agnew, 2003: 51-57). The ontological foundation for both of these theories is realist, looking at the world in an anarchical way where states prioritise survival and security above all else; in essence being security maximising entities.

To give the theory further context, the dominating theory used as the foundation for the formation of the current world order is liberalism. While still sharing some ontological features and views on the building blocks of the world, for example the anarchical nature of states, the philosophy on how to best handle and manage the situation, stands in sharp contrast to geoeconomics and geopolitics (de Buck & Hosli, 2020: 12-13). The liberal tradition sees building trade connections and increasing states' dependencies on each other as a way to minimise conflict through limiting the incentives and increasing the negatives of attacking another state. The benefits of trade would outweigh the consequences of war, is the thought behind this, leading to peaceful relations and coexistence. It

was also thought that this would spread the ideas of liberal democracy via norms and greater economic prosperity (Gill-Tiney, 2022: 416-421).

Evident by the diminishing state of democracy and peace in the world (V-Dem Institute, 2023: 9-11, Institute for Economics and Peace, 2022: 27), this does not quite ring true. In addition, one of the most prosperous states in the world, China, is leading the trend of moving towards totalitarianism, often theorised to have its origins in economic growth and stability giving the state its legitimacy to do so (Tsang, 2014: 153-173). In Europe, the Russian invasion of Ukraine happened despite deep economic ties to large parts of the continent and while the economic consequences have been significant it has not deterred the conflict. Instead, it has bared the vulnerability of states when important systems, for example the energy supply, are tied to another state whose intentions cannot be trusted. This directs back to *geo-economics*, which problematises these connections and begs the question of how they figure in the global power relations.

What separates *geo-economics* from geopolitics is the focus on how economic means, which will be defined below, in a globalised world impact the power dynamics and security on the global stage (Babić et al, 2022: 5), described as the gap between international political economy and international security (Choer Moraes & Wigell, 2022: 33). Another factor that differentiates *geo-economics* into its own theory is the covertness of the display of power versus the more overt nature of geopolitics. Expressing power through geopolitical means is overt in the sense that it has a more military character, with threats and the ability to, if need be, use force. The covert power of *geo-economics* lies in coercion, increasing another state's dependency through, for example, initial benefits and investments and the following control over vital parts of another state (Wigell & Vihma, 2016: 605-606, 609-611).

The economic aspect of *geo-economics* brings forward aspects like global value chains, (inter)dependence, and autonomy, but also the infrastructure that facilitate economic connections between states (Choer Moraes & Wigell, 2022: 31). Also defined as “securitisation of economic policy and economisation of strategic policy” (Wesley, 2016: 4), this in conjunction with these terms serve to illustrate what in the international economic system that within the understanding of *geo-economics* becomes a security issue, and subsequently ways power travels across borders. In essence, dependencies on critical assets from another state

makes it possible for that state to leverage this dependency for strategic purpose and consequently gain relative power (Choer Moraes & Wigell, 2022: 30).

Another aspect of geoeconomics that separates it from geopolitics is the inclusion of corporations, which are recognised to have a significant role in the global economy and therefore capable of exercising power. Some of these are even bigger economies than small states, which further puts their significance into perspective. Moreover, the interests of companies may not align with their states of origin and they can, with their economic power, deter or enable states' geoeconomics efforts and strategies (Choer Moraes & Wigell, 2022: 37). To give an example to how companies can leverage their economic power, the mass exodus of enterprises leaving Russia after the invasion of Ukraine shows the impact of companies' actions. While it may not be fully understood until after some time has passed, it is estimated that around 40% of the Russian economy was lost even early on in the process (Sonnenfeld et al, 2022). Choer Moraes & Wigell call this *corporate geoeconomics* (2022: 37).

Delving into the terminology of geoeconomics, there are many ways to attach words to the concepts within the theory and various researchers and states use different terms to refer to the same phenomena. For the purpose of clarity, the core terms should therefore be defined starting with the ones listed above in the previous section.

Power is a central concept in geoeconomics, and it therefore needs to be defined. At its essence, the assumption is that the world is operating on a balanced zero-sum system, where one actor's gain of power is another's relative loss. Power here consists of the ability to exert influence across borders which can to a certain extent be measured in material resources, or in other world economic means (Babic et al, 2022: 5, Choer Moraes & Wigell, 2022: 34). Quite plainly, a state with resources another state needs, has relative power in those relations, or what is often referred to as *autonomy* which will be return to shortly (Choer Moraes, 2022: 34). In addition to that, not all resources carry the same gravity and measuring the power a state can wield over another requires context and circumstance (Babic et al, 2022: 5).

Supply chains are the connections that reaches from producers to customers across the world, for example supplying valuable resources to industries. The supplier and the links of the chain are crucial for the goods to reach their

destination, making the control over these an important tool in using geoeconomic power (Choer Moraes & Wigell, 2022: 43).

Dependence in this context refer to the power relationships created through, for example, supply chains where one state is dependent on resources from another and therefore subjected to potential influences from the other. Being dependent on another state becomes an insecurity, consequently, for one party and adds to the power and security of the other that are in control of the supply (Choer Moraes & Wigell, 2022: 30).

Interdependence is a similar term yet refer to the network of dependencies between states. This relationship can be asymmetric, either by volume or importance, leading to one state being dominant. It can also lead to states of similar power pulling the strings on both sides, in what is commonly referred to as a trade war (Sheng & de Nascimento, 2021: 2). As put by Wesley, the welfare and economic state of states becomes closely tied to this network and its sometimes-volatile character (Wesley, 2016: 4).

Autonomy is one of the most important terms and refer to a state being free from foreign influence and able to act according to its own will. It denotes the *effective independence* of a state (as opposed to formal sovereign independence) (Munhoz Svartman & Pivatto Junior, 2021: 171-172), meaning that an autonomous state in the context of geoeconomics is not dependent on another state willing to leverage that dependency against them but may have dependencies on “friendly” states. Examples of this is the United States strategy of “friend and ally-shoring” as part of their effort to “re-shore” value chains (Choer Moraes & Wigell, 2022: 29, 31), where “shoring” refers to the locations of the pivotal points of their vital imports, the critical nodes of the value chains they depend on. Autonomy is the goal for states and maximising one’s autonomy is equal to maximising one’s security. Other examples for this from major powers can be seen in the EUs “strategic autonomy”, the plan to move towards being more self-reliant and adapt to the political-economic environment (Lavery et al, 2022: 58), as well as China’s similar strategy dubbed “Made in China” (Choer Moraes & Wigell, 2022: 29).

2.1.2 Framework

Geoeconomics is a framework as well as a theory and the main inspiration for the framework of this paper is developed by Choer Moraes & Wigell (2022), which stems from the premise of states attempting to balance dependencies with the aim of gaining more autonomy. In the centre of this framework, there is a security dilemma where dependencies on critical resources from other states have a direct negative impact on a state's security and renders them vulnerable, or at the very least with the perception of being vulnerable. This drives states to work towards balancing out this dependence and the redefinition of what the make-up of national security is (Choer Moraes & Wigell, 2022: 33-36).

With the assumption that power, equal in this case to security, has its source in economy and how one's economic ties are connected, the way to analyse a geoeconomics relationship subsequently involves identifying these ties, value chains, and their relative importance to the states involved. All value chains do not carry the same importance, which in effect means that some have greater effect on a state's security while others may be minimally important. This is subject to change and depend on the contextual circumstances, one example being the Covid-19 pandemic and the surge for medical supplies where the access to some had not been seen as critical before and exposed vulnerabilities of states (Choer Moraes & Wigell, 2022: 42). In an analysis, it is therefore important to identify supply chains or critical resources that do have an impact of state security in order to be able to assess something about the geopolitical relationship between entities.

Before the analysis, it is also important to note what the units of analysis is and what is not. As the theory, as touched on in the previous section can have a focus on companies, and the geoeconomic power they can possess in their own rights, a combination of state and enterprises or only states, there is a need to specify in which dimension the analysis will be carried out. Here, it is states (with the EU being treated as such) that will be in the focus, and the relationship and power dynamics between them. While there is no denying that companies and certainly international corporations have a role in the global economic system, it is states that are responsible for national security which is the focal point here. In the case of China, a key actor in this paper, it can also be argued that Chinese companies lack the agency to act. For this reason, the role of enterprises is of less focus but can also, again in the case of China, be treated as a way for a state to have control over a value chain.

To summarise the framework, the analysis focuses on states with the assumption that they want to maximise their own security through gaining autonomy by minimising dependencies. A state's power in relation to another can be understood through how dependent the other is of the other's resources, and how important the resources in question are. As balancing dependence is the goal, this imbalance is insecurity and also an imbalance in power. This link will then serve as a way to measure how trade and economic ties have an impact on the relationship between states and, based on the definition of power in the theory, their power vis-à-vis each other.

2.1.3 Relevance for this case

The relevance of geoeconomics as a theory to analyse and understand the case at hand has been hinted at for the duration of this and the previous section but will finally be concretised here together with the benefits of such an analysis. Looking at the context of the case, there is an interplay of great power politics and industrial demands. On one hand, the rules-based world order is being challenged by some of the bigger powers on the world stage in what can be seen as two sides of the conflict forming to either defend or deconstruct it. On the other hand, parallel to this the challenges of transitioning the energy supply towards green sources demand resources for production, storage and overall function, materials referred to as Critical Raw Material, CRMs. In the case of the EU these need to be imported from a (using the terminology of the EU itself) rival state, China, that globally stands for the majority of the supply.

To investigate and analyse this, the theory needs to be able to cover both of these aspects: global power politics as well as economic ties. Geoeconomics with its ability to see the connection between the global trade networks and politics make it possible to connect the world order political conflict with the green transition through this, by seeing the power held in controlling the supply of materials that carry important roles in societal function. As the research question calls for an analysis of the implications of the green transition's impact on the EU-China relations, it is these qualities that make it especially relevant. Additionally,

it brings with it the appropriate terminology, as defined above, that through the theory capture the global power dynamics in the economic connections.

To briefly touch upon what that could make the theory less relevant for this specific case, it would be the inclusion of corporate geoeconomics and the dimension of the private companies' role in the global economic networks. However, as explained above, the specific framework chosen is developed with the purpose of staying on the state level and keeping the abstraction level to only include state actors in the analysis. This is explained in more detail above, and hence the purpose will not be repeated here, but what remains is that the analysis will focus entirely on the state actors.

3 Method

This section will lay out the methodology of the paper, from the research design to the selection of cases, to how the research question will be operationalised, to the concluding part going over what material will be used. The choices related to the different components of the methodology, while connected to each other and the other parts of the paper, will each be explained and motivated to give a clear picture why they were made and what they bring to the study overall. Before delving deeper into the design of the paper and consequently why the case study was the choice here, the first section will lay the foundation by looking at the ontology and epistemology of the paper.

3.1 Ontology & Epistemology

Something that plays an important role in the research and method is the ontological and epistemological standpoint. This impacts the foundational assumptions of the world and the knowledge that can be obtained of it (Stoker, 2010: 181), which in research impacts reliability, and internal and external validity (Halperin & Heath, 2018: 189-192). Returning first to the understanding of the world, knowledge obtaining, and what this paper's stance on this is, this section will then finish with considering the reliability of the research.

The ontological and epistemological position taken by this paper can be categorised as critical realist. Ontologically, this means that it is fundamentalist (Marsh et al, 2020: 193), believing that there exists an objective reality independent of its observer (Furlong & Marsh, 2010: 185). On the epistemological side, the critical realist stance taken means a belief in the observer not being able to perceive reality objectively and instead being affected by other perceptions, narratives, and ideas (ibid.: 190). Consequently, while there is an

objective reality, an objective observation of it is impossible by humans due to the clouded lens that lend itself to different interpretations depending on the person, their previous experiences and preconceived notions.

For this paper, then, this means assuming that the implications of the green transition are subject to the lens reality is viewed through, that while an import dominated by one source in itself does not impact another state's security, the observers that live in a certain political climate are impacted by this and sees reality with that filter. Likewise, the implications and analysis of this case is affected by the political circumstances that gives this meaning to reality. The lens is provided by the theory, that guides which meaning that is put on what aspect of reality and therefore how to analyse and understand what is being observed.

This leads onto the question of reliability, where the question asked is if another researcher would reach the same result and conclusion (Halperin & Heath, 2020: 191-192). While this is also dependent on material (John, 2018: 256), the ontological and epistemological position determines how much of the analysis and conclusions stem from direct and sometimes quantifiable observations to direct interpretations where it is more difficult for the result to be externally reliable (Halperin & Heath, 2020: 196-197). For this study, based on the position and theory, the reliability has potential to be relatively high depending on the actual execution and presentation.

The ontological and epistemological positioning also steers which method is best fitting for the research. The realist tradition, which this critical realist positioned study belong to, lends itself both to quantitative and qualitative methods (Furlong & Marsh, 2010: 205). As this paper aims to explain and analyse a single case with a large amount of context and, as will be detailed below, varied types of data, it was determined that a qualitative method was the appropriate choice.

3.2 Research Design

3.2.1 Case study

The case study allows for a deeper study and understanding of a specific instance. It allows for a more detailed and context rich study, compared to, for example, other designs within the comparative field that might study everything from two cases to a multiple digit number of cases. There, the multitude renders it necessary to keep closer to the surface level of the cases while the case study with its singular focus can open up for more layers and a more nuanced analysis. This choice also impacts which type of study and the type of data that best suit the research. While the case study, single-N, as well as smaller case studies, so called small-N, can be both qualitative and quantitative larger case studies, large-N, are best suited to be quantitative as the large number of cases make it a difficult task to qualitatively analyse every case sufficiently (Halperin & Heath, 2020: 234-235).

While this study is not comparative, the case study belongs to the broader category of comparative studies, where the comparative nature of the case study comes from its existence in a broader context where it is a study of an instance of something that might also occur in another case as well (Ryan, 2018: 284). A theory based on one case can be tested on another case in a case study, leading to a test of the theory and if the previous case displayed unique or more universal characteristics. The question here is if the theory can be used to explain more than the one case it was developed from, or if there are other cases where theory do not hold up. The development of theory is also one of the main functions of the case study, but as that is not the purpose of this study the details will be spared (Halperin & Heath, 2020: 234-237).

Moreover, the choice of design must come with a reflection on the internal and external validity, that is impacted by this. To first explain what validity is, it can shortly be described as how either specifically well a study captures its case(s) or how generalisable it is to other cases. The internal validity, looking inwards, deals with how well the research take the specific and unique context into consideration, thus being able to account for this in the result. The external validity, in contrast, is to what extent the result is applicable to other cases; it's generalisability (Halperin & Heath, 2020: 189-190, 192-193).

The reasons for choosing the case study as the tools for this study is precisely the level of detail and precision it allows for. With the purpose to examine the implications of the green transition on power relations, there is a considerable

amount of context that needs to be taken into account. In addition, the other case would have to be in a similar situation and share some characteristics crucial to the purpose of the study, like the green transition focus. The main candidate for this would be the United States, but what speaks against this is differences in data availability on top of the compromises in terms of contextualisation it would require. It fits the aim of understanding how the green transition's dependency on certain CRMs only if the materials' roles can be properly situated and understood within their case, which adding another case might compromise.

Looking at the specific case of this study, where the research question asks for the geoeconomic implications of the green transition on the EU-China relations, another argument for why the case study is the most appropriate method is tied to the ontology and epistemology. As explained in the previous, specifically dedicated, section, the ontological and epistemological position of this paper is aligned with a critical realist one which in turn make it appropriate to turn to a qualitative method as it gives opportunity to look at the objective facts and see what meaning they have in the current political climate, how they through other changes in the system gain new implications.

Moving on the type of application of theory, it is insinuated above that this study belongs to the category of case studies whose purpose is not to generate new theory, but rather apply an existing theory to a new case. There is no interest to disprove the theory itself, but rather use it to make sense of how power can be projected and how a significant change in production further impacts power dynamics on a more global scale.

Of course, the choice of a case study does not come without some drawbacks. Notably, it is the question of external validity that is difficult to ensure, due to the amount of context as case specific factors that might not travel well over to other cases and studies (Halperin & Heath, 2020: 237). While it might not be a directly transferable study due to this, some of the general concepts are general to the point that they are independent of the case specifics. Another study would need to do its own assessment of critical materials and imports that impact a that state or entity's relationship with another, but the overall concepts should still be able to be transferred. Though, much of the study is centred around the two actors of the cases being great powers, leading to it and other cases having to be acutely aware of that context and how it impacts the result and analysis.

3.2.2 Selection of cases

Before something can be studied, there needs to be a case of it study. How to choose the cases varies depending on what the purpose is, what the attempt is to capture. Here, the underlying logic of the case selection is revelatory, defined by Halperin & Heath (2020) as a way to “reveal relationships which cannot be studied by other means” (235). To motivate why this was the chosen method of selecting the cases, first and foremost it is a relationship that the study is researching; the case itself is the EU’s relations to China. The purpose is to reveal certain aspects of it as to be able to analyse these in the context of the world political climate, which through the theory and material give light to the entanglements and broader potential political impact of societal changes. Researching the green transition and global politics requires the big actors in the field for the impact to be big enough, just as it requires an appropriate theory to capture it properly. Thus, choosing the case based on how to best reveal this is crucial. Before moving on to describe what makes each of the actors of the case the appropriate ones (because, as mentioned above, the United States share some features that might make it interesting to analyse in a similar context as well), the choice of case selection also ties back to the fact that there is no desire to either generate new theory or disprove the theory, which might call for another type of case selections (Halperin & Heath, 2020: 236-237).

Starting with China, it has two obvious features that make is a good actor to have as a part of the selected case. To connect it to the green transition, it is the largest producer and exporter of CRMs related to production of green energy components (Swedish Geological Survey), giving it an important role for analysing international aspects of the green transition. The second feature is China’s current position in world politics, where the challenging of the rules-based world order put it in a rival position to, for example, the EU (Xing, 2023: 30). Being one of the major powers in the world makes it interesting, too, but is perhaps somethings that becomes especially relevant in relation to the other actor in the case.

The EU does indeed share being a major power in the global political system together with China (Guimelli et al, 2020: 5), which give a weight to the importance of the political aspect of the case. With the EU opposing the

dismantling of the rules-based world order, its location bordering Russia both impact the relations to China (much to do with the Russian invasion of Ukraine, in Europe) and the green transition (with the imports of gas from Russia ushering in a political urgency to increase green energy in the mix (European Commission, 2022a)). The EU's relation to the green transition is primarily that it has a goal to be carbon-neutral by 2050, with smaller goals on the way (European Council, 2023), making the green transition crucial for this.

Connecting the case and the actors making up the case more firmly to the purpose and theory, the case suits both of these very well. Theory-wise, the case provides rich context and the actors' relationship with the green transition exemplify the trade connection the theory attributes much of its intellectual contribution to the broader theoretical tradition to. The EU being in need to import CRMs and China being the largest exporter of these (as mentioned above), together with the background of an already contentious political situation makes for an analysis that is able to use its particular arsenal and point to how the green transition's potential implications for the EU-China relations. While the theory could be well applied to other cases as well, selecting this one also comes with the added quality of contributing to the understanding of current global political events.

To round off this section, a slight reflection on possible critique to the selection of the case. It could perhaps be said that analysing the United States and China's relations would have more use, seeing as they are the two biggest economies and the United States have an even bigger dependence on importing, for example, graphite (United States Geological Survey, 2022). Or, the United States-EU relations, given that the Inflation Reduction Act (IRA) from the United States has stirred up reaction in the EU in regard to the impact on the trade between them (European Parliament, 2023a). Nevertheless, on the basis of the EU having "built the most advanced climate policy framework among world actors, underpinning it as an international climate leader" (Oberthür & von Homeyer, 2022: 446), selecting the EU-China relations is motivated.

3.3 Operationalisation

In order to be able to answer the research question, a way to properly measure the factors contributing to the problem is necessary. It also related back to the theory, and the concepts within it that will be used to explain and analyse the case and result. Because of this, a good way to start is to figure out firstly, what is it that needs to be measures and how can it be identified, and secondly, how is it based in the theory and how is the concepts in the theory measured.

Looking at the research question, what is being asked is how the green transition, in the context of the current state of the global political climate, impact the EU's geoeconomic relations to China. From what has previously been established in the theory section, the important factor within geoeconomics is power, and how power presents itself in economic relations. To reiterate from the theory section, the concept of power in geoeconomics is to be able to exert influence through economic ties by having another state, or power such as the EU, dependent on another for vital supplies. The goal is to be autonomous from unfriendly states, where there is no dependence of them.

Therefore, what needs to be measured is what the impact of the green transition on the economic ties between the EU and China is, in terms of what imports that are important to it. Importance is necessary due to the fact that the theory makes a difference between more or less critical dependencies, where trade connection of goods vital to a state's economy have a larger impact on power than, say, flowers. By establishing the importance of the imports related to the green transition, there is a foundation for a geoeconomic analysis of how this impacts the EU-China relations, as it directly links the goods to the green transition.

Additionally, the context does matter. China, as also established in the introduction, is identified as having an ambition to reshape the current world order, and a "systemic rival" (European Commission, 2018), making it very undesirable to have a dependency imbalance against it. This again goes back to all trade dependencies not being created equally, as who controls the supply chain is vital for the analysis, and trading with an ally is different than a systemic rival. Therefore, the implications of different relations do differ significantly. This will prove important in the analysis, where the EU's political relationship vis-à-vis China will prove important.

As stated above, the theory guides the link between power and the root cause of it. Geoeconomics having trade and supply chains of valuable resources as ways to extend power leads to the material of analysis needing to include these. Specifically, it calls for an identification of the resources important for the development of green energy production in the EU, as the case is focused on the link of this transition and changes global power relationships. To determine that an import is related indeed the green transition, the link between these materials and the green energy production is highly important. It can be found by looking the production of green energy components and the imports patterns of them. Where do they come from, what is the actor's relations to the source, how important are they and where are the deposits found? With that, the data should be sufficiently narrowed down to capture the object of study; the power relations as defined by geoeconomics.

A question of the timeframe of the data remains, concerning how far back and how far in the future the research will look. As stated by the background and the purpose, the most severe and over political changes have taken place in the recent years and as the study studies the current situation with reference to this the data will therefore be of the most recent numbers. The green transition's role in today's political climate can then be fully captured, and its role specifically understood. Additionally, data on the future prospects of CRM supplies will be used, to understand the broader implications of the green transition not only currently but in the coming years. Neither the EU-China relations nor the green transition exist only now, but extend into the future and the prospects for CRM extractions in other states therefore also have implications. The next section, Result and Analysis, will focus and elaborate more on the exact materials.

3.4 Material

For material, it comes in a few different forms. As context matters a great deal, it is important to have a foundation of material to frame in the rest of the material, to set the scene that give geoeconomic meaning to the data. Because, as previously explained, a trade imbalance or dependency is not a geoeconomic insecurity in

itself and does not necessarily indicate a power difference with bigger implications for the world order. Examples previously lifted is the United States' concept of "friend and ally-shoring", meaning sourcing critical material from friendly states and thus minimising negative dependency imbalance to rival states (Choer Moraes & Wigell, 2022: 31). To establish the relations between the EU and China, what is therefore needed is material such as official statements relating to the other, information regarding their stances in the conflict of the world order, such as supporting Russia and opposing established international law. Examples of this is President Xi's state visit to Russia and President Putin, a bit more than a year into the Russian illegal invasion of Ukraine (Ministry of Foreign Affairs of the People's Republic of China, 2023), positioning China clearly opposed to the EU. Information and statements from the EU visit to China is also relevant (European External Actions Service, 2023). Regarding statements not related to these occasions, the dubbing of China as a "systemic rival" from the EU's side is an example of the EU considering China as being on an opposing side. Regarding official documents, examples reign from China's EU-policy from 2018, to the EU's "EU-China Strategic Outlook" and "A Strategic Compass for Security and Defence".

Moving on to the green transition, the material needed here is an identification of which materials are critical for the EU's green transitions, so called Critical Raw Materials (CRMs). The EU has produced its own list of this (European Commission, 2020), which will be the source of which CRMs to concentrate the research on. The CRMs are relevant as material for the study as they are crucial for the green transition, making it impossible to meet the demands of the industry without them and, important here, imports of them from China (European Commission, 2020). Other material related to this is the predicted growth of the EU's CRM demand (see for example Menkhoff & Zeeveart, 2022: 323, Lewicka et al, 2021: 10-11, Bolortuya & Weida, 2021: 414-415, Schmid, 2020: 7), further solidifying the impact of the green transition on the EU CRM dependency. Furthermore, data on the actual imports of the identified CRMs to the EU from China, and other states for contrast, will be used to both look at the general Chinese imports as well as put it into perspective with the other exporting states. This will be done for the deposits of the CRMs in different states as well, to account for prospective extractions and ways for the EU to source these in the

future, internally and externally. The purpose of this is to account for if a potential EU dependency on Chinese CRMs would extend into the future or if it is likely that other sources could replace it and affect the geoeconomic relevance of Chinese imports for the EU.

With the listed types and examples of material and data, the geoeconomic analysis can capture both the political climate and, with its unique feature of taking trade relations into consideration, how the modernisation of European civil societies in a globalised world can have an impact on the EU's security and relations to China. Furthermore, the data give a picture both of the current situation of the CRM import to the EU, as well as how the situation have the potential to develop. This makes it possible to analyse the implications of this, if eventual current dependency can be expected to endure or if it is possible for the EU to diversify its sourcing to the point where it does not have a dependency on a rival state for its supply.

4 Result and Analysis

The result will be presented in three sections. Firstly, a look at the context of the case, to get a comprehensive view of how the EU-China relations sit in relations to global political changes, as well as how they see each other and their relations. The following section will look at the green transition and how CRMs are linked to it. Through this, there will be both preparation of the field for the analysis, but also an introduction to the specific materials that the follow sections and analysis will focus on. Following this, a look at the current situation regarding CRMs and their supply chains as well as how the general presence of CRMs and plans of extractions that have the potential of changing the present situation. To finish the analysis off, the end will be a comprehensive geoeconomic analysis of the EU-China relations, and the impact of the green transition and CRMs on it.

4.1 The EU-China relations & CRMs

4.1.1 World Order Extravaganza

As the introduction put it, the EU-China relations are characterised by being multifaceted. There are many areas where the relations are dominated by collaboration, something that Pavličević (2022) finds have dominated the EU's narrative on China for the majority of the 21st century through a study on EU policy documents on China spanning from 2003 to 2022. During the latest years, however, there is shift in how the relations are described. Here, there is the emergence of the strategic and systemic rivalry and how China is treated more as

something that needs to be dealt with rather than a partner (Pavličević, 2022: 67-71). What divides the EU and China further is the contrast of values (such as democracy and human rights) (Taylor, 2019: 230-232), also reflected in the preferred world order, where the liberal democracies of the EU stand in stark contrast to the development in China with the Xi regime (Li, 2023: 261-264). Yet, the fact remains that the trade relations between the EU and China are hugely important for both of the actors, with opportunities on both sides (Garcia Herrero & Xu, 2022: 13-14). China itself name the EU as its largest trading partner (Ministry of Foreign Affairs of the People's Republic of China, 2018) further illustrating how deep these ties stretch. Before moving on to delving into the currents of the world order contestation, the conclusion on the EU-China relations on a surface level is that it started on a more collaborative note before gaining a more apprehensive tone towards the end of the 2010s, while still retaining the economic connections.

While the overt challenger in deconstructing the established rules-based world order must be said to be Russia, most clearly illustrated by its invasion of neighbouring Ukraine, China does have an important role to play. The old security order rested on international law, and what the invasion does is essentially hollowing it out and eroding the trust in the international system's ability to uphold it, with the inability of the international community to take action legally (Nihreieva, 2022: 32-35). Instead, as argued by Xing (2023), powers such as Russia and China use the upheaval to try to establish a new international order less influenced by the West and instead on their terms. Essentially, this is a move away from the previous hegemony of the West to a more multipolar world where both China and Russia can have more influence and not have to follow the Western order (Xing, 2023: 26-29).

Here, the contours of the conflict and the two main sides take shape. While the relations within the sides cannot said to be conflict free (take, for example the United States' IRA and the EU's reaction to it (Bernoth & Meyer, 2023: 54)), it is the EU and United States on one side and China and Russia on the other (Xing, 2023: 26-29). Of course, many other states positioned themselves, but as the major powers (with Russia being counted in based on action and historical position, such as in the security council with the veto right) those are the most important actors. That being said, it is still the EU-China relations that are the

object of study here, but the conflict sides provide more context to the world the relations exist within.

Looking specifically at the policies governing the EU-China relations, there are a few on both sides. Starting this time with the Chinese side, with its 2018 policy document outlining both its views on the general world, describing a wish for more multipolarity, and on its relations with the EU. There, it is focused on trade and on urging the EU to not support any independency movements within Chinese legal territory. It is also stated that China does not view the EU relations as having strategic conflicts despite the difference in social systems (Ministry of Foreign Affairs of the People's Republic of China, 2018). On the EU's side, the latest document was issued by the European Commission in 2019. While there is a growing demand for a new full-on strategy (with the latest dated to 2016) (European Parliament, 2023b), this is the most current example of the EU's official view. In this document, the Chinese stance on the rules-based world order is put forward as a cause for concern, citing examples such as the South China Sea conflict, accountability, and Human Rights violations. Additionally, the document mentions China as a strategic competitor with reference to its growing economy and uneven trade conditions (European Commission, 2019b).

Since then, the relations have developed with the changes in the world. Circling back to the year since the Russian invasion of Ukraine, there has recently been an increase of worried rhetoric in relation to China from the EU. Even if the narratives are not quite unified from the EU's different actors, there is undoubtedly a tension and new tone (see, for example, President Macron's speech during his visit to Beijing in April 2023 (French Embassy to the United Kingdom, 2023), and the speech by President von der Leyen at the Mercator Institute for China Studies and the European Policy Centre in March 2023 (Von der Leyen, 2023)). Von der Leyen's speech also quote President Xi during his visit to Russia earlier in 2023, where President Xi made the remarks that "right now, there are changes, the likes of which we have not seen for 100 years. And we are the ones driving these changes together" (Von der Leyen, 2023).

To sum up the EU-China relations, it is dominated both by trade and a fundamentally different view on the world order. Expressed by both sides in different words, even from the policy documents, China is positioning itself to urge on a change in the rules-based world order. While still in dialogue, this

shows the opposition in the relations. With the backdrop of the Russian aggressions and the Chinese failure to denounce this, what this goes to show is an increasingly precarious situation where the largest powers in the world stand in challenge with each other. To tie this back to the research question and theory, the situation makes it important to consider which ties the EU and China has and analyse what impact they have on their relations.

4.1.2 CRMs and the green transition

To firmly establish the relationship between CRMs and the Green Transition, a first step is to look at the industries involved in the Green Transition. Looking at the sectors that emit the most greenhouse gases in the EU, the top three spots in order is transportation, energy supply, and the manufacturing industry. Additionally, the trends show that while energy supply and manufacturing, as well as all the other main categories, have decreased their emission, the transportation sector show an increase (European Environment Agency, 2023: 82-84). The efforts to mitigate the emissions from these sectors include the production of green, renewable energy and battery run vehicles. An example lifted by Rabe et al (2017) clearly link both solar and wind energy production to a number of CRMs, and also mention electric vehicles as another industry in need of CRMs for production (Rabe et al, 2017: 692). The electric vehicle industry needs batteries to be able to store enough energy to drive the vehicles, a spot that more often than not lithium-ion batteries fill. The production of these need both lithium and cobalt, and while a full list of raw materials listed as critical will be presented shortly, these are two of the CRMs important for the EU. Lithium-ion batteries also figure in the challenge to convert to green energy production, as a way to store energy and better plan the supply for the energy grid (Olivetti, 2017: 229-230). While these are only a few examples of the role CRMs play in the EU's Green Transition it serves to illustrate how CRMs are present and have a critical role in the main challenges in moving towards a more sustainable energy production.

Connecting this to the demands of the EU, the European Commission's REPowerEU Plan lay out the sustainable energy sources identified as important contributors to reaching the goals of decreasing the unions emissions and

diversifying the supply, in the effort to minimise reliance on Russia. Here, solar and wind energy is highlighted as the two most promising sources, and in conjunction with the REPowerEU Plan, a specific strategy for solar energy was released (European Commission, 2022a). According to this strategy, the supply of critical raw material is one of the main obstacles in producing solar energy, and the sourcing is dependent on foreign imports with only a small percentage produced domestically. This is also connected to the storage of energy, which again stresses the need for batteries with high enough capacity (European Commission, 2022b). Summarised, the sectors with the highest greenhouse gas emissions in the EU match the energy sources the EU itself sees as the most urgent to develop. The green transition encompasses a multitude of sections, but one thing that seem to be shared is the need to store energy in order to have a plannable supply: Lithium-ion batteries are tied both to transportation and storing the energy produced by green sources (Graham et al, 2021). What is clear is that there is a specific tie between the green transition and production demanding CRMs, and with that said the next step is to look at the CRMs the EU itself has identified as, well, critical.

In 2020, the European Commission released a communication, “Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability”, which is the to date most recent listing of the EU’s need for raw materials. Apart from listing the up-to-date CRMs, it also explicitly links CRMs to the Green Deal and security as well as identifying the sources of the CRMs in question (European Commission, 2020). These materials are, as presented:

Antimony	Hafnium	Phosphorus
Baryte	Heavy Rare Earth Elements	Scandium
Beryllium	Light Rare Earth Elements	Silicon metal
Bismuth	Indium	Tantalum
Borate	Magnesium	Tungsten
Cobalt	Natural Graphite	Vanadium
Coking Coal	Natural Rubber	Bauxite
Fluorspar	Niobium	Lithium
Gallium	Platinum Group Metals	Titanium
Germanium	Phosphate rock	Strontium

Source: European Commission, 2020.

Given that it is thirty different categories, it is necessary to draw some limitations in which to concentrate on. To do this, the knowledge of which

sources of energy and technology for the green transition is the most needed to develop and produce is crucial. As already established just above, wind and solar energy is the energy sources the EU sees as the green energy of the future, and lithium-ion batteries serve both as a way to electrify the transportation sector, the biggest emitter of greenhouse gases. as well as stabilise the electricity grid by having the ability to store energy and allowing for a plannable supply. Therefore, the scope of the analysis will focus on the CRMs tied to those technologies.

Starting with batteries, cobalt and lithium are the most well-known components of lithium-ion batteries (Olvetti et al, 2017: 229), but they are not alone. Additionally, coking coal, natural graphite and Heavy Rare Earth Elements (HREEs) belongs to this category and will be taken into consideration in the analysis (European Commission, 2020). It is not specified which HREEs that are needed, but according to Schmid (2020), it is most likely neodymium (which belong to the Light Rare Earth Element category), praseodymium, dysprosium, which are associated with the magnets needed in the batteries (Schmid, 2020: 7). As for solar and wind energy, Rabe et al list tellurium, gallium, and indium for solar. Wind energy demands two types of rare earth elements (REEs) for its turbines, the heavy dysprosium, and the light neodymium (Rabe et al, 2017: 693-694). Out of these, tellurium is not listed by the EU as a CRM and will therefore not be used in this study. What is, however, is silicon metal, which is also linked to solar energy and therefore suitable for analysis (European Commission, 2020). As the Lithium-ion batteries share dysprosium and neodymium with wind turbines, the research will be limited to those two in terms of REEs.

In conclusion, there are direct and deep connections between the green transition and CRMs as they are key elements in the efforts to mitigate emissions with new technology. Having identified both the main green energy technologies for the green transition and the associated CRMs, what remains to do is analysing their role and impact on the EU-China relations.

4.2 The current situations of the CRMs

Starting with the current situation, the situation for the identified CRMs will be assessed individually. Looking at the current trade patterns, trade balance, countries origins, the aim is to create a profile on each of the CRMs before ending the section with an analysis of the current situation from a geoeconomic perspective.

4.2.1 Individual assessments

Lithium

Lithium has its main producers in Chile and China, together covering 83% of the total production. As for the EU, it is fully dependent on imports to cover its need but it also reports that China is not one of its main sources for the material, but rather Chile and the United States (European Union, 2020). China remains as one of the biggest producers globally, though, with a significant market share (Menkhoff & Zeevaert, 2022: 324), but with the current situation it does not appear to have a notable geoeconomic impact on the EU-*China* relations at least.

Cobalt

For cobalt, the main producers globally are the Democratic Republic of Congo (DRC), China, and Canada. The EU imports 86% of its need, with the DRC being its main supplier overall, and Finland its biggest domestic supplier at 14% of the total need (European Commission, 2020). China does itself need to import cobalt from the DRC, but importantly, also owns cobalt production in the DRC as well as in Papua New Guinea. This gives it a larger share in the production than visible in the raw data (Gulley et al, 2016:321-322).

Coking Coal

Coking coal is produced in China, Australia, and Russia. The EU does produce about 38% of it domestically, with Australia and the United States as its biggest foreign sources (European Commission, 2020). Looking at the statistics for imports of coking coal, China is a partner still. The amount of Chinese coking coal imports has varied greatly over the last few years in the official statistics, but nevertheless a top ten supplier (Directorate General for Trade, 2023). China is also an importer of coking coal, and more than doubled its imports of the resource

from Russia when it was put under sanctions by, for example, the EU, to a much cheaper price (Bloomberg, 2022b).

Natural Graphite

Natural graphite is dominated by Chinese production. At 69% of the total market share (with India and Brazil at 12 and 8%, respectively) and almost half of the EU's imports, counting for about the same amount of the total EU market (European Commission, 2020). For the data on the EU-China trade in natural graphite, it has consistently ranked highest throughout the last decades (Directorate General for Trade, 2023). What is more regarding natural graphite used for lithium-ion batteries, relating back to why it was chosen as an example, is that the material needs to be refined to be an anode in the batteries. This type of graphite production is to a degree of 90 % dominated by China, furthering the dependence on Chinese imports (European Carbon and Graphite Association, 2022).

Gallium

In the case of Gallium, China produces 80% of the global supply. Germany and Ukraine each contribute with less than 10% each, with Germany being the largest supplier of Gallium to the EU, followed by the United Kingdom. Still, China covers 27%. The import reliance is comparatively low, compared to other CRMs not dominated by an EU country, yet China still supplies more than a fourth of the EU's entire need (European Commission, 2020). By more recent statistics on imports of gallium to the EU, China seems to have caught up to the United Kingdom (Directorate General for Trade, 2023). Interestingly, the EU imports half of the *global* supply of gallium, giving it few options in sourcing the material (Arendt et al, 2020).

Indium

Indium, on the other hand, has potential to be fully covered by the domestic EU supply. It is mainly produced by China, South Korea, and Japan, with China just shy of 50% according to the EU (European Commission, 2020). Though, according to the United States Geological Survey, indium imports from China to the EU increased drastically in 2021 (United States Geological Survey, 2022).

This rings true with the trade data from the EU, that does point to a growth in the indium imports from China in 2021 (Directorate General for Trade, 2023). Based on this, it appears that the self-sufficiency rate might have slightly changed. Primarily, the EU is an importer of indium, according to the Swedish Geological Survey (2020b).

Dysprosium

Now, as mentioned above, dysprosium is a Heavy Rare Earth Element, HREE, which in the EU's assessment of CRMs is presented as aggregated data together with other HREEs. Nevertheless, the HREE extraction world-wide is mostly concentrated to China at 86%, with Australia having about 6% and the United States at 2%. When it comes to the EU's sourcing of HREEs, China sits at 98% and the total import rate at 100% (European Commission, 2020). As for the trade data, it is not presented on a more precise level than REEs in general together with scandium and yttrium, without differentiating further than that. Clearly, though, China is not far away for having a monopoly on REEs and dysprosium (Directorate General for Trade, 2023).

Neodymium

Neodymium shares many aspects with dysprosium, apart from being a *Light* Rare Earth Element, LREE, instead of heavy. In the European Commission's statistics, the LREEs have the exact same data as the HREEs, with the exception of accounting for one percent more, 99%, of the total EU LREE supply (European Commission, 2020). As previously stated, the trade data lack specificity but does stress the fact that China is the main player when it comes to REEs overall. Overall, neodymium can be said to be one of the most important REEs, accounting for about 20% of the consumption, and out of all the states trading in neodymium, only China is a net-exporter (Liu et al, 2022: 11807, 11811).

Silicon metal

Silicon metal is, also, mainly produced in China. The Chinese production reaches 66%, while the other biggest producers the United States, Norway, and France lands on 8%, 6%, and 4%. The EU imports 63% of its use, where Norway represents the highest share, 30%, followed by France, 20%, and finally China at

11% (European Commission, 2020). What is needed for the production of silicon metal is quartz, but particularly high-quality quartz. Despite China being the largest producer of silicon metal, it can only boast about 16% of the global quartz deposits compared to the United States' 55%. However, there are multiple uses of quartz and various types of silicon (Pan et al, 2022: 2-4).

4.2.2 Analysis

With the facts and figures laid out, it is time to analyse what they imply for the geoeconomic relations between the EU and China. This means looking at the dependency level, how autonomous the EU is in regards to China and the materials needed to cover the needs of the green transition technologies at the present date.

Starting with the CRMs that the EU is *not* reliant on China for, there is lithium and indium where it is discernible that there is not a considerable, if any, dependency on Chinese imports. While they are still *critical* raw materials for a reason, it is not with China that the risk lays at present. This might come to change, which will be return to in the following section about the general prospects, but for now an analysis of these materials would need to focus on another trade partner for it to have particular geoeconomic value. Both materials are produced by China, yet they have enough variety in the imports from states that would be considered friendly (indium being domestically produced and lithium from Chile and the United States). Therefore, the analysis will swiftly move on to the other CRMs.

The CRMs that could be considered mid-level in this context are cobalt, natural graphite, coking coal, gallium, and silicon metal. What they share is China being one of the main producers globally and also part of the foremost suppliers of the material to the EU. Cobalt is something of an outlier, given that the DRC does have such a large share of the total production globally and EU imports. Crucial here is the information about the Chinese ownership of cobalt mining in the DRC, that increases Chinese control over cobalt supply chains and increases cobalt's impact EU dependency on China. Coking coal is one of the CRMs with lesser impact, seeing as China is not one of the main suppliers and the actual

sources of coking coal are states that would be considered friends (the United States and Australia). Something to note with coking coal is that China has taken over the previous Russian exports to the EU and other countries with sanctions against Russia. Through this, the EU has lost some of its source diversity and China has gained access to more resources to a lower price.

Natural graphite is to a qualified majority dominated by China in terms of production, but just below half of the EU's source of the material. As the by far largest supplier compared to the relatively smaller other ones and how dependent the EU is of importing natural graphite it does pose a threat to the EU's autonomy in production of the technologies where natural graphite is present. As stated above, lithium-ion batteries are composed to about 50% of graphite, making this particularly concerning. Circling back to how lithium-ion batteries play a role in both electrifying the transportation sector and storing the energy produced by solar panels and wind turbines, it further stresses how important the reliable and risk-free access to natural graphite is.

Gallium is mid-level in the sense that China is the main producer, but the domestic production being bigger than the imports from China. The second largest source being the United Kingdom is also positive for the EU's gallium autonomy, but the fact that China still accounts for over a fourth is a problem. With China producing 80% and the two largest suppliers to the EU each producing less than 10%, it would be difficult for the EU to find alternative suppliers if there were changes in the Chinese supply or disruptions in the supply chains. Therefore, the EU is still dependent on China when it comes to gallium. The situation with silicon metals is similar, but less severe. China does produce a large share, but less at 63% and just above a tenth of the EU's supply. Similarly, it would be disruptive if the supply chains had problems and China was the state with control over these and the majority of the possible supply, but to a slightly lesser degree. The EU cannot be said to be autonomous in regards to silicon metal, and like with gallium, depend on China for some of its supply.

The most critical CRMs are found in the REEs, dysprosium and neodymium. Starting with dysprosium, almost the entirety of the EU's supply is under Chinese control. Looking at the worldwide supply, China is still the absolute foremost producer globally with 86%, making the alternatives for finding other producers very limited. This makes the EU dependent on China for supplying its industry

with dysprosium, which as mentioned above, is used in both in lithium-ion batteries and wind turbines and therefore affect multiple sectors in the green transition. The same can be said about neodymium. Given that China is the only state with abundance and capacity enough to be a net-exporter of neodymium serves to further point to the fact that the EU would not be able to support the demand for neodymium without the Chinese supply.

To summarise and conclude, there are differences between the different CRMs and how they relate to the EU's relations to China, mostly owing to where the materials are produced but also how wide the application of the material is. Lithium and indium are the only CRMs that does not have at least a partly dependency on China, even though they are both largely produced there and China has influence over a considerable part of the total supply. A possibly increased production of green energy technology and subsequent increased demand for these does prove a possible worry, which the next section will address. As for the mid-level and most critical CRMs, the EU is not autonomous but instead to different degrees dependent on China for the materials needed for the currently most important technologies for the green transition. This is especially true for the REEs, where any disruption in the supply chains from China would impact the EU. The current situation thus does have the technologies of the green transition dependent on Chinese supplies, and a lack of EU autonomy in regards to this.

4.3 The prospects of the CRMs

While the previous sections focused on how the most recent numbers of the selected CRMs stand in relation to the EU-China relations, this section will look to the future. Still looking at the same nine CRMs, it will first assess what the prospects of the materials are, if there are possible other ways to source them, and what the future demands look to be. This will culminate in an analysis of what this means for the EU's dependency on China, trying to see if the CRMs have a long-term effect on the EU-China relations or if it is more of a temporary nature.

4.3.1 Individual assessments

Lithium

The future of lithium is tied to the growing demand for the products produced from it, where batteries are the main and most important category. According to Menkhoff & Zeevaert (2022), the demand for lithium is expected to increase by forty times by 2040 if the green transition is followed through (Menkhoff & Zeevaert, 2022: 323). This is also echoed by da Silva Lima et al (2022), also connecting it specifically to the electrification of the transportation sector (da Silva Lima et al, 2022: 2).

Looking at the prospects of meeting that demand, South America remains the location of the largest deposits. Yet, Australia is also a big producer, and there are large deposits even within the EU that could yield large supplies (Swedish Geological Survey, 2023a). Portugal has started to produce some lithium, and multiple others have stated to assess their own possible deposits, where Portugal and Finland appear to have the best prospects. All in all, the accumulative prospects might be able to meet at least a part of the demand (Gourcerol et al, 2019: 495, 500).

Cobalt

The cobalt supply faces much the same challenge as the lithium supply, as they are both important components in lithium-ion batteries. The demand for the batteries themselves is estimated to increase by 30% per year in the coming decade (Lewicka et al, 2021: 10-11), with the need for the cobalt following suit. As for the prospects in production of the material, it is still concentrated to the DRC which is a politically unstable state. There is some production in other states at a smaller scale, but none in the EU and none in any capacity to compete with the DRC (Olivetti et al, 2017: 235-236, 238).

Coking Coal

Coking coal is produced to a fairly high degree domestically in the EU, by some even estimated to 69% of the supply in 2023, but the prospect of the production is unclear as the mining of coal (of which the yield contains both coking coal and

energy coal) is decreasing and the domestic share of the supply will dwindle. However, both Australia and the United States, the largest exporters of coking coal to the EU, seem to have better prospects of continuing to extract coking coal in the future as well (Sivek & Jirásek, 2023: 2, 5). As for estimations of the general demand for coking coal, about 2% per year in the near future and a peak around 2035 is predicted. China continues to be the biggest producer globally, and states such as Mongolia with large coal reserves will have to contend with the supply chains in the region being part of the Chinese controlled silk-road project and likely to feed the growing Chinese demand (Bolortuya & Weida, 2021: 414-415, 418).

Natural Graphite

Natural graphite demand is projected to increase by twenty-five times by 2040 (Schmid, 2020: 7). Looking at all the materials needed for the lithium-ion batteries, natural graphite has the highest demand for the future. For natural graphite, there is a possibility for the EU to produce more domestically. Specifically, in the Nordic region of Europe, including Greenland, there are multiple plans and identified locations where it would be possible to extract natural graphite. Though, as this is only prospective, the look-out for the coming decade is still bleak and not enough to meet the demands (European Carbon and Graphite Association, 2022). Additionally, pushback against mining by local communities halt the process of starting the production in the first place (Bloomberg, 2022a).

Gallium

As mentioned in the previous section on gallium, China is by far the foremost producer and it likely to continue to dominate the supply. No prospects of increasing the production in any other state has been found in the research, and while for example Australia has deposits of the material gallium is extracted together with, bauxite, no actual prospects are found (Geoscience Australia). Additionally, due to the Russian invasion of Ukraine, one of the globally biggest producers of gallium, it likely that the supply will be impacted (Swedish Geological Survey, 2020a).

Indium

Not much data can be found on the prospects of indium, but there is reportedly a possibility for production in central Europe, yet, not near China's production volume. One way to assess the potential for indium is by looking at zinc extraction, of which indium is a by-product. This shows that a number of countries in Asia, Oceania and the Americas are able to produce it, yet none in the same capacity as China either (National Renewable Energy Laboratory, 2015: 8-10). Echoing what was said in the previous section, the EU does still produce indium, but what is unclear is what will be done when the production of the associated technologies increase.

Dysprosium

The demand for dysprosium is through to increase in tandem with the production of its associated green energy technology (Xiao et al, 2022 :8682). It is unlikely that the demand will be able to be met fully either domestically or through supplies from friendly states, as China's dominance on the market is too large and other production comparatively small (de Boer & Lammertsma, 2013: 2054). Yet, the United States and Australia has both opened mines for REEs that could potentially help alleviate this problem (Schmid, 2020: 8). Additionally, there are prospects for extracting REEs in Sweden, both through a new mine and through developing processes for extracting it from the waste material of existing mining activities. Though, no definite answer on the success of these projects can be found at the present date as they have yet to be approved (Swedish Geological Survey, 2023b).

Neodymium

Neodymium is much in the exact same situation as dysprosium. The projected demand of neodymium in the EU in 2030 reaches an increase of 45%, due to the demand of wind turbines in the EU energy mix. Potential other suppliers of neodymium are not likely, with the small, possible exception of Australia, due to the low price of neodymium not incentivising new production sites elsewhere. China is also keen to keep its monopoly intact, which might be attributed to its own production of wind turbines for domestic use and the limited supply of material (Rabe et al, 2017: 693-695).

Silicon metal

Silicon metal is, as mentioned before, produced from quartz. To meet future demands, what is needed is extraction of high-quality, pure quartz. The United States has some of the largest supplies of this, giving it potential for the future (Pan et al, 2022: 17). In the EU, there are possibilities for quartz mining, but not yet realised to its full capacity (Swedish Geological Survey, 2020c). All in all, there are possibilities for silicon metal to be produced in other places than China, but perhaps not at the same speed as the demand for products containing silicon metal.

4.3.2 Analysis

Looking at the information regarding the future prospects of the CRMs, it is clear that the development of many of them has potential to have a different impact in the future than they would be considered to have at the present date, while some do not have obvious potential to do the same. All of them are likely to experience an increase in the demand, as all of the technologies they are needed for are predicted to do so. What differs between them are what the potential for either increasing the domestic production or sourcing the materials through supply chains not dependent on China.

Starting with the CRMs in a chronological order, lithium does have potential to be at least partially more politically sustainably sourced. With Australia as a bigger supplier and potential future bigger trading partner, as well as the prospects for domestic production the risks associated with the future of lithium seem manageable. Granted, with the enormous increase in demand, forty times, the EU will continue to depend on importing lithium for its industries, but the diversity of possible sources make the EU more autonomous and especially less dependent on China. Cobalt, on the other hand, do not have prospects of a diversification in the sourcing and retain the same risk as previously. The EU is not necessarily dependent on China for cobalt, but certainly does not have any cobalt autonomy.

Coking coal seem to have negative prospects in terms of autonomy. With smaller production and higher demand, it does not look positive. Comparatively, the demand predictions are not very high, at 2% per year, which could be

alleviated by imports from Australia and the United States rather than China. With the example of Mongolia and how new production there are dependent on Chinese controlled supply chains, it does show how important it is for the EU's trading partners to also not depend on China for the EU to also not depend on China for supplies to reach it. Mongolian coking coal might not be necessary for the EU if Australian and American coking coal can replace it domestic production, but it is one less potential source lost in terms of geoeconomic security.

For natural graphite, the EU has the advantage of having a lot of untapped potential to produce it within the union. Yet, with the amount of graphite the EU will need in the coming decades to be able to meet its goals and produce enough batteries to power a new electrified vehicle fleet, it will still need to import natural graphite. As mentioned above, China does today account for more than half of the world's production and about half of the EU's imports, leading to the dependency persisting if the domestic production cannot keep up with the demands. Additionally, with pushback against opening up mines for extraction (Bloomberg, 2022a), any new production in the EU is likely to be delayed and not up and running for many years. Therefore, the dependency of China for natural graphite does not seem likely to go down for a long while, and the EU cannot be said to have good prospects to be autonomous in the regard.

The EU's import dependency on China for gallium looks to remain the same, as production elsewhere are unlikely to have any mitigating effect. Additionally, as stated above the Russian invasion of Ukraine and the EU's sanctions effectively leads to the future of sourcing it being impacted by how long the war lasts. The EU's gallium supply therefore is likely to continue to be in the hands of China. Indium on the other hand show potential for a more diversified production, however with China having almost a majority of the production currently and the other possible sources not being able to produce it in the same capacity, the EU will still have some dependency on China. However, increased domestic production leads to the dependency being to a lower degree than otherwise, making the EU marginally more autonomous.

Lumping together the REEs dysprosium and neodymium, the prospects for the EU to rid its dependency on China looks bleak. While both of these have a slight possibility to be produced in Australia, China is the vastly biggest supplier and the incentive for starting new production is tied to the economic potential. Looking at

the potentials for Swedish extracting and the potential impact of that, it is impossible to say with the uncertainty clouding it. Nevertheless, there are potential for the supply of REEs to more diversified in the future, which would be beneficial for the EU's dependency on China. With the dominance of China, the EU does not look likely to achieve autonomy on this front, but it is a step in the direction towards it.

With silicon metal, there are possibilities for it to be produced both domestically and by states with friendly relations to the EU. As such, even though China produces a large chunk of the global supply, the EU has the possibility to diversify its sourcing and potentially phase out Chinese imports if needed. This is of course a long time frame to this, as production would have to start before this can come to reality, but the potential to be autonomous and independent from China is still there.

Summarising the analysis of the prospects, while there are efforts and potential for some of the CRMs to not be subject to Chinese influence, the overall supply of CRMs for the EU's green transition looks to continue to have a degree of dependency on China in the future too. This also depends on how the realisation of the prospects proceed, if for example REEs can be produced in the EU or Australia, and it is impossible to say with certainty how the future will plan out. What this contributes with, though, is to deepen the analysis of the case, through an understanding of the broader situation of the occurrences of CRMs. Having established that the EU's dependency on China both in the present and in the foreseeable future, the next step is to analyse how this impacts the EU-China relations.

4.4 Summarising Analysis

To connect the circumstances surrounding the selected CRMs more firmly to the theory, a look into how they stand in regard to its central concepts is needed. To refresh from the section on theory, the overarching goal of geoeconomics is maximising security of a state, and that security is in turn tied to how dependent

the state is on others for its supply of goods and overall economy. *Dependency* is per definition an insecurity as it gives another state influence and ability to exercise power over another. *Autonomy* is the lack of dependence and freedom from foreign influence. *Effective independence* is the result of autonomy, differentiating dependence from sovereign independence, a formality. A difference is made contextually when it comes to dependencies, regarding the relationship to a state, if it is an ally or enemy, as well as the importance of the goods, how vital it is to the economy/state. The concept of *power* which is central to the analysis is the ability to exert influence across borders through controlling economic means. Here, due to the case, it is measured in to which degree China controls the supply of CRMs the EU needs for the green transition to succeed, to analyse how the green transition impacts the EU's relations to China.

As this study looks at nine different CRMs, the degree of dependency on China varies between them greatly. What is common for all nine of them is that the production of them globally to a significant degree is happening in China. The most severe cases of this are the REEs dysprosium and neodymium, where the EU is currently 98-99% dependent on China for the supply and has very limited choices in diversifying the supply to other producers. As for the rest of the CRMs, even if the dependency is not as immense, the growing demand poses a problem as the urgency for an undisrupted supply increases, and the pressure on the system heightens. An example of a CRM that by the previous sections has the least risk of a growing dependency on imports from China would be coking coal, owing to the relatively small projected growth, domestic production, and the continued production in states with friendly relations to the EU. Even if the EU would continue to import coking coal from China, having this diversity in sources protects the EU from being *dependent* on China for this commodity.

For the CRMs in-between these two examples, China does play an important role in the EU having access to these materials. Even if there is potential for more domestic production, for this to have substantial effect the prospects first need to be realised and yield enough material to keep up. That is not to say that these prospects do not impact the dependency on China, on the contrary it has all the possibility to have a positive effect on the EU's China relations (to the EU's advantage, that is), but it must be put into the wider context and time frame. Something else tied to the context of the world, and the picture of it painted

above, is the materials previously imported from Russia, that the EU has placed sanctions against, or Ukraine and therefore needs new sources for. Examples of this is gallium (from Ukraine) and coking coal (Russia).

Returning to the context, related to the question of security (again, the ultimate goal in geoeconomics) is the political climate and what increased power in the hands of China means for the EU. As previously mentioned, the rules-based world order based on international laws (such as the prohibition of invading a neighbouring country) has overtly been challenged Russia, with China lurking in the background reaping the benefits of a less stable world and the sanctions against Russia lowering the prices on Russian goods. It is in China's interest to establish a new order of the world, evident both in its policy towards the EU and its relations to Russia. "Multipolarity" is the word China speaks of when envisioning the future of the world, calling for a new power distributing giving more power to itself and less ability for other states to dictate how it can act. "[...] we are the ones driving these changes together" is what the Chinese leader President Xi told President Putin, furthering the connections of their causes and China's side in the conflict between the side upholding the world order and the one opposing it.

With China and the EU on opposite sides in this conflict, this further highlights the need for the EU to be as independent from China as possible and it is a security issue for China to have influence over the EU and ability to use economic connections to exert power over the EU. China having control over a large quantity of CRMs the EU needs is inevitably an insecurity, and, unlike connections to states with similar interests in upholding the rules-based world order, a threat. The EU has already identified China as a systemic rival, as stated many times throughout this paper, and what now follows is the comprehensive geoeconomic analysis of the situation.

Finally reaching the analysis of the impact of the green transition on the EU's relations to China, what has already been established above is that the green transition requires a lot of resources to be realised. Additionally, the challenge to world order has created a more clearly defined division in the world between states that wish to keep it rules-based and the ones that do not, leading to the EU both having the ambition to accelerate the transition to green energy (as per the REPowerEU plan) and having a more antagonistic relationship to China. So, how

does this affect the EU's autonomy and in turn, its effective independence and security?

For autonomy the questions to be asked is if the EU depends on China for vital goods. As per the result presented in this paper, the immediate answer would be yes, but further nuance is needed to fully grasp the situation. Returning again to the measuring tools, the CRMs, what is clear is that there are variations between them. For all but two of them, coking coal and indium being the exceptions, the imports will in the present and in the near future, according to the research in this study, have to some degree come from China for the green transition to be continued on in the EU. Though, as the EU is only fully dependent on China for two materials, it still retains some autonomy and even if a potential intentional disruption in the supply chains from China were to occur, these materials would still be possible for the EU to obtain, albeit possibly for a higher price. Yet, dysprosium and neodymium are important to the, according to the REPowerEU plan, most important technologies and they therefore carry more weights in the analysis. In the section on the prospects of producing the REEs elsewhere, the foreseeable future does have a few possible new sources, where at least one lies within the EU and the rest would fall under what the United States (as stated above in the theory section) would refer to as "friend and ally-shoring". Though, as the world order conflict is ongoing in the present, the assessment of the situation remains that the EU lacks in autonomy (and power in relation to) from China in the context of CRMs related to the green transition, currently.

The result of this is that the effective independence of the EU in this particular case is low. Additionally, this gives China power over the EU and the success of the green transition, as Chinese ambitions to influence the EU in a particular way could take advantage of this to put pressure on the EU to act in a certain way or hurt the EU's industries, should it want to. The balance of power here is consequently tilted in the advantage of China, leading to the situation being an insecurity for the EU. As power is equating to security, and power is relative to the other, the loss of security of the EU and the gained power for China also have the result of gained security for China and loss of power for the EU in the overall zero-sum power relations between them.

The urgency of this in the geoeconomic sense is the fact that there is the dimension of rivalry between the two actors, which gives the security aspect its

gravity. Circling back to the EU's relations to China around the time of the first EU policy paper on China, something has changed significantly and while this study does not cover the time of the other policies or their contents, the recent developments is what makes the situation noticeably more impactful on the security and power spectra than a similar trade imbalance would have caused had the global political environment been different. Instead, the present time with the global disorderliness make the same trade numbers a security risk and causes shifts in the power relations.

So, to summarise the impact of the green transition of the EU-China relations from a geoeconomic perspective is for the EU a poorer security situation in which its ambitions of transitioning its energy production both the power grid and the energy powering its transportation are put in the crossfire as a result of a hostile political environment, and consequently becomes a burden for the union's security. The dependency on China for supplying the materials vital for the green transition and the subsequent lack of autonomy are given their impact and geoeconomic implications on the EU's security by the context they exist in; the rivalry between the EU and China give all their connections a role to play in their relations. The green transition's role just so happens to have the economic dimension though this context.

5 Discussion

As there were no explicitly expressed hypothesis, discussing the result will be more related to what in the result that is interesting relating to, for example theory, how the limitations of scope could have impacted the result, reflections provoked by the result, and finally considerations of what further research on the topic could look like. The thought is to discuss multiple parts of the result and analysis, in order to have a wide angle on the content.

Starting with what is interesting about the result relating to theory is how much the context of the case impact the degree to which the theory captures the trade relations as having a negative impact on the security of the EU. While the study focuses on the EU's relations to China, this allowed for both considerations for the nuances that the global political context gave the trade connections between the EU and China, but also to assign a different impact on security from, for example, the United States and Australia as friendly states. Had the theory solely deemed any trade imbalance a security risk, any imports and lack of self-sufficiency would have been treated equally. Additionally, the only prospects of future production would have had would have been domestic, limiting both the scope of material and the analysis. The theory would have led to a very insipid analysis and result with very little to say about the situation other than there being an unfortunate trade imbalance regarding the CRMs to China and deem the green transition a security threat with little prospect to improvement. Any type of import would have been an insecurity, in what reminds of a protectionist mercantilist approach to trade and international relations. That is not what this study has any ambition to achieve, making the element of context crucial.

What the study did not capture, in order to not expand the scope to much and need additional research and material that would require a limitation of detail, is how the continued value chains of the materials stretch. For example, what happens to lithium-ion batteries produced in the EU, to solar cells and wind turbines, if they stay and are used in technologies in the EU or are trades

elsewhere, perhaps back to China where the material first came from. To analyse the full cycle of the CRMs and make a more detailed analyse of how these CRMs impact the EU-China relations, the amount of material is simply too big for the parameters of this study, and it had to be limited to one stage of the full value chain. Yet, it is still able to show how the foundation of the production of green energy technologies (which the production of, for example, electric vehicles reasonably would not be able to function without) is impacting the EU's relations to China, arguable the most important step.

Another thought about the result is the amount of different material that the EU's economy and the production of technology depends on. This goes for policies too, and political aims, that depend on these to be realised. For the REPowerEU policy in this study that put out the goals to increase the wind and solar energy in the energy grid, that political goal requires more of materials that the EU has already deemed as critical and increases the uncertainty of the EU being able to support its industries. The variety of different industries that use the CRMs selected for the study was also not expanded upon, as an increase there would not have had any impact on result, with the increase in demand not being related to the green energy technologies and any impact on security because of those would not be equally directly related to the green transition.

Another thing about the result that is worth mentioning is the possibility that it could be interpreted like or used to promote the idea that the green transition is a negative thing overall for the EU. No such claim is made, and there is no purpose to either necessarily promote or demote the EU's objective to increase the amount of green energy and work to lower the green house gas emissions. Rather than that, it could be seen as studying how an increasingly volatile global political arena makes all connections between states contentious with trade and the green transition as an example of this. Not studying a phenomenon because it might be interpreted in an unintended way would be a restriction, which itself is undesirable. Mining, a topic frequently mentioned throughout the paper, is also a sensitive subject in many places. It is not mentioned, as the perspective taken in the study concerns itself with national (or as close to that as a supranational union's security comes too) security and on a state rather than a societal or individual level. Generally, the environment effects of obtaining the CRMs or

indeed the green transition itself is not relevant to the analysis and is therefore left out.

Before finishing off the discussion, some ideas of further research on the topic this paper could inspire have both to do with CRMs and geoeconomics. Something currently lacking in the field of CRMs, with reservation for language or other accessibility barriers, is the more social science perspective on them and the role they play in realising political and/or societal aims; how they figure in society. Capturing that aspect could make them less distant and a more graspable concept. When it comes to geoeconomics, further research on the current political state of the world is needed. In fairness, it is a new development that it has come to such urgency recently, but it should still be studied and understood from multiple perspectives. For example, understanding the geoeconomic ramifications of the EU sanctions on Russia, or perhaps attempting to explain the failure of Russia to use their gas exports to hinder the EU from acting strongly against Russia and the illegal invasion of Ukraine. It is a theory with a lot of potential in a world deeply connected.

To conclude this discussion, the result allows more multiple topics of discussion, whether it is to remark on the limitations and the choices of where the line of relevant material is drawn, on how the theory impacts the result or to raise ethical question of what ideals the paper could be interpreted as promoting. There is a plethora of opportunities to continue weighing different perspectives against each other, different ways to structure the analysis and how something should be analysed, but for now the conclusion stands that the study staying on a state level with a theory focusing on security, it abstracts away certain aspects.

6 Conclusion

Circling back to the research question, what this study seeks to answer and understand is how the green transition, from a geoeconomic perspective, impacts the EU's relations to China, what the geoeconomic implications of the green transition are on the EU's relations to China. In this section, the result will be summarised and the question answered based on the result and analysis of the material.

Firstly, what is the impact of the green transition? As evident by the result and the materials presented, the ambition to move from fossil fuel and greenhouse gas emissions requires new ("new" with a grain of salt, but relative to others) technologies that can harness energy from the world around them without needing to burn something to release the energy. The EU sees wind and solar energy as the most important paths forward but realising the ambitions to increase the amount of green energy requires production of more wind turbines and more solar panels, if it is to power the EU. Additionally, part of the green transition is to electrify the transportation in the EU, something that requires batteries to store the energy in. So, both the production and storing of energy needs to be increased for the green transition. As the result shows, that requires materials.

Looking at the two sectors emitting the largest amount of greenhouse gas and the technologies proposed to deal with those problems, what can be concluded is that they require a number of materials the EU has deemed as critical, CRMs, for being important but also having some difficulties associated with acquiring them. To be able to transition the energy production to be increasingly green, the EU therefore needs to be able to have access to these, especially if the production of green energy technologies is to increase to cover more of the EU's energy needs. What that is found in the result and analysis of this paper is that all of the CRMs associated with the green transition technologies in this study to a significant degree is produced in China, albeit to different degrees. Some have more diverse sources than other, but for at least two of them, the REEs, that are used in both

batteries and green energy production, China dominates the market and imports, and the prospects of sourcing them elsewhere is small and need time before being realised.

Having established that, analysing this information from a geoeconomic perspective requires context. The relationship between the EU and China matters, as trading with an ally, in theory, poses a much smaller security risk than a rival or enemy. States as security maximising entities gain power by having another state dependent on them, and power is equal to security. Power is particularly not something a state wants a rival to have. For the EU, it sees and publicly states its view that China is a rival, a systemic rival, to the EU. Additionally, the state of the world further proves the point that China and the EU are in opposition to each other when it comes to the world order and whether it should remain as it is, the rules-based world order, or be dismantled. China also wishes for a multipolar world, gravitating away from the West.

Against this backdrop, the analysis of the green transition finds that the demand for CRMs often sourced from China are a concern. Through having multiple of the technologies needed for the green transition dependent on imports from China, this gives China a way to exert power over the EU as it has the possibility to restrict access to these materials and control whether or not the EU can have the capacity to produce what it needs and fulfil its plans. Additionally, this affects the degree to which the EU can act autonomously, as China could have the possibility to hold the access to CRMs over the EU's head. The result does find that there are some prospects of sourcing CRMs from elsewhere, domestically or from friendly states, which would be an improvement security-wise for the EU. Though, as evident by the fact that they are prospects, it would take a while before it could come into effect. Yet, with a wider perspective, the long-term implications of the green transition are impacted by these.

So, what can be concluded on the implications of this? First and foremost, with the connection between the green transition to materials who to different degrees but still consistently are linked to China, this implies that the green transition in the current global political conditions makes the EU less secure relative to China. All the CRMs do not affect this to the same degree, but cumulatively, there is a dependency that deprives the EU of some of its autonomy. Loosing that does, in the larger scheme of things, shift the balance on the power

scale between the EU and China in the favour of China. What cannot be concluded is how the whole power balance looks like, as this study only measures one piece, one of many weights on the scale. How other goods and trade patterns affect the balance is not known, which limits what conclusions can be drawn.

What the more long-term implications are, looking at the situation for CRMs sourcing in the coming years, depend on what measures that are being taken to diversify the sources of CRMs. There are possibilities for the EU to reduce its dependency on China by sourcing CRMs elsewhere, that much is clear by the result. Though, it also shows that there are limits to how much, and which of the CRMs. In short, the EU can work towards becoming less dependent on China for its green energy industry, but only to a certain degree. The analysis thus seems to imply that transitioning the energy production to green energy comes with the cost of losing autonomy and becoming less secure, as rival states gain more power over the EU.

As a final conclusion, what the result and geoeconomic analysis yield is that the green transition in the EU does imply that the power balance between the EU and China is shifting, as the process of transitioning cannot happen without imports from China. The current global political situation with Russia and China working to dismantle the rules-based world order, opposing, amongst others, the EU, makes this a security threat from a geoeconomic standpoint. While a conclusion on the full balance of power cannot be drawn, the conclusion within the parameters of this study is that the green transition, due to its demand for CRMs, do make the EU less secure in relation to China.

7 References

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