energies

MDPI

Article

Fuelling the Fire: Rethinking European Policy in Times of Energy and Climate Crises

Valeria Costantini [1,*], Valentina Morando [1], Christopher Olk [1,2] and Luca Tausch [1]

[1] Department of Economics, Roma Tre University, 00145 Rome, Italy
[2] Department of Political Science, Free University Berlin, 14195 Berlin, Germany
* Correspondence: valeria.costantini@uniroma3.it

Abstract: The European Union's relative disregard for the economic, geopolitical and climatic concerns of its peripheral Eastern countries has contributed to making the war in Ukraine possible. Its consequences are now returning in the form of energy dependence and economic instability on the Union as a whole and the risk of economic crisis and deindustrialisation. This should prompt a re-assessment of the EU's strategy towards its eastern neighbours, particularly in the energy and climate policy field. This evaluation starts from the issue of control over cheap energy as a key material foundation of state and interstate power. On this basis, we analyse the struggle between Russia and the European core states over Ukraine in terms of the ability to extract an economic surplus through the unequal exchange of energy. The current escalation should be understood as an attempt by the Russian petrostate to preserve the economic basis of its regime, which is threatened by the prospect of a low-carbon transition in Europe. We conclude that a massive acceleration of the transition away from fossil fuels is the key to economic, geopolitical and climate stabilisation, highlighting possible policy instruments the EU could use to secure its production system and protect citizens' security.

Keywords: climate policy; core-periphery; energy crisis; European Union; Russia–Ukraine conflict; world systems analysis

Citation: Costantini, V.; Morando, V.; Olk, C.; Tausch, L. Fuelling the Fire: Rethinking European Policy in Times of Energy and Climate Crises. *Energies* **2022**, *15*, 7781. https://doi.org/10.3390/en15207781

Academic Editor: Seung-Hoon Yoo

Received: 27 September 2022
Accepted: 19 October 2022
Published: 20 October 2022

1. Introduction

Russia's armed invasion of Ukraine started in February 2022, has turned into a protracted, violent war of attrition that is drawing in more and more resources from an expanding North Atlantic Treaty Organization (NATO), whose members are pouring billions into their military forces and increasingly into Ukraine's [1]. The West has also imposed heavy economic sanctions on Russia. Both the war and these sanctions have disrupted global food and energy supply chains, which creates enormous pressures throughout the global economy, in particular on countries of the global political south.

The European Union (EU) states have abruptly discovered the degree of their dependence on fossil fuel imports from Russia. In order to withhold the key source of funds from Putin's government, the EU is adopting increasing sanctions on imports of Russian fossil fuels. The geography of the EU consensus on such decisions is not homogeneous, as while Poland claims to be able to ensure oil supplies to the entire region through its ports [2], Hungary, Slovakia, the Czech Republic and Bulgaria are lobbying against an EU oil embargo for fear of cutting their ties to Russia.

Many European states are hastening to decouple from Russian energy imports, mainly by importing more fossil fuels from other petrostates and building new infrastructure for this purpose, consequently burying their climate ambitions [3,4]. The newly accelerated push for increased extraction of fossil fuels to fill the energy supply gaps accompanies the escalating effects of the climate breakdown that are already being felt by those most affected people and areas of the planet. In this way, the effects of the war are rippling

not only through the EU production system but also the global, interstate system and the world economy.

As a matter of fact, the Russia–Ukraine war is impacting all economic and political branches. Therefore, a systemic view combining economic policy and political economy is the way forward to foresee potential peace solutions.

The paper aims to develop a critical political economy analysis of the current set of interrelated crises, with a focus on the role of EU energy policy. To this end, we apply the theoretical framework of world systems analysis to a set of quantitative and qualitative data comprising both historical developments and current events, following a broadly historiographical approach and mixing interpretative instruments from the disciplines of economics and political science

We propose three key arguments that amount to complementary and mutually consistent, even if not exhaustive, interpretations of the current conflict: (i) it is a geopolitical struggle between Russia and the core EU members over access to cheap energy sources and the ability to extract an economic surplus from the Eastern European peripheral members through trade; (ii) it is an attempt of the Russian petrostate to preserve the economic basis of its regime, which is threatened by the prospect of a low-carbon transition in Europe; (iii) it is a sign of the vulnerability that the EU has partly subjected itself to and partly exported to its Eastern periphery by way of adopting a half-hearted and self-centred approach to energy and climate policy. The politics of energy is thus at the core of all three perspectives on the current conflict.

Ukraine is at the centre of this conflict because it is situated simultaneously in the periphery of the EU and that of Russia, de facto the corridor for Russian energy exports to Europe. The country has been the locus of the struggle between these two power blocs for decades, not least because of its rich energy and mineral sources, as well as its fertile soils. It is an important market for both Russia and the EU and is geographically located as the transit country for the flow of several raw materials between the East and the West. However, the world-systemic position of Ukraine is not fundamentally different from that of other countries in Europe's Eastern periphery or in Central Asia. Similarly, the strategic situation in which Russia finds itself may be comparable to that of other Petrostates, such as Nigeria or Saudi Arabia [5]. Accordingly, understanding this conflict is essential to draw more general lessons for the EU's energy policy at the intersecting objectives of geopolitical stability, energy security, and the prevention of climate collapse in order to reduce the risk of additional transnational crises.

The remainder of the paper is organised as follows. Section 2 traces the political reasons behind the vulnerabilities of EU–Russia–Ukraine relations throughout history according to a world-systemic approach. Section 3 applies this world-systemic view to interpret the current crisis's dimensions and challenges. Section 4 discusses the main implication for the EU, and Section 5 concludes with some policy implications on the EU climate and energy security.

2. World Systems Analysis Framework Applied to the Russia–Ukraine Crisis

2.1. The World Systems Analysis and the Types of Vulnerability

The theoretical framework of world systems analysis is the best way to understand the global political economy and international relations as a core-periphery constellation of "combined and dependent development" [6]. The key tenet of this framework is that the industrial "core" of the world system extracts an economic surplus in the form of embodied energy, land, labour and raw materials from the extractive "periphery" through the unequal exchange while exporting environmental destabilisation [7,8]. Access to this surplus allows the polities of the core to create a degree of internal socioeconomic order and security. This occurs at the expense of the periphery, whose extractive political economy implies both lower political stability and higher vulnerability to external economic shocks. The industrial core of the world system is thus able to enhance its own socioeconomic stability by displacing instability and vulnerability to the periphery [9].

In the present context, a core region of the global capitalist world system—Western Europe—has been seeking to expand its control over the supply of energy, resources, agricultural land and cheap labour as well as over export markets in its Eastern European periphery. This process started when the European core integrated large parts of this Eastern periphery (including Poland, Hungary, the Czech Republic, Slovakia, and parts of the Balkan and the Baltic states) into the EU. These states occupy a distinct position best described as an internal periphery of the EU. Other parts of Europe's Eastern periphery (including Ukraine and Moldova) have not been integrated into the EU, putting them in an even more disadvantaged position vis-à-vis the EU core.

Between the core and the periphery lie "semi-peripheral" states, which struggle to establish a degree of independence from the core and control over a periphery of their own. Russia occupies such a semi-peripheral position in the world economy [10]. Semi-peripheral countries are to some degree dependent on resource exports to the core but are sometimes also able to challenge their domination in some areas (e.g., Brazil, South Africa, Turkey or Saudi Arabia).

The key vectors of surplus extraction in the capitalist world economy, and thus important objects of international competition and conflict, are access to and control over cheap sources of energy, land, labour, raw materials and ecological sinks [11]. States strive to structure trade to perpetuate the Ecologically Unequal Exchange (EUE) of these resources [12,13]. The EUE theory posits that the asymmetric transfer of resources from the periphery to the core and the diverging compensation lead not only to high economic growth in the core [14] but also to underdevelopment and environmental degradation in the periphery [15]. Energy is a key driving factor of a EUE [16] as revealed by Figures 1 and 2, which show the energy embodied in all net imports and exports per capita, and the trade-in value added per unit of energy embodied in exports in 2015 from the Eora26 multi-regional input–output model.

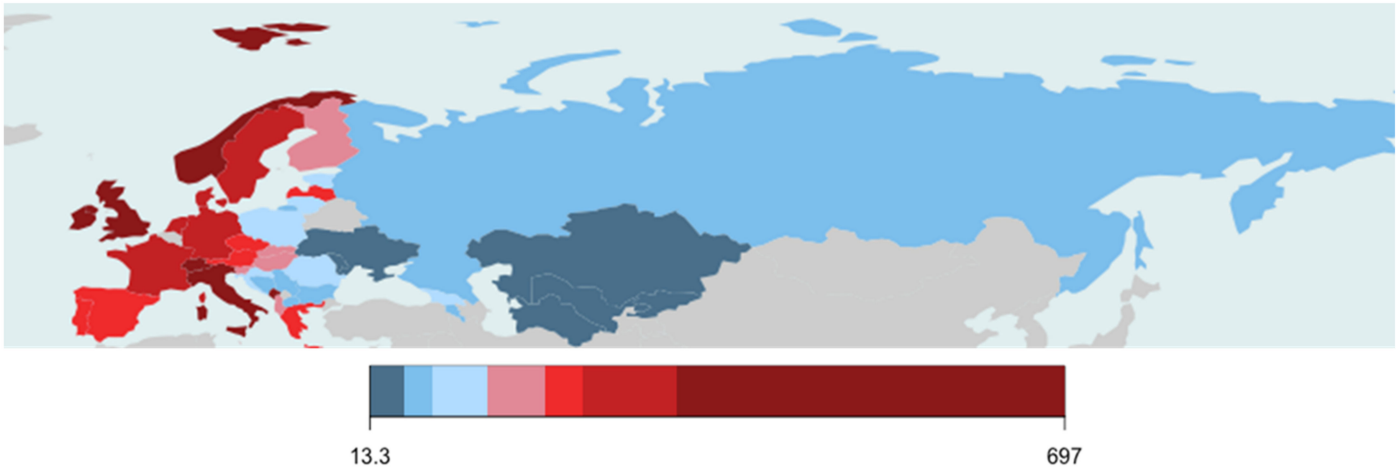

Figure 1. Trade in Value Added (USD) per unit of energy embodied in exports (TJ) (own elaboration on Eora26 [17]).

Both maps demonstrate the core status of Western Europe, the semi-peripheral status of Russia, and the existence of a post-Soviet periphery in Eastern Europe and Central Asia. This unequal distribution of surplus and the dependence of both core and (semi-) periphery on cross-border flows of energy tend to give rise to unequally distributed socioeconomic and political vulnerabilities. We trace the emergence and the distribution of three types of vulnerability: (i) the ability (or lack thereof) of a government to maintain legitimacy by pacifying social conflicts and creating consent; (ii) the economic and social instability that hinges on the access to a secure supply of energy; (iii) the exposure to direct effects of the climate and broader ecological crises.

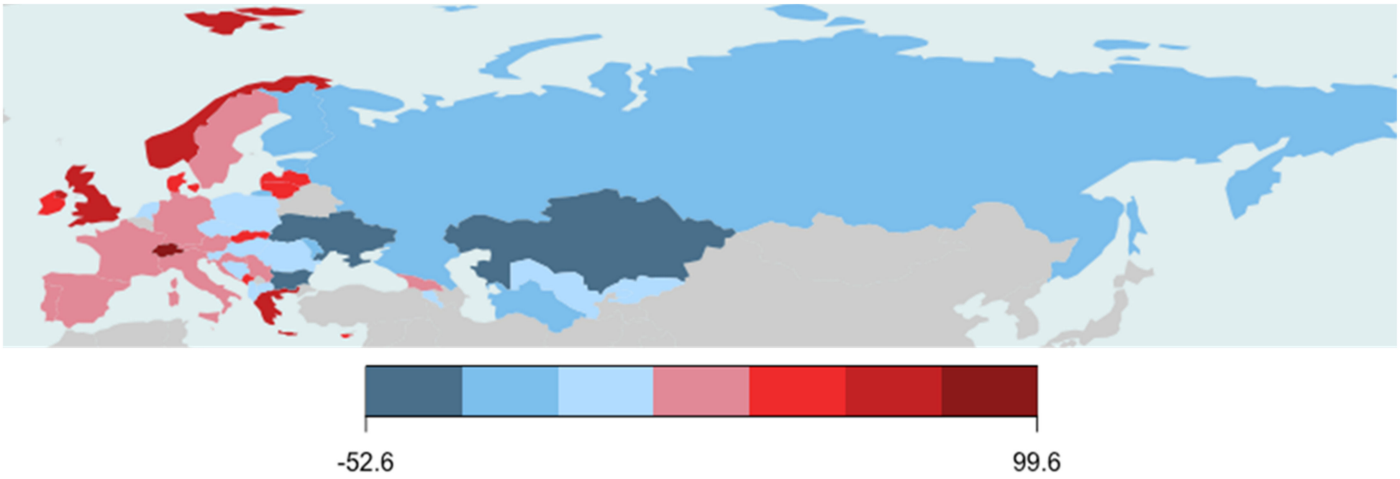

Figure 2. Net imports (negative values: exports) of embodied energy (GJ) per capita (authors' elaboration on Eora26 [17]).

The first vulnerability is typically related to the position of core states that can maintain the modicum of class compromise and popular consent required for liberal democracy when they distribute the surplus drawn from the periphery. In semi-peripheral states, the surplus is distributed among elites, which is sufficient to stabilise an authoritarian system. Lacking such a distributable surplus, peripheral states cannot follow either of these two models of regime stabilisation and typically experience a higher degree of conflict over control of the state [18].

The second type of vulnerability depends on the fact that core states use their economic and political leverage to maintain their bilateral trade agreements with semi-peripheral Petrostates, benefiting from a more secure energy supply, a more diversified energy provider base, and consequently a reduced vulnerability to external supply shocks. Petrostates, in turn, can use their advantageous position as energy-exporting countries, being vulnerable only to external demand shocks. Lacking such advantageous bargaining positions, peripheral states cannot follow either of these two models, and thus are often characterised by a concentrated mix of sources and providers and a high vulnerability to external supply shocks.

The third source of vulnerability is related to the direct effects of the climate and the broader ecological crises. Greenhouse Gas (GHG) emissions are a case of ecologically unequal exchange from which the core gains more than the periphery, while the latter is asymmetrically more vulnerable to the consequences of climate change [19]. Additionally, the overutilisation of the environmental space of the core suppresses resource use and consumption in the periphery [20] as well as increases the vulnerability to ecological impacts in the latter [21].

These types of vulnerability interpreted through the lens of the EUE framework should be complemented by a deep understanding of the historical roots of the Russia–Ukraine crisis and the current distribution of weakness in political stability to inform the EU debate on how to design the way forward for solving the international political deadlock.

2.2. When and Where Does Vulnerability Originate?

One key to the emergence of vulnerability in modern societies is their dependence on the consumption of high levels of energy, including in manufacturing and service sectors. Most core economies are not capable of internally supplying the demanded energy at sufficiently low costs; instead, depending on cheaper international imports to ensure the profitability of industries, high levels of household consumption, and continued economic growth [22]. In policy debates, this vulnerability is broadly conceptualised as a question of energy security, starting from the early 1970s after the oil crises. EUE theory adds to

this debate by providing evidence on the position of semi-peripheral energy exporters as exploited economically by core countries and industries.

Russia is the world's largest exporter of fossil fuels, with most of its exports flowing to Europe. The Russian state is highly dependent on revenues from oil, gas and coal exports, representing 25% of the GDP and 45% of the federal budget [23]. Those numbers are even larger when considering the energy embodied in its industrial exports, as reported in Figure 1. This corresponds to the typical social configuration of a petrostate. Externally, such states typically depend heavily on military power, while internally, they tend towards an authoritarian model based on elite (rather than broad popular) consent of the governed [24]. Both Russia and Eastern Europe are similar in their economic positions relative to Western Europe since they represent net exporters of energy, food, and resources, with a relatively cheaper labour cost and a lower economic complexity. More importantly, Russia's share of the global domestic product has been halved over the last decade, strongly reducing any real prospects for these semi-peripheral states to achieve the core status [25,26]. At the same time, Russian economic power was historically based on controlling a periphery of its own in Eastern Europe and Central Asia. This control has been curtailed since the collapse of the USSR, including through NATO expansion to the East. Accordingly, Russia's loss in economic relevance at the world level, combined with the loss of control over the Eastern European (now semi-) periphery, has fostered the emergence of ultranationalist ideology and the neo-imperial revisionism of the Russian regime, which ultimately resulted in its invading Ukraine [27].

Ukraine is the largest country both in Europe's Eastern periphery and Russia's Western periphery. Its economy heavily depends on cereal, seed oil and iron exports. Besides fertile agricultural land, it has abundant resources such as oil, natural gas, coal and some critical minerals required for renewable energy and digital technologies, significant hydropower and biomass potential. Moreover, it exports steel and other metal products that embody large quantities of energy, much of which is originally imported from Russia. As a result, Ukraine is one of the world's ten most energy-intensive countries, with an energy intensity exceeding the OECD average [28]. Its large population, high energy consumption and its geographical position make Ukraine one of Europe's largest energy markets and the country with the most natural gas transits in the world. At the same time, its geographical position turns Ukraine into a ground of extreme competition between the EU and Russia over the ecologically unequal exchange.

Hirschman's theoretical approach thus seems to ring more clearly than ever in this instance: asymmetry confers power on the stronger power, forcing the smaller power to converge on the interests of the stronger [29]. Ukraine, in this case, as a peripheral country, found itself caught between two fires. Russia, as a semi-peripheral petrostate that has historically dominated Ukraine until recently and used its energy and economic power to include it in its own arrangements, and on the other side, the EU, a core of the world system, which with the promise of greater integration and economic support, has taken advantage of its role in the energy market, postponing and never ensuring adequate protection [18].

3. Ukraine as an In-Between Energy Node in EU-Russia Relations

3.1. The EU-Russia Energy Chain

The energy relations between Europe and the Soviet Union can be traced back to the late 1950s, including the building of pipelines to transfer oil and gas. The integration of Russia as a key energy supplier into the European semi-periphery began in the late 1990s and culminated in the opening of an energy dialogue between the two parties in 2000 [30].

In the first decade of the 21st century, the EU was hardly concerned about its dependence on Russian fossil fuels and energy security in general [31]. Despite this diffused concern, most regulations and directives in the past decades were directed towards liberalisation, trade deregulation and free market mechanism, de facto stimulating the relative convenience of investing in cheaper Russian energy sources [32].

After the enlargement process of the EU in 2004, the deeper integration of parts of the Eastern periphery into the liberalised common market increased the access for Western Europe to cheap imports of embodied labour and energy, much of which were based on Russian gas imports [33]. While many of the new post-Soviet EU members were already concerned about their high dependency on energy imports, core Western states used their bargaining power within the EU to maintain bilateral trade agreements with Russia improving their position in the hierarchy of EUE by bargaining for relatively low energy prices while ensuring preferential supply channels. The vulnerability thus remained high for the entire EU but was largely felt by the newly integrated Eastern periphery [34].

What forced the EU to amend its energy security strategy was the external threat of the gas dispute between Ukraine and Russia in 2006 and the credible risk of a gas cut-off [35]. This wave of change in 2004 also affected Ukraine, which, for the first time after a decade of a divisive but always Russia-friendly policy, experienced more open forms of conflict. The success of the "Orange Revolution" and the victory of a pro-European party in the presidential elections moved Ukraine towards the EU and NATO, competing with the economic concessions made by Russia to integrate Ukraine into its periphery.

In particular, Russia had been setting the prices for its gas and the respective transit taxes for Ukraine below European and world levels for years. After 2004, Russia began to put economic pressure on raising fuel prices for Ukraine and other peripheral countries (Estonia, Georgia, Moldova, Latvia and Lithuania). Following the refusal of Ukraine to pay these higher prices, the reaction was a cut in supplies to Ukraine, specifying, however, that the gas deliveries to the European core would not be affected. Nevertheless, the drop in delivered volumes was soon felt across the whole EU. Hungary lost up to 40% of its supplies; Austrian, Slovakian, and Romanian supplies fell by 33.3%, France's by 25–30%, Italy's by around 25%, and Poland's by 14%. The crisis did not last long, as the European outcry forced the Russian government and Gazprom to reach a provisional agreement with Ukraine. However, the text of this agreement reveals that many issues, particularly the price of gas, remained unresolved [36,37].

This was a turning point also for the EU, recognizing the still high vulnerability to external energy supply disruptions and the low effectiveness of its past energy security policies. Partly as a result, in 2014, the EU proposed the 2030 Framework on Climate and Energy, aiming at a 40% reduction of GHG emissions (from 1990 levels), a 32% share for renewables energy in the energy mix and at least 32.5% improvements in energy efficiency [38]. Within this renewed energy package, the increase in energy security was focused on suppliers' diversification and the enhancement of the interconnections and coordination among member states. Shortly after the delivery of the 2030 energy agenda, the debate upon an Energy Union emerged as the way forward for a coherent energy security strategy within the EU. It was finalised in the "Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy" [39].

The strong impact of the EU approach to climate and energy issues on global negotiations also threatens the already difficult relationships between Russia and its energy-importing partners as a side effect. The stability of the Russian economy is fundamentally based on a compromise between the state and the oligarchy that structurally depends on revenues from fossil fuels. This basis has been threatened in recent years by the decarbonisation objectives of the Paris Agreement, requiring an immediate reduction in the exploitation of fossil fuels reserves worldwide, absent feasible large-scale carbon removal technologies, and a swift phase-out of fossil fuels. At the same time, a large part of the past EU decarbonisation strategy was founded on the transition to massive use of natural gas, as supposedly less damaging to the climate than their substitutes, coal and crude oil.

3.2. Digging under the Surface: Ukraine in between

According to the evolution of EU-Russian energy relations, one element of the backdrop against which Russia invaded Ukraine is the paradoxical situation that it can no longer count on the stability of Europe's demand for its fossil fuels after the 2030s, but

it can indeed rely on the dependence of Europe on its supply over the next years. As already discussed, all transition scenarios for the EU had foreseen considerable amounts of Russian gas in the energy mix. While high dependence on Russian natural gas was considered a concern for Europe regarding energy security, the continued reliance on fossil fuels remained unquestioned. Large pipeline projects such as Nord and South Streams indicated that the EU remained interested in deepening its energy relationship with Russia, as well as remained interested in the consumption of fossil fuels. However, recent developments demonstrate a break with the half-hearted approach to effectively reduce fossil fuel consumption. As the global climate justice movements put pressure on policymakers to act upon their responsibility, the EU responded with the European Green Deal and the more recent Fit for 55 package, aiming to be the first climate-neutral continent [40,41]. Within this renewed climate and energy package, the phase-out of conventional gas was supposed to bring the gross inland consumption to 22% in 2030 and 9% in 2050. Consequently, with its fossil fuels export-dependent economy and the shrinking demand for natural gas from its major trading partner in the following years, the Russian economy is on track to vanish as a portion of global GDP.

This is related to the second internal factor. Suppose Europe is serious about reducing its carbon emissions to net zero by 2050. In that case, Russia will not be among the last sources of fossil fuels to be abandoned, as the production costs of Russia's ageing oil fields are generally higher than those of West Asia. At the current price level, only a third of Russia's proven reserves will be profitable to extract [42]. The underlying physical mechanism can be expressed in terms of the Energy Return On Investment (EROI) of fossil fuels, which expresses how many units of energy are required to produce one more unit of energy [43]. Although the Russian fossil industry is attempting technological improvements, in the last years, the EROI of gas has been declining, from 1:84 in 2015 to 1:83 in 2008 to 1:74 in 2016 [44]. As the EROI has been identified as the strongest determinant of the growth of the gas industry and, indeed, of Russian GDP [45], this constitutes a true political threat to Russia's economic and political stability. Additionally, unlike other petrostates, Russia has not made serious attempts at scaling up renewable energy production as a viable solution to replace the reduction in export rents from the exploitation of exhaustible resources [46]. Provided that all transition pathways to meet the goals determined in the Paris Agreement require a swift phase-out of fossil fuel combustion, as well as net zero pledges by more than 130 countries, together responsible for around 88% of global carbon emissions, will impede Russia to replace the EU with other importers in natural gas trade. Even if demand from Asia and elsewhere may partly compensate for Europe's declining demand for fossil fuels, the combination of downward pressure on prices and the heightened uncertainty fundamentally threaten Russian fossil capital and, with it, the entire political economy of the Russian state [47].

The elements discussed below allow us to formulate a clear picture of the escalation of the conflict in Ukraine. Russian fossil capital and the associated regime, facing the spectre of a long-term decline, are currently minimizing their losses by benefiting from the short-term window of opportunity provided by the post-pandemic recovery phase. European industries' hunger for immediately available energy sources during the recovery from the 2020 production collapse, associated with a sudden rise in fossil fuels prices on the international markets, meant soaring extra profits from Russian energy exports.

Clearly, the Russian state's bargaining power in international conflicts depends on European fossil fuel consumption. Against this backdrop, it becomes clear that the Russian invasion of Ukraine itself has only been possible because the EU has, on the one hand, credibly committed to exiting fossil fuels but, on the other hand, been hesitant to transition fast enough to be independent of Russia. Consider a counterfactual scenario in which the EU had taken drastic measures to exit fossil fuels already in the 1990s. It would have drastically reduced its fossil fuel consumption and rolled out more sustainable provisioning systems and renewable energy. This would have given the European core and periphery much more bargaining power vis-a-vis Russia and withheld significant funds from the

fossil fuel complex that helped stabilise and radicalise Putin's autocratic regime. In this scenario, the Russian state, starved of fossil revenues, may have adopted a rather different and probably much less aggressive model of consolidating the nation state's power.

4. The Way Forward for EU Energy Security

4.1. Energy Security: Europe Is Licking Its Wounds, Not Treating Them

In order to determine the overall degree of the EU energy security, it is essential to consider its energy mix. The energy mix is expressed as the share of gas, oil, coal, nuclear or renewables in gross available energy, the overall supply of energy for all activities on the territory of the country. Figure 3 represents the EU energy mix in 2020. It demonstrates to what extent the EU still relies on fossil fuels such as natural gas and oil but also offers a perspective on the progress toward the sustainable transition based on the share of renewables in the energy mix.

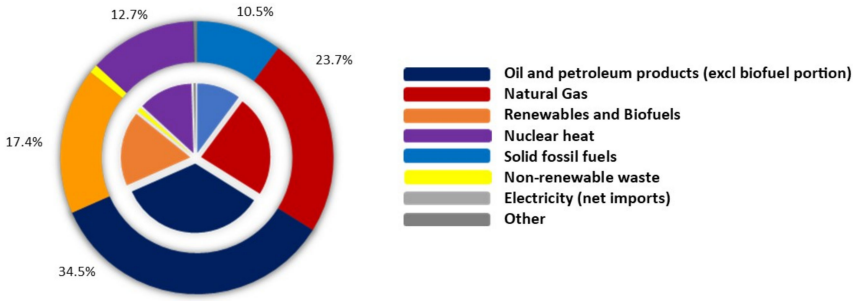

Figure 3. The EU energy mix in 2020 (authors' elaboration on [48]).

According to the statistics provided by Eurostat [48], the EU has not managed to reduce its overall dependence on natural gas and oil. While the share of renewables has increased and the share of nuclear power has decreased, natural gas and oil remain the largest components, making up almost 60% of the entire energy mix. The EU imports almost all of these fossil fuels, as only 42% of the entire gross available energy in the EU in 2020 were produced domestically, while the other 58% was due to imports, with almost 25% coming from Russia.

Furthermore, EU policy has failed to significantly increase its share of renewable energy within the energy mix. The current 17.4% share of renewables represents a partial failure to comply with the ambitious energy packages ratified in 2009 that aimed at a share of 20% renewables by 2020. Moreover, in the face of such numbers, it seems unrealistic that the EU targets of a 40% share of renewables by 2030 included in the Fit for 55 package will be accomplished, given the current path of investments. Unless radical changes occur in the upcoming years, it seems unlikely that the EU can achieve any of its targets by 2030. Lastly, these numbers perfectly fit with the large bilateral fossil fuel trade agreements between the EU core and powerful petrostates, including Russia, made to secure an energy supply at affordable prices, as discussed above. The expected benefits in terms of security of supply have been one of the major causes of delay in redirecting massive investments toward renewable sources, given the price competition of natural gas over renewables, especially in electricity production.

Related to this point, also the EU import dependency deserves attention. It highlights the extent to which a country relies upon imports in order to meet its energy needs. According to Eurostat [48], in 2019, the total energy import dependency for the EU was 60.7%, with 90% for natural gas and 97% for oil, reaching a net import dependency level among the highest in the past 30 years.

These figures represent an ambivalent position of the EU in the world system. On the one hand, as a net importer of energy, it benefits from the ecologically unequal exchange and maintains high standards of living [16]. On the other hand, the extremely high import dependency and the extremely high energy supplier concentration make the EU vulnerable

to external shocks. As of 2019, the EU imports 41% of its natural gas, 27% of its crude oil and NGL and 46% of its hard coal from Russia. According to Eurostat Energy Balances, this dependency trend from Russia has even increased over the past two decades, standing in sharp contrast to the EU energy security strategy aimed at reducing its vulnerability to external shocks. Thus, the EU energy security is still characterised by a concentration of sources and suppliers, with Russian fossil fuels still being the bedrock of European prosperity. More importantly, Figure 4 shows the intra-EU division between the internal periphery and the core.

While the periphery is eager to decrease its vulnerability in terms of energy imports from Russia out of national security concerns, the core member states have been using their economic leverage to work out alternative advantageous bilateral energy trade agreements. Both for natural gas and oil imports, Europe's periphery has a much higher dependence on imports from Russia (Finland, Lithuania, Latvia, Estonia, Slovakia, Bulgaria, and the Czech Republic rely on Russian gas with at least 85% of their domestic natural gas consumption), whereas core members have a much more diversified mix of providers. In particular, core members such as Spain, Portugal, France and, more recently, Italy have a much more diversified energy import strategy than most of the peripheral EU members.

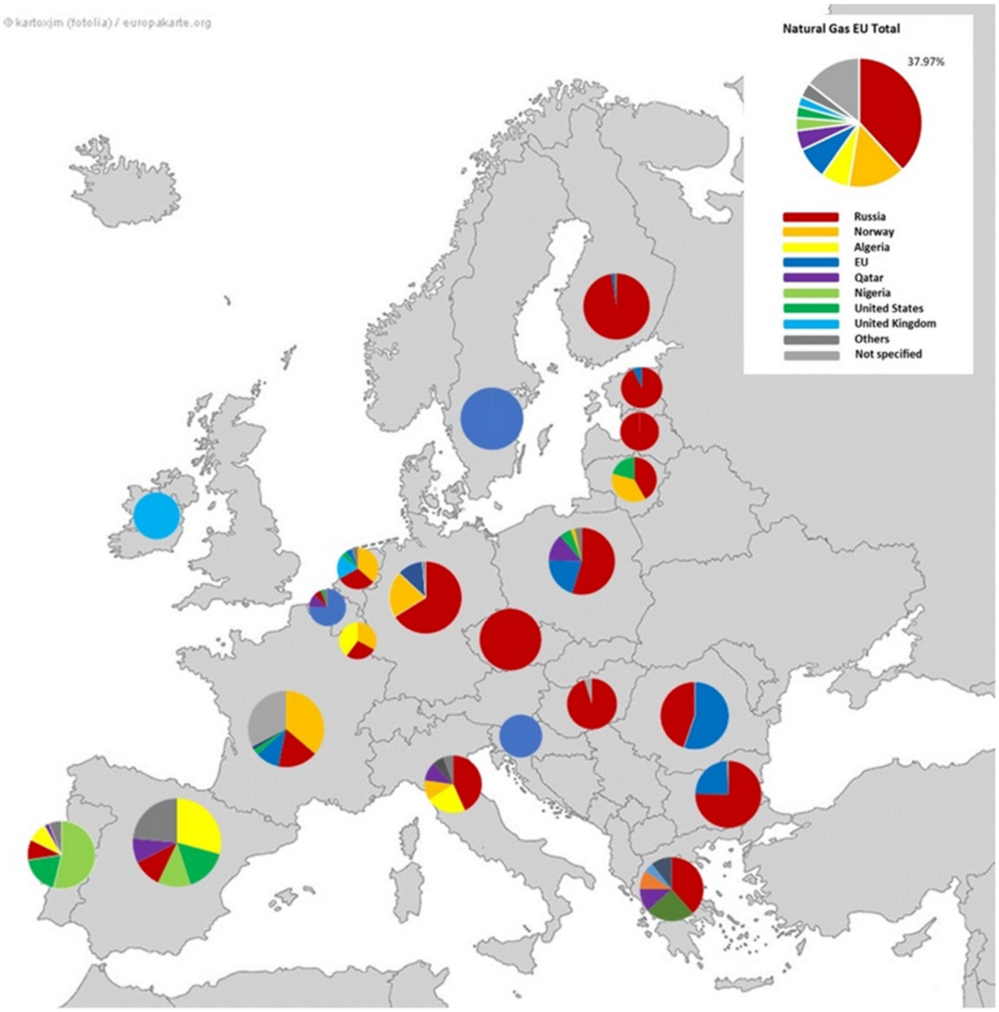

Figure 4. *Cont.*

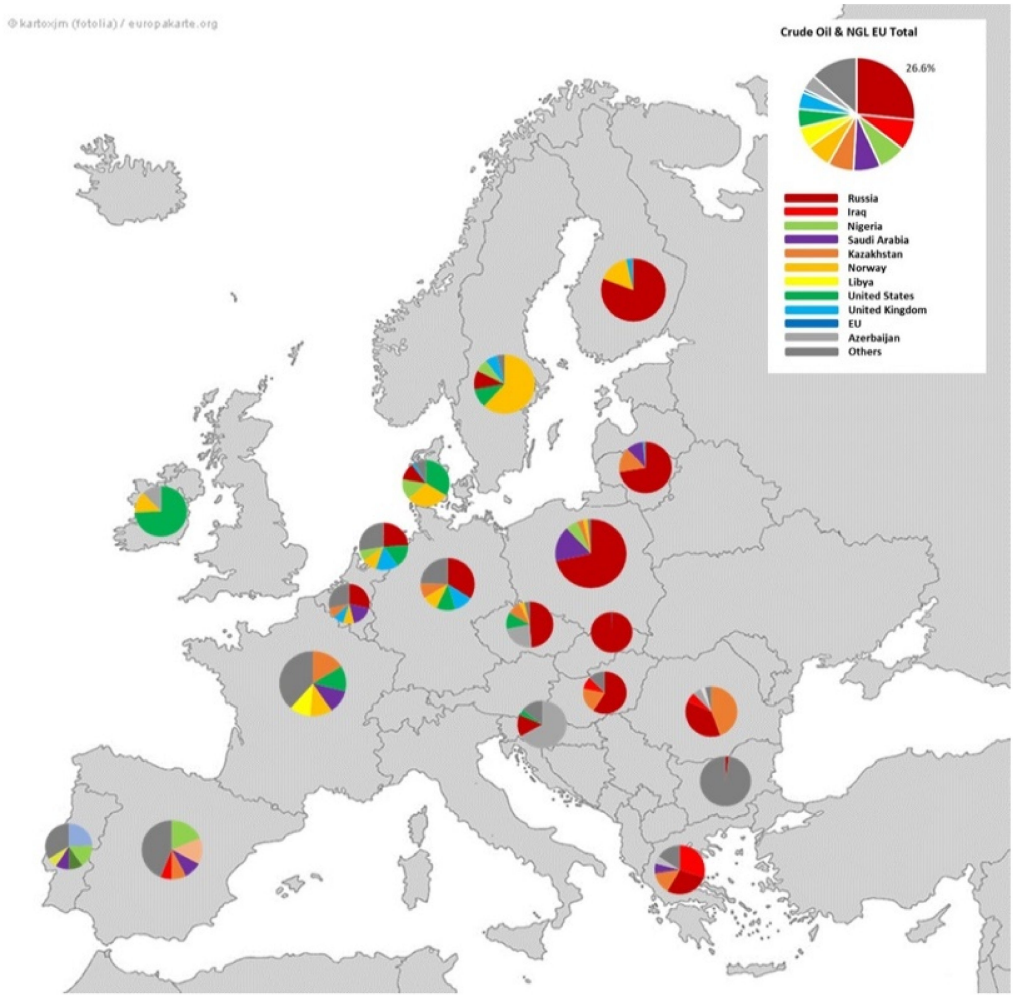

Figure 4. Share of EU import origin for natural gas and crude oil (authors' elaboration on Eurostat data).

Weak bargaining power, unreliable trade agreements, and lower fiscal capacity render the Eastern periphery relatively less capable of both preventing disruptions in the inflow of energy and dealing with their consequences. The first EU members to face an end of Russian fuel supplies over the summer of 2022 were Poland and Bulgaria [49,50]. Moreover, replacing Russian fuels and stabilizing energy prices through subsidies puts great demands on governments' balance sheets, and core members outbid Eastern EU members with larger fiscal space, particularly Germany [51]. Additionally, as a result of the ongoing war in Ukraine, food prices have increased sharply all over the world. Within the EU, people in the Eastern Periphery have been hit hardest by the sharp price increases [52]. Despite the urgency for an Energy Union strategy already discussed in 2015 [39], the reluctancy of core members to effectively commit to a unified approach with respect to external relations has maintained the intra-EU division, asymmetrically felt by the Eastern periphery in terms of higher vulnerability to external energy supply and price shocks.

4.2. Geopolitics: Fuelling the War

While the dependence on energy imports from Russia renders the EU vulnerable to supply shocks, Russia is also dependent on European demand. In particular, the capacity of the Russian state to create and spend roubles on military activities indirectly depends on continued fossil fuel imports. This is not a matter of sustainability of public finance narrowly conceived; what matters for the fiscal policy space of a semi-peripheral country is, first and foremost, its balance of payments [53]. Figure 5 suggests that the largest share

of Russia's constant current account surpluses over the period from 2000–2022 can be attributed to its fossil fuel exports [54].

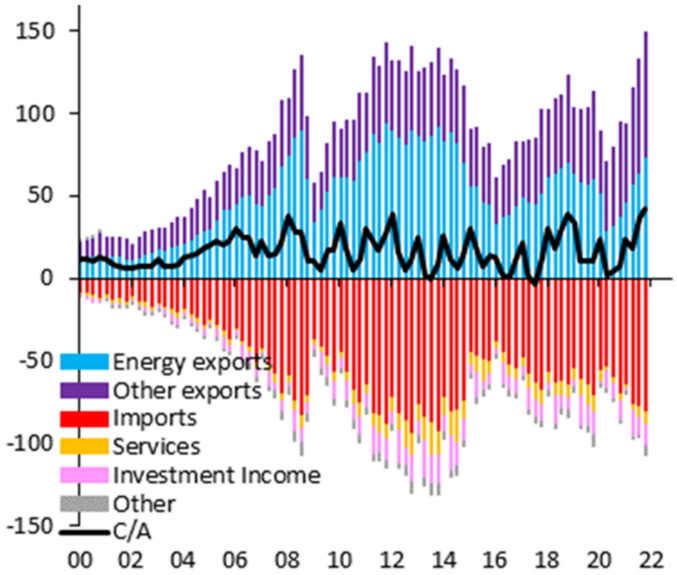

Figure 5. Composition of the Russian balance of payments (in USD billion) [54].

Oil and gas make up roughly 42% of Russian export volumes [55], and the EU accounts for 50% of those exports [56]. Furthermore, roughly 70% of exports from Russia to the EU are mineral products, with crude oil and refined petroleum accounting for roughly 55% and petroleum gas accounting for 10% [57]. Thus, it can be demonstrated that Russia's current account surplus is heavily financed by energy exports and, most importantly, by the energy imports of the EU that make up a large share of Russia's national income. Since the start of the war on February 24th, Russia has doubled its revenues from fossil fuels since it invaded Ukraine, approximately half of which come from the EU [51,58].

Continued exports of fossil fuels from Russia maintain the demand for its currency. This has stabilised the rouble's exchange rate despite massive sanctions, including on the Russian central bank, and thereby the Russian capacity to import goods necessary to make war. Only if both prices and quantity of fuels declined would the rouble crash. Combined with the current sanctions in place, this would make capital-intensive imports more expensive, and inflation would be imported, possibly threatening Russia's political economy and requiring deflationary adjustments. This would undermine both elite and popular consent (and what is left of a class compromise) on which the regime rests; a dangerous situation, especially with significant numbers of young male workers being armed. That is why the EU has indirectly financed the current war against Ukraine [59]. Only a decline in both international demand for fossil fuels and related prices would significantly hamper Russia's ability to sustain the war.

4.3. Climate: Fighting Fire with Fire

Three days after Russia's invasion, the Sixth Assessment Report of Working Group III of the Intergovernmental Panel on Climate Change (IPCC) was released. In the words of Svetilna Krakovska, the leader of the Ukrainian delegation of climate scientists to the IPCC, "almost half of the world's population is already experiencing the effects of climate change [. . .] we have one last chance to be climate resilient. But the window for action is getting narrower and narrower, and now with this war, it is closing". The report identifies 2030 as a crucial deadline. Before that year, the world must achieve a substantial reduction in emissions, and by 2050 zero net carbon emissions and a drastic decrease in all other greenhouse gases are required.

The EC's Fit for 55 package revises its target share of renewables in the energy mix for 2030 upwards from 32% (the goal set in 2019) to 40% [41]. However, unless radical changes occur in the upcoming years, it seems unlikely that the EU can achieve any of its targets by 2030. The current share of 17.4% renewables clearly represents a failure to comply with the ambitious energy packages ratified in 2009 that aimed at a share of 20% renewables by 2020. The numbers show a partial unwillingness to take climate change seriously over the last 20 years. The bilateral fossil fuel trade agreements that gave the EU core states privileged access to cheap fuels from Russia and other petrostates have played a key role in delaying the necessary transition to a more sustainable energy mix.

For the first time, the latest IPCC report explicitly mentions fossil fuels as the direct cause and economic growth as the structural driver of the climate crisis. Fossil fuels must be phased out as quickly as possible to limit the possibility of catastrophic climate collapse. Although the scientific community has established this fact for decades, the vast majority of countries have not only kept extracting and consuming fossil fuels. The war has, in fact, accelerated the extraction of fossil fuels. If the Russian state is stabilised by oil, gas and coal revenues, then, to destabilise the Russian war machine, these revenues should be cut. However, Western countries argue that it is not possible to meet the current level of energy consumption by replacing fossil fuels with renewables. As long as a change in the level of energy consumption is not part of the discussion, the only logical option then is to replace Russian fuels with fossil fuels from elsewhere.

This is precisely what the EU has been concentrating its efforts on. The REpowerEU program presented by the EC in March 2022 [60], which aims to reduce Europe's dependency on Russian gas, plans to spend EUR 195 billion to stop importing Russian fossil fuels by 2027, combining a faster rollout of renewable energy and energy savings with a switch to alternative gas suppliers and increased use of coal. Gas is supposed to be supplanted and partly replaced by hydrogen, at least partly from renewable sources. However, the goal for the share of renewable energy in the energy mix is set at 45% by 2030, which is just a 5% increase compared to the current target of the EU climate policy. Thus, the plan still envisions Europe as a massive importer of fossil fuels and focuses on identifying alternative countries that could become the basis for Europe's future supply of fossil fuels.

This approach is not conducive to stabilisation—neither of the geopolitical nor of the economic, let alone the climate crisis. The key reason is that it keeps up the overall demand for fossil fuels in the short run and locks Europe further into the fossil age, possibly for decades. This problem is aggravated as energy supplies cannot be increased in the short run without increasing emissions, while the rollout of renewables requires time (and consumes energy itself). Hence, the only way to increase supply quickly is to increase the extraction of fossil fuels.

Consequently, there are only two possibilities: either the supply of fossil fuels from West Asia, North America and elsewhere is increased, which might push down prices and thereby hurt Russia by rendering most of its reserves unprofitable to extract. However, this would imply rising emissions, which would be catastrophic for the climate. The second option is that supply does not rise but that some supply of oil and gas from West Asia and elsewhere is diverted towards Europe, and the former consumers of that gas and oil now buy from Russia. This would stabilise or even increase high fossil fuel prices, thereby benefitting Russia and other petrostates while stabilizing emissions at exorbitantly high levels. The construction of infrastructure, like pipelines and LNG terminals, would require large investments that could instead go into the transition away from fossil fuels. Ironically, the EU actually plans to fund the investments that are part of the RepowerEU program by selling more emission certificates [4].

5. Discussion

World systems analysis suggests an unequal distribution of both the economic gains and the geopolitical, economic and climatic vulnerabilities resulting from trade with Russia to the relative benefit of the EU core and the relative expense of the Eastern periphery. The

complex framework of domestic and external sources of vulnerability, together with the network of international and intersectoral connections that nowadays characterises the global value chain, make clear that the route for a peaceful resolution of the war should be complemented by rethinking the energy and industrial strategy of the EU. Leaving behind the reflections on diplomatic actions, we here focus on the specific actions related to the energy system.

5.1. The Need to Exit Fossil Fuels

Over the last 20 years, the EU has failed to implement policies effectively to secure its energy supply and transition to a zero-carbon economy, partly contributing to the continued existence of semi-peripheral petrostates, rendering itself vulnerable to ecological and environmental damage impacts, asymmetrically felt by the Eastern periphery.

While ecologically unequal exchange theory and world systems analysis focuses on the economic exploitation of the periphery, the core is also vulnerable to any disruption in the inflows of cheap energy. Importantly, the resulting vulnerability is not equally distributed between the EU's core and its internal periphery. Empirical evidence demonstrates that the EU is still largely dependent on fossil fuels in its energy mix, its import dependency remains significantly high, and the concentration of Russian fossil fuels is still large. Dependence on Russian gas is asymmetrically distributed and largely felt by the Eastern periphery, which is much more vulnerable to external energy supply shocks. Additionally, current and past energy payments have and are still financing the ongoing war in Ukraine by stabilizing both Russia's federal budget and its exchange rate.

The Eastern European periphery still bears the brunt of the geopolitical risk associated with a prolonged war or even possible further Russian expansions. It also suffers much more from the current rise in energy and food costs than the European core, which has far higher levels of GDP. Their access to energy has never been carefully secured with appropriate policies. Moreover, Eastern Europe has absorbed most of the Ukrainians who were forced to flee from their homes. More than ten million refugees have migrated to Poland, Hungary, Romania, Slovakia and Moldova (as of 20 September 2022) [61].

On a broader level, the war has been impeding any serious efforts at mitigating global heating. Dealing with the climate crisis and trying to solve it must, first of all, involve peace and cooperation. Instead, a return to global power blocs seems imminent. While NATO members are collaborating on sanctions and rearmament, precisely the sanctions imposed through the dollar system have already inspired closer collaboration between BRICS states (Brazil, Russia, India, China, South Africa) on ways to circumvent Western sanctions on the Russian payment system [62]. Notably, India and China have begun to use the Rupee, the Renminbi and the Rouble as units of account for bilateral trade with Russia, thereby undermining global dollar hegemony [63]. While a transition to a more multipolar economic world order may or may not be considered desirable from a critical perspective on world systems, effective climate policy is likely to be further delayed by the formation of a bloc of authoritarian Semi-peripheral states with stakes in increased fossil fuel combustion.

This aspect also highlights a good reason to move beyond a world system based on unequal flows of energy. Without drastically reducing the use of fossil fuels, vulnerabilities are likely to persist in all three dimensions: petrostates will be trapped in a precarious model of an extractive political economy and continue to seek ways to exploit windows of opportunity for stabilizing their precarious power base. Energy-importing countries will face high and volatile energy costs, which hurts poorer countries and poorer segments of their populations the most. Their policy space for actions that foster geopolitical stability will remain constrained by their fossil fuel dependence. Lastly, and most importantly, the continued combustion of fossil fuels escalates the breakdown of the planet's climatic systems and thereby begets even more economic and geopolitical instability.

5.2. The Need to Design Interconnected Policy Actions

The different strands of the analysis presented here all lead up to one clear and straightforward policy implication: reduce the consumption of fossil fuels swiftly instead of replacing Russian fuels with imports from elsewhere. This is the key to increasing geopolitical security and economic and social stability as well as, obviously, combatting climate change.

The imperative to reduce fossil fuel use can be achieved in three ways:

1. Replace fossil fuels with renewable energy;
2. Reduce overall energy demand;
3. Accelerate the research, development and deployment of innovative technologies
4. Introduce practices that help to achieve the first two goals favouring social inclusion and equal distribution of essential need satisfiers.

Massive acceleration of the rollout of solar and wind energy and heat pumps is an inevitable step to accelerate the swift phasing out of fossil fuels. According to [64], G-7 countries, including major European core states, could save more natural gas than they import from Russia by 2025. Major reduction opportunities are found in three sectors: industry, power generation and buildings up to 18%. However, since not all fossil fuels can be replaced by sustainable energies in the short run, it is also vital that overall energy demand is reduced. This is the key to bringing energy prices down as well as reaching climate targets [65]. One way to achieve this is a significant acceleration of existing energy conservation efforts, particularly by retrofitting and insulating buildings, and also through efficiency measures in the industry.

Increasing energy efficiency is an important part of the transition but rebound effects may limit the effectiveness of efficiency measures [66]. A framework aiming for energy sufficiency should take primacy. Governments should ensure that all households have access to the essential energy services while reducing the excess energy use of high-income households and industries that do not directly contribute to social or ecological objectives [67]. Soft, market-based forms of rationing, like controlling the price for a certain quantity of gas consumed per household, could be an effective and efficient instrument towards this end. In addition, scholarship in environmental psychology has developed a range of tools to promote sufficiency in consumption behaviour [68].

The key to sufficiency is the construction of sustainable public provisioning systems. Accessible public services would allow for an improved standard of living at a low throughput of energy. In addition to offering a range of sustainable public services, the state may have to take over the fossil fuel industry and energy companies to ensure a rapid transition from fossil fuels without significant disruption to essential energy provisions. Clearly, these measures stress the incapability of the capitalist system to achieve a just and effective transition to a different and sustainable mode of production. Most importantly, they indicate the need to move beyond the current neoliberal governance hegemony and seriously consider alternative governance models, such as polycentric democratic planning, as a helpful tool to achieve such a large-scale transition.

These measures will have to be accompanied by an accelerated development and deployment of technological and social innovations. Across sectors, there are massive opportunities to scale up technologies that increase energy efficiency and sufficiency, including the key sectors of agriculture and mobility. The re-orientation of the EU's approach to innovation policy towards mission-oriented innovation should be accelerated. Even if this implies drawing resources from and accelerating the Schumpeterian creative destruction of ecologically and socially less useful sectors [69]. Importantly, the core will have to share the technologies more freely with the peripheries and semi-peripheries of the world system, as their potential must be fully used to catch up with the escalating climate crisis [70].

The issue related to creating sufficient funds to finance such actions is critical. As many of the necessary measures are unlikely to be economically profitable, at least in the short term with the current market structure, the only way to implement them is to fund them

publicly. Several alternatives are available from the instruments of climate finance [71]. For example, the European Central Bank could buy government bonds to fund the necessary public investments for reducing the energy demand and increasing the supply of green technologies. In addition, the newly approved Social Climate Fund by the EU as part of the revision of the EU Emission Trading Scheme and the implementation of the Fit for 55 package might strongly redirect the investments toward a sustainable and just transition, reducing the distributive burden of rapid decarbonisation within citizens and among core and peripheral countries at least at the EU level [72]. Where increased public spending risks exacerbating inflation in the short term, policymakers can use a variety of fiscal and monetary policy measures to reduce private excess demand for non-essential activities in sustainable and equitable ways [73].

6. Conclusions

Through the lens of world systems analysis is clear that the global geopolitical economy of energy resources is still rooted in a core-periphery constellation of combined dependencies across key Western economies and semi-peripheral petrostates, with peripheral countries lagging behind in the catch-up of opportunities for sustainable and equal development pattern. The key tenet of this framework is that the industrial core of the world system extracts an economic surplus from the extractive periphery through the unequal exchange. The climate and energy security strategy adopted by the EU during the past decades was intended to escape from the dependency on heavy shares of carbon-intensive sources. However, the result of these policies has been a partial failure since the reduction in climate-related emissions has been obtained at the expense of an increased vulnerability to external shocks. The extreme concentration of natural gas imports from Russia, especially for the peripheral areas of the EU, recently revealed that the energy strategy should be updated with a radical rethinking of priorities and vulnerabilities.

The three actions—replacing fossil fuels with renewables, reducing energy demand, and sharing social and sustainable technologies globally—could run counter to ecologically unequal exchange and effectively contribute at breaking the principle of uneven and combined development. The EU should delink both from importing fossil fuels and from reaping the economic benefits of a specialisation in high-tech, high-energy modes of production.

This would flatten the hierarchy of ecologically unequal exchange within the world system, and thus possibly constitute a relative decline of European power vis-à-vis the periphery. However, the EU could simultaneously determine a new era of economic equality and geopolitical stability if it is ready to take concrete steps to reduce the vulnerabilities of the peripheral world, including its nearest Eastern partners, by drastically reducing its dependency on fossil fuels. Above all, the precondition for lasting peace and prosperity is to take the danger of climate collapse seriously and the principles of climate justice, putting into practice the complex policy instruments already available in the EU's renewed climate and energy strategy.

Author Contributions: Conceptualisation, V.C., V.M., C.O. and L.T.; methodology, V.M., C.O. and L.T.; investigation, V.M., C.O. and L.T.; data curation, V.M., C.O. and L.T.; writing—original draft preparation, V.M., C.O. and L.T.; writing—review and editing, V.C., V.M., C.O. and L.T.; supervision, V.C.; project administration, V.C.; funding acquisition, V.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Italian Ministry of University and Research (MIUR), Scientific Research Program of National Relevance PRIN 20177J2LS9_001 project "Innovation for global challenges in a connected world: the role of local resources and socioeconomic conditions", Roma Tre CUP F88D19002210001.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Comments, discussions and suggestions from several persons enriched the current development of the research.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Tooze, A. Is Escalation in Ukraine Part of the US Strategy? Available online: https://www.theguardian.com/commentisfree/2022/may/04/us-lend-lease-act-ukraine-1941-second-world-war (accessed on 12 September 2022).
2. Liboreiro, J.; Koutsokosta, E.; Murray, S. Hungary, Slovakia, Czechia and Bulgaria Resist EU Ban on Russian Oil. Available online: https://www.euronews.com/my-europe/2022/05/09/hungary-slovakia-czech-republic-and-bulgaria-still-resisting-eu-ban-on-russian-oil (accessed on 12 September 2022).
3. Bounds, A.; Dempsey, H.; Mount, I. Europe's Push to Plug Its Energy Gaps. Available online: https://www.ft.com/content/dd4aeffe-d243-49c7-9f4e-152ee54a4f26 (accessed on 12 September 2022).
4. Bounds, A.; Fleming, S. EU Prepares to Sell More Carbon Permits to Pay for Exit from Russian Gas. Financial Times. Available online: https://www.ft.com/content/be8d95cc-273a-43b8-b6ab-e9f95685ddc7 (accessed on 12 September 2022).
5. ACLED (Armed Conflict Location & Event Data Project). Mid-term Report on 10 Conflicts to Worry About in 2022. Available online: https://acleddata.com/10-conflicts-to-worry-about-in-2022/nigeria/ (accessed on 16 October 2022).
6. Arrighi, G. *The Long Twentieth Century: Money, Power, and the Origins of Our Times*; Verso Books: London, UK, 2010.
7. Emmanuel, A. *Unequal Exchange: A Study of the Imperialism of Trade*; Monthly Review Press: New York, NY, USA, 1972.
8. Hornborg, A. The unequal exchange of time and space: Toward a non-normative ecological theory of exploitation. *J. Ecol. Anthropol.* **2003**, *7*, 4–10. [CrossRef]
9. Wallerstein, I.M. *World-Systems Analysis: An Introduction*; Duke University Press: Durham, NC, USA, 2004.
10. Dragneva, R.; Wolczuk, K. Between Dependence and Integration: Ukraine's Relations with Russia. *Eur. Stud.* **2016**, *68*, 678–698. [CrossRef]
11. Moore, J. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*; Verso Books: New York, NY, USA, 2015.
12. Ciccantell, P.S. Ecologically Unequal Exchange and Raw Materialism: The Material Foundations of the Capitalist World-Economy. In *Ecologically Unequal Exchange*; Frey, R.S., Gellert, P.K., Dahms, H.F., Eds.; Palgrave Macmillan: Cham, Switzerland, 2019; pp. 49–73. [CrossRef]
13. Jorgenson, A.K. Environment, Development, and Ecologically Unequal Exchange. *Sustainability* **2016**, *8*, 227. [CrossRef]
14. Gellert, P.K.; Frey, R.S.; Dahms, H.F. Introduction to Ecologically Unequal Exchange in Comparative Perspective. *J. World-Syst. Res.* **2017**, *23*, 226–235. [CrossRef]
15. Hornborg, A. *Global Ecology and Unequal Exchange: Fetishism in a Zero-Sum World*; Routledge: Oxfordshire, UK, 2012.
16. Dorninger, C.; Hornborg, A.; Abson, D.J.; von Wehrden, H.; Schaffartzik, A.; Giljum, S.; Engler, J.-O.; Feller, R.L.; Hubacek, K.; Wieland, H. Global patterns of ecologically unequal exchange: Implications for sustainability in the 21st century. *Ecol. Econ.* **2020**, *179*, 106824. [CrossRef]
17. The Eora26 MRIO Input-Output Model Database. Available online: https://worldmrio.com/eora26/ (accessed on 12 September 2022).
18. Desai, R.; Freeman, A.; Kagarlitsky, B. The Conflict in Ukraine and Contemporary Imperialism. *Int. Crit. Thought* **2016**, *6*, 489–512. [CrossRef]
19. Ciplet, D.; Roberts, J.T. Splintering South: Ecologically Unequal Exchange Theory in a Fragmented Global Climate. *J. World-Syst. Res.* **2017**, *23*, 372–398. [CrossRef]
20. Hornborg, A.; Martinez-Alier, J. Ecologically unequal exchange and ecological debt. *J. Politi-Ecol.* **2016**, *23*, 328–333. [CrossRef]
21. Jorgenson, A. Unequal Ecological Exchange and Environmental Degradation: A Theoretical Proposition and Cross-National Study of Deforestation, 1990–2000. *Rural Sociol.* **2006**, *71*, 685–712. [CrossRef]
22. Taylor, T.G.; Tainter, J.A. The Nexus of Population, Energy, Innovation, and Complexity. *Am. J. Econ. Sociol.* **2016**, *75*, 1005–1043. [CrossRef]
23. IEA (International Energy Agency). Gas Trade Flows—Data Product. Available online: https://www.iea.org/data-and-statistics/data-product/gas-trade-flows (accessed on 12 September 2022).
24. Meynkhard, A. long-term prospects for the development energy complex of Russia. *Int. J. Energy Econ. Policy* **2020**, *10*, 224–232. [CrossRef]
25. Kormishkina, L.A.; Kormishkin, E.D.; Koloskov, D.A. Economic growth in modern Russia: Problems and prospects in the context of neo-industrial paradigm. *J. Appl. Econ. Sci.* **2016**, *11*, 1115–1119.
26. Dabrowski, M.; Collin, A.M. Russia's Growth Problem. Bruegel Policy Contribution Issue 4, February 2019. Available online: https://www.bruegel.org/policy-brief/russias-growth-problem (accessed on 12 September 2022).
27. Way, L.A.; Casey, A. The structural sources of postcommunist regime trajectories. *Post-Soviet Aff.* **2018**, *34*, 317–332. [CrossRef]
28. IEA (International Energy Agency). Key Energy Statistics. Country Profile: Ukraine. Available online: https://www.iea.org/countries/ukraine (accessed on 12 September 2022).
29. Hirschman, A. *National Power and the Structure of Foreign Trade*; University of California Press: Berkeley, CA, USA, 1980.
30. Tichý, L. *EU-Russia Energy Relations: A Discursive Approach*; Springer International Publishing: New York, NY, USA, 2019.

31. EC (European Commission). European Energy Security Strategy, COM (2014) 330 Final. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0330&from=EN (accessed on 18 October 2022).
32. Belyi, A. New dimensions of energy security of the enlarging eu and their impact on relations with Russia. *J. Eur. Integr.* **2003**, *25*, 351–369. [CrossRef]
33. Kustova, I. EU–Russia Energy Relations, EU Energy Integration, and Energy Security: The State of the Art and a Roadmap for Future Research. *J. Contemp. Eur. Res.* **2015**, *11*, 288–295. [CrossRef]
34. Esakova, N. *European Energy Security: Analysing the Eu-Russia Energy Security Regime in Terms of Interdependence Theory*; Springer Science & Business Media: Heidelberg, Germany, 2013.
35. Siddi, M. EU-Russia Energy Relations: From a Liberal to a Realist Paradigm? *Russ. Polit.* **2017**, *2*, 364–381. [CrossRef]
36. Stern, J. The Russian-Ukrainian Gas Crisis of January 2006. Available online: https://efaidnbmnnnibpcajpcglclefindmkaj/http://171.67.100.116/courses/2016/ph240/lee-m1/docs/stern-jan06.pdf (accessed on 12 September 2022).
37. Stern, J.; Pirani, S.; Yafimava, K. The Russo-Ukrainian gas dispute of January 2009: A Comprehensive Assessment. Available online: https://ora.ox.ac.uk/objects/uuid:3e2ad362-0bec-478a-89c1-3974c79363b5 (accessed on 12 September 2022).
38. Dellano-Paz, F.; Fernandez, P.M.; Soares, I. Addressing 2030 EU policy framework for energy and climate: Cost, risk and energy security issues. *Energy* **2016**, *115*, 1347–1360. [CrossRef]
39. EC (European Commission). Energy Union Package—Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy. COM (2015) 080 Final. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080 (accessed on 18 October 2022).
40. EC (European Commission). Communication from the Commission. The European Green Deal. COM(2019)640final, European Commission, Bruxelles. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN (accessed on 18 October 2022).
41. EC (European Commission). Communication from the Commission. Fit for 55: Delivering the EU's 2030 Climate Target on the way to climate neutrality. COM(2021)550final, European Commission, Bruxelles. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0550 (accessed on 18 October 2022).
42. The War in Ukraine Has Reshaped the World's Fuel Markets. Available online: https://www.economist.com/interactive/briefing/2022/09/24/war-in-ukraine-has-reshaped-worlds-fuel-markets (accessed on 25 September 2022).
43. Capellán-Pérez, I.; de Castro, C.; González, L.J.M. Dynamic Energy Return on Energy Investment (EROI) and material requirements in scenarios of global transition to renewable energies. *Energy Strat. Rev.* **2019**, *26*, 100399. [CrossRef]
44. Alina, S.; Wang, Z.; Artem, D.; Maxim, R.; Svetlana, R. Is the implementation of energy savings and EROI increasing policy really effective in Russian gas companies? The case of JSC "Gazprom". *Nat. Gas Ind. B* **2019**, *6*, 639–651. [CrossRef]
45. Steblyanskaya, A.; Bi, K.; Denisov, A.; Wang, Z.; Wang, Z.; Bragina, Z. Changes in sustainable growth dynamics: The case of China and Russia gas industries. *Energy Strategy Rev.* **2021**, *33*, 100586. [CrossRef]
46. Chebotareva, G.; Strielkowski, W.; Streimikiene, D. Risk assessment in renewable energy projects: A case of Russia. *J. Clean. Prod.* **2020**, *269*. [CrossRef]
47. Makarov, I.; Chen, H.; Paltsev, S. Impacts of climate change policies worldwide on the Russian economy. *Clim. Policy* **2020**, *20*, 1242–1256. [CrossRef]
48. Eurostat. EU Energy Mix and Import Dependency: Tables and Figures. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_energy_mix_and_import_dependency (accessed on 12 September 2022).
49. Pokharel, S.; Thompson, M. Russia Shuts off Gas Supplies to Poland and Bulgaria. Available online: https://www.cnn.com/2022/04/26/energy/poland-russia-gas/index.html (accessed on 12 September 2022).
50. Hancock, A.; Fleming, S. German €200bn Energy Support Plan Sparks 'Animosity' within EU. Available online: https://www.ft.com/content/f52b06b9-3932-44ca-b831-777cf68c3dc8 (accessed on 30 September 2022).
51. Dempsey, P. Global Energy Suffers Invasion Effects. *Eng. Technol.* **2022**, *17*, 20–23. [CrossRef]
52. Eckardt, L.-M. KNA Katholische Nachrichten-Agentur; ZEIT Online. Gas aus Russland: Cem Özdemir erwartet Lieferengpässe bei einzelnen Lebensmitteln. Die Zeit. Available online: https://www.zeit.de/politik/2022-05/cem-oezdemir-lieferengpaesse-preise-gas-russland?utm_referrer=https%3A%2F%2Fwww.ecosia.org%2F (accessed on 12 September 2022).
53. Alami, I.; Alves, C.; Bonizzi, B.; Kaltenbrunner, A.; Koddenbrock, K.; Kvangraven, I.; Powell, J. International financial subordination: A critical research agenda. *Rev. Int. Politi-Econ.* **2022**, 1–27. [CrossRef]
54. Brooks, R. A German Embargo on Russian Energy Would Obviously Hurt Germany, but It Would Hurt Russia Much More, Hindering Putin's Ability to Wage War. Available online: https://twitter.com/RobinBrooksIIF/status/1508009547708964865?s=20&t=YZwsI2sOVKwEeZMduk62jg (accessed on 12 September 2022).
55. OEC. What Does Russia Export? Available online: https://oec.world/en/visualize/tree_map/hs92/export/rus/all/show/2020/ (accessed on 12 September 2022).
56. OEC. Where Does RUSSIA Export Mineral Products to? Available online: https://oec.world/en/visualize/tree_map/hs92/export/rus/show/5/2020/ (accessed on 12 September 2022).
57. OEC. What Does Russia Export to the EU? Available online: https://oec.world/en/visualize/tree_map/hs92/export/rus/aut.bel.bgr.hrv.cze.dnk.est.fin.fra.deu.grc.hun.irl.ita.lva.ltu.lux.nld.pol.prt.rou.svk.svn.esp.swe/show/2020/ (accessed on 12 September 2022).

58. CREA (Centre for Research on Energy and Clean Air). The Russian Fossil Tracker. Available online: https://www.russiafossiltracker.com/ (accessed on 12 September 2022).
59. Brzoska, M. Is the West Funding the Russian War in Ukraine? Available online: https://www.visionofhumanity.org/is-the-west-funding-the-russian-war-in-ukraine/ (accessed on 12 September 2022).
60. EC (European Commission). REPowerEU Plan. COM(2022) 230 Final. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN (accessed on 18 October 2022).
61. UNHCR (United Nations Refugee Agency). Ukraine Refugee Situation. Available online: https://data.unhcr.org/en/situations/ukraine (accessed on 25 September 2022).
62. Mallapaty, S.; Padma, T.V.; Mega, E.R.; Van Noorden, R.; Masood, E. The countries maintaining research ties with Russia despite Ukraine. *Nature* **2022**, *604*, 227–228. [CrossRef]
63. Bhattacharjee, S. India-Russia Explore a Rupee-Rouble Payment Scheme to Bypass War. Available online: https://www.aljazeera.com/economy/2022/3/31/india-russia-explore-a-rupee-rouble-payment-scheme-to-bypass-war (accessed on 25 September 2022).
64. Polugodina, M.; Meissner, F.; Lettow, F.; Neuhoff, K.; Handrich, L. G7 Gas Reduction Plan. Available online: https://www.greenpeace.de/publikationen/S04021-greenpeace-studie-g7-gas-reduction-engl.pdf (accessed on 25 September 2022).
65. Tagliapetra, S.; Zachmann, G. The Only Quick-Fix to Europe's Energy Price Crisis Is Saving Energy. Bruegel Policy Brief. Available online: https://www.bruegel.org/2021/10/the-only-quick-fix-to-europes-energy-price-crisis-is-saving-energy/ (accessed on 12 September 2022).
66. Brockway, P.E.; Sorrell, S.; Semieniuk, G.; Heun, M.K.; Court, V. Energy efficiency and economy-wide rebound effects: A review of the evidence and its implications. *Renew. Sustain. Energy Rev.* **2021**, *141*, 110781. [CrossRef]
67. Becker, S.; Renn, O. Saving Energy Doesn't Have to Mean Social Imbalance—But We Will Need to Change Our Habits. Available online: https://www.iass-potsdam.de/en/blog/2022/03/saving-energy-doesnt-have-mean-social-imbalance-we-will-need-change-our-habits (accessed on 12 September 2022).
68. Freudenreich, B.; Schaltegger, S. Developing sufficiency-oriented offerings for clothing users: Business approaches to support consumption reduction. *J. Clean. Prod.* **2019**, *247*, 119589. [CrossRef]
69. Mazzucato, M. Mission-oriented innovation policies: Challenges and opportunities. *Ind. Corp. Chang.* **2018**, *27*, 803–815. [CrossRef]
70. Herman, K.S. Beyond the UNFCCC North-South divide: How newly industrializing countries collaborate to innovate in climate technologies. *J. Environ. Manag.* **2022**, *309*. [CrossRef]
71. Battiston, S.; Monasterolo, I.; Riahi, K.; van Ruijven, B.J. Accounting for finance is key for climate mitigation pathways. *Science* **2021**, *372*, 918–920. [CrossRef]
72. EC (European Commission). Proposal for a Regulation of the European Parliament and of the Council Establishing a Social Climate Fund. COM(2021) 568 Final. Available online: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0568 (accessed on 18 October 2022).
73. Olk, C.; Schneider, C.; Hickel, J. How to Pay for Saving the World: Modern Monetary Theory for a Degrowth Transition. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4172005 (accessed on 18 October 2022).