PhD Politics

The Effects of Renewable Essential Materials on Arms Transfers and Militarised Interstate Disputes

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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Abstract

The global energy system is experiencing a major transition due to the growing application of renewable technologies. However, such technologies require large quantities of natural resources to produce power. As such, demand for Renewable Essential Materials (REMs) has also increased. As prior research links natural resources to Militarised Interstate Disputes (MIDs), this thesis investigates the impact of REMs on interstate conflict processes. I argue that the increased exportation of REMs provides states with a source of revenue that leaders can use to buy more weapons. This increase in military capabilities provides states with a greater opportunity and willingness to launch an MID; increasing the likelihood that they will do so.

This theory is tested in three inter-related empirical chapters using panel data for states in sub-Saharan Africa between 1995 and 2014. In the first empirical chapter, I directly examine the arguments made. The results show that the increased exportation of REMs reduces the level of Major Conventional Weapons (MCWs) that states import. Moreover, REMs do not impact the likelihood that states will initiate an MID.

I then investigate whether the observed results vary between different regimes. I argue that the hypothesised effect only occurs in personalist and non-personalist autocracies as REMs provide economic incentives to refrain from purchasing more weapons. As the survival of autocratic regimes is dependent upon a strong military, leaders have the required motivations to overrule such financial incentives. The results show that my original findings hold for all regimes.

Finally, I examine whether the effect of REMs varies for the transfer of MCWs and Small Arms and Light Weapons (SALWs). MCWs are expensive and possibly unaffordable with REM-based revenue. SALWs by contrast are more affordable. The results show that the increased exportation of REMs has no effect upon the transfer of SALWs for all regimes.

Acknowledgements

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Abbreviations

COW	Correlates of War Project
MCW	Major Conventional Weapon
MID	Militarised Interstate Dispute
NISAT	Norwegian Initiative on Small Arms Transfers
OEC	Observatory of Economic Complexity
PMSG	Permanent Magnet Synchronous Generator
REE	Rare Earth Element
REM	Renewable Essential Material
SALW	Small Arms and Light Weapon
SIPRI	Stockholm International Peace Research Institute
TIV	Trend Indicator Value
WDI	World Development Indicator

Chapter 1

Introduction

The global energy industry is currently experiencing a major transition in production methods. The size of the renewable energy market has soared in recent decades with the total volume of power produced by such means increasing by 178% between 1973 and 2019 [International Energy Agency, 2021a]. At the same time, the importance of fossil fuels has declined with oil's share of the world's annual energy supply falling by more than 15%. This shift has largely been the result of a global commitment to fight climate change and reach net-zero carbon emission targets.

However, in comparison to fossil fuels, renewables are an extremely mineral intensive way to generate power, as shown by Figure 1.1. Typically, they make use of sophisticated technologies, such as turbines and solar cells, that require a large volume of materials to manufacture. An offshore wind-farm, for example, needs more than 15,000 kg of natural resources per mega-watt of installed capacity [International Energy Agency, 2021b]. This includes almost 8,000 kg of copper and 5,000 kg of zinc.

I refer to the resources required to manufacture the clean energy technologies as Renewable Essential Materials (REMs). Historically, the global energy market has provided very little demand for these resources. This has been due to fossil fuels' dominance of the industry and the fact that they require very few

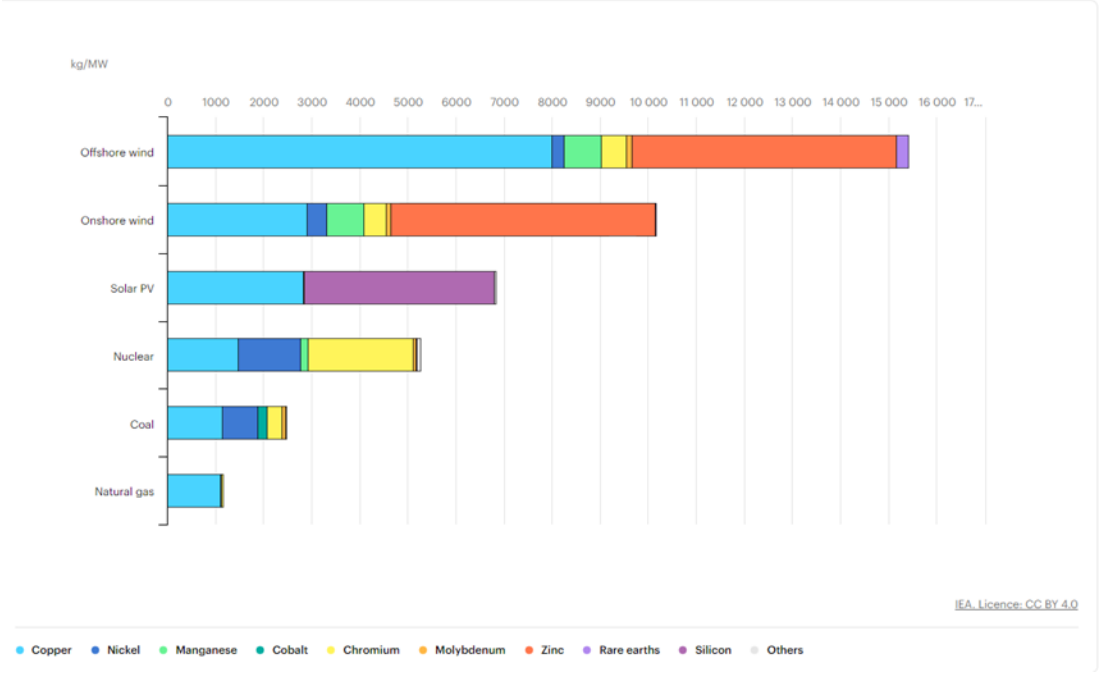

Figure 1.1: The materials used in renewable energy technologies compared to other sources of power generation [International Energy Agency, 2021b].

materials to produce power. However, the increased deployment of clean energy technologies has meant that renewables now represent the fastest growing area of REM demand [International Energy Agency, 2021b]. This likely contributed to the significant rise in their exportation levels which occurred in the last several decades. For example, between 1995 and 2022, exports of copper ore increased by more than 1,240% [OEC World, 2024].

Extensive international relations literature has examined how natural resources impact interstate conflict processes [Acemoglu et al., 2012, Homer-Dixon, 1991, 1994, Westing, 1986, Wolf, 2007, Wolf et al., 2003]. In particular, scholars have shown that oil increases the propensity for which states initiate interstate disputes by enabling an increase in their capacity to fight and win such conflicts [Colgan, 2010, 2013, Strüver and Wegenast, 2018]. Given the growing value and importance of REMs, it is therefore reasonable to consider whether such resources may have a similar effect. This is especially so, given that REMs share numerous similarities with oil. For example, both are non-renewable natural resources that are important to the energy industry, are unevenly distributed throughout

the Earth's crust, are extremely valuable, and are easily exportable. Nevertheless, despite these similarities, scholars have largely refrained from discussing how REMs influence international security.

Whilst the renewable transition is still in its relative infancy, and by extension so too is the resource-related research, this lack of investigation can be considered a significant oversight given the newfound importance of REMs. In this thesis, I seek to take the first steps in correcting this oversight by providing an answer to the question: *What effect do REMs have upon interstate conflict processes?*

To address this question, I investigate the impact that REMs have upon the likelihood that a state will initiate a Militarised Interstate Dispute (MID). More specifically however, I investigate whether the increased exportation of REMs enables states to increase the number of weapons they purchase, and whether this rise in their capacity to wage war increases the likelihood that they will launch an international attack. This mechanism is theorised to have facilitated oil's relationship with interstate conflict processes [Colgan, 2010, 2013, Strüver and Wegenast, 2018]. Given the similarities between oil and REMs therefore, it is worthy of investigative focus.

However, in this thesis I also examine whether the relationship between REMs, arms transfers, and MIDs is influenced by a state's regime type. Research indicates that different state structures create varied incentives related to military spending and the procurement of arms [Conrad and Souva, 2020]. Thus, I examine whether the effect of REMs changes depending upon such incentives.

1.1 REM-Backed Aggression

In response to the research question posed by this thesis, I develop and test an original theory based upon the idea of *REM-backed aggression*. Simply, I argue that the increased exportation of REMs effects interstate conflict processes by increasing the likelihood that states will initiate an MID. This relationship can be

separated into two main hypotheses. First, a rise in REM exportation gives way to an increase in the level of weapons that states import. Such material exports provide states with a significant source of revenue via two main streams of income: state-based exports and royalty payments from private mining companies. As both sources of revenue are considered to be outside the regular taxation system, leaders have more freedom to use the money for policies which the general public would otherwise not support. Amongst such policies is the increased importation of foreign arms. As such, I hypothesise that leaders capitalise upon this increased opportunity to develop their military strength, thus leading to a rise in arms imports when REM exportation increases.

Second, the REM-induced increase in arms imports subsequently increases the opportunity and willingness that states have to launch an MID. By importing more arms, states naturally see a rise in their military capabilities and their capacity to fight. This outcome raises the odds that they will win any conflict they are involved in as they have more chance of overwhelming the opposition by force. Thus, initiating a conflict becomes both a more realistic foreign policy option for states and a more appealing one. By enabling an increase in the number of weapons that states import, the increased exportation of REMs makes it more likely that they will initiate an MID.

1.2 Research Design

To investigate the relationship between REMs, arms transfers, and MID initiation, I conduct three inter-related empirical analysis. This thesis can therefore be viewed as a single empirical investigation with each new chapter building upon the findings of the last. Such an approach allows for a more thorough and accurate analysis of the arguments made; thus, enabling more incisive conclusions to be drawn. Additionally, as discussions of REMs within international security literature are few and far between, such an in-depth examination may help establish a solid foundation for which future work can build.

In the initial empirical analysis, I directly examine my theory of REM-backed aggression. This is then followed by an investigation of the impact that regime type has upon this relationship. Finally, I examine whether the observed effect of REMs upon arms transfers applies to different weapons categories.

For this thesis, an original panel data set is constructed, consisting of 960 state-year observations. Such observations are based upon the 48 states located in sub-Saharan Africa between 1995 and 2014.[1] The parameters of this time frame are dictated by the availability of data.

For an analysis focused upon examining the effects of REM exportation, such an investigative time frame is far from ideal. Since the last point of observation – 2014 – the REM industry has grown considerably in both importance and value. Following the implementation of the Paris Agreement in 2015, and the subsequent increase in renewable energy production, the annual value of the REM export market has increased by more than $150 billion [International Energy Agency, 2021a, OEC World, 2024]. However, due to data availability, such a crucial period of growth and expansion is not included here. As such, it could be argued that this thesis fails to capture the current and accurate effect of REMs.

Nevertheless, I believe that it can still offer a clear indication as to the real relationship. The transition may have accelerated post 2014, but it kick-started in the mid-1990s when a global effort was made to recognise the threat that climate change poses [UNFCC, 2023]. As such, REMs had already grown in importance by 2014. This thesis therefore examines the effect of REMs during the initial stages of the transition. Any findings offer an indication of the overall effect as it can be argued that the relationship's trajectory was set during this period. Thus, this thesis offers valuable insight, regardless of data limitations.

[1] Sub-Saharan African states are in accordance with those identified by the World Bank. A full list of included states can be found in Appendix A.

1.2.1 A Focus on Sub-Saharan Africa

As indicated previously, this thesis focuses specifically upon sub-Saharan African states. There are various reasons for this decision. First, sub-Saharan Africa is a resource rich region which has been at the centre of a REM-mining boom for several years. It is thought to be home to roughly 30% of the world's critical materials, including 50% of known manganese and chromium reserves [IMF, 2024].

Following the global increase in REM demand, sub-Saharan African states experienced much investment in their mining industries as both private and state-based actors sought to exploit the regions vast reserves. China has taken a particularly keen interest, investing more than $36 billion in projects since 2006 [Cohen, 2021]. This global investment has also been reflected in the number of REM mines which have opened. Since 1995, more than 100 facilities have become operational [World Bank, 2023]. As shown by Figure 1.2 this has lead to a major rise in the annual level of REMs exported from the region whilst the number of exporters has more than doubled [OEC World, 2024].[2]

The region is also likely to maintain its position at the heart of the mining expansion. According to some reports, REMs are expected to provide roughly $2 trillion to regional exporters within the next 25 years [IMF, 2024]. Therefore, given its current and predicted position within the REM-market, sub-Saharan Africa is a clear choice for investigative focus.

Second, the region is considered to be one of the world's most conflict-affected areas [International Institute for Strategic Studies, 2023]. Whilst most of said conflicts are categorised as internal, interstate disputes are also widespread. Since 1995, more than 18% of recorded MIDs have involved at least one sub-Saharan state [Palmer et al., 2020]. Furthermore, since the renewable transition kick-started in the mid 1990s, the region's average annual rate of MIDs increased by 2.3 disputes. This rise in conflict onset is greater than that of the global average which only saw an increase of 1.8 MIDs per year, as indicated by Table 1.2. Thus,

[2]Table 1.1 presents the ten largest exporters of REMs in sub-Saharan Africa.

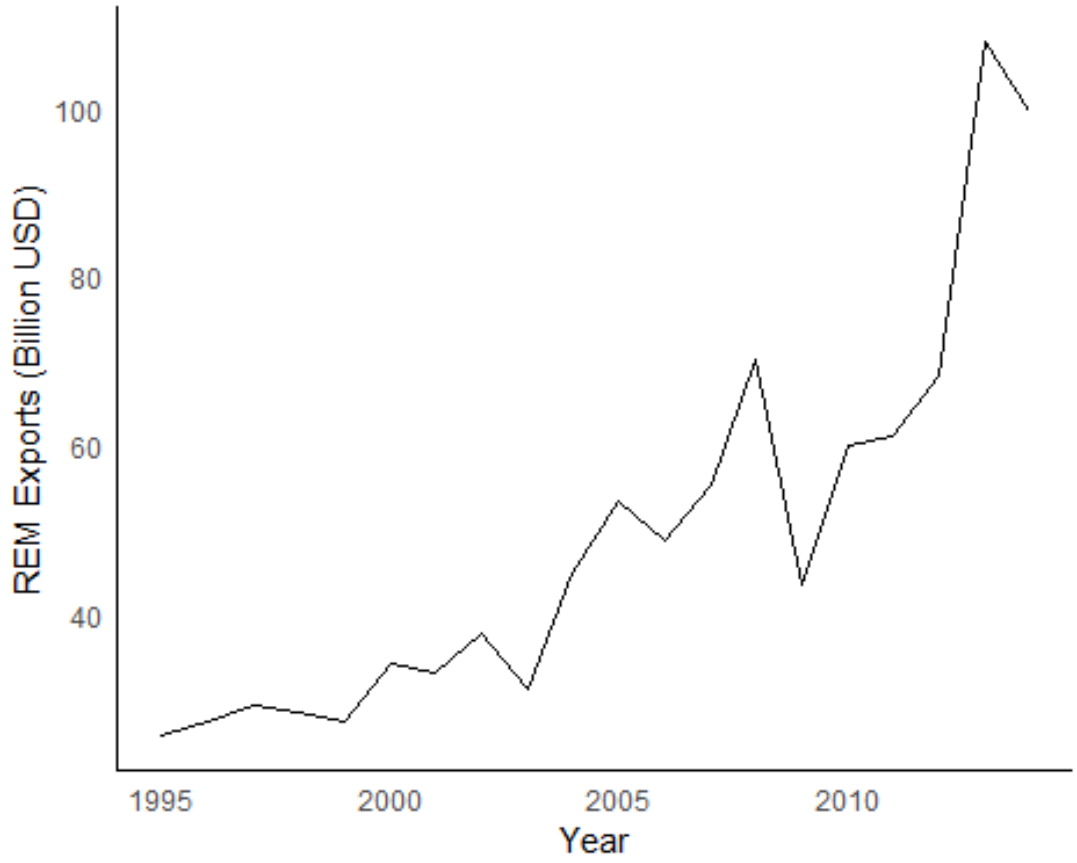

Figure 1.2: The annual level of REMs exported from sub-Saharan Africa (Billion USD), 1995-2014.

not only has the region witnessed an increase in REM mining and exportation, but it has also witnessed an increase in conflict onset. This helps to highlight sub-Saharan Africa as a potential hotspot for REM-related MIDs, further justifying the decision to specify upon the region.

Third, sub-Saharan Africa offers a great opportunity for empirical comparability. Significant variation exists between the states on a range of important factors, such as oil exports.[3] Given that many of these variables have been shown to influence the propensity for which states initiate an MID, focusing upon a region with appropriate variation improves both the reliability and robustness of

[3]In 2014, Nigeria exported more than $74 billion worth of oil. This was almost 30 times more than that of Cameroon [OEC World, 2024].

my empirical examination.

Table 1.1: The ten largest exporters of REMs in sub-Saharan Africa and the associated value of their exports in USD, 1995 and 2014 [OEC World, 2024].

1995		2014	
South Africa	$953 million	South Africa	$8,130 million
Guinea	$342 million	Mauritania	$2,120 million
Mauritania	$253 million	Sierra Leone	$1,430 million
Gabon	$160 million	Democratic Republic of Congo	$1,260 million
Ghana	$30 million	Guinea	$838 million
Madagascar	$13 million	Gabon	$627 million
Sudan	$6 million	Eritrea	$507 million
Sierra Leone	$3 million	Namibia	$444 million
Liberia	$2 million	Liberia	$345 million
Mozambique	$0.6 million	Tanzania	$308 million

Table 1.2: The average annual onset of MIDs, 1975 - 1994 and 1995 - 2014 [Palmer et al., 2020].

	1975 - 1994	1995 - 2014	Change
Sub-Saharan Africa	10.4	12.7	2.3
World	67.3	69.1	1.8

1.3 Key Findings and Implications

The results of this thesis show that an increase in the exportation of REMs is associated with a *decrease* in the level of Major Conventional Weapons (MCWs) that states import. By extension, as there is no rise in a state's military capacity to fight and win an interstate dispute, there is no increase in the opportunity and willingness of leaders to initiate an MID. Thus, the increased exportation of REMs has no effect upon the likelihood that states will launch an international

attack. These results hold regardless of regime type. However, the reducing effect that REMs have upon the number of weapons that states import only applies to MCWs. An increase in their exportation has no effect upon the level of Small Arms and Light Weapons (SALWs) that states purchase.

These findings have numerous important implications. First, as the renewable transition progresses, the international system may become more peaceful. The continuation of the transition will further increase the importance of REMs, and their demand. As this thesis finds that the increased exportation of REMs leads to a reduction in the level of MCWs that states import, then as the exportation levels increase in the coming years, there may be a significant reduction in the global transfer of arms. By extension, states will have less capacity to use violence as a means of achieving their foreign policy objectives.

Additionally, as this thesis also finds no evidence to suggest that the exportation of REMs has any effect upon the likelihood that states will initiate an MID, it is possible that there will be a reduction in resource-related conflicts. As oil's influence continues to decline, there may also be a drop in petro-related disputes. As REMs do not share oil's ability to spark MIDs, there will subsequently be one less trigger for international conflict.

Second, from an academic perspective, this investigation has helped to further the understanding of how natural resources influence interstate conflict processes. By establishing that REMs do not effect the likelihood that states will initiate an interstate dispute, I show that differences exist between non-renewable natural resources in this regard. Therefore, this thesis helps to highlight that the effect observed for oil is unique. As such, it helps to move the needle of understanding.

1.4 Thesis Structure

This thesis is organised as follows. Chapter 2 provides background information on REMs and outlines the literature which discusses their role within international

security. Specifically, it discusses in more detail what REMs are and how their importance to the energy industry has grown. It then highlights the literature that discusses the relationship between natural resources and interstate conflict processes. Discussed first is the extensive research that has analysed oil's effect on interstate conflict. This helps to highlight the origin of the theoretical assumptions made in the REM-related research. The limited scholarly work that has referred to the effect of REMs is then analysed. Finally, I draw linkages between the REM and oil literature, demonstrating an important gap in investigation. This subsequently allows for the formulation of my central argument.[4]

Chapter 3 presents the central argument. So as to make the general point easier to follow, it is broken down into two smaller theoretical sections. Firstly, I present the argument that a rise in REM exportation gives way to an increase in the level of arms that states import. I then outline my theory that this REM-induced increase in military capabilities leads to a rise in both the opportunity and willingness of states to initiate an MID; thus, making it more likely that they will do so. In a further section, I address the theoretical influences for my central argument and highlight some of the differences that exist. This chapter then concludes with a discussion of some possible theoretical alternatives and a brief summary.

In Chapter 4, the central argument – and the associated hypotheses – are tested. First, details of the data set and methodological approach are outlined. In this chapter, I conduct two separate empirical analysis, each examining a different step in my theoretical pathway. I initially investigate the effect of REM exports on arms transfers using a series of generalised linear regression models. I then examine the effect of such exports on the likelihood that states will initiate an MID using a binomial logistic regression analysis. The results of these analyses are then presented and discussed. The findings indicate that, in opposition to that which was hypothesised, an increase in REM exportation is associated with

[4]Whilst this chapter provides background to the main literature that has discusses the role of REMs, subsequent chapters refer to additional research. Literature is therefore reviewed and discussed throughout this thesis, rather than in a single chapter.

a reduction in the level of MCWs that states import. More importantly however, a rise in REM exports has no statistical effect upon the likelihood that a state will initiate an MID.

Chapter 5 further investigates my central argument. The prior findings suggest that REMs provide economic incentives to states not to use the revenue to buy more arms. These incentives are successful, leading to a decrease in the number of weapons that states purchase. However, I argue that regime structure creates varied incentives to pursue a policy of increased arms procurement and that in some regimes, these motivations outweigh the economic incentives that REMs provide. I therefore hypothesise that the central argument of this thesis only applies to personalist and non-personalist autocracies. I believe this to be the case as their regime's survival is directly influenced by the strength of their military capabilities. I do not believe the same to be true for democracies as their leader's political endurance is determined by public satisfaction rather than military strength.[5] This argument is tested using the same data set and empirical strategy as Chapter 4. However, an interaction between regime type and REM exportation is also included. After establishing the empirical approach, the results are presented and discussed. Once more however, they do not support the arguments made. The effect of increased REM exportation does not vary between the different types of regimes. This is true for both arms transfers and MID initiation.

As a final investigation, Chapter 6 examines the direct relationship between REM exports and the transfer of SALWs. The purpose of this chapter is to probe the possibility that the previous results are a consequence of REMs' restricted capability to finance the purchase of more weapons. In the prior analyses, MCWs are used as the measure of arms transfers. However, such weapons are expensive and whilst REMs can provide a large revenue stream for states, it is possible that it is not large enough to enable an observable increase in MCW transfers. Nev-

[5]I expect personalist autocracies to import more arms than Non-personalist autocracies as their survival is more dependent upon a strong military capacity. I also expect that they will be more likely to initiate an MID.

ertheless, I argue here that as SALWs are considerably cheaper than MCWs, the increased exportation of REMs permits states to purchase more of these weapons. Therefore, the logic of the first step in my main theoretical pathway is examined here. Once more, after this argument is presented, I highlight the empirical strategy used to test it. For this chapter, I maintain the interaction between REMs and regime type but naturally change the measure of arms transfers to SALWs. The findings of the empirical analysis are then outlined and discussed. In contrast to my hypotheses, an increase in REM exportation has no effect upon the level of SALWs that states import. This result holds for all specified regimes.

Chapter 7 then concludes this thesis with a summary of the key empirical findings. It also presents a discussion of the associated implications for both international relations and academia. I then highlight the limitations of this paper and offer some suggestions for future research.

Chapter 2

Background Literature

2.1 Introduction

Despite growing in importance, international security literature largely refrains from discussing the role that REMs may play in interstate conflict processes. The literature that does so borrows a contested argument from oil/conflict research to suggest that in the future, states may engage in violent disputes to secure access to certain types of REMs. However, upon further investigation this argument is both theoretically flawed and unsubstantiated by the evidence.

In this chapter, I review this literature. However, I first provide additional information regarding what REMs are and how their importance has grown. This helps to provide context to the research that examines the effect of REMs. Additionally, as the theoretical assumptions made in the REM literature mirror those from oil/conflict research, I also review the extensive scholarly work on this topic. This chapter concludes with a comparison of the two resource-related areas of research, demonstrating the gap in the literature that this thesis fills.

2.2 Renewable Essential Materials

Before reviewing the literature that discusses the effects of REMs, providing further information on what resources are categorised as such and their growing

importance to the energy industry is an important first step. Whilst much literature has given consideration to the material requirements of renewable energy, I only include those established by Hund et al. [2020] in my categorisation of REMs. This research provides the most complete and comprehensive breakdown of the required resources for each form of renewable energy. For the most part, the resources specified as essential are also in line with those discussed in other reputable reports [Carrara et al., 2020, International Energy Agency, 2021b]. Table 2.1 presents the materials that Hund et al. [2020] identify as REMs and the associated technologies that they are used in.

Table 2.1: Renewable Essential Materials and their associated technologies.

Materials	Wind	Solar Photovoltaic
Aluminium (Al)	**X**	**X**
Chromium (Cr)	**X**	
Copper (Cu)	**X**	**X**
Indium (In)		**X**
Iron (Fe)	**X**	
Lead (Pb)	**X**	**X**
Manganese (Mg)	**X**	
Molybdenum (Mo)	**X**	**X**
Neodymium (Nd)	**X**	
Dysprosium (Dy)	**X**	
Nickel (Ni)	**X**	**X**
Silver (Ag)		**X**
Zinc (Zi)	**X**	**X**

It is important to note that I only consider the materials that are used in wind and solar power as REMs. I do not consider the materials required to generate hydropower as such because it is not expected to significantly contribute to the renewable transition in the coming years [Edenhofer et al., 2011]. Therefore, if hydropower is not essential to the transition, there is unlikely to be an increase in

the demand and importance of its required resources. Thus, they do not warrant inclusion in this investigation.

The increased integration of renewables into the global energy system has resulted in a spike in demand for REMs. Since the transition kick-started in the mid-1990s, total REM exportation levels have increased by more than 1,100% [OEC World, 2024]. Whilst there are some alternative suggestions, there is a consensus within the literature that this trend will continue as the transition progresses [Carrara et al., 2020, Hund et al., 2020, International Energy Agency, 2021b, 2022a]. Nickel requirements are expected to double by 2050, for example, whilst copper will see an estimated rise in demand of 34% [Calvo and Valero, 2022]. In scenarios where the world continues to transition at its current rate, demand for wind-related REMs could increase by roughly 150 million tons [Hund et al., 2020]. If the decarbonisation process is fast tracked however, it could increase by as much as 450 million tons.

Naturally, numerous states have sought to capitalise upon this increased demand for REMs. Since 1995, the number of exporting nations increased by almost 30%, as indicated by Figure 2.1 and Figure 2.2. Investment in material exploration has also increased; for example, an estimated $9 billion was spent on copper initiatives between 2017 and 2021 alone [International Energy Agency, 2022b]. It is therefore likely that in the near future, both exportation levels and the number of exporting states will rise further. Moreover, it is likely that the importance of these resource to both the global energy system and international relations will also increase.

2.3 Natural Resources and Interstate Conflict

Having now fully established what REMs are and why they are important, this chapter moves on to review the literature that discusses their effect on interstate conflict processes. However, as the arguments made in this research are similar to those from literature regarding the effect of other natural resources, it is prudent

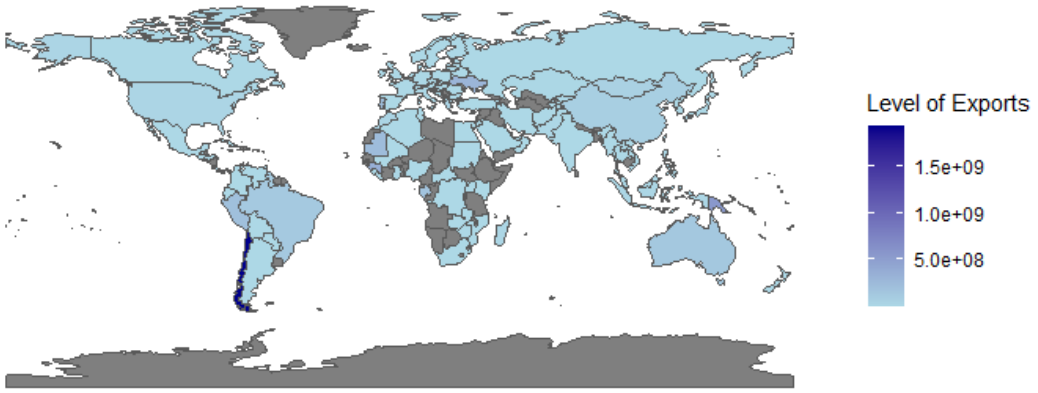

Figure 2.1: REM exporting states in 1995 and the associated value of exports in USD [OEC World, 2024].

Note: States coloured grey indicate that no REMs were exported.

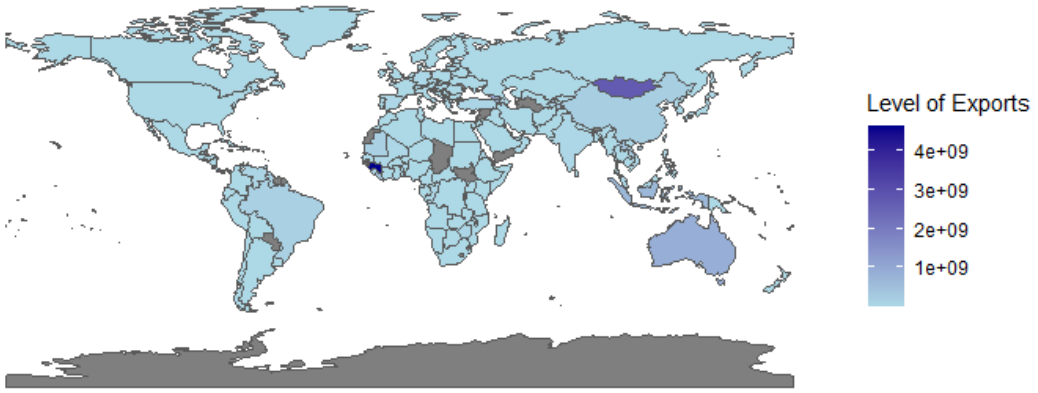

Figure 2.2: REM exporting states in 2022 and the associated value of exports in USD [OEC World, 2024].

Note: States coloured grey indicate that no REMs were exported.

to discuss this scholarly work beforehand. As such, I first review the extensive research regarding the effect of oil on interstate disputes.

2.3.1 Oil and Interstate Conflict

Oil has long been at the heart of international security, playing an essential role in numerous interstate disputes. The 1990 Iraqi invasion of Kuwait, for example, was thought to be partly due to the former's belief that the latter was stealing their petroleum reserves [Colgan, 2010]. Similarly, the Chaco War was considered a consequence of Paraguay's occupation of Bolivian territory that was believed to hold significant oil reserves [Westing, 1986].

Naturally, given oil's role in in such conflicts, and owing to its energy and economic importance, much scholarly work has focused upon oil's relationship with MIDs. Such research has provided strong empirical evidence indicating that oil has a conflict inducing effect for states [Hendrix, 2017, Strüver and Wegenast, 2018]. In particular, petrostates – those in which at least 10% of their GDP comes from oil exports – were shown to engage in MIDs at a rate of almost 60% higher than comparable non-petrostates [Colgan, 2013].

Following the understanding that oil increases the rate at which states are involved in MIDs, a debate has taken place within international security literature as to what explains this relationship. The literature can be split into two main theoretical camps: *resource competition* and *resource-backed aggression*.

The resource competition theory – first made prominent in the late 1980s – proposed that the overall effect of oil is the result of actors seeking to secure access via the use of violence [Hermsmeyer, 2002, Homer-Dixon, 1994, Klare, 2002, 2008, 2012, Westing, 1986]. Whilst oil is an essential commodity for states, it is also a finite resource that has witnessed a significant increase in demand, despite its share of globally produced power declining [International Energy Agency, 2021a]. States are therefore seeking to secure access to oil from an ever-shrinking pool of reserves. At the same time, they face rising levels of competition for access. It is this threat of restricted access that scholars argue leads to oil's relationship

with conflict as states opt for violence as a means of securing their own supply [Klare, 2002]. Thus, scholars argue that the observation that oil-rich states are particularly conflict prone is driven by MIDs in which they are targeted for their resources.

However, whilst conflicts in which oil abundant nations are attacked do occur, especially when reserves are located vis-à-vis a bilateral border [Caselli et al., 2015], the argument that they are more likely to be targeted is not supported by empirical evidence. Further research found that oil-rich states are no more likely to be the target of an MID, than non-oil wealthy nations [De Soysa et al., 2009a]. This may be the case as the use of violence against another state is an illogical strategy for resource acquisition, owing to the hidden costs that accompany a successful campaign [Meierding, 2016]. MIDs, for example, often result in significant damage to oil production facilities and infrastructure. This was evident during the Iraqi invasion of Kuwait in which hundreds of oil wells were destroyed [Westing, 2013]. Thus, even if a state is successful in their military efforts to acquire oil, they are left with the high costs of repairing the damage caused by the conflict.

Furthermore, states are often dependent upon private organisations to aid with oil related financing and production. However, such actors are thought to be reluctant to cooperate with conflict prone states, especially over resources located in disputed territories [Meierding, 2016]. Therefore, states have numerous difficulties in accessing their spoils of war. These associated difficulties are also perhaps so great that they outweigh any potential benefit that may come from a violent pursuit of oil; thus, explaining the lack of empirical support for the resource competition argument.

In response to the perceived inaccuracies of this theory, further research hypothesises that the relationship between oil and interstate conflict is the result of resource-backed aggression. This argument notes that rather than making states an attractive target for conquest, oil actually enables those who possess it to act aggressively [Colgan, 2010, 2013, Strüver and Wegenast, 2018].

Owing to the nationalised nature of the oil industry – in which roughly 75% of production is state owned [Mahdavi, 2020] – proponents of this theory argue that oil can be converted into a source of state-based revenue via it's exportation [Colgan, 2010]. Leaders can then use this money to increase their military capabilities by purchasing more foreign weapons [Strüver and Wegenast, 2018]. Subsequently, this increase in military capabilities makes it more likely that states will be successful in an MID. It also makes leaders more confident of achieving their foreign policy goals via the use of force. Thus, violence is a more appealing foreign policy for oil rich states, leading to an increased propensity for interstate aggression.

Similarly, oil revenue can be used by leaders to buy off domestic political support [Colgan, 2013]. This subsequently results in an increase in the leader's political autonomy, making it less likely that they will be removed from power for pursuing otherwise unpopular policies. As such, oil creates a confidence in leaders that they will maintain their position, even if they engage in an MID. Thus, one potential barrier that may prevent states from launching an international attack can be removed with the help of oil.

Empirical evidence supports this idea. The increased exportation of oil is shown to increase the likelihood that states will initiate an MID [Strüver and Wegenast, 2018]. Furthermore, statistical results from Colgan [2010] indicate that the likelihood that petrostates will attack another nation is greater than the likelihood that they themselves will be attacked, as shown in Table 2.2.

Table 2.2: The annual average number of Aggressor-MIDs and Defender-MIDs for petrostates, 1945 - 2001 [Colgan, 2010].

	Aggressor-MID Onset	Defender-MID Onset
Petrostates	0.350	0.338

However, some scholars also argue that oil alone does not explain the propensity for which resource rich states initiate MIDs. In addition to providing opportunities for interstate aggression, oil also creates economic incentives to avoid

such actions [Colgan, 2010]. The relationship between oil and MID initiation is therefore considered to be driven by states that possess the necessary conditions to disregard such incentives [Colgan, 2013].

States with revolutionary governments are identified as one such condition [Colgan, 2010]. To be successful, revolutions tend to require both violence and risk taking. The increased political autonomy and military capabilities that oil provides is theorised to amplify such qualities, making it more likely that leaders will disregard the incentives to refrain from conflict initiation. Thus, such leaders are more likely to launch an MID. This assumption is seemingly supported by the empirical evidence as revolutionary petrostates are more likely to start an MID than comparable non-revolutionary petrostates [Colgan, 2013].

However, other scholars argue that the relationship between oil and revolutionary governments is driven by a few conflict prone nations. In particular, Iran, Iraq, and Libya are considered to make up 90% of disputes initiated by revolutionary petrostates [Antony and Thompson, 2023]. This subsequently raises questions about the role that revolutionary governments play in oil's relationship with MIDs. Nevertheless, whilst the idea of revolutionary petrostates may be questionable, it does not mean that the theory of resource-backed aggression is entirely inaccurate. The empirical support for the general relationship still stands; oil increases the likelihood that states will attack other nations and resource-rich states attack others more than they are attacked.

In sum, oil has been observed to increase the propensity for which states engage in MIDs. Whilst some conflicts are the result of resource competitions, the general relationship is not explained by such disputes. Instead, it is more likely driven by the aggression of oil-rich states. As such, the literature has established the possibility that non-renewable natural resources can impact interstate conflict processes by encouraging MID initiation.

2.3.2 REMs and Interstate Conflict

Whilst much literature has investigated the effects of oil, the role of REMs has been greatly understudied. However, the limited literature that does discuss this potential relationship predominantly considers the possibility that a wealth of such resources has a conflict inducing effect.

Although many states have access to one or more REMs, the uneven distribution of non-renewable natural resources means that there are also many who do not. Moreover, even if states do have large reserves, it does not necessarily mean they have the capabilities to extract them. For example, whilst various nations in sub-Saharan Africa have deposits of neodymium and dysprosium, only South Africa exported any of such resources in 2022 [OEC World, 2024, Orris and Grauch, 2002]. This varied distribution of resources and extraction capabilities subsequently means that many nations are dependent upon the exports of others.

However, as demand for REMs is expected to increase in the coming years of the transition, it is possible that access to these resources may be restricted. As such, some scholars suggest that those who are dependent upon the exports of others will be forced to compete to secure access [Scholten et al., 2020]. Whilst this literature acknowledges that most of these competitions will be resolved peacefully, it is also argues that the use of military force cannot be ruled out, particularly in times of extreme desperation [De Ridder, 2013, Rothkopf, 2009]. If such violent strategies for resource acquisition were to be implemented, it should be expected that those who do not have access will attack those who do.

Whilst scholars claim that competitions may arise over various REMs, neodymium and dysprosium are theorised to be those that states are most likely to fight over [O'Sullivan et al., 2017]. Both materials are endowed with powerful magnetism that makes them of particular use to wind power technologies. They make up the main components of the NdFeB magnet which is deployed in Permanent Magnet Synchronous Generator (PMSG) turbines [Pavel et al., 2017]. They also belong

to a subcategory of materials known as Rare Earth Elements (REEs).[1] Owing to the historically limited usage of REEs, literature does not distinguish between the different resources categorised as such. Thus, most research that discusses how the demand for neodymium and dysprosium may spark international disputes generally refers to the resources as REEs.

As demonstrated by Figure 2.3, REE reserves can be found in numerous states around the world. However, despite the spread of deposits, China has established a near monopoly on production; representing 70% of the entire market in 2022 [U.S. Geological Survey, 2023]. In the late 2000s they also revealed themselves to be an unreliable REE supplier when they reduced their global export quota by nearly half [Habib et al., 2016]. Moreover, following the arrest of a Chinese fishing captain, they used their dominance over the market as a political weapon against Japan by withholding numerous REE shipments [Klare, 2012].

It is this market dominance by an unreliable supplier that led some scholars to believe that neodymium and dysprosium are likely to be at the centre of any REM-related competitions in the near future. They argue that China cannot be depended upon to provide consistent access to REEs. As such, disruptions to supply must be expected as the transition continues [O'Sullivan et al., 2017].[2] Thus, during periods of high demand, as should be expected in the coming decades, such disruptions will increase the likelihood of conflict as the rest of the world scrambles to secure access to the pool of remaining reserves. This could be further amplified by the reaction of non-Chinese producing states who may withhold reserves so as to protect their own supply. Thus, a small pool of resources may become even smaller, making it harder for states to secure access. If such arguments are to be believed, states with a wealth of neodymium and dysprosium will likely see an increase in the number of conflicts initiated against them. The

[1] REEs are a set of elements that consists of the lanthanide series of the periodic table, scandium, and yttrium.

[2] Evidence supports this argument. REEs are statistically more likely to experience supply disruptions than any other metal [Habib et al., 2016].

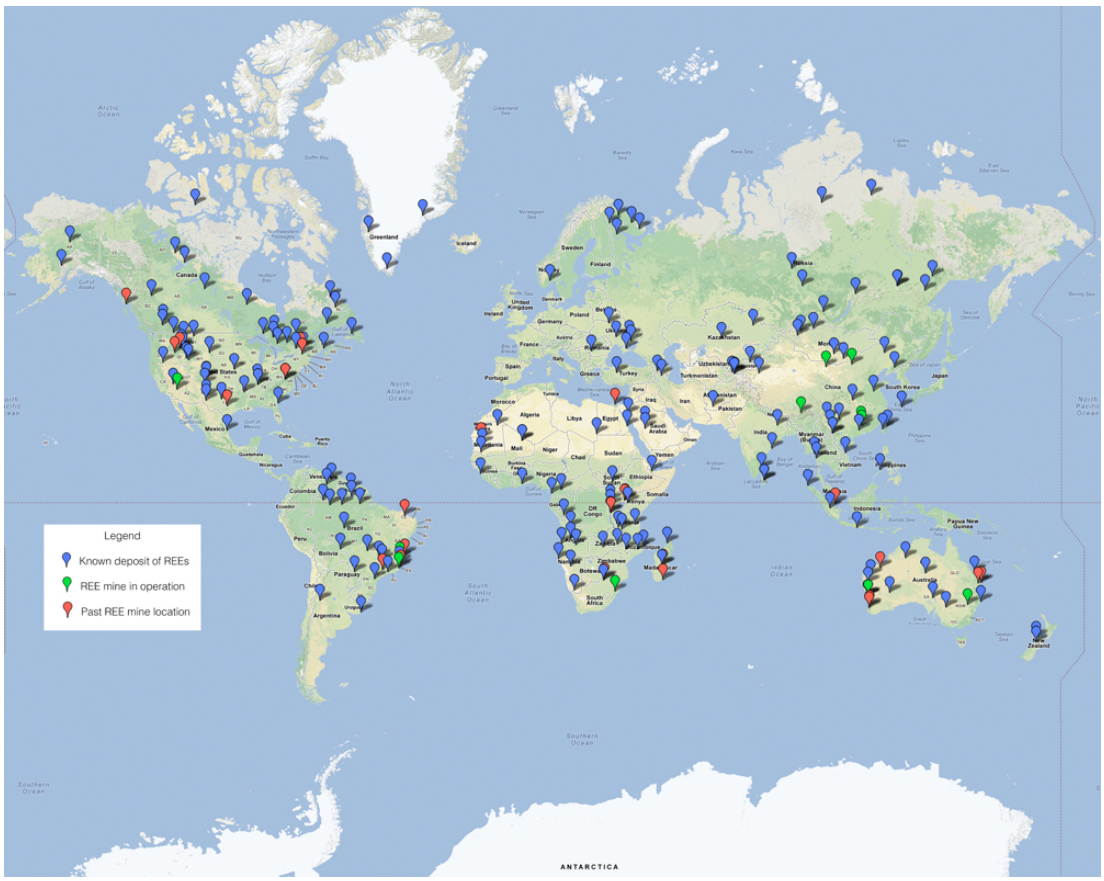

Figure 2.3: Rare earth reserves and mines located around the world [Orris and Grauch, 2002].

desperate need for limited but important materials will force export-dependent states to attack those with an abundance of resources so as to secure access.

However, not all scholars are convinced by this argument as some suggest that fears of impending resource competitions have been greatly exaggerated [Lovins, 2017, Overland, 2019]. It is argued by such scholars that the academic community has overestimated the importance of neodymium and dysprosium to renewable energy technologies. Whilst NdFeB magnets are used in PMSG turbines, most active systems do not currently use this specific design. In the United States of America, for example, roughly 98% of turbines are constructed without the use of either REM [Overland, 2019]. There are numerous alternative designs that are just as effective and less reliant upon materials at high risk of supply disruption [Lovins, 2017]. Additionally, neodymium and dysprosium are

highly recyclable. Thus, there is much potential for the reliance upon foreign exports to be reduced further still [Overland, 2019]. Given the relative use of such resources and the range of possible alternatives, this literature suggests that it is unlikely that resource competitions over neodymium and dysprosium will occur.

This argument is supported by the international response to the previously mentioned Chinese quota restrictions. When such an event occurred, states did not opt to engage in violent competitions to secure access. Instead, they pursued more peaceful and cooperative solutions [Barteková and Kemp, 2016]. Japan, for example, decided to apply resource diplomacy and entered into joint exploration ventures with the likes of Vietnam and Australia. They also invested heavily in R&D to develop a new magnet that would reduce their requirements for neodymium and dysprosium.[3] Thus, concerns regarding resource competitions over neodymium and dysprosium have indeed been exaggerated.

Given that neodymium and dysprosium are the REMs most likely to witness supply disruptions [Habib et al., 2016], but that such disruptions are unlikely to spark a violent scramble for access, it is probable that the remaining REMs will have a similar relationship. Such resources have more secure markets in which there are various supply options [OEC World, 2024]. States therefore have less need to resort to violence as a means of securing access. Thus, the argument that suggests that REMs may spark violent disputes, in which one state tries to take the reserves of another, appears to be inaccurate.

2.4 Discussion

By focusing upon the idea that resource competitions may erupt over REMs, and specifically neodymium and dysprosium, the limited work that has discusses the effects of REMs has followed the same theoretical pathway as that of early oil/conflict literature. Both theorise that the increased demand for important

[3] A similar reaction was also observed in Europe, Australia, and the USA. See Barteková and Kemp [2016] for more information.

but finite natural resources will encourage export dependent states to secure access from resource rich nations via the use of force [Hermsmeyer, 2002, Homer-Dixon, 1994, Klare, 2002, 2008, 2012, O'Sullivan et al., 2017, Scholten et al., 2020, Westing, 1986]. However, as discussed, such violent attempts to secure access to REMs are unlikely to occur. This is supported by the understanding that attempts to acquire oil via the use of force do not generally materialise due to the hidden costs associated with a violent resource acquisition strategy [Meierding, 2016].

It stands to reason that the same hidden costs associated with oil-related interstate disputes also apply to REMs. As with oil, REM production requires the use of large mining facilities and infrastructure that are likely to be damaged during any conflict. Russian mercenaries, for example, were recently accused of launching a series of attacks upon mining operations along Sudan's border with the Central African Republic [Burke, 2022]. Thus, even if states successfully acquired the reserves of another, they would have to finance the repairs that would enable them to access the resources.

Additionally, the REM-market is generally privatised with less than a third of active mines in sub-Saharan Africa owned and operated by the state [World Bank, 2023]. As such, should a state attempt to seize the REMs of another nation, they would be highly dependent upon the support of private mining companies to enable production. As noted previously, such companies are hesitant to enter into relationships with violent nations, making it even harder for states to reap the benefits of their conquests. Given such high costs, it is unlikely that states would seek to acquire REMs through such violent actions. This further supports the alternative argument and evidence that concerns over REM-related resource competitions have been over exaggerated [Lovins, 2017, Overland, 2019].

However, whilst a wealth of REMs may not increase the likelihood that resource rich states will be targeted, it does not necessarily mean that there is no relationship between said resources and interstate conflict processes. So far, no research has considered the possibility that REMs may encourage those with

rich reserves to initiate MIDs in a similar way that oil is theorised to do so; by enabling an increase in their military capabilities. This investigative oversight is perhaps unsurprising given that there has been a general lack of literature that has considered how REMs may influence international security. Nevertheless, it is an interesting and important gap in the associated research given that similar non-renewable natural resources are considered to inspire such interstate aggression.

Moreover, scholars have understandably focused their attentions upon the effect that REMs may have in the coming years as the transition progresses and the resources become even more important. However, the transition has already started, and REMs are already an important set of resources. As such, literature has largely failed to consider that REMs may already have an effect upon interstate conflict processes.

Finally, by mainly focusing upon neodymium and dysprosium, literature has overlooked the influence of various other REMs. This can be seen as a further oversight as such resources are also important to the manufacturing of clean energy technologies and are likely to see an increase in their demand. Thus, it is equally as important to understand what effect they have upon interstate conflict processes.

There is a gap in international security literature for a comprehensive empirical investigation into the effects of REMs on MID initiation. Additionally, there is a gap for research with a specific focus upon the impact of REMs as a collective resource category during the previous stages of the transition. In the following chapters, I seek to help fill this gap. To do so, I first develop an original theory, based upon aspects of resource-backed aggression, which predicts that REMs enable states to act aggressively in the international arena by enabling an increase in their capacity to fight and win disputes.

Chapter 3

A Theory of REM-Backed Aggression

3.1 Introduction

Building upon literature on natural resources, arms transfers, and interstate conflict, and utilising the opportunity and willingness theoretical framework, the central argument of this thesis is that REMs have a conflict inducing effect for states. More specifically, I hypothesise that an increase in REM exportation is associated with a rise in the likelihood that states will initiate an MID.

The international transfer of REMs provides states with a significant source of revenue that leaders can use to buy more arms. This rise in military capabilities leads to a rise in the opportunity and willingness of states to use force as a means of achieving their foreign policy objectives. Consequently, it is more likely that they will adopt such an approach. Thus, when REM exports increase, states are more likely to launch an international attack. This assumed relationship is henceforth referred to as the *REM-backed aggression theory*.

So as to best communicate this entire theoretical pathway, I divide my central argument into two separate hypotheses. Each hypothesis is then covered in their own section of this chapter. First, I outline the suggestion that a rise in

REM exportation increases the level of arms that states purchase. I then establish the argument that the subsequent increase in military capabilities leads to a greater likelihood of MID initiation by states. Additionally, I discuss the main influences for the REM-backed aggression theory and justify the observable differences. Finally, I highlight the range of possible theoretical alternatives that exist before summarising my central argument.

3.2 REMs and Arms Transfers

The first step along my theoretical pathway from REMs to MID initiation builds upon the work of scholars who identified that the exportation of oil facilitates an increase in a state's military capabilities. Specifically, scholars identified that rents from the exportation of oil are positively associated with an increase in a state's military expenditure [Al-Mawali, 2015, Al-Rawashdeh et al., 2013, Ali and Abdellatif, 2015, Bakirtas and Akpolat, 2020, Ross, 2001, Stockholm International Peace Research Institute, 2010].

Whilst this does not necessarily translate to the increased procurement of arms, research has also established that rent-dependent expenditures are more frequently used to expand a state's military arsenal, via the purchase of foreign weapons [Basedau and Lay, 2009, Chan, 1980, Vézina, 2021]. During the Angolan Civil War, for example, the government received roughly $900 million from multinational oil firms for the licenses to offshore reserves. The majority of this $900 million was spent directly upon improving the government's military apparatus [Farzanegan, 2011].

This effect of oil is theorised to have been facilitated by the ownership structure of the industry and the nature of the revenue it generates. As previously indicated, the fossil fuel industry is mainly nationalised [Mahdavi, 2020]. Thus, whilst private mining companies are required to aid with production, the majority of the profits made from this multi-billion-dollar industry go directly to the states. Oil exportation therefore generates a large pot of money for leaders and

governments to spend.

However, this revenue stream also exists outside of a state's regular taxation system. As such, scholars argue that leaders have greater liberty with regards to its budgetary allocation [Le Billon and El Khatib, 2004, Perlo-Freeman and Brauner, 2012]. It is assumed by such scholars that states often face a domestic push-back for allocating tax-based resources to military-related projects. This is believed to be the case as the general public prefer greater spending on social sectors, such as healthcare. Fearing the domestic consequences therefore, leaders – more often than not – refrain from overspending on controversial policies.

Nevertheless, the non-tax nature of oil income allows exporting states to overcome such consequences as the public is less concerned with how this form of revenue is spent [Le Billon and El Khatib, 2004, Perlo-Freeman and Brauner, 2012]. Thus, oil revenue is more easily spent on such controversial policies as it is under significantly less scrutiny. It is this mechanism that is thought to have partly enabled the expansion of pertostates' military power in the Persian Gulf as actors used their oil income to acquire more weapons [Le Billon and El Khatib, 2004].

Although no literature has considered such a possibility, REMs also have the capacity to generate a similar source of non-tax revenue for states, albeit via slightly different means. First, as with oil, states can generate a REM-based income stream by exporting resources from the mines that are under their control. In Madagascar, for example, the state owned Ankazotaolana mine generated an estimated $140 million from chromium exports between 1995 and 2008 [OEC World, 2024, World Bank, 2023].[1] These exports provided the Madagascan government with tens of millions of dollars in revenue during this time.

However, the REM mining industry is largely dominated by private firms. Thus, whilst some states – such as Madagascar – may be able to generate a direct

[1]This value is an estimation. Between 1995 and 2008, the Ankazotoalana mine was the only operational chromium facility in Madagascar [World Bank, 2023]. Thus, all $140 million worth of exports from the country during this time came from the Ankazotoalana mine.

stream of revenue via REM exportation, the vast majority cannot. Instead, such states utilise a system of royalty payments to produce a source of income. These payments are a form of compensation paid by private mining firms to the state for the right to extract, produce, and export their non-renewable natural resources. Whilst baring some similarities to taxes, royalties are instead considered the price that companies must pay to access the materials they extract [Lilford and Guj, 2020].

Whilst various royalty payment structures exist, the most commonly used is the ad valorem structure – otherwise known as the value-based system. In this system, companies pay the state a percentage of the revenue they receive for the exportation of resources [Guj, 2012, Lilford and Guj, 2020]. This method is considered the most preferable for states as it provides them with a consistent source of income rather than an upfront lump sum.

Various nations around the world have recently implemented this royalty structure and applied it to almost all minerals – including REMs. Since the 1990s, African nations have particularly sought to capitalise upon the increased mining attention that they have received by instituting value-based systems [Gajigo et al., 2012]. These states have been able to accumulate significant revenue from their REM exports. As shown by Figure 3.1, in 2014 alone, sub-Saharan Africa generated roughly $150 million in royalty payments. Whilst the revenue that individual states generate is not on such a level, it is likely to still be a significant source of income.

Given that REM exports can generate a large and consistent source of revenue for states, which is considered to be non-tax, the theory that explains how oil enables an increase in a state's level of arms imports can also be applied here. Whilst the transactions and scale of the revenue generated are obviously different, the simple process of a state selling its non-renewable natural resources is essentially the same. Thus, a similar relationship to that of oil and arms transfers should be expected for REMs.

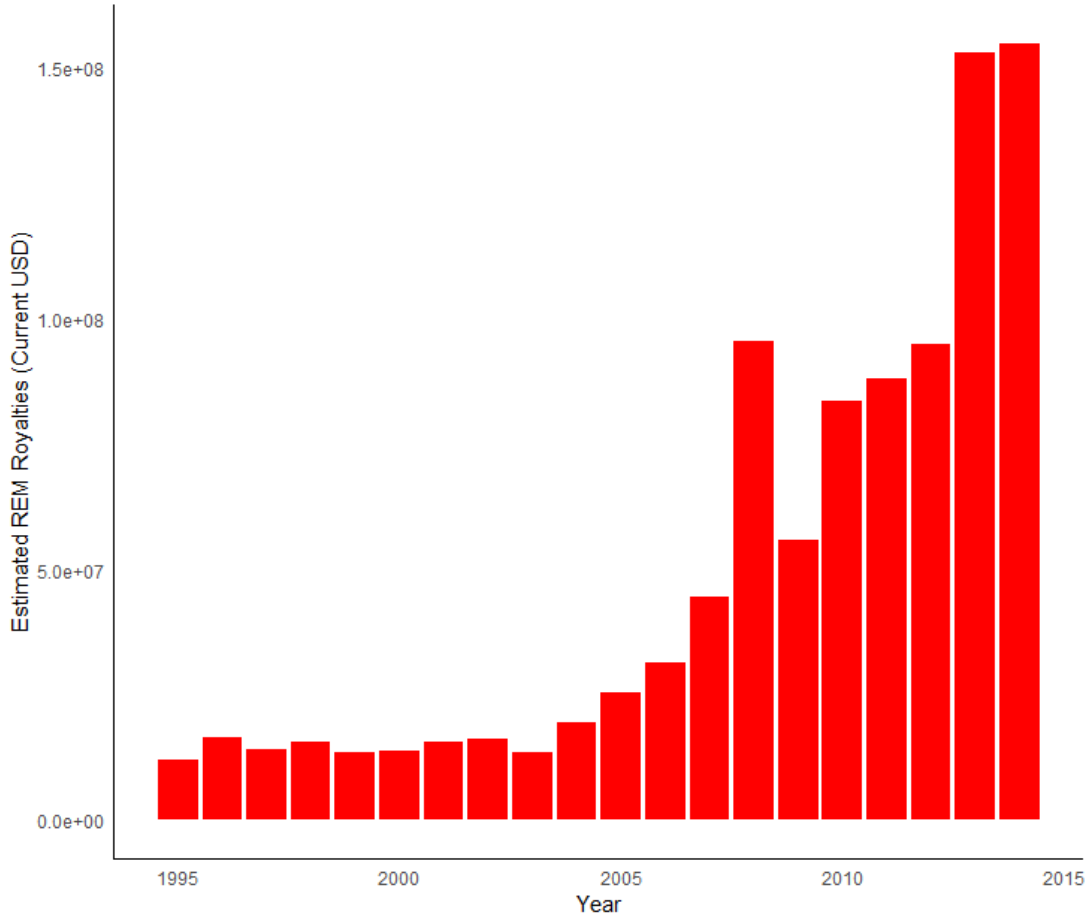

Figure 3.1: Estimated annual REM royalty revenue for sub-Saharan Africa, 1995 - 2014.

Note: Estimations based upon export data from OEC World [2024] and royalty rates from [Gajigo et al., 2012].

There is also evidence of REM-based revenue being used to buy more arms via off-budget transactions. Such transactions refers to financial payments made by a state that are not included in their national budget [Schick, 2008]. The military is most often the recipient of such transactions – given their predisposition for secrecy – whilst funds are most frequently derived from natural resource revenue.[2] Until September 2019, Chile's Copper Law demanded that 10% of the revenue generated by the National Copper Cooperation be transferred to the military via an off-budget transaction so that they could acquire more arms

[2]Off-budget transactions have been used in states such as Myanmar, Peru, Turkey, and Nigeria. For more information see Lopes da Silva and Tian [2023].

[Lopes da Silva and Tian, 2023]. In the year before it's abolishment, exports provided more than $1 billion to the Chilean military, allowing them to almost double the level of weapons that they imported in 2017 [Stockholm International Peace Research Institute, 2023]. Whilst only one example, it is nevertheless clear that REM export revenue can be used to increase the level of weapons that states purchase.

Therefore, as REMs have the capacity to generate a source of non-tax revenue for states, which existing literature has shown to enable an increase in arms transfers, I subsequently theorise that REM exportation will also increase the level of weapons that states purchase. This marks the first step in my theory of REM-backed aggression. As such, I hypothesise that:

Hypothesis 1: *As REM exportation increases, the level of arms that states import increases.*

3.3 REM and MID Initiation

The second step in my theory of REM-backed aggression is the hypothesis that a REM-induced increase in arms transfers leads to a rise in the likelihood that a state will initiate an MID. Utilising the framework of opportunity and willingness, as outlined by Most and Starr [2015], I argue that a rise in a state's military firepower makes conflict a more realistic and appealing foreign policy option for states as it improves the likelihood of a successful campaign. The greater expectation of success raises the likelihood that they will launch an international attack [Blainey, 1973, Huth, 1988].

3.3.1 The Opportunity and Willingness Framework

Before progressing with the specifics of this step, it is first prudent to thoroughly outline the opportunity and willingness framework. First developed in the 1970s,

it builds upon the work of Sprout and Sprout [1957] and their notion of the "ecological triad" [Starr, 1978].[3] As Siverson and Starr [1990] elaborate, opportunity and willingness can be viewed as concepts that allow for linkages to be made between the decisions that actors make and their environment. From an international relations perspective, the concept of opportunity is defined as the options available to states for interaction with other nations. Moreover, willingness is the process that leaders face in the selection of one possible interaction from the list of viable alternatives [Most and Starr, 2015, Siverson and Starr, 1990, Starr, 1978].

In this framework, the opportunities for interaction that states have – including the use of force – are determined by the actor's objective environment. More simply, the options available to each state are dictated by what is actually possible. Nevertheless, what is possible for some states is not always possible for others. There are some options for interaction that are dependent upon crucial factors, such as geographic location and economic wealth. The opportunity to use nuclear weapons against another state, for example, is mainly determined by a nation's financial, industrial, and technological proficiency. Without a high level of proficiency in these areas, they would not be capable of developing a nuclear arsenal. However, important capabilities vary from state to state [Most and Starr, 2015]. Therefore, each state has their own list of options for interaction, based upon the distribution of important factors.

Such an idea is best demonstrated via an analogy of a restaurant, as discussed by Russett [1972] and Most and Starr [2015].[4] An individual (*Person A*) does not have the opportunity to go to an expensive restaurant for a meal as they do not have enough money to pay for it. Whilst the restaurant is a dining option, in the sense that it is physically real and serves food, *Person A's* personal circumstances mean that this restaurant is not on their list of possible options for dinner. Thus, the probability that they will dine here is likely near 0. On the other hand, a

[3]The ecological triad consists of an entity, their environment, and the relationship between the two. See Sprout and Sprout [1957] for more information.

[4]The analogy has been further adapted in this thesis to better fit the topic under discussion.

wealthy individual (*Person B*) does have the opportunity to eat at the expensive restaurant as they can afford the extravagance. Thus, as the distribution of capabilities means that the restaurant is on their list of available options, the likelihood that they will eat here is far greater than that of *Person A*.

However, opportunity alone does not lead a state to pursue one course of interaction. The willingness of leaders to do so is also of critical importance. Here, willingness is based upon the leader's motivations and goals, as well as their interpretation of the environment [Joyce et al., 2014, Siverson and Starr, 1990]. Willingness is therefore the process by which leaders recognise and weigh-up each opportunity against the others and decide which one they would like to pursue.

Returning to the restaurant analogy, whilst *Person B* may have the opportunity to eat at the restaurant, they may not have the willingness to do so. It may be a steak house, for example, and *Person B* might be a vegetarian. In this case, whilst their financial circumstances mean that they can eat here, their personal preference makes it unlikely that they will do so. On the other hand, if *Person B's* favourite food is a fillet steak, then they will be more inclined to eat at the restaurant. Thus, this willingness, coupled with their financial capabilities, means it is more likely that they will do so.

In sum, opportunity refers to the options available to states for interstate interaction. Willingness refers to the desire of a leader to select one of the options available to them. For any interaction to occur between states, both the opportunity and willingness to do so must exist.

3.3.2 REM-Backed Aggression Within the Opportunity and Willingness Framework

Within the opportunity and willingness framework, interactions between states can take various forms. This thesis particular interest is the use of military force against another. As with all possible interactions, states must have both the

opportunity and willingness to engage in such aggressive activities. Whilst there are doubtless numerous factors that may have an influence upon this, a nation's military capabilities are amongst the most important.

It is argued by scholars that the aim of initiating an MID is to achieve one's foreign policy goals via the coercive use of force [Clausewitz, 2003]. However, further research finds that the odds of successfully achieving such goals with violence are, at least in part, determined by a nation's military capabilities [Henderson and Bayer, 2013]. States with a strong military arsenal therefore have the opportunity to engage in an MID as they have high odds of successfully achieving their objectives with force. Inversely, in states that lack the capacity to fight and win, it is not a realistic foreign policy option for them. Thus, they lack the opportunity to launch an international attack [Fordham, 2004].

In addition to providing an opportunity to interact with other states via the use of force, a strong military apparatus also provides a willingness amongst leaders to pursue such a course of action. As mentioned, solid military capabilities provides high odds that a state will win any interstate conflict that they are involved in [Henderson and Bayer, 2013]. By extension therefore, a strong military arsenal also provides high odds that a state can achieve their foreign policy objectives. Assuming that this an important goal for leaders, a high level of military fire power provides them an opportunity to achieve their foreign policy ambitions; thus, providing them with a willingness to initiate an MID. This idea is reflected in prior research. According to Blainey [1973], leaders have a disposition for violence in periods when confidence is high that they can successfully deliver their foreign policy objectives via the use of force. As such, anything that installs such a confidence provides leaders with a willingness to initiate an MID. Naturally, as strong military capabilities provide high odds of success, they enable such confidence. As such, they are amongst the most logical influences [Most and Starr, 2015].

However, as with other factors, military capabilities significantly vary between states. As such, variation also exists with regards to the opportunity and

willingness that nations have for initiating an interstate dispute. Nevertheless, such capabilities are not fixed and are subject to change over time. These changes can therefore alter both a state's opportunity and willingness for a conflictual interaction. By extension therefore, these changes also alter the likelihood that states will initiate an MID.

If we return to the analogy of the restaurant once more, should *Person A* inherit a small fortune, they would now have the option to eat at the restaurant as they have the money to afford it. Thus, the probability that they will do so increases. Furthermore, the increased confidence that they can satisfy their desire for a nice meal by eating at the restaurant that they can now afford, also incentives them to do so. In a similar vein, should a state increase their military capabilities by importing more arms, conflict becomes a more viable option for them, given that their chances of success have increased. Moreover, now faced with greater odds of victory, leaders will be more willing to initiate an interstate dispute as it provides them a higher likelihood of delivering their foreign policy objectives. Thus, due to an increased opportunity and willingness, it is more likely that states will initiate an MID when their military capabilities increase.

This assumption is also supported by some statistical evidence. For example, recent research shows that an increase in arms imports – measured as a percentage of a state's GDP – lead to a rise in the likelihood that states will initiate an MID [Dharia, 2019]. Moreover, aggregate conflict levels in sub-Saharan African states are affected by their levels of arms transfers [Craft and Smaldone, 2003].[5]

Given such findings, should the argument of the previous section – that the increased exportation of REMs increases the level of arms that a state imports – be considered accurate, a subsequent effect upon the likelihood that a state will initiate an MID should also be observed. If REMs lead to an increase in arms transfers, this will naturally spark a rise in military capabilities. By extension, this will provide states with more opportunity to initiate interstate conflicts as

[5]Craft and Smaldone [2003] doe not distinguish between intra and interstate conflict. The aggregate conflict level measurement is a combination of both.

the chances of achieving their foreign policy goals have subsequently increased. Furthermore, this increased chance of success will create a sense of confidence in leaders that will increase their willingness to choose such an option from the range of alternatives. REMs will therefore make conflict a more viable and appealing option. As such, I hypothesise the following:

Hypothesis 2: *As REM exportation increases, the likelihood that states will initiate an MID increases.*

3.4 Theoretical Inspirations

Evidently, the central argument of this thesis is heavily inspired by the resource-backed aggression theory. There are various similarities between the two, such as the focus upon the role that arms transfers and military capabilities can play. However, unlike the resource-backed aggression theory, my argument does not refer to the effect that REMs may have upon a leader's political autonomy. Whilst I acknowledge that REMs could increase said autonomy by providing a source of money that could be used to buy off domestic support, I do not believe that this would impact the likelihood of a state initiating an MID. Although a rise in autonomy can increase the opportunity that states have to launch an international attack by removing a potential barrier, I do not believe that it makes success more likely. As such, leaders have no more reason to opt for this interaction above all possible alternatives. As such, I exclude this idea from my theoretical pathway. Additionally, I do not refer to revolutionary governments in my REM-backed aggression theory, given the potential empirical flaws established in recent literature [Antony and Thompson, 2023].

3.5 Theoretical Alternatives

Whilst I argue that the exportation of REMs increases the likelihood that states will launch an MID, there also exists a range of possible alternatives. The first of such alternatives is that REMs increase the likelihood of a conflict being initiated against an exporting state, as is assumed by the resource competition theory.[6] Scholars of this argument suggest that this effect is most likely to occur when supply is scarce and prices are high. In such circumstances, states either panic that their access will be disrupted or they attempt to capitalise upon the financial possibilities that REM reserves may grant them [Caselli et al., 2015, De Ridder, 2013, Homer-Dixon, 1994, Klare, 2002, 2008, 2012, O'Sullivan et al., 2017, Rothkopf, 2009, Scholten et al., 2020].

Although there is limited support for this assumption, there is a small body of evidence that alludes to such a possibility. For example, the 1944 invasion of the Finnish Petsamo territory by the USSR is thought to have been motivated by a desire to secure the regions nickel reserves [Westing, 1986]. However, whilst such conflicts may occur, they are rare for a number of reasons. First, the REM market is generally diverse with numerous exporters for most resources. In 2021, for example, each REM was exported at some level by at least 60 different states [OEC World, 2024]. Such diversification reduces the peril that states face regarding disruptions to supply. Thus, they are highly unlikely to start a conflict in pursuit of resources that are more easily acquired via diplomacy.

Furthermore, international consequences reduce the incentives for states to try and seize another nation's reserves for financial gain. The international community does not take such actions lightly, often imposing financial sanctions upon states – as was the case for Iraq in 1990 following their invasion of Kuwait [Carisch and Rickard-Martin, 2013, Meierding, 2016]. These sanctions nullify the spoils that a REM-related conquest may bring. Therefore, it is unlikely that MIDs would be launched against resource-rich states as a strategy for material acquisition.

[6] See Chapter 2, Sections 2.3 for more information.

A more plausible alternative, however, is that the increased exportation of REMs actually has no effect upon the likelihood that states will initiate an MID. This is due to the financial costs associated with the increased importation of arms that may subsequently dissuade states from buying more weapons. If they do not import more arms therefore, they may be no-more likely to initiate an interstate conflict.

The exportation of any important material or resource – including REMs – can naturally have a positive effect upon a state's economy. This means that REM exporting states likely have incentives to refrain from engaging in any questionable activity that may harm their economic development. One such activity is the purchase of foreign weapons as scholars note that it can increase domestic and regional tensions [Choulis et al., 2022, Fordham and Walker, 2005, Sample, 2018]. Such tensions can then negatively impact a nation's financial performance. Local insecurities, for example, can lead to a pause in production as concerns over safety begin to rise [Meierding, 2016]. It is therefore possible that whilst REMs provide a source of revenue that states can use to buy more weapons, these economic incentives discourage them from doing so.

Whilst such a relationship is possible, I maintain that it is unlikely. A key factor in this alternative argument assumes that states value their economic development above other policy goals and objectives. Whilst this may be true for some states, particularly those with few alternative revenue streams, it is unlikely to be consistent amongst all actors. Moreover, whilst REM exports can produce revenue for states, it is possible that it does not contribute to enough economic development to dictate how a state should spend their money. As such, I believe that this alternative theory is also unlikely.

3.6 Conclusion

In sum, I hypothesise that the increased exportation of REMs enables states to increase the level of arms that they import. Such is the case as exports generate

a source of revenue that can be easily used to buy more weapons. This REM-induced increase in arms transfers subsequently increases the opportunity and willingness of states to launch an MID by raising the odds of success. As such, I hypothesise that when REM exports increase, states are more likely to initiate an international conflict. In the following chapter, I empirically examine these arguments.

Chapter 4

REM-Backed Aggression: Empirical Analysis

4.1 Introduction

What effect do REMs have upon interstate conflict processes? This is the central question that drives this thesis. In the previous chapter, I presented a possible answer in the form of my REM-backed aggression theory. Simply, this theory argues that the increased exportation of REMs gives way to a rise in the level of arms that states import. As this subsequently makes conflict a more realistic and appealing foreign policy option for states, an increase in REM exportation also increases the likelihood that they will initiate an MID. This chapter now moves on to empirically investigate the key arguments made by this theory. Specifically, the following hypotheses are examined:

Hypothesis 1: *As REM exportation increases, the level of arms that states import increases.*

Hypothesis 2: *As REM exportation increases, the likelihood that states will initiate an MID increases.*

The remainder of this chapter is structured as follows. First, I describe the research design used to test the hypotheses. This includes a brief discussion of the

data and methodological approach, as well as each included variable. Second, I present the results of the analysis in two separate sub-sections, each focusing upon a different aspect of the hypothesised relationship. Here, the robustness checks are also outlined and analysed. Third, I discuss the findings of the empirical investigation and the associated implications. The chapter then concludes with a brief summary of the key findings.

4.2 Research Design

4.2.1 Data and Methodology

As discussed, an original panel data set is constructed for this thesis, and it consists of 960 state-year observations. Such observations include sub-Saharan African states for the period between 1995 and 2014.[1] The first analysis examines the relationship between REM exports and arms transfers. It utilises a series of generalised linear regression models, specified with a gaussian distribution, as the dependent variable is continuous in nature and follows a normal distribution when log transformed. Furthermore, this approach helps to ensure the existence of robust and flexible models. The second analysis examines the effect that REM exports have upon the likelihood that a state will initiate an MID. I conduct a binomial logistic regression analysis as the dependent variable is dichotomous. Using this methodological approach allows for not only the general effect of REMs on arms transfers and MIDs to be captured, but also the extent and accuracy of my entire theoretical pathway.

The unit of analysis for both sets of statistical examination is the state-year. Models are first conducted using random effects to ensure the coefficients are estimated in a statistically efficient manner. However, to account for possible differences that may exist between states that did not vary over the course of observation, all models are also specified with country-year fixed effects.[2]

[1] See Chapter 1, Section 1.2 for more information.

[2] Colgan [2010] sets a precedent for the use of both random and fixed effects models.

4.2.2 Dependent Variables

Arms Transfers

The dependent variable used in the first analysis is the Trend Indicator Value (TIV) for the level of arms delivered to a state: *Arms Transfers*. TIV is a measure for the level of arms a state imports, based upon the military value of the transfer. It is not a measure for the cost of the weapons purchased. As shown by Figure 4.1, there has been a significant increase in the annual level of weapons imported to sub-Saharan Africa since 1995.

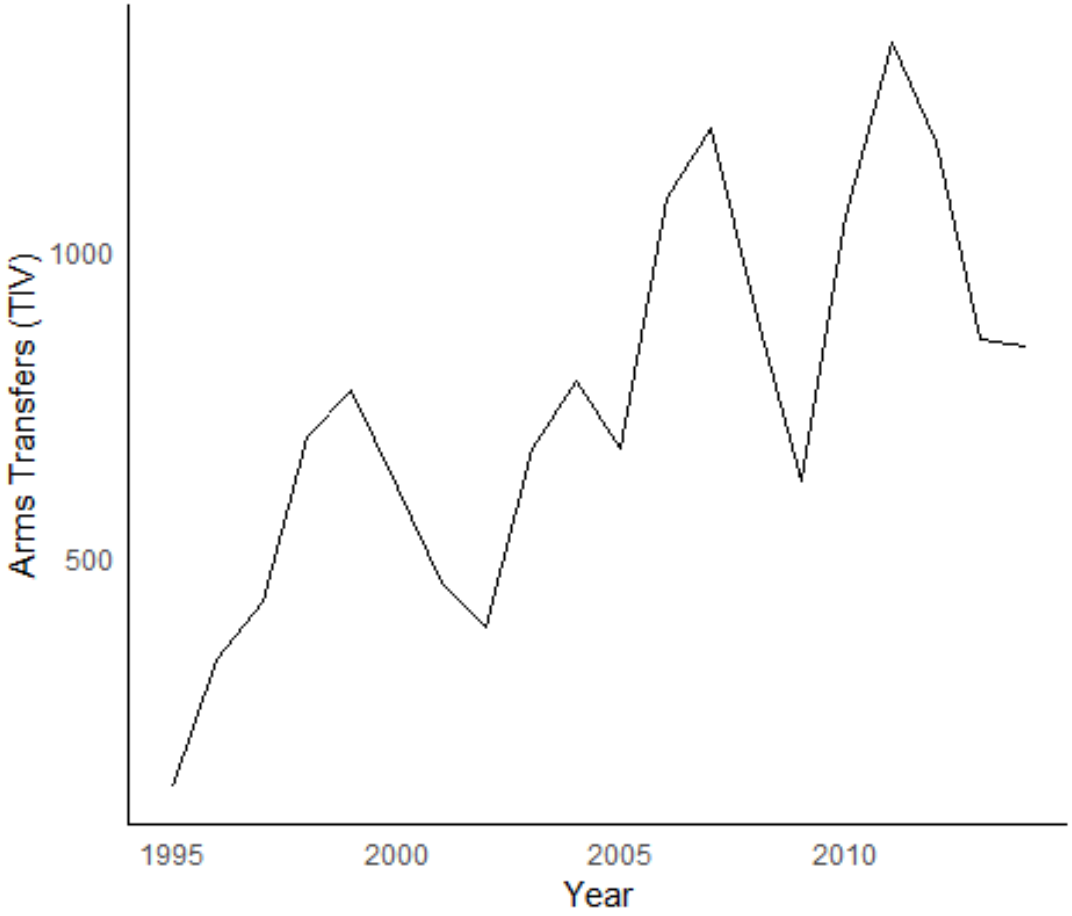

Figure 4.1: Annual level of arms imported to sub-Saharan Africa (TIV).

The data for this variable is taken from the SIPRI 'Arms Transfers' database. This data provides observations for the level of arms imported to states between 1950 and 2023. However, whilst the SIPRI database has been used in much significant research, it is not without it's limitations. As noted by Fleurant and Tian

[2018], the 'Arms Transfers' dataset significantly under reports the exportation of weapons from Chinese-based firms. As noted by such scholars, organizations, like the North Industries Corporation, have sold a significant number of arms to states in Sub-Saharan Africa; yet such information is not included in the database.

The under reporting of Chinese-based exports could negatively impact the results of this analysis. As noted previously, China is one of the biggest investors in the sub-Saharan African mining industry [World Bank, 2023]. However, China also has a history of trading arms for natural resources. This was evident during the early 2000's when they supplied Sudan with weapons in exchange for access to oil [Herbst, 2008, Vézina, 2021]. It is therefore possible that similar 'guns-for-REMs' deals may exist between sub-Saharan African states and China. Due to the limitations of the SIPRI database, such weapon transfers would not be captured by this analysis. This could ultimately produce results which do not support Hypothesis 1.

Nevertheless, whilst some Chinese-based exports are not included, others are. This research should therefore be capable of capturing the general trend of the relationship in question. Furthermore, the under reporting of Chinese based exports is not an issue that is unique to SIPRI. It is a consequence of a lack of transparency from the Chinese government [Amnesty International, 2006]. As such, all available data would likely be subject to the same limitations. I therefore opt to fall in line with important recent literature in my usage of the 'Arms Transfers' database.

In this analysis, I use a 5-year forward moving average to measure the level of arms that states import. As shown by Equation 4.1, this variable does not measure the level of weapons that states import in a given year; rather it measures the average trend for arms transfers in the following 5 years. The decision to use a moving average is in accordance with recent literature on arms transfers [Johnson, 2020, Johnson and Shreve, 2023]. It accounts for the infrequency and inconsistency of weapons transfers whilst controlling for delays between payment and delivery. Within other areas of political science, dependent variables that face

similar issues related to irregularity and infrequency have been measured using a forward moving average; thus, justifying its usage for this analysis [Devarajan et al., 1996]. [3]

$$Y_t^{(5\text{-year})} = \frac{1}{5}(Y_t + Y_{t+1} + Y_{t+2} + Y_{t+3} + Y_{t+4}) \tag{4.1}$$

The *Arms Transfers* variable is also log transformed. This accounts for the significant variation that exists between sub-Saharan African states in terms of military and financial firepower.[4] Due to the illicit trade of SALWs, and the difficulties associated with reporting the transfer of such weapons in the SIPRI database, this variable only includes observations for the importation of MCWs.[5]

MID Initiation

In the second empirical analysis, the main dependent variable is the annual onset of an MID for which a state is considered to be the primary initiator: *MID Initiation*. Data for this variable is drawn from the Correlates of War Project's (COW) 'Militarised Interstate Dispute' data set. This provides information on interstate disputes involving two or more states between 1816 and 2014. This data establishes the end point for observations.[6]

The variable is measured dichotomously with each observation allocated a value of either '1' or '0'. The former indicates that a state did initiate an MID in a given year whilst the latter implies that they did not. Although previous literature has preferred to measure MID onset in a continuous format [Colgan, 2010], the dichotomous structure of this variable is deemed more appropriate as

[3] As a robustness check, I include a binary variable measuring whether a states imported any level of arms in a given year.

[4] In 2014, Nigeria's GDP was more than 1650 times greater than that of São Tomé and Príncipe [World Bank, 2024].

[5] A full list of the included weapons can be found in Appendix B.

[6] The COW MID data set has been used to measure conflict in much existing literature, such as Colgan [2010], Hendrix [2017], Jang and Smith [2021], Strüver and Wegenast [2018].

there is a lack of variation between the number of disputes initiated by states each year.[7]

In this analysis, MIDs are defined as international conflicts in which military force is either threatened, displayed, or directly used by one state against another [Palmer et al., 2020]. Moreover, a state is considered to be the primary initiator of such conflicts if they were the actor that first crossed the threshold of any of the outlined actions.[8]

As a robustness check, variations of this dependent variable are also used. These include: *MID Initiation With Force*, *MID Initiation Without Force*, and *MID Participation*.[9] All of the alternative dependent variables are also measured dichotomously.

4.2.3 Independent Variable

In both analyses, the independent variable is a state's total annual exports of Renewable Essential Materials, expressed as a percentage of a their GDP: *REM Exports % GDP*.[10] The REM exportation data comes from the Observatory of Economic Complexity (OEC) which provides annual information of material exports for all active states between 1995 and 2021.[11] The World Development Indicator (WDI) database also provides the necessary GDP data that allows for the calculation of the *REM Exports % GDP* variable.

As sub-Saharan African states have varying levels of mineral reserves, extraction capabilities, and foreign mining investment, variation also exists between states with regards to their levels of REM exports. In 2014, for example, those

[7] Only in 12 of the observations did a state initiate more than 1 MID in a given year.

[8] Initiators of disputes are identified as those coded as Side A in the COW MID data set.

[9] *MID Initiation With Force* includes disputes with hostility level 4 or 5 in the COW data set. *MID Initiation Without Force* includes disputes with hostility level of less than 4. *MID Participation* includes the onset of all MIDs, regardless of whether the observed state was the initiator.

[10] As a robustness check, I include a variant predictor variable that measures REM exports in current USD.

[11] The starting point for observations is dictated by the OEC data.

from South Africa were worth an estimated $8 billion, whilst those from Senegal were thought to be worth less than $1 million [OEC World, 2024]. To account for such variation, the independent variable is also log transformed. Additionally, it is lagged by 1 year to account for the likelihood of a delay in the process for which REM revenue is allocated and translated into arms imports.[12]

However, it is important to note that REMs can be exported in numerous forms, depending upon their level of post extraction processing. Nevertheless, I only include those at the earliest point in their material processing in my measurement of REMs.[13] As scholars, such as Guj [2012] and Lilford and Guj [2020] note, it is at this point – when minimum or no processing has occurred – for which royalties should be paid to states. Given the importance of royalties to REM-based income, limiting the scope of material exports to such resources is thus an appropriate step to investigate the theory of REM-backed aggression.

For most REMs, this point in their processing corresponds to their form as material ores. The only exceptions are the Rare Earth Elements, neodymium and dysprosium. REEs are not extracted as ores as they make up part of the lattice structure of other minerals. As such, some level of processing is required to produce the materials. However, rather than disregarding neodymium and dysprosium from the analysis entirely, the categorisation of REM exports instead includes the contribution of REEs in their compound state.

4.2.4 Control Variables

A series of control variables are included in both sets of analyses.[14] First, I include measures of *GDP per capita (log)* and *Population Size (log)*. These variables account for the extent to which states are both able to finance the purchase of

[12]Whilst a further lag may also have been useful, the limited time frame of analysis dictates that this is not empirically appropriate.

[13]A full list of the materials included in the analysis can be found in Appendix B. The material classification of Rare Earth Elements replaces neodymium and dysprosium due to a lack of data. Indium is also excluded for the same reason.

[14]These controls are consistent with those specified in prior arms transfers and MID literature.

foreign weapons and initiate an MID [Blomberg and Tocoian, 2016].[15] Data for both controls is drawn from the WDI database [World Bank, 2024]. This data provides observations between 1960 and 2023.

A state's *Polity V Score* is also included as a control variable. This data comes from the Polity Project's 'Polity5' data set [Marshall and Gurr, 2020]. It measures states on a scale of -10 (completely autocratic) to +10 (completely democratic). The *Polity V Score* controls for the understanding that democracies are both less likely to import weapons and initiate interstate disputes [Boehmer, 2007, Li and Reuveny, 2011]. Data for this variable is available between 1776 and 2020.

As oil literature suggests that a state's economic interdependence can create incentives to avoid actions that may create regional instability [Colgan, 2010], I also include *Trade Openness (log)* as a further control. This is measured as the annual sum of both a state's imports and exports, divided by their GDP. The Our World in Data 'Trade Openness' database provides the necessary information for this control.[16] It covers the period between 1960 and 2022.

I also control for the effect of *Oil exports USD (log)*. As previously discussed, such exports can have a significant impact on both dependent variables [Basedau and Lay, 2009, Chan, 1980, Colgan, 2010, Hendrix, 2017, Strüver and Wegenast, 2018, Vézina, 2021]. Operationally, this variable measures the total value of oil exported by a state in a given year, expressed in current USD. To remain consistent with the REM exportation data, observations are drawn from OEC World [2024].[17] This includes annual data on oil exports between 1995 and 2021.

Some regional dimensions are also controlled for in both analyses. First, I include the number of alliances each state had with those for which they share a

[15] *Population Size (log)* accounts for the possibility that larger states need more weapons to protect themselves [Johnson and Shreve, 2023, Singer, 1988].

[16] The WDI database is the most commonly used source of trade openness information. However, a lack of observations for sub-Saharan Africa in the required time frame reduces its usefulness to this analysis. The WDI data is applied as a robustness check.

[17] *Oil Exports % GDP* is included as a robustness check.

land border: *Contiguous Alliances*. This accounts for the likelihood of interstate cooperation between neighbouring nations. Data for this measurement is drawn from the COW 'Formal Alliances' data set [Gibler, 2009].[18]

Second, each analysis encompasses a measurement of the maximum distance in UN ideal voting points from a state's neighbours: *Contiguous UN Ideal Point Difference*. This data is derived from Bailey et al. [2017] and covers between 1946 and 2015. Simply, it acts as a proxy for regional similarities in terms of foreign policy. By extension therefore, it acts as a proxy for regional tensions.

Third, the number of sub-Saharan diplomats hosted by a nation in each year is also included: *Sub-Saharan African Diplomats*. This variable is used as a proxy for a state's regional status. Moreover, it accounts for the possibility that a state's standing within a regional community influences their desire to demonstrate their power to the other members of the international system [Renshon, 2016]. The 'Diplometrics' data set supplies the observations for this variable [Moyer et al., 2021]. Observations are available between 1960 and 2020.

Finally, I use the UCDP/PRIO 'Armed Conflict' data set to include a control variable measuring the occurrence of a civil war [Gleditsch et al., 2002].[19] This variable is expressed dichotomously with a value of '1' assigned when a state was involved in an intrastate dispute in a given year. Furthermore, it is lagged by 1-year to correspond with prior literature. This variable controls for the finding that states involved in a civil war are more likely to become involved in MIDs and import a greater number of arms [Blomberg and Tocoian, 2016, Gleditsch et al., 2008].

[18]This data set includes observations between 1816 and 2012. It is extended until 2014 based upon the last known number of alliances. This extension is justified given that alliances tend to be long-term partnerships.

[19]Observations cover the period between 1946 and 2022.

4.3 Results

4.3.1 Arms Transfers

Table 4.1: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 5-Year Average (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (1)	Model (2)	Model (3)	Model (4)
REM Exports % GDP (log)			−0.366***	−0.327*
			[0.093]	[0.155]
GDP/Cap (log)	0.372***	0.321	0.393***	0.285
	[0.061]	[0.278]	[0.064]	[0.301]
Total Population Size (log)	0.575***	3.378**	0.569***	3.430*
	[0.121]	[1.154]	[0.127]	[1.302]
Polity V Score	−0.016	0.005	−0.016	0.005
	[0.013]	[0.035]	[0.014]	[0.039]
Trade Openness (log)	0.052	0.119	0.118	0.159
	[0.114]	[0.203]	[0.120]	[0.199]
Oil Exports USD (log)	0.010.	0.011	0.009	0.009
	[0.006]	[0.007]	[0.006]	[0.006]
Contiguous Alliances	0.045	0.065	0.066*	0.077
	[0.029]	[0.067]	[0.030]	[0.061]
Contiguous UN Ideal Point Difference	−0.185	−0.372	−0.141	−0.334
	[0.141]	[0.341]	[0.144]	[0.349]
Sub-Saharan African Diplomats	0.030.	0.060	0.030.	0.051
	[0.016]	[0.049]	[0.017]	[0.054]
Civil War	0.146	0.173	0.100	0.134
	[0.095]	[0.131]	[0.097]	[0.115]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	724	724
Log-likelihood	−957	−858	−904	−808

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.1 presents the results of the generalised linear regression analysis used to test Hypothesis 1. The dependent variable for all of the included models is *Arms Transfers - 5-Year Average (log)*. Models 1 and 2 are baseline analyses in which the key independent variable is not included. Furthermore, random effects are specified in Models 1 and 3. State-year fixed effects are then specified in Models 2 and 4.

The results do not provide support for Hypothesis 1. Instead, they favour the alternative theory that an increase in REM exportation is associated with a reduction in the level of weapons that states import. The coefficient for *REM Exports % GDP (log)* in Model 3 is both negative and statistically significant at the 0.001 level. This indicates that a 1% increase in the contribution of REM exports to a states GDP is associated with an average 0.366 TIV reduction over a 5-year period. This negative effect also holds when fixed-effects are applied in Model 4.[20] Given the consistency of the predictor across model specifications therefore, the negative effect of REM exports can be interpreted with a high degree of confidence. Thus, whilst the null hypothesis that there is no relationship between REM exports and arms transfers can be rejected, the results do not support the initial argument made in the REM-backed aggression theory.

This finding is further supported by the results for the control variables. Such results are almost entirely in line with those identified in the baseline analyses. When the *REM Exports % GDP (log)* variable is introduced, there is no change in the direction of effect for any of the controls. Additionally, only the *Contiguous Alliances* variable becomes statistically significant in Model 3; thus, indicating a certain degree of robustness.

The results for the control variables are also mostly in line prior expectations. In keeping with the assumption that larger states typically require more weapons, *Population Size (log)* has a consistently positive and significant effect on arms transfers. A similar result is also present for both GDP per capita and the number

[20]In Model 4, the coefficient size falls to 0.327 and the significance level is reduced to 0.05.

of contiguous alliances a state has.[21] This is unsurprising given that greater economic wealth means that states are more capable of purchasing weapons. Similarly, a greater number of alliances means that states have more options for which they can buy weapons from. Research has shown that states are more likely to trade arms with nations who's international goals align with their own [Chou et al., 2023, Mehrl et al., 2023].[22]

The only control variable of any concern is that of a state's *Polity V Score*. The direction of this effect is inconclusive, and changes depending upon model specifications. Nevertheless, as the results in Models 3 and 4 are consistent with those of Models 1 and 2, confidence can be installed that this finding is accurate, if somewhat surprising.

Arms Transfers: Robustness

To further ensure the accuracy of the observed results, this analysis is subjected to a series of robustness checks.[23] First, the models are re-conducted with additional variables included. These variables measure both the number of alliances a state had in a given year and the total number of diplomats they hosted.[24] Second, several of the original control variables are replaced with alternative measures.[25] In no such additional models does the direction or significance of the key explanatory variable change. As such, the findings of this analysis can be deemed highly robust.

However, in additional tests, the dependent variable is replaced with alterna-

[21] *GDP/Cap (log)* and *Contiguous Alliances* are positive in all models and statistically significant in those specified with random effects.

[22] Whilst insignificant, the direction of effect for *Oil Exports USD (log)*, *Civil War*, *Sub-Saharan African Diplomats*, and *Contiguous UN Ideal Voting Point Difference* are in line with prior literature.

[23] Results for all arms transfers robustness checks can be found in Appendix B.

[24] To control for the influence of time trends, I also include binary variables for year of observation in the random effects models.

[25] *Oil Exports USD (log)* is replaced with *Oil Exports % GDP (log)*, *Contiguous Alliances* is replaced with *Total Alliances*, *Sub-Saharan African Diplomats* is replaced by *Total Diplomats*, and *Trade Openness (log)* is replaced with *WDI Trade Openness (log)*.

tive specifications. First, when a 3-year rolling average is utilized, the coefficient for *REM Exports % GDP (log)* is no longer statistically significant in the fixed effects model. This is also the case in both random and fixed effects models when a binary arms transfer variable is applied.[26] This helps to provide some valuable insight as the result implies that REM exports only influence the transfer of arms in the longer term. Nevertheless, this is not entirely surprising given that there can often be delays in the process that enables REM exports to be converted into state-based revenue.

As a final check, *REM Exports % GDP (log)* is replaced with an alternative independent variable. This variable instead measures REM exports in current USD. Table 4.2 presents the results of this additional analysis. In Model 7, the coefficient of the predictor variable is negative. However, when state-year fixed effects are applied, the direction of effect becomes positive. Whilst the results for Model 7 are in line with those identified by the main analysis, the inconsistent orientation means that there is inconclusive evidence of the relationships true direction. Furthermore, as neither coefficient is statistically significant at the accepted 0.05 level, it cannot be asserted that the genuine effect statistically differs from 0. As such, these results indicate that it is not the value of REM exports that influences the arms transfer policies of states; rather it is the contribution that such exports make to their economic performance.

4.3.2 MID Initiation

The results of the binomial logistic regression analysis used to test Hypothesis 2 are presented in Table 4.3. In line with the prior investigation, Models 9 and 10 are baseline analyses. Random effects are once more specified in Models 9 and 11 whilst fixed effects are applied in Models 10 and 12. The coefficients for the *REM Exports % GDP (log)* variable are also converted into odds ratios to allow for a greater interpretation of the results. These ratios are presented in

[26]The coefficient for the random effects model in which the dummy variable is applied switches to positive but remains statistically insignificant.

Table 4.2: Robustness check: Generalised linear regression analysis for the effect of REM Exports USD (log) on Arms Transfers - 5-Year Average (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (5)	Model (6)	Model (7)	Model (8)
REM Exports USD (log)			−0.006	0.003
			[0.007]	[0.012]
GDP/Cap (log)	0.372***	0.321	0.384***	0.298
	[0.061]	[0.278]	[0.068]	[0.299]
Total Population Size (log)	0.575***	3.378**	0.596***	3.722**
	[0.121]	[1.154]	[0.126]	[1.238]
Polity V Score	−0.016	0.005	−0.019	0.005
	[0.013]	[0.035]	[0.014]	[0.039]
Trade Openness (log)	0.052	0.119	0.053	0.094
	[0.114]	[0.203]	[0.118]	[0.203]
Oil Exports USD (log)	0.010.	0.011	0.010	0.010
	[0.006]	[0.007]	[0.006]	[0.007]
Contiguous Alliances	0.045	0.065	0.054	0.075
	[0.029]	[0.067]	[0.030]	[0.069]
Contiguous UN Ideal Point Difference	−0.185	−0.372	−0.162	−0.361
	[0.141]	[0.341]	[0.146]	[0.342]
Sub-Saharan African Diplomats	0.030.	0.060	0.030.	0.060
	[0.016]	[0.049]	[0.016]	[0.053]
Civil War	0.146	0.173	0.109	0.145
	[0.095]	[0.131]	[0.098]	[0.123]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	725	725
Log-likelihood	−957	−858	−1049	−953

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.3: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation.

Dependent Variable: MID Initiation				
	Model (9)	Model (10)	Model (11)	Model (12)
REM Exports % GDP (log)			−0.020	−0.036
			[0.022]	[0.023]
GDP/Cap (log)	−0.054**	−0.077	−0.053**	−0.057
	[0.017]	[0.055]	[0.018]	[0.053]
Total Population Size (log)	0.032	0.265	0.017	0.086
	[0.021]	[0.227]	[0.022]	[0.226]
Polity V Score	−0.008**	−0.006	−0.007*	−0.002
	[0.003]	[0.006]	[0.003]	[0.006]
Trade Openness (log)	0.013	0.042	−0.005	0.016
	[0.031]	[0.051]	[0.033]	[0.054]
Oil Exports USD (log)	0.004*	0.003	0.003.	0.003
	[0.002]	[0.002]	[0.002]	[0.003]
Contiguous Alliances	−0.014.	−0.009	−0.010	−0.002
	[0.007]	[0.018]	[0.008]	[0.018]
Contiguous UN Ideal Point Difference	0.055	−0.033	0.067	−0.030
	[0.045]	[0.067]	[0.046]	[0.071]
Sub-Saharan African Diplomats	0.004	0.028*	0.005.	0.033*
	[0.003]	[0.012]	[0.003]	[0.013]
Civil War	0.079*	0.034	0.088*	0.041
	[0.035]	[0.050]	[0.036]	[0.050]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	724	724
Log-likelihood	−183	−132	−172	−121

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.4: Odds ratios for the effect of REM Exports % GDP (log) on MID Initiation.

Dependent Variable: MID Initiation		
	Model (11)	Model (12)
REM Exports % GDP (log)	0.981	0.964
	[0.939 : 1.023]	[0.849 : 1.052]

Table 4.4.

The results presented do not support Hypothesis 2. In Model 11, the coefficient for the primary predictor variable is negative and suggests that for every 1 unit increase in REM exportation, the log odds of a state initiating an MID decrease by 0.020. More simply, for every percentage increase that REM exports contribute to a state's GDP, the likelihood that they will launch an interstate conflict reduces by 2%. Model 12 finds a similar effect when fixed effects are applied. However, here the likelihood that states will initiate an MID falls by 3.6% per single unit increase in REM exportation.

The consistently negative direction of the REM export coefficients initially implies that the observed relationship is in opposition to that specified in Hypothesis 2. However, despite the consistent orientation, in neither model is the effect statistically significant. Thus, the null hypothesis that there is no relationship between REM exportation and the likelihood that a state will initiate an MID cannot be rejected.

For the most part, the control variables in Models 11 and 12 are in line with those identified by the baseline analyses. The only exceptions are *Trade Openness (log)* and *Oil Exports USD (log)*. In the former's case, the direction of effect reverses from positive to negative in Model 11. In the same model, the coefficient for the latter becomes statistically insignificant at the 0.05 level. Such findings naturally raise questions over the robustness of the results. However, these changes could be explained by the slight drop in observations that occurs when the key explanatory variable is introduced.[27]

Moreover, the negative effects observed for *GDP per capita (log)*, *Contiguous Alliances*, and *Polity V Score* are in line with prior research [Bremer, 1992, Souva and Prins, 2006]. Similarly, the positive effects for *Oil Exports USD (log)*, *Sub-Saharan African Diplomats*, and *Civil War* are also consistent with the literature [Gleditsch et al., 2002, Renshon, 2016, Strüver and Wegenast, 2018]. As such,

[27]When *REM Exports % GDP (log)* is included, the number of observations falls by almost 5%.

the relationship between REM exportation and MID initiation can be asserted with a certain level of assurance. Thus, Hypothesis 2 is not supported by this empirical investigation.

MID Initiation: Robustness

This analysis is also subjected to a string of robustness checks.[28] As in the prior examination, *Total Alliances*, *Total Diplomats* and *Binary Year* variables are added. In accordance with MID -based literature, I also include cubic polynomial variables for the number of years since a state last engage in an MID [Carter and Signorino, 2010, Colgan, 2010]. Various controls are also replaced with alternative specifications. Furthermore, *REM Exports USD (log)* once more replaces the primary explanatory variable. Following these checks, the finding that the increased exportation of REMs has no effect upon the likelihood that a state will initiate an MID can be considered robust. Whilst there are occasionally changes to the control variables, the size, direction, and significance of the key independent variable does not change in any of the models.

As a further test of robustness, I also make use of three alternative dependent variables: *MID Initiation With Force*, *MID Initiation Without Force*, and *MID Participation*. Table 4.5, Table 4.6, and Table 4.7 demonstrate the findings of these checks. The results show that the observed effect of REMs does not vary between different measures of conflict; further indicating the robustness this empirical analysis.

4.4 Discussion

The empirical results of this chapter do not support the REM-backed aggression theory. States do not capitalise upon the opportunity to allocate the REM-based revenue for the purpose of increasing their military arsenal. As such, the increased exportation of these resources does not lead to a rise in the level of arms that states import. Instead, it has a reducing effect.

[28]Results for all MID initiation robustness checks can be found in Appendix B.

Table 4.5: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation With Force.

Dependent Variable: MID Initiation With Force		
	Model (13)	Model (14)
REM Exports % GDP (log)	−0.016	−0.035
	[0.019]	[0.019]
GDP/Cap (log)	−0.045	−0.025
	[0.016]	[0.046]
Total Population Size (log)	0.009	0.030
	[0.019]	[0.186]
Polity V Score	−0.008	−0.005
	[0.003]	[0.006]
Trade Openness (log)	0.009	0.036
	[0.029]	[0.051]
Oil Exports USD (log)	0.003	0.005
	[0.002]	[0.002]
Contiguous Alliances	−0.006	−0.001
	[0.007]	[0.016]
Contiguous UN Ideal Point Difference	0.080	−0.014
	[0.040]	[0.055]
Sub-Saharan African Diplomats	0.005	0.029
	[0.002]	[0.012]
Civil War	0.076	0.016
	[0.033]	[0.044]
Fixed Effects	No	Yes
Sample size	724	724
Log-likelihood	−93	−45

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.6: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation Without Force.

Dependent Variable: MID Initiation Without Force		
	Model (15)	Model (16)
REM Exports % GDP (log)	−0.002	−0.001
	[0.011]	[0.011]
GDP/Cap (log)	−0.007	−0.032
	[0.010]	[0.029]
Total Population Size (log)	0.008	0.056
	[0.011]	[0.098]
Polity V Score	0.001	0.004
	[0.002]	[0.003]
Trade Openness (log)	−0.015	−0.020
	[0.017]	[0.020]
Oil Exports USD (log)	0.000	−0.002
	[0.001]	[0.001]
Contiguous Alliances	−0.005	−0.001
	[0.004]	[0.010]
Contiguous UN Ideal Point Difference	−0.007	−0.016
	[0.024]	[0.036]
Sub-Saharan African Diplomats	0.000	0.004
	[0.001]	[0.005]
Civil War	0.019	0.026
	[0.018]	[0.021]
Fixed Effects	No	Yes
Sample size	724	724
Log-likelihood	274	314

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.7: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Participation.

Dependent Variable: MID Participation		
	Model (17)	Model (18)
REM Exports % GDP (log)	−0.022	−0.006
	[0.030]	[0.037]
GDP/Cap (log)	−0.086***	−0.080
	[0.024]	[0.058]
Total Population Size (log)	0.025	0.128
	[0.032]	[0.271]
Polity V Score	−0.009.	0.004
	[0.004]	[0.009]
Trade Openness (log)	−0.050	−0.057
	[0.043]	[0.062]
Oil Exports USD (log)	0.004.	0.002
	[0.002]	[0.003]
Contiguous Alliances	−0.017.	−0.010
	[0.010]	[0.018]
Contiguous UN Ideal Point Difference	0.078	−0.046
	[0.058]	[0.067]
Sub-Saharan African Diplomats	0.008.	0.037*
	[0.004]	[0.013]
Civil War	0.069.	0.035
	[0.041]	[0.040]
Fixed Effects	No	Yes
Sample size	724	724
Log-likelihood	−261	−189

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This result explains the lack of empirical evidence to support Hypothesis 2. Without a positive relationship between REMs and arms transfers, there is no obvious pathway for which these resources would be able to facilitate an increase in a state's opportunity and willingness to launch an MID. This is subsequently reflected in the results as the increased exportation of REMs has no effect upon the likelihood that a state will initiate an MID.

Whilst contradictory to the expectations of this thesis, these results are still both interesting and important. They signify that the effect of REM exports is drastically different to the effect of oil. Whilst the latter encourages arms transfers and interstate aggression, the former does not. This signals the potential for a more peaceful international system in the coming years. As the renewable transition progresses, and the natural resource demand from the energy sector switches from fossil fuels to REMs, it is possible that there will be fewer conflicts initiated as a result of material wealth. This will perhaps be the case as the mechanism that is heavily theorised to enable oil abundant states to act aggressively, does not translate to REMs. Thus, when the importance of oil declines, it's conflict inducing effect may shrink and disappear entirely. As the results presented in this chapter show that REMs will not replace oil as a trigger for MIDs, resource-backed aggression may be left in the petro-era.[29]

Moreover, in addition to less interstate disputes, it is possible that there may also be a reduction in the number of civil wars that occur. Research has shown that the increased transfer of arms can lead to a higher risk of internal conflict in which one-sided violence occurs [Gallea, 2023].[30] Thus, by reducing the level of imported arms, the increased exportation of REMs may help prevent intrastate tensions from escalating into full scale war. This is particularly good news for sub-Saharan African states which, as mentioned, have experienced much internal

[29]This prediction is dependent upon a decline in oil-related disputes, and an unchanging effect of REMs; neither of which can be expressed with any degree of certainty. Such optimism should therefore be approached with caution.

[30]This is especially true for Africa with a 10% increase in the log of imported arms associated with a 0.16% increase in the risk of civil war [Gallea, 2023].

conflict in recent years [International Institute for Strategic Studies, 2023]. As their mining industry continues to develop therefore, and REM exports continue to rise, it is possible that there will be a continued reduction in the level of arms transferred to the region. Thus, there may be a rise in domestic stability.

However, optimism aside, the question remains: why do REMs lead to a reduction in the average level of arms that states import? As previously discussed, one possible explanation is that the increased exportation of REMs provides economic motivations that discourage states from importing more arms.[31] As shown by Figure 4.2, a rise in REM exports has a positive correlation with a states GDP. As such, states likely want to protect this continued development and avoid any actions that may put it at jeopardy. This is likely to be especially true in developing regions, such as sub-Saharan Africa, that cannot throw away opportunities to advance economically.

Nevertheless, scholars note that increased military expenditures, including greater arms procurement, can increase the security dilemma for states [Fordham, 2004, Sample, 1998]. This subsequently leads to national and regional instability. In response to such instability, mining companies often withdraw or halt production. Moreover, new organisations are discouraged from entering the market whilst existing operators become reluctant to return [Meierding, 2016]. Given the reliance upon private mining companies to produce and export REMs, using the revenue to buy more arms is an activity that could put a state's future economic development at risk. Thus, states have incentives to avoid such actions. Moreover, they likely have incentives to appear more peaceful and as such, reduce their overall level of arms transfers. This theory therefore offers an explanation for the results observed in this chapter.

Alternatively, the results could be due to the under reporting of arms transfers from Chinese-based firms. The Chinese government has long been accused of lacking transparency with regards to their weapons exports [Amnesty International, 2006]. As such, several arms deals go under reported. Given China's

[31] See Chapter 3, Section 3.5 for more information.

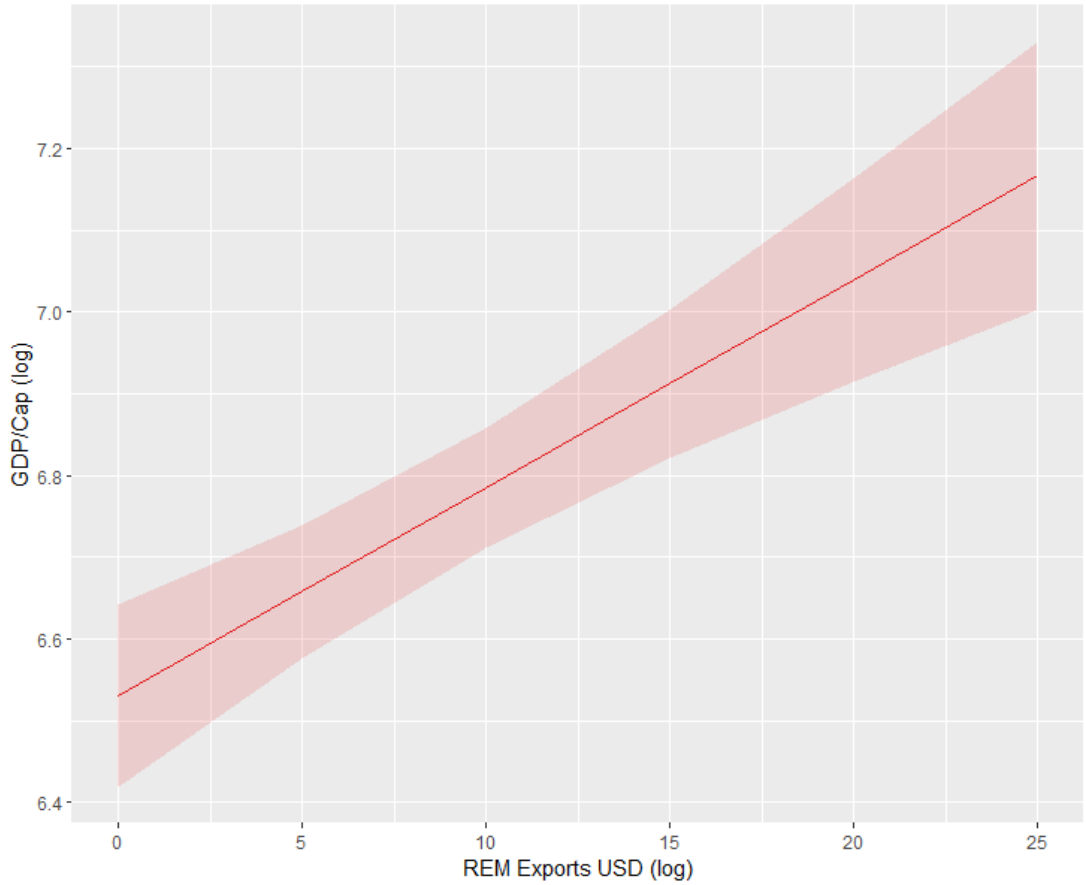

Figure 4.2: Correlation between REM Exports USD (log) and GDP/Cap (log) with 95% confidence intervals.

history of engaging in 'arms-for-resource' deals [Herbst, 2008], and as they are a major investor in the sub-Saharan mining industry [World Bank, 2023], it is possible that a different relationship may have been observed should such export data have been accurately recorded.

4.5 Conclusion

In this chapter, I sought to empirically examine the theory of REM-backed aggression. Specifically, I aimed to test whether an increase in the exportation of REMs is associated with an increase in the likelihood that a state will initiate an MID. Moreover, I sought to examine if such a relationship is facilitated by a rise in a state's level of arms transfers.

The results did not support the theory of REM-backed aggression. Rather than leading to a rise in arms transfers, increased REM exportation is instead associated with a decrease in the level of weapons that states import. As such, increased REM exportation does not give rise to the opportunity and willingness of states to initiate an interstate dispute; thus, leading to no observable relationship between REMs and MID initiation.

The observed reduction in arms transfers may be on account of the economic incentives that REMs provide states to avoid such actions. These incentives may be of particular strength in developing countries for which financial improvement is of the upmost importance. In the following chapter, I investigate the possibility that the incentives to pursue a policy of increased arms procurement vary between different types of regimes. Moreover, I investigate whether any of these motivations outweigh the economic incentives to buy fewer weapons that REMs may provide.

Chapter 5

The Role of Regime Type in REM-Backed Aggression

5.1 Introduction

The findings of the previous chapter show that REMs have no effect upon interstate conflict processes. More specifically, they show that an increase in REM exportation is related to a decrease in the level of weapons that nations import. This indicates that although REMs provide states with revenue to buy more arms, leaders decide not to spend the money in this way. This highlights an important point in the process of arms transfers; the decision to pursue a policy of increased procurement is based on more than just the availability of funds. It is also based upon the motivations that leaders have to seek such a course of action. The prior results show that REMs provide financial incentives to leaders not to use the export revenue to buy more weapons.

However, research shows that variation exists between different regime types with regards to their motivations for increasing their military capabilities [Conrad and Souva, 2020, Dunne and Perlo-Freeman, 2003, Fordham and Walker, 2005, Hewitt, 1991, Mulligan et al., 2004, Töngür et al., 2015, Yildirim and Sezgin, 2005]. Specifically, research suggests that the regimes most at risk of being vio-

lently removed from office are inclined to better finance their military to ensure their survival. These arguments also apply to arms transfers and as such, the various types of regimes may also have different motivations for increasing the number of weapons that they purchase. Therefore, when states are provided with REM exportation revenue, it could be the case that in some regimes, the incentive to ensure their own survival outweighs the financial motivation to import less arms.

To fully explore the REM-backed aggression theory, this possibility is investigated. This chapter re-examines the analysis of Chapter 4 whilst accounting for the role of regime type. Whilst conventional literature has tended to distinguish between regimes as either democracies or autocracies, some research has observed that alternative manifestations of the latter regime type differ from each other as much as they do democracies [Geddes, 1999]. This has led recent international relations literature to differentiate between regime types as such [Colgan and Weeks, 2015, Johnson and Shreve, 2023, Way and Weeks, 2014, Weeks, 2012]. To accommodate these findings and fall in line with recent scholarly work, this chapter defines regimes as either democracies, personalist autocracies, or non-personalist autocracies.

The central argument of this chapter is that the effect of REM exports on both arms transfers and the likelihood of MID initiation varies between these different types of regime. The structure of a state's regime presents different incentives for increasing their level of arms transfers by generating alternative threats to a leader's control of power. As democracies generally maintain power by satisfying the general public, who by in large do not favour increased arms procurement, they have fewer incentives to import more weapons [Conrad and Souva, 2020]. Instead, they have incentives to reduce their overall levels to better ensure their economic development and subsequently boost their chances of re-election [Balaguer-Coll et al., 2015, Brender and Drazen, 2008]. Thus, the incentive to import more weapons when REM exports increase does not outweigh their incentives to reduce their level of arms transfers.

Alternatively, both personalist and non-personalist autocratic regimes are more regularly removed from office via a domestic use of force [Conrad and Souva, 2020]. Thus, they have significant incentives to increase their military arsenal to ensure their regimes endurance. As such, I argue that the incentives to protect their regime are sufficient to overpower any counter-motivations. I expect that there is an increase in their level of arms transfers when REM exports increase. Additionally, owing to this hypothesised effect, I argue that the opportunity and willingness of autocratic leaders to initiate an MID is also greater when REM exports increase. However, the same is not expected for democracies as their reduced level of arms transfers means that their desire and capacity to pursue their international goals by way of military power does not change. The effect of REMs on both arms transfers and the likelihood that a state will initiate an MID is hypothesised to be greatest in personalist autocracies. They are most at risk of violent attempts to remove leaders from office, face the greatest consequences if such attempts are successful, and have fewer options available to them for increasing their military capabilities.

The remainder of this chapter is structured as follows. First, the central argument is presented in three clear steps: a re-cap of the theorised relationship between REMs and the importation of arms, a breakdown of regime type's influence on arms transfer motivations, and the interaction between the two. Second, details on the employed methodological approach are outlined. Third, the results of this investigation are presented. Fourth, the results are analysed and discussed in relation to the chapter, the REM-backed aggression theory, and international relations. Fifth, the chapter concludes with a summary of the key findings.

5.2 Regime Type and REM-Backed Aggression

5.2.1 REMs and Arms Transfers

Since the genesis of the renewable energy transition, the REM market has grown considerably. As shown by Figure 5.1, more than $200 billion worth of materials

were exported in 2014 alone. States with an abundance of REMs have therefore been granted an opportunity to capitalise upon the growing and lucrative market and generate a substantial revenue stream from their exports. This revenue stream provides states with a larger pot of money to spend on policies and initiatives than they would otherwise have had.

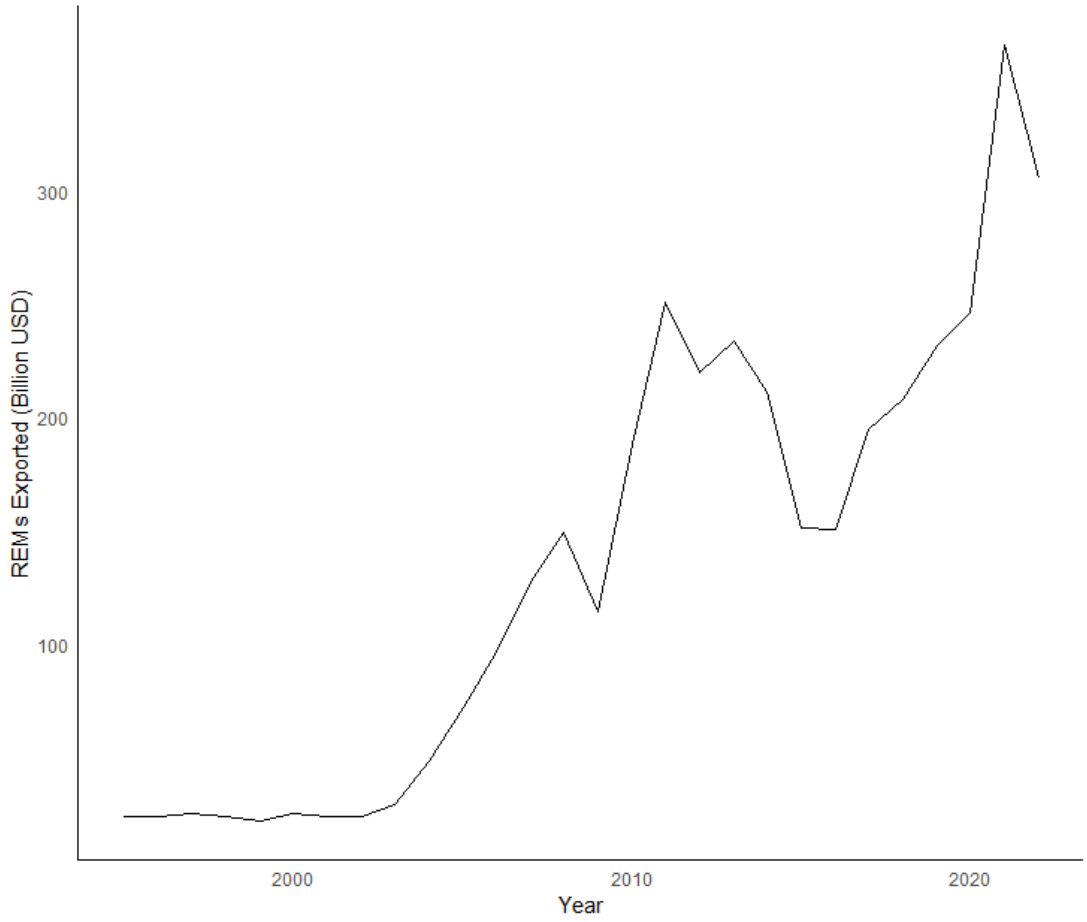

Figure 5.1: Annual value of global REM exports measured in billion USD, 1995 - 2022 [OEC World, 2024].

Whilst there are numerous ways that states can generate an income stream from REM exports, there are two primary mechanisms: state-based exports and royalty payments. States can generate income by exporting materials from the mines which they own and operate. As the entire process is under state control, so too is the revenue it generates. However, such mines are rare with less than a third of active REM facilities in sub-Saharan Africa falling under this ownership

structure [World Bank, 2023]. As such, the opportunities for revenue generation via such means are limited.

Nevertheless, states can also generate revenue via royalty payments. Such payments are paid by private mining companies and are considered to be the price they must pay for the right to mine and sell a state's non-renewable natural resources [Lilford and Guj, 2020]. Although such payments can take many forms, they are typically calculated as a percentage of the material's price at the point of exportation [Guj, 2012]. As they are only a percentage of the revenue made from exports, royalties do not generate the same level of income for regimes as state-based exports. However, their widespread use in a largely privatised market does provide states with a consistent and considerable source of income. For example, Ghana adjusted its royalty payment structure in 2010, introducing a flat 5% rate for all metals [Gajigo et al., 2012]. In the following 4 years, this generated an estimated $53 million in revenue for the state.[1]

Both state-based exports and royalty payments are considered to be outside the regular taxation system of the general public. As such, states have greater freedom when it comes to its allocation as there is significantly less scrutiny upon how it is spent. Research regarding the effect of oil has previously shown that similar resource-based non-tax revenue can be more easily spent on unpopular policies [Le Billon and El Khatib, 2004, Perlo-Freeman and Brauner, 2012]. Amongst such questionable policies is the pursuit of greater arms procurement. This policy is frowned upon given its relationship with regional instability [Basedau and Lay, 2009, Chan, 1980, Farzanegan, 2011, Le Billon and El Khatib, 2004, Perlo-Freeman and Brauner, 2012, Vézina, 2021]. Thus, it can be argued that REM exports not only provide leaders with more money to spend, but that its non-tax nature means it can be spent on unfavourable policies, such as greater arms transfers.[2]

However, this fiscal freedom does not necessarily mean that states will choose

[1]Royalty estimations are based on data taken from OEC World [2024].

[2]See Chapter 3, Section 3.2 for more information.

to spend the money on such controversial policies. REMs create economic incentives not to do so by encouraging economic development. As such development is threatened by regional instability, which is increased by the greater importation of weapons [Sample, 2018], leaders are motivated to buy fewer arms. Thus, for REMs to increase the level of arms that states purchase, leaders must have significant incentive to disregard these motivations and put their economic development at risk.

5.2.2 Regime Type and Arms Transfers

Regime Type and Military Expenditure

Over the last several decades, much literature has investigated the effect of regime type on military expenditure. Scholars note that autocratic states allocate significantly more financial resources to their military [Dunne and Perlo-Freeman, 2003, Fordham and Walker, 2005, Hewitt, 1991, Töngür et al., 2015, Yildirim and Sezgin, 2005]. Specifically, it is estimated that each year they allocate an estimated 3% more of their GDP to their military than their democratic counterparts [Mulligan et al., 2004].

In a recent review, Conrad and Souva [2020] argue that this is the case as the structural differences in regimes leads to variance in the primary threat that leader face to their control of power. In democracies, due to the emphasis on political participation, leaders tend to lose power by way of peaceful elections. To retain office therefore, incumbents are encouraged to pay close attention to the views of the public and allocate resources in a manner that is consistent with their expectations. However, increased military expenditure is associated with an increase in the security dilemma for states and the onset of interstate conflicts [Choulis et al., 2022, Fordham and Walker, 2005, Sample, 2018]. Such conflicts adversely affect the average citizen considerably and as such, they naturally favour social spending above military expenditures. Therefore, as their regime's survival is influenced by their capacity to refrain from increasing their military expenditure, democratic leaders have few incentives to pursue this course

of action.

By contrast however, autocracies do not place their survival in the hands of the public, but rather in the hands of a few key groups of supporters. Thus, they are more regularly ousted from power via the use of force in either coups or domestic revolutions. As their survival does not depend upon the average voter, autocratic leaders have less need to adhere to their ant-militarisation preferences. Instead, the threat of domestic conflict encourages them to pursue greater military expenditure. This can be considered particularly likely given that such an increase in expenditure reduces the likelihood of a successful coup [Albrecht and Eibl, 2018]. Furthermore, the regimes most likely to survive a domestic uprising are those whose military strength greatly outmatches that of the opposition [Balcells and Kalyvas, 2014]. Thus, as autocracies are more likely to survive when they spend more on their military, they have a greater level of motivation to increase such expenditure.

Regime Type and Arms Transfers

The arguments presented above can also be extended to arms transfers. The purchase of major foreign weapons is a significant component and costly contributor to a state's military expenditure. For example, a single F-16 – a fighter jet used by 26 different states – costs an estimated $63 million [Rennolds, 2023]. As the average citizen does not favour increased military expenditure generally, it is unlikely that there should be an exception for this expensive individual component. It is instead more plausible that they would favour such an expenditure less given that increased arms transfers have the potential to spark military build-ups in neighbouring states that can descend into conflict [Sample, 1998]. Therefore, democracies not only have incentives to refrain from increasing their military expenditure, but also their level of arms imports.

Alternatively, the need for a strong military in autocratic regimes to ensure their survival against domestic revolutions suggests that the incentives for increasing their military expenditure also translate to arms transfers. As noted

above, in circumstances where a state's personal military power greatly outweighs that of their domestic opposition, it is more likely that the state will prevail and maintain their position. Whilst military power is influenced by various factors – including military size and efficiency – weapons and technology are considered to be amongst the most important contributors [Souva, 2023]. Therefore, the incentive of autocracies to protect their regime by increasing their military expenditure can also be considered as an incentive to increase their military arsenal.

These considerations demonstrate that the structure of a regime effects the motivations that democracies and autocracies have for importing more arms. This argument is further supported by the work of Blomberg and Tocoian [2016] that highlights that autocratic regimes import more than 1.5 times as many arms as democracies. Moreover, Table 5.1 also shows that on average, autocratic regimes in sub-Saharan Africa import almost 20% more weapons each year.

Table 5.1: The annual average level of arms imports by regime type in sub-Saharan Africa, 1995 - 2014.

Regime Type	Annual Average Arms Transfers (TIV)
Democracies	14.28
Autocracies	17.07

Autocracies and Arms Transfers

Whilst evidence indicates that autocratic regimes have greater incentives to import more arms than democracies, this observation does not consider that there are different types of autocracy. Although in the most recent literature numerous classifications of autocracy have emerged, most scholarly work – and the related data – tends to differentiate to some extent between those led by individuals (personalist) and those led by groups, factions, or institutions (non-personalist). Research has observed that there are various difference between the two with personalist regimes more likely to pursue nuclear weapons and initiate interstate conflicts [Colgan and Weeks, 2015, Way and Weeks, 2014, Weeks, 2012].

However, there is also reason to believe that in addition to varying in terms of interstate belligerence and nuclear adventurism, personalist and non-personalist regimes also differ in their motivations for importing arms. Whilst both are more likely to be removed from office via force than they are elections, research shows that personalist autocracies are more likely to experience the onset of civil war and violent revolutions - particularly during periods of high mobilisation [Grundholm, 2020, Gurses and Mason, 2010]. This is assumed to be the case as personalist leader's desire to remain in power is such that it leads them to remove all other avenues for their legitimate expulsion from office. As best summarised by Kendall-Taylor et al. [2017, p. 12], such leaders "cling to power in the face of domestic challenges, often leading to violent and protracted transitions."

Given the higher potential for violent challenges, it can be argued that personalist regimes have greater incentive to increase their level of arms transfers. This can be considered particularly likely given the finding that in the event of a regime's collapse, personalist leaders are more likely to be exiled, imprisoned, and killed than those in other regime types [Radtke, 2020]. Thus, not only does their regime's survival depend upon strengthening their military arsenal, but personalist leaders' lives do too.

Furthermore, personalist autocracies also have greater incentive to import more arms than non-personalist regimes as when faced with violent revolutions, their options for increasing their military strength are more constrained. In addition to experiencing higher levels of civil conflict and domestic uprisings, personalist autocracies are also at risk of experiencing military coup attempts. As noted by Bove and Brauner [2016], more than 60% of autocratic regimes, including personalist, collapse as the result of a military coup. In an attempt to prevent such a possibility and "coup-proof" the regime, personalist leaders tend to keep their military divided via the employment of para-militaries, positional rotations, and regular purges [Grundholm, 2020]. Non-personalist autocracies tend to pursue alternative policies such as indoctrinating members of the military into the ruling party or offering efficiency bonuses.

Whilst the strategy of personalist regimes is deemed to be the most successful in preventing military takeovers, it does reduce the options available to leaders for increasing their military strength. In response to the threat of domestic revolutions, personalist leaders cannot risk making the military more efficient as it reduces the threat of civilian uprising but increases the risk of a military coup. However, as noted previously, there are other ways in which states can achieve greater military strength, such as increasing their physical firepower. As such, it can be assumed that in response to a heightened threat of domestic conflict, personalist regimes have greater incentive to import more arms than non-personalist autocracies.

5.2.3 The Interaction Between REMs and Regime Type

The central argument of this chapter is that the effect of REM exports on a state's level of arms transfers, and by extension their likelihood of initiating an MID, varies between the different regime types. As discussed, REMs provide states with a source of revenue that leaders can use to increase the volume of arms they import. Nevertheless, they mostly decide not to allocate the revenue in this way, emphasising the importance of motivations in policy decision making. However, for any policy option a leader faces, there likely exists competing motivations for an alternative course of action. Leaders must weigh up these different incentives with the final decision on any action determined by which set of motivations is the most convincing. This idea is best summarised by former President of the United States of America, Barack Obama [2020];

"One of the first things I discovered as President of the United States was that no decision that landed on my desk had an easy, tidy answer...I created a sound decision-making process - one where I really listened to the experts, followed the facts, considered my goals and weighed all of that against my principles."

In the context of arms transfers, whilst states may have incentives to import more arms when provided with REM-based revenue, there are also competing motivations that encourage states to reduce such levels. In order for REMs to have a positive effect on the level of arms a state imports, the motivation to buy more weapons must outweigh the incentive to refrain from doing so. I argue that this is not the case in democratic states. Given their reliance upon the public and their anti-militaristic preferences, democracies have few incentives to pursue a policy of increased arms procurement. Moreover, democratic leaders have significant incentives to reduce their level of arms imports in response to the increased exportation of REMs. As discussed, such exports can have a positive effect upon a state's economic development.[3] However, increased arms transfers can generate regional instability that can further effect a state's economic development [Polachek and Sevastianova, 2012]. As the likelihood of being re-elected for democratic leaders and parties is directly influenced by the state's economic performance – especially in developing nations – such leaders are encouraged to reduce their levels of arms transfers by the increase in their level of REM exportation [Balaguer-Coll et al., 2015, Brender and Drazen, 2008].

However, I argue that the motivations for both personalist and non-personalist autocracies to increase their level of arms transfers are such that they outweigh any counter incentives. I theorise that leaders prioritise their own survival, and that of their regime, above almost everything else. As the endurance of autocratic regimes is highly dependent upon a well-armed military, the incentive to increase their level of arms transfers is thought to be a top priority for leaders. Thus, when provided with the REM-based revenue, I argue that there is little that would discourage them from using it to buy more weapons. As such, I expect that the effect of REM exports on arms transfers varies between the different types of regimes. Therefore, I hypothesise:

Hypothesis 3a: *As REM exportation increases, the level of arms that democracies import decreases.*

[3]See Chapter 4, Section 4.4 for more information.

Hypothesis 3b: *As REM exportation increases, the level of arms that personalist and non-personalist autocracies import increases.*

However, personalist and non-personalist autocracies have different levels of motivation for buying more weapons. Thus, whilst both may use the REM-based revenue to increase their level of arms transfers, when presented with the money variation also exists between the two types of state with regards to the level of weapons that they purchase. In the regime whose structure provides them with the greatest motivation to import more arms, leaders are more inclined to allocate the REM-based revenue accordingly. Due to the higher threat of a violent removal from power in which their lives are directly at risk and given that they have fewer options available to them to strengthen their military capabilities, I argue that personalist autocracies have the greater incentives to import more arms. Thus, I also hypothesise that:

Hypothesis 4: *As REM exportation increases, personalist autocracies import more arms than non-personalist autocracies.*

In line with the REM-backed aggression theory outlined in Chapter 3, variation between states in terms of arms imports should also lead to disparities between regimes with regards to the likelihood that they will initiate an MID. The hypothesised expansion of military capabilities in personalist and non-personalist autocracies is theorised to increase the opportunity that such states have to launch an international conflict. By using REM revenue to enhance their military capacity in this manner, states increase the likelihood that they will be successful in any military campaign they enter. Thus, they have more opportunities to engage in disputes as conflict becomes a more viable option. Furthermore, the rise in arms transfers also increases the willingness of autocratic leaders to adopt this course of action. Their increased capacity in this sense fills them with a greater

confidence that their campaign will be successful. Thus, it is argued here that when REM exports increase in both forms of autocratic regime, the likelihood that they will initiate an MID also increases.

However, whilst personalist autocratic regimes may be more likely to initiate such conflicts when REM exports increase, their need to keep their military structurally separated to prevent a coup may also discourage such actions. This is possible as a fractured military does not lend itself to success in international disputes [Narang and Talmadge, 2018]. Therefore, any advantage that increased arms transfers may give personalist regimes in achieving interstate conflict victory is possibly counterbalanced by their fragmented military.

Nevertheless, before REMs and arms transfers are even taken into consideration, research has shown that personalist regimes are more likely to initiate MIDs than non-personalist autocracies and democracies [Weeks, 2012]. This is considered to be the case as the decision to initiate conflict is influenced, at least in part, by the domestic audiences of the state. If such audiences hold power, leaders are less inclined to pursue violent international policies in order to keep them happy. When there is no-such audience or it is severely limited, as is the case in personalist regimes, the decision to initiate an MID is based upon the leader's own preferences. As personalist leaders most regularly assume their position by way of violence, they have a pre-disposition for the use of force as a means of achieving their policy goals [Colgan and Weeks, 2015]. Given that personalist regimes regularly disregard their structural disadvantages in pursuit of their militaristic preferences, when a REM-induced increase in arms transfers occurs, such regimes are no less likely to refrain from launching an international attack.

In contrast to the autocratic regimes however, as greater exportation is assumed to be associated with a reduction in the level of arms imported to democracies, it is more likely that for such states, increased exportation will have no significant effect on the likelihood that they will initiate an MID. I argue that this is the case as when REM exports increase, the capabilities of democracies to

fight and win an international conflict do not significantly change. By extension therefore, neither does the desire of the leaders to pursue such a course of action. It is therefore unlikely that democracies will be more inclined to pursue their foreign policies in this way than they would if there was no change to their level of REM exports. Based upon these further arguments, I hypothesise that:

Hypothesis 5a: *As REM exportation increases, there is no change in the likelihood that democracies will initiate an MID.*

Hypothesis 5b: *As REM exportation increases, the likelihood that personalist and non-personalist autocracies will initiate an MID increases.*

Furthermore, as variation is theorised to exist between personalist and non-personalist autocracies with regards to the size of the effect of REMs on arms transfers, variation may also exist in the likelihood of said states initiating an MID. Given that personalist regimes are expected to import more arms in such circumstances, I argue that they will also have the greatest opportunity and willingness to launch an international dispute. Thus, they are considered more likely to initiate an MID. This idea is also not surprising. Given that personalist leaders tend to achieve power via violent means, they have more militaristic preferences [Weeks, 2012]. The same is not considered true for non-personalist autocracies as they usually come into power by more peaceful means. As such, I hypothesise:

Hypothesis 6: *As REM exportation increases, the likelihood that personalist autocracies will initiate an MID is greater than that of non-personalist autocracies.*

5.2.4 Theoretical Alternatives

In addition to the arguments presented above, there are also a range of possible theoretical alternatives. The first of which is that there exists no variation between regime types with regards to the effect of REM exports. Whilst states may have differing levels of motivation for increasing the number of weapons they buy, it is possible that the economic incentives to reduce such imports are greater for all regimes. This is especially possible for the states investigated in this thesis. As noted, all sub-Saharan African states are considered developing. Thus, it is likely that they place significant value on economic improvement and are therefore reluctant to jeopardise it. As such, even in personalist and non-personalist autocracies, where motivations to buy more arms are high, leaders may seek to reduce their import levels to protect their development.

However, whilst this is indeed possible, I do not believe that it is likely. Instead, I believe that whilst autocratic leaders may want to see their state prosper financially, they want to live and to rule more. As such, I argue that the desire of such leaders to protect their lives and their regimes outweighs any financial motivation that may discourage them from using the REM-based revenue to buy more arms.

It may also be possible that variation not only exists between personalist and non-personalist autocracies, but also between military and non-military autocracies. Much research has shown that there exists several military related differences between such regimes [Bove and Brauner, 2016, Kim et al., 2013, Töngür et al., 2015]. One such difference is that military autocracies allocate greater fiscal resources to their armed forces than comparable non-military regimes. This is due to their greater threat of coups and a reliance upon repressive strategies to keep the general public in line. Given therefore that military regimes need a strong armed forces, it may also be the case that when REM exports increase, they have greater incentive to increase their level of imported arms. If such is the case, they would also be more likely to initiate an MID. As a robustness check, I examine the interaction between REMs and regime type with the latter including the following

categories: democracy, military autocracy, and non-military autocracy.

5.3 Research Design

5.3.1 Data and Methodology

To examine the hypotheses presented above, the empirical analysis of Chapter 4 is re-conducted here with the inclusion of an interaction between REM exports and regime type. The initial stage once more examines the effect of REM exports on a state's level of arms transfers using a series of generalised linear regression models, specified with a gaussian distribution. The relationship between REMs, regime type, and MID initiation is then investigated via the use of binomial logistic regression analysis. The original data set used in the previous chapter is also employed here. Finally, the models are initially specified with random effects before being re-examined with country-year fixed effects.

5.3.2 Dependent Variables

Arms Transfers

The primary dependent variable for the initial analysis is the TIV of the level of arms imported to a state: *Arms Transfers*. TIV once more refers to the military value of the imported arms, not the financial sum paid. The variable is expressed as a 5-year forward moving average to account for the infrequency in which arms transfers occur. Moreover, the variable is log transformed to account for variation in arms transfers between the observed states.[4]

MID Initiation

In the second analysis, the dependent variable is the annual onset of an MID in which the observed party is deemed to be the primary initiator: *MID Initiation*. This is a dummy variable with observations assigned a value of '1' if they are

[4]Data is taken from the SIPRI 'Arms Transfer' database. This data covers between 1950 and 2023.

judged to have initiated an MID in a given year. If the specified conditions are not met, a value of '0' is allocated.[5]

5.3.3 Independent Variables

REM Exports

Also returning for this analysis as a primary independent variable is the level of REMs exported by a state in a given year: *REM Exports % GDP (log)*. Such exports are once more measured as a percentage of a state's annual GDP. It is also log transformed and lagged by 1 year.[6]

Regime Type

This chapter introduces a second set of key explanatory variables: regime type. Here, three separate dummy variables are utilised with a value of '1' assigned to each different regime: *personalist autocracy*, *non-personalist autocracy*, and *democracy*. Whilst different interpretations and data sets exist for autocratic regimes, I use that of Geddes et al. [2014]. This data set best overlaps with the pre-established analytical time frame, 1995 - 2014. However, it only includes observations between 1946 and 2010. As such, I extend the data until 2014 based upon the last known measurement.

Although the data set provides various sub-categories of autocratic regimes, Geddes et al. [2014] define the autocratic leadership structure of such states as either party, military, monarchical, oligarchical, or personalist. This is based upon where control over policy and the public lies. Given the theoretical differences exhibited between the broader autocratic categories of personalist and non-personalist regimes, I combine the classifications outlined above as follows:

Personalist autocracies are those allocated to the category of the same name by Geddes et al. [2014]. They include regimes in which control over the entire

[5]Data is available between 1816 and 2014. For more information regarding both dependent variables, see Chapter 4, Section 4.2.2.

[6]See Chapter 4, Section 4.2.3 for more information.

state is held in the hands of a single individual regardless of their background. An example of this regime type is Equatorial Guinea under the rule of Teodoro Obiang Nguema Mbasogo.

Non-personalist autocracies are those in which power is held in the hands of a group, faction, or institution. This category includes those regimes defined by Geddes et al. [2014] as party, military, monarchical, or oligarchical.[7] Such regimes are assembled together owing to their group-based leadership structures. Examples of such regimes include the ZANU–PF party in Zimbabwe (party), President Buyoya's government in Burundi (military), and the Dlamini royal family in Eswatini (monarchical).

Whilst Geddes et al. [2014] primarily identify variation in the different types of autocracy, observations of democratic states are also included. Such states are those that are not assigned to each of the autocratic regime categories and are thusly considered as either democratic or transitionally democratic. For this analysis, both are categorised as democracy. The data set includes numerous examples of such states, including South Africa post 1994. Democratic regimes are used as the baseline regime type category for this analysis.

Within the data set used for this thesis, the distribution of observations between the three categories is relatively even. There are 287 personalist autocracies, 269 non-personalist autocracies and 358 democracies. Such a distribution allows for a more thorough analysis of the hypotheses. Furthermore, given that democracies are the most frequently occurring regime type in my data set, contributing almost 40% of observations, the support of this chapter's hypotheses would provide an explanation for the results identified in Chapter 4. The more frequent occurrence of their effect may be sufficient enough to guide the entire relationship. This further highlights the importance of examining the theory of REM-backed aggression with regime types separated.

[7]There are no observations for oligarchical states within the analytical time frame.

5.3.4 Control Variables

To remain consistent with the empirical strategy employed in Chapter 4, this analysis also includes the same series of control variables. Table 5.2 demonstrates the variables that are carried over. This table also includes a description of each variable and the source from which they are drawn.

Table 5.2: Chapter 5 control variables.

Variable	Description	Source
GDP/Cap (log)	The log transformed annual GDP of a state divided by their mid-year population estimates.	World Bank [2024]
Total Population Size (log)	The log transformed annual mid-year estimates of a state's total population.	World Bank [2024]
Polity V Score	A measurement of how autocratic/democratic a state is on a scale of -10 (autocratic) to +10 (democratic).	Marshall and Gurr [2020]
Trade Openness (log)	The log transformed annual sum of a state's total imports and exports divided by the GDP, expressed as a percentage.	World Bank, OECD, Our World in Data [2024]
Oil Exports USD (log)	The log transformed annual value of a state's crude oil exports, measured in current USD.	OEC World [2024]
Contiguous Alliances	The annual number of alliances a state has with nations that they share a contiguous land border with.	Correlates of War Project [2017], Gibler [2009]
Contiguous UN Ideal Point Difference	The maximum annual difference in UN Ideal voting points from a nation that the state shares a contiguous land border with.	Bailey et al. [2017]
Sub-Saharan African Diplomats	The annual number of diplomats hosted from sub-Saharan African states.	Moyer et al. [2021]
Civil War	A binary measurement of whether a state was involved a civil war each year, lagged by 1 year.	Davies et al. [2023], Gleditsch et al. [2002]

5.4 Results

5.4.1 Arms Transfers

Table 5.3: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 5-Year Average (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (1)	Model (2)	Model (3)	Model (4)
REM Exports % GDP (log)			−0.419**	−0.346*
			[0.134]	[0.147]
Personalist Autocracy			−0.212	−0.340
			[0.194]	[0.263]
Non-Personalist Autocracy			−0.532**	−0.768.
			[0.180]	[0.381]
REM Exports % GDP (log) X Personalist Autocracy			0.151	0.061
			[0.152]	[0.186]
REM Exports % GDP (log) X Non-Personalist Autocracy			0.019	0.091
			[0.171]	[0.187]
GDP/Cap (log)	0.372***	0.321	0.388***	0.340
	[0.061]	[0.278]	[0.065]	[0.285]
Total Population Size (log)	0.575***	3.378**	0.510***	3.242*
	[0.121]	[1.154]	[0.132]	[1.251]
Polity V	−0.016	0.005	−0.029.	−0.021
	[0.013]	[0.035]	[0.016]	[0.041]
Trade Openness (log)	0.052	0.119	0.070	0.137
	[0.114]	[0.203]	[0.130]	[0.194]
Oil Exports USD (log)	0.010.	0.011	0.008	0.009
	[0.006]	[0.007]	[0.006]	[0.006]
Contiguous Alliances	0.045	0.065	0.053.	0.075
	[0.029]	[0.067]	[0.032]	[0.057]
Contiguous UN Ideal Point Difference	−0.185	−0.372	−0.082	−0.236
	[0.141]	[0.341]	[0.147]	[0.351]
Sub-Saharan African Diplomats	0.030.	0.060	0.038*	0.052
	[0.016]	[0.049]	[0.017]	[0.055]
Civil War	0.146	0.173	0.088	0.132
	[0.095]	[0.131]	[0.096]	[0.112]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	714	714
Log-likelihood	−957	−858	−886	−789

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of the generalised linear regression analysis are presented in Table 5.3. Included are the baseline models and those specified with the key explanatory variables. Given that democracies are the baseline category for regime type, the *REM Exports % GDP (log)* coefficient demonstrates the effect of increased exportation on the level of arms imported within democratic states. As shown in Model 3, this effect is both negative and statistically significant at the 0.05 level. Figure 5.2 demonstrates that a 1% increase in REM exports contribution to a democracy's GDP is associated with a 5-year average arms transfer reduction of 0.419 TIV. This negative relationship is also consistent when county-year fixed effects are specified. Therefore, the results provide support for Hypothesis 3a.

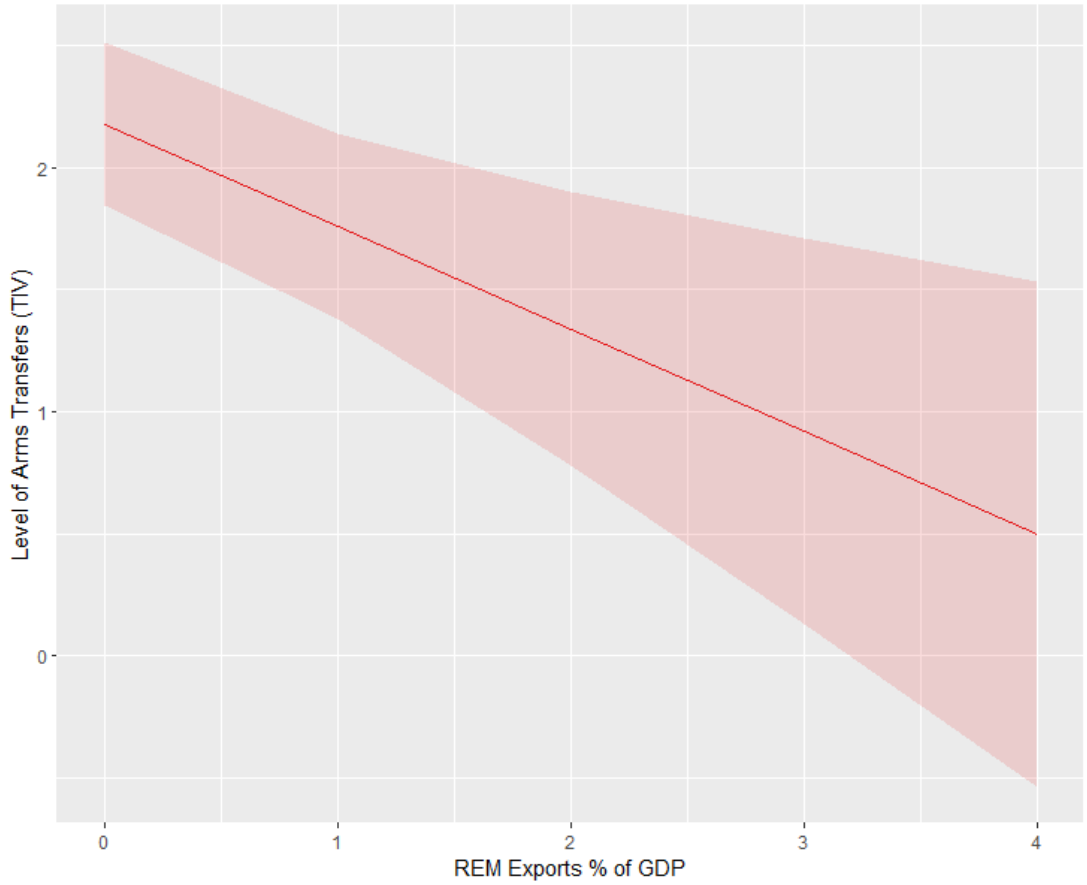

Figure 5.2: Effect of REM Exports % GDP (log) on Arms Transfer - 5-Year Average (log) in Democracies with 95% confidence intervals.

Table 5.3 also provides the interaction effects of REM exports with personalist and non-personalist autocracies. Such coefficients indicate the effect that greater REM exportation has on arms transfers within the autocratic regimes relative to democracies. These results show that in both random and fixed effects models, as REM exports increase, both autocratic regime types import more arms than democracies over a 5-year period. However, the difference for neither regime is statistically significant at any level or under any specification. Thus, it cannot be concluded that the effect in either personalist or non-personalist autocracies is empirically different to the negative effect observed in democratic regimes. As such, Hypothesis 3b is not supported.

Hypothesis 4 is also not supported by the results of this analysis. In Model 3, the effect of personalist autocracies is greater than that of non-personalist regimes, relative to democracies. This indicates that when exports increase, personalist-led states import more arms than non-personalist autocracies. However, when fixed effects are specified in Model 4, the inverse is seemingly true. These inconsistencies mean that it cannot be stated with any degree of certainty that one regime imports more arms than the other. As neither effect is statistically different to that observed in democracies, the null hypothesis that the difference between the two autocratic regimes is equal to 0 cannot be rejected.

This finding is further evident in Figure 5.3 and Figure 5.4. These figures visualise the interaction effects identified in Model 3 along with their 95% confidence intervals. The red line indicates whether the specified autocratic regime is present.[8] The overlapping confidence intervals displayed in these figures further supports the conclusion that neither regime statistically imports more arms than the other when REM exports increase. Therefore, Hypothesis 4 is not supported.

The results for the control variables help support these findings as they are consistent with those observed in the baseline models. The only difference

[8]In all plots, the controls are held at their mean value. The other regime types are also held at 0.

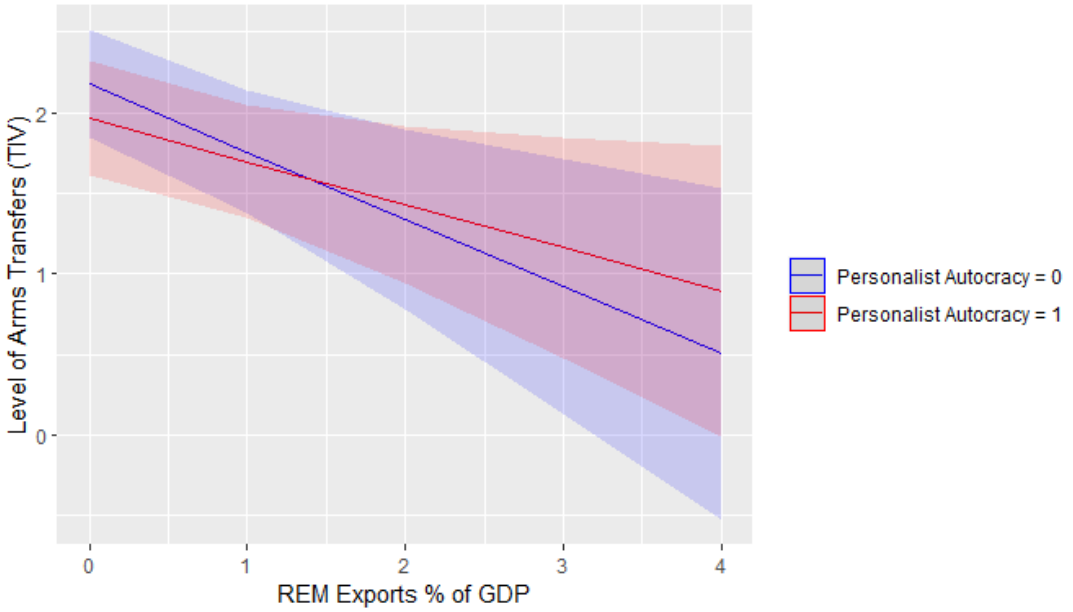

Figure 5.3: Interaction effect of REM Exports % GDP (log) and Personalist Autocracies on Arms Transfers - 5-Year Average (log) with 95 percent confidence intervals.

comes from the *Polity V Score* variable. In Models 1 and 2, the coefficients direction changes depending on whether random of fixed effects are specified. When the explanatory variables are introduced however, the effect of *Polity V Score* becomes consistently negative. This change may be due to the drop in observations witnessed in the analytical models. However, as the effect remains statistically insignificant, this consistently negative effect does not bring the key findings into disrepute.

Additionally, the results are also in line with prior expectations. A state's total population size has a consistently significant and positive effect on the average level of arms transferred to a state. As noted in the previous chapter, this is to be expected as the more populated states are thought to have a greater need for a larger military arsenal [Blomberg and Tocoian, 2016]. Similarly, *GDP/cap (log)* is significant when random effects are specified.[9]

[9] *Trade Openness (log)*, *Oil Exports USD (log)*, *Contiguous Alliances*, *Sub-Saharan African Diplomats*, and *Civil War* all have a positive effect as is to be expected. See Chapter 4, Section

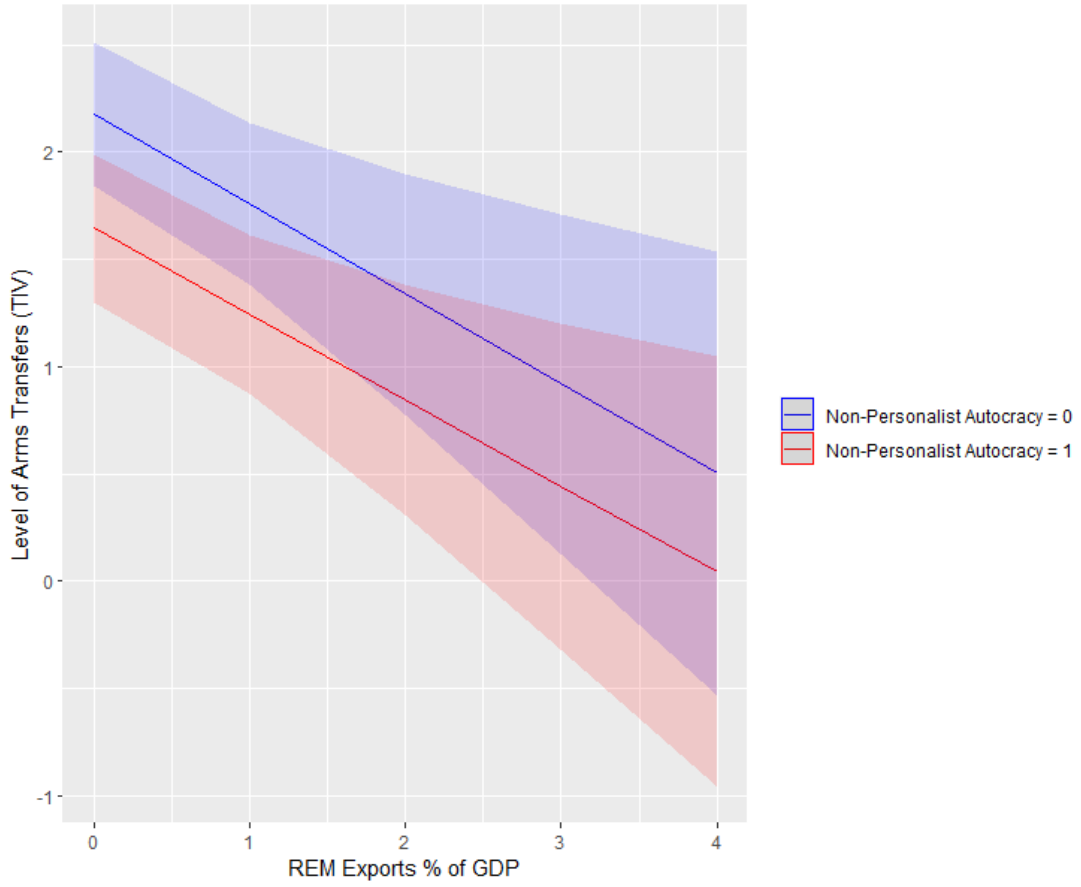

Figure 5.4: Interaction effect of REM Exports % GDP (log) and Non-Personalist Autocracies on Arms Transfers - 5-Year Average (log) with 95 percent confidence intervals.

A point worth noting however is that when the REM/regime type interactions are included, the random effects coefficients for *Sub-Saharan African Diplomats* also becomes statistically significant. This suggests that there is some factor that influences this relationship that was not included in the baseline models. As this is not consistent across effects specifications, the newfound significance is not particularly influential in the overall results.

4.2.4 for more information.

Arms Transfers: Robustness

To ensure the robustness of the results, the models above are re-examined with alternative specifications. Furthermore, several of the control variables are replaced with alternative measurements.[10] For almost all models, there is no observable change in the size, direction, or significance for the key effects. The only exception to this however being when *Oil Exports % of GDP (log)* replaces *Oil Exports USD (log)* in the random effects model. Here, the coefficient for the interaction between non-personalist autocracies and REM exports becomes negative. However, as the result remains insignificant, it has little effect on the overall conclusions. Thus, the results are fairly robust in this regard.

As a further test of robustness, the dependent variable is replaced with a 3-year rolling average of the level of arms imported to a state. This specification produces more interesting results with the effect of REM exports in democratic regimes no longer statistically significant.[11] These results indicate that any effect of REM exports only occurs in the longer term. This is however unsurprising given the similar findings of Chapter 4 and the understanding that there is likely a delay in the influence that economic factors have on international policy.

One of the most interesting results of the robustness checks comes from the replacement of *REM Exports % GDP (log)* with *REM Exports USD (log)*. In these models, the relationship between REM exports and arms for democracies changes to positive, but is no longer statistically significant at any level. Moreover, the difference in effect between democracies and non-personalist autocracies also changes with the results showing show that the latter imports significantly less arms than democratic states when exports increase. This implies that variation may exist between the regime types but not in the hypothesised way. Nevertheless, this result itself is not robust as the significance does not hold when fixed effects are applied. Therefore, no clear effect for any regime type is observed when REM Exports USD are utilised as the dependent variable. This suggests

[10] All robustness checks can be found in Appendix C.

[11] A similar result is observed when a binary variable for arms transfers is included.

that the reducing effect of REM exports on arms transfers is not based solely on the volume of money produced, but rather its contribution to a state's economic performance.

As a final robustness check, personalist and non-personalist autocracies are re-specified as either military or non-military autocracies. This is to allow for an examination of the possibility that variation exists between such regimes with regards to the effect of REM exports. Table 5.4 presents the results of this robustness check. As shown, the check produces the same results as the main analysis. The increased exportation of REMs reduces the level of arms that states import, regardless of regime type.

5.4.2 MID Initiation

Table 5.5 presents the results of the binomial logistic regression analysis used to examine Hypothesis 5a, 5b, and 6. Models 5 and 6 demonstrate the baseline analyses whilst Models 7 and 8 show the results when the primary independent variables are included. Table 5.6 converts the coefficients of said independent variables into odds ratios to ensure a better interpretation of the results.

The effect of increased REM exportation on the likelihood of democratic states initiating an MID is represented by the coefficient *REM Exports % GDP (log)*. This effect is negative across both random and fixed-effects specifications. Thus, when REM exports increase, the likelihood of democracies initiating an interstate conflict decrease. More specifically, as demonstrated by Figure 5.5, when REM exports increase by 1%, the likelihood of MID initiation by such states falls by roughly 1.6%. When specified with fixed effects in Model 10, this likelihood falls further to 4%. However, as the effect is not statistically significant under any specification, an increase in exportation is not empirically associated with a change in the likelihood that democracies will initiate an MID. Thus, Hypothesis 5a is supported by this analysis.

As also shown by Table 5.5, when REM exports increase, the likelihood of personalist autocracies initiating an MID is roughly 1% greater than that of

Table 5.4: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports USD (log) and Regime Type on Arms Transfers - 5-Year Average (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)		
	Model (5)	Model (6)
REM Exports % GDP (log)	−0.463***	−0.393*
	[0.134]	[0.160]
Military Autocracy	−0.299	−0.199
	[0.287]	[0.504]
Non-Military Autocracy	−0.422*	−0.672*
	[0.172]	[0.305]
REM Exports % GDP (log) X Military Autocracy	−0.061	−0.221
	[0.276]	[0.258]
REM Exports % GDP (log) X Non-Military Autocracy	0.155	0.148
	[0.143]	[0.183]
GDP/Cap (log)	0.380*	0.316
	[0.065]	[0.290]
Total Population Size (log)	0.519***	3.406*
	[0.134]	[1.239]
Polity V Sore	−0.030.	−0.018
	[0.016]	[0.042]
Trade Openness (log)	0.054	0.104
	[0.130]	[0.187]
Oil Exports USD (log)	0.008	0.009
	[0.006]	[0.007]
Contiguous Alliances	0.066*	0.080
	[0.031]	[0.058]
Contiguous UN Ideal Point Difference	−0.085	−0.239
	[0.147]	[0.349]
Sub-Saharan African Diplomats	0.035*	0.051
	[0.017]	[0.056]
Civil War	0.090	0.137
	[0.097]	[0.113]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−888	−790

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5.5: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation.

Dependent Variable: MID Initiation				
	Model (7)	Model (8)	Model (9)	Model (10)
REM Exports % GDP (log)			−0.016	−0.041
			[0.044]	[0.037]
Personalist Autocracy			0.004	−0.033
			[0.052]	[0.069]
Non-Personalist Autocracy			0.010	−0.063
			[0.049]	[0.154]
REM Exports % GDP (log) X Personalist Autocracy			0.008	0.010
			[0.049]	[0.037]
REM Exports % GDP (log) X Non-Personalist Autocracy			−0.038	0.012
			[0.059]	[0.048]
GDP/Cap (log)	−0.054**	−0.077	−0.050**	−0.056
	[0.017]	[0.055]	[0.018]	[0.061]
Total Population Size (log)	0.032	0.265	0.014	0.076
	[0.021]	[0.227]	[0.022]	[0.232]
Polity V	−0.008**	−0.006	−0.007	−0.004
	[0.003]	[0.006]	[0.004]	[0.006]
Trade Openness (log)	0.013	0.042	−0.013	0.016
	[0.031]	[0.051]	[0.035]	[0.057]
Oil Exports USD (log)	0.004*	0.003	0.003.	0.003
	[0.002]	[0.002]	[0.002]	[0.003]
Contiguous Alliances	−0.014.	−0.009	−0.011	−0.002
	[0.007]	[0.018]	[0.008]	[0.020]
Contiguous UN Ideal Point Difference	0.055	−0.033	0.065	−0.024
	[0.045]	[0.067]	[0.049]	[0.075]
Sub-Saharan African Diplomats	0.004	0.028*	0.005.	0.032*
	[0.003]	[0.012]	[0.003]	[0.013]
Civil War	0.079*	0.034	0.090*	0.042
	[0.035]	[0.050]	[0.037]	[0.051]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	714	714
Log-likelihood	−183	−132	−170	−121

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.6: Odds ratios for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation.

Dependent Variable: MID Initiation		
	Model (9)	Model (10)
REM Exports % GDP (log)	0.984	0.960
	[0.903 : 1.072]	[0.891 : 1.034]
REM Exports % GDP (log) X Personalist Autocracy	1.008	1.010
	[0.916 : 1.110]	[0.938 : 1.087]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.963	1.013
	[0.857 : 1.082]	[0.919 : 1.115]

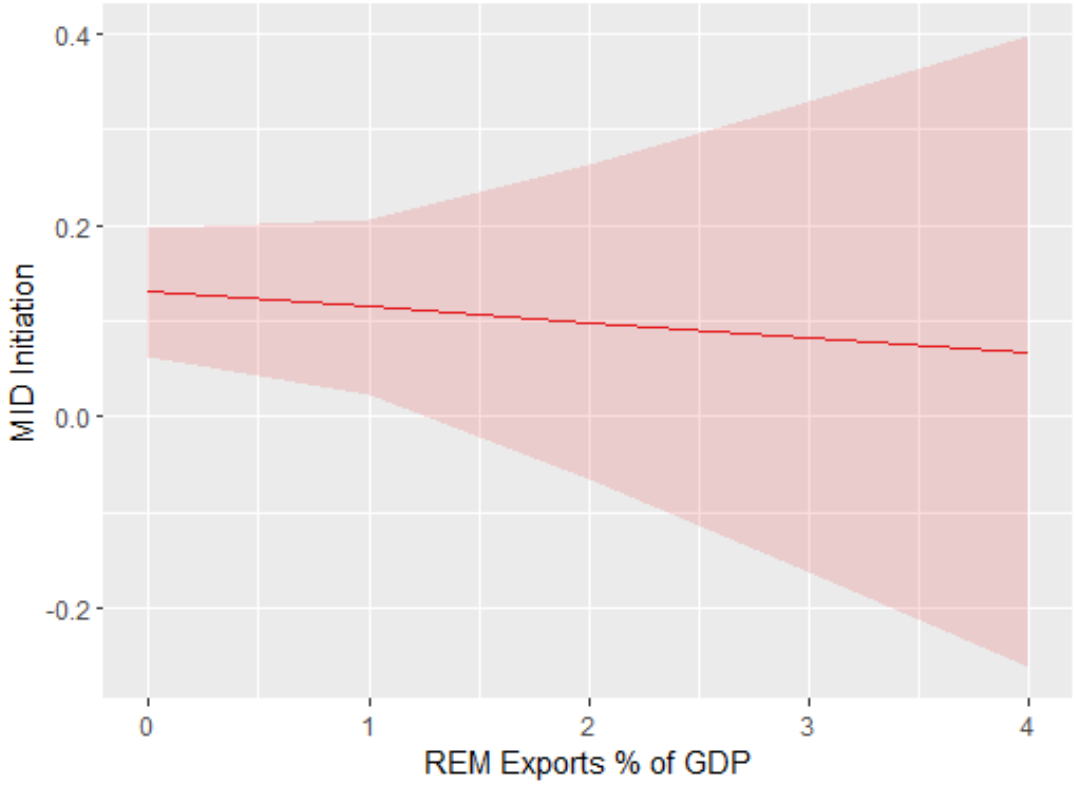

Figure 5.5: Effect of REM Exports % GDP (log) on MID Initiation likelihood in Democracies with 95% confidence intervals.

democracies. As shown by Figure 5.6, this result produces an overall negative trajectory for the effect of REM exports on MID initiation in such states. This negative effect is not in line with Hypothesis 5b. Additionally, whilst such regimes may be more likely to initiate an MID when REM exports increase, the differ-

ence in effect when compared to democracies is near negligible and statistically insignificant. As such, it cannot be concluded that the effect in such states is empirically different to the insignificant negative relationship observed in democracies.

The same can also be said for non-personalist autocracies. As indicated by Figure 5.7, the effect of REM exports on MID initiation for such states follows the same general trajectory as that of democracies. Additionally, the effect is statistically insignificant. Thus, as neither personalist nor non-personalist autocracies have an empirically different effect to that of democracies, Hypothesis 5b is also not supported.

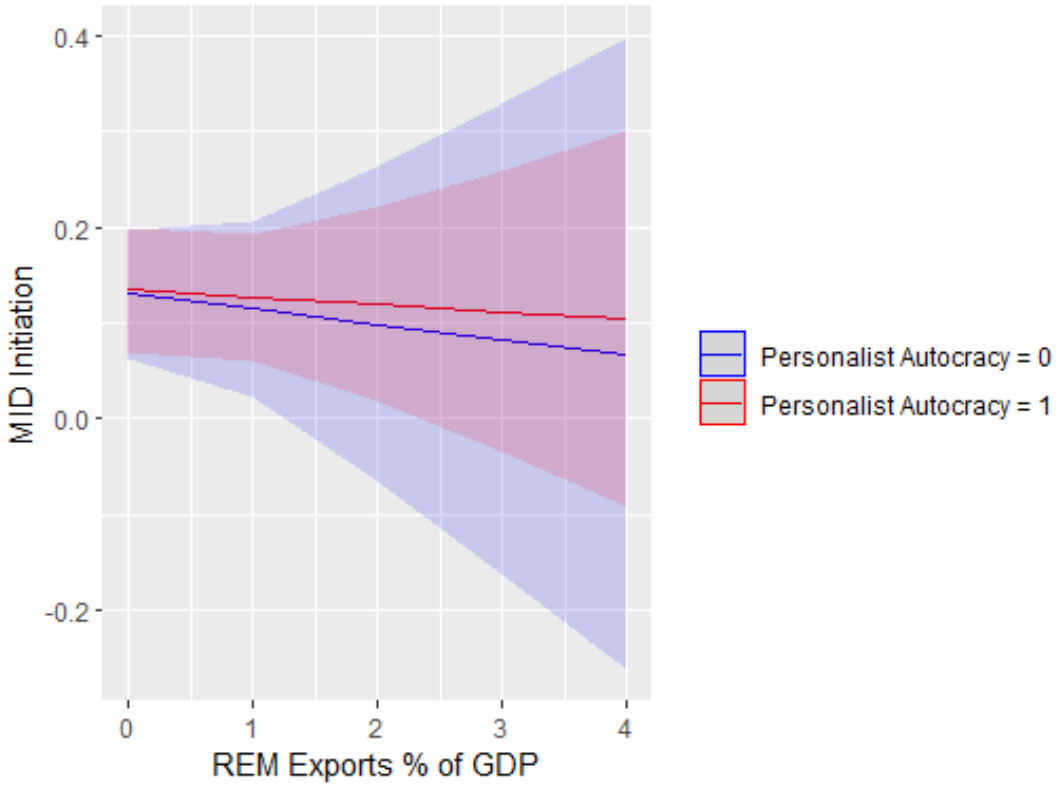

Figure 5.6: Interaction effect of REM Exports % GDP (log) and Personalist Autocracies on MID Initiation likelihood with 95% confidence intervals.

Given that no interaction between the types of autocracy and REM exports produces a statistically significant finding, Hypothesis 6 is also not supported by

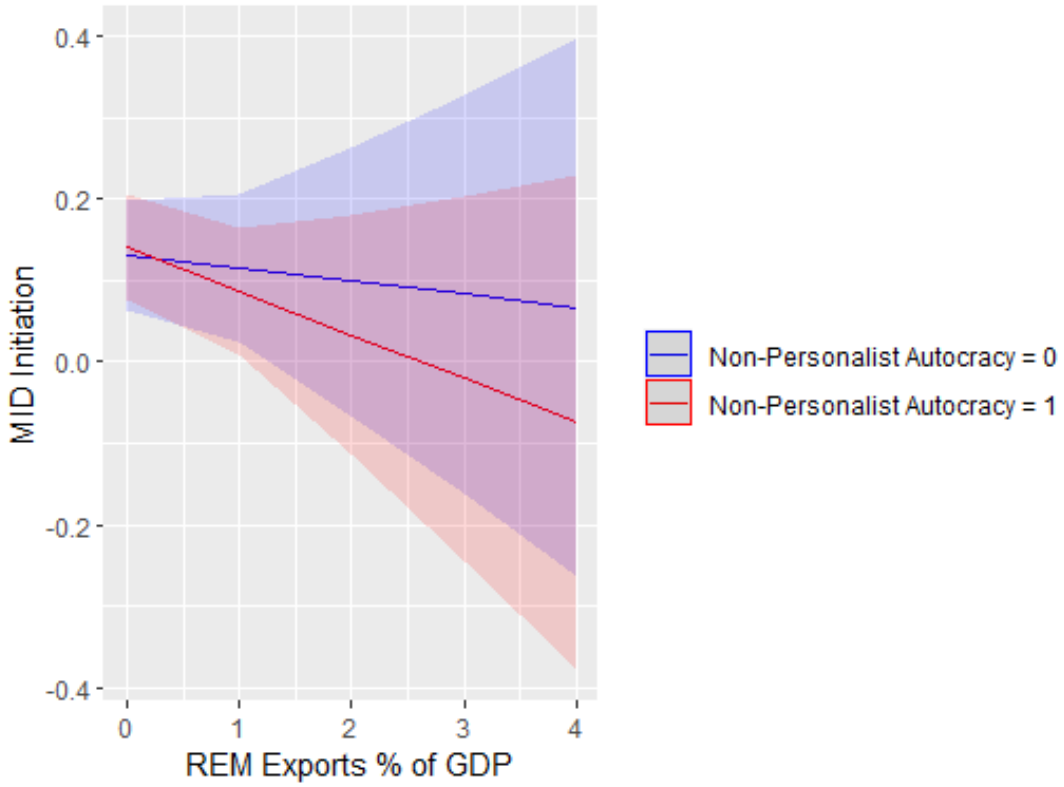

Figure 5.7: Interaction effect of REM Exports % GDP (log) and Non-Personalist Autocracies on MID Initiation likelihood with 95% confidence intervals.

the results. As it cannot be claimed that the effect in either regime is statistically different to that of democracies, the conclusion that personalist regimes are more likely to start a conflict than non-personalist autocracies cannot be drawn. Even if such results had been significant, the variation in the likelihood between the regimes under the different model specifications would provide inconclusive evidence.

For the most part, the included control variables are in line with the baseline models. The only significant change can be found in the coefficient for *Trade Openness (log)*. For this variable, differing effects can be found in Models 7 and 9. It is however possible that this change, and the slight drop in significance that occurs for other variables, is a consequence of the reduction in the number of observations included in the analysis. Between the baseline and investigative

analyses, observations fall by more than 6%. Nevertheless, as the majority of the findings are in accordance with the baseline models, such results provide support for the observed effect of the main independent variables. This support is further amplified by the fact that the control results are largely in line with prior literature.[12]

MID Initiation: Robustness

This section of the analysis is also subject to its own series of robustness checks. In line with the prior analysis, several control variables are replaced with different measurements whilst others are added to the models.[13] Under such checks, there is no significant change to the effect of the key independent variables.

To further probe the results, the independent variable *REM Exports % GDP (log)* is once more replaced in the analysis with *REM Exports USD (log)*. Whilst there are some alterations to the overall direction of the interaction effects, there is no change to their statistical significance. Therefore, the finding that there is no empirical difference in personalist and non-personalist autocracies to that of democracies remains consistent. Thus, the findings can be considered robust in this regard.

This finding holds when military and non-military autocracies are introduced as alternative independent variables. Under such conditions, there is no change in significance for the interaction between REM exports and any of the regimes. Thus, the conclusion that there is no effect in any state is robust.

As a final test of the results robustness, a series of analyses are conducted in which alternative specifications of the dependent variable are included. Table 5.7, Table 5.8, and Table 5.9 demonstrate these results. First to narrow the focus of the analysis to disputes when violence is and is not used, *MID Initiation*

[12]The negative effect for *GDP/Cap (log)*, *Contiguous Alliances*, and *Polity V Score* corresponds with findings of Bremer [1992] and Souva and Prins [2006]. The positive effect of *Oil Exports USD (log)*, *Population Size (log)*, and *Civil War* is also in line with prior research [Colgan, 2010, Gleditsch et al., 2002, Strüver and Wegenast, 2018].

[13]Robustness checks can be found in Appendix C.

With Force and *MID Initiation Without Force* are used as dependent variables. Second, to account for the possibility that REM exportation may increase conflict involvement rather than simply initiation, *MID Participation* is also deployed as an alternative dependent variable.

Outside of slight changes to the coefficients direction, the overall effect of REM exports in the different regime types does not vary in the *MID Initiation With Force* and *MID Participation* models. However, when *MID Initiation Without Force* is deployed as the dependent variable in Model 18, the interaction between REM exports and personalist autocracies becomes positive and statistically significant. This suggests that when such exports increase, personalist leaders are more likely than democracies to initiate disputes in which violence does not occur. Moreover, as there remains no observable difference between democracies and non-personalist autocracies, the results also provide some support for Hypothesis 6. However, as this effect only occurs when country-year fixed effects are applied, the result itself is not robust.

5.5 Discussion

The results presented above provide some interesting findings that have implications for this chapter, thesis, and international relations. First, in contrast to what was theorised, the effect of increased REM exportation on a state's level of imported arms does not vary between the different types of regimes. As shown, such exports lead to a statistically significant decrease in arms transfers within democratic states. However, the effect of REMs in both personalist and non-personalist autocracies is not empirically different to that of democracies. Therefore, in line with the results of Chapter 4, an increase in REM exportation's contribution to a state's GDP is associated with a reduction in the level of weapons purchased, regardless of their regime type.

Second, not only does the effect of increased REM exports on the likelihood of MID initiation not vary between the different regime types, but there is no

Table 5.7: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation With Force.

Dependent Variable: MID Initiation With Force				
	Model (11)	Model (12)	Model (13)	Model (14)
REM Exports % GDP (log)			0.009	−0.033
			[0.039]	[0.032]
Personalist Autocracy			0.022	−0.023
			[0.045]	[0.054]
Non-Personalist Autocracy			0.003	−0.079
			[0.043]	[0.062]
REM Exports % GDP (log) X Personalist Autocracy			−0.023	−0.009
			[0.043]	[0.033]
REM Exports % GDP (log) X Non-Personalist Autocracy			−0.050	0.011
			[0.053]	[0.037]
GDP/Cap (log)	−0.042**	−0.040	−0.043**	−0.022
	[0.015]	[0.046]	[0.016]	[0.047]
Total Population Size (log)	0.020	0.160	0.006	0.024
	[0.018]	[0.181]	[0.019]	[0.191]
Polity V	−0.009***	−0.007	−0.008*	−0.008
	[0.003]	[0.006]	[0.004]	[0.006]
Trade Openness (log)	0.019	0.051	0.005	0.036
	[0.026]	[0.047]	[0.030]	[0.054]
Oil Exports USD (log)	0.004*	0.005*	0.003.	0.005.
	[0.002]	[0.002]	[0.002]	[0.002]
Contiguous Alliances	−0.007	−0.003	−0.007	0.000
	[0.006]	[0.016]	[0.007]	[0.017]
Contiguous UN Ideal Point Difference	0.054	−0.040	0.076.	−0.007
	[0.039]	[0.052]	[0.043]	[0.057]
Sub-Saharan African Diplomats	0.004.	0.026*	0.005*	0.028*
	[0.002]	[0.012]	[0.003]	[0.012]
Civil War	0.078*	0.014	0.077*	0.016
	[0.032]	[0.045]	[0.034]	[0.045]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	714	714
Log-likelihood	−97	−49	−91	−45

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5.8: Robustness Check: Binomial logistic regression analysis for effect of REM Exports % GDP (log) and Regime Type on MID Initiation Without Force.

Dependent Variable: MID Initiation Without Force				
	Model (15)	Model (16)	Model (17)	Model (18)
REM Exports % GDP (log)			−0.022	−0.008
			[0.023]	[0.011]
Personalist Autocracy			−0.018	−0.011
			[0.026]	[0.033]
Non-Personalist Autocracy			0.013	0.016
			[0.024]	[0.112]
REM Exports % GDP (log) X Personalist Autocracy			0.031	0.019*
			[0.026]	[0.009]
REM Exports % GDP (log) X Non-Personalist Autocracy			0.007	0.001
			[0.031]	[0.026]
GDP/Cap (log)	−0.013	−0.038	−0.005	−0.033
	[0.010]	[0.027]	[0.010]	[0.034]
Total Population Size (log)	0.010	0.105	0.008	0.052
	[0.012]	[0.101]	[0.011]	[0.101]
Polity V	0.000	0.001	0.001	0.004
	[0.002]	[0.002]	[0.002]	[0.004]
Trade Openness (log)	−0.007	−0.009	−0.020	−0.020
	[0.017]	[0.018]	[0.018]	[0.021]
Oil Exports USD (log)	0.000	−0.001	0.000	−0.002
	[0.001]	[0.001]	[0.001]	[0.001]
Contiguous Alliances	−0.006	−0.005	−0.003	−0.002
	[0.004]	[0.009]	[0.004]	[0.010]
Contiguous UN Ideal Point Difference	0.006	0.007	−0.004	−0.017
	[0.024]	[0.037]	[0.026]	[0.040]
Sub-Saharan African Diplomats	0.000	0.002	−0.001	0.004
	[0.002]	[0.004]	[0.001]	[0.005]
Civil War	0.009	0.020	0.020	0.026
	[0.018]	[0.019]	[0.018]	[0.020]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	714	714
Log-likelihood	277	322	267	306

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5.9: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Participation.

Dependent Variable: MID Participation				
	Model (19)	Model (20)	Model (21)	Model (22)
REM Exports % GDP (log)			−0.022	−0.016
			[0.052]	[0.039]
Personalist Autocracy			−0.020	−0.156*
			[0.069]	[0.074]
Non-Personalist Autocracy			−0.015	−0.037
			[0.064]	[0.176]
REM Exports % GDP (log) X Personalist Autocracy			0.029	0.074
			[0.059]	[0.059]
REM Exports % GDP (log) X Non-Personalist Autocracy			−0.045	−0.016
			[0.070]	[0.060]
GDP/Cap (log)	−0.085***	−0.091	−0.082***	−0.086
	[0.023]	[0.065]	[0.024]	[0.068]
Total Population Size (log)	0.039	0.238	0.016	0.092
	[0.031]	[0.270]	[0.033]	[0.271]
Polity V	−0.008.	0.004	−0.009	0.000
	[0.004]	[0.008]	[0.006]	[0.008]
Trade Openness (log)	−0.063	−0.039	−0.075	−0.072
	[0.040]	[0.058]	[0.046]	[0.063]
Oil Exports USD (log)	0.004.	0.002	0.004	0.002
	[0.002]	[0.003]	[0.002]	[0.003]
Contiguous Alliances	−0.025*	−0.020	−0.018	−0.010
	[0.010]	[0.020]	[0.011]	[0.018]
Contiguous UN Ideal Point Difference	0.054	−0.058	0.055	−0.034
	[0.057]	[0.064]	[0.061]	[0.068]
Sub-Saharan African Diplomats	0.006	0.030*	0.009*	0.035**
	[0.004]	[0.011]	[0.005]	[0.012]
Civil War	0.070.	0.032	0.067	0.040
	[0.040]	[0.040]	[0.042]	[0.040]
Fixed Effects	No	Yes	No	Yes
Sample size	762	762	714	714
Log-likelihood	−281	−210	−256	−187

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

observable effect at all. As REMs do not increase the level of arms transferred to any regime type, there is no change in the opportunity and willingness of any leader to initiate an interstate conflict. Thus, when REM exports increase states are no more eager or capable of pursuing their foreign policy goals via the use of force. As such, they are no more likely to initiate an MID.

Third, the results of this chapter show that the economic incentives provided by REM exports to reduce the level of weapons that states import are so great that they outweigh any possible motivation that leaders may have to buy more arms. Whilst economic development is doubtless important to states, it is surprising that it outweighs the desire of leaders to secure their own survival. However, it is possible that the observed results are a consequence of this thesis' focus upon sub-Saharan Africa. As noted, this is a developing region which likely puts greater emphasis upon economic development. Thus, leaders are less likely to put such development at risk. Nevertheless, as most countries within the international system are classed as developing, most nations would also priorities their economic development in a similar way. Thus, the results presented here can be generalised outside of the region.

Fourth, by providing no support for the arguments made within this Chapter, the findings also fail to provide any support for the REM-backed aggression theory more broadly. This, however, lends support to the conclusion that the renewable transition may see a decline in resource-related disputes. The reducing effect of arms is shared amongst all regimes. As such, REMs do not act as a trigger for conflict in either democracies or autocracies. If oil's conflict inducing effect declines alongside it's importance, there may be less resource wars overall.

However, this chapter is not without its limitations. The time frame for examination remains between 1995 and 2014. As such, the analytical capacity is restricted given that the post-2014 boom in renewable energy and REM exports is excluded. Additionally, the autocratic regime type data that corresponds with this time frame is restricted. Whilst Geddes et al. [2014] best covers this time frame, its coverage ends in 2010. Taken in its original form, the number of

observations in this already narrow data set would be even more limited. I address this issue by extending the work of Geddes et al. [2014] for sub-Saharan Africa until the end of the observation period in 2014. This enables a more thorough analysis, but future work should seek to re-evaluate the investigation when more recent data becomes available.

5.6 Conclusion

In this chapter I argued that the effect of increased REM exportation on both the level of arms that states import and the likelihood that they will initiate an MID varies between different types of regimes. Whilst REMs may provide economic incentives to refrain from buying more weapons, I argued that the structure of a regime can motivate leaders to ignore them and pursue a policy of increased arms procurement. Specifically, as autocratic leaders' survival and lives are dependent upon the strength of their military, I argued that they purchase more arms when provided with a source of non-tax revenue from REM exports. This increase in their capacity to fight and win a conflict then makes them more likely to initiate an MID. I did not believe the same relationship exists for democracies as they have few incentives to import more arms.

The results did not support my argument. When REM exports increase, states reduce the level of arms they import, regardless of their regime type. As no state experiences an increase in their opportunity and willingness to launch an interstate conflict, these is no observable relationship between increased REM exportation and MID initiation for any type of regime. In the following chapter, I investigate whether the effect of REM exports on arms transfers varies between different types of weapons categories.

Chapter 6

Renewable Essential Materials and the Transfer of Small Arms

6.1 Introduction

This thesis has shown that despite providing states with a source of revenue that leaders can use to buy more arms, the increased exportation of REMs is associated with a reduction in the level of weapons that states import. As REMs do not lead to an increase in military capabilities, there is no rise in the opportunity and willingness of states to initiate an MID. These results hold for all regime types.

An explanation for these results is that the increased exportation of REMs provides states with economic incentives to reduce their level of arms imports. As previously shown, a rise in a state's level of REM exports is correlated with an increase in their GDP per capita.[1] However, increased arms transfers can create regional instability that, in turn, negatively effect economic development [Polachek and Sevastianova, 2012]. As such, states have reason to refrain from

[1]See Chapter 4, Section 4.4 for more information.

spending their REM-based revenue on more arms. These economic incentives are so great that they outweigh all motivations that encourage alternative action.

Nevertheless, there is an alternative explanation; REM exports simply do not provide states with enough revenue to facilitate the hypothesised increase in arms transfers so far measured by this thesis. In the prior analyses, I only examined the effect of REM exports on the importation of MCWs. These weapons can be very expensive; for example, in 2021 the United Kingdom paid more than £6 billion for two Queen Elizabeth Aircraft Carriers [UK Parliament, 2024]. Whilst REM exports produce multi-million-dollar revenue streams for states, it is possible that it is too small to facilitate the purchase of major military technologies. A single F-16 fighter jet, for example, would require more than 5 years' worth of Ghana's annual REM-based revenue.[2]

However, MCWs are not the only type of weapons that states can import. They can also buy SALWs that are considerably cheaper, with a single rifle costing between $10 and $1,000 [Wezeman, 2003]. Therefore, although states may not be able to afford MCWs with their REM-based revenue, they could afford SALWs. Whilst it would take Ghana 5 years to buy a single F-16 with their export income, they could purchase between 12,500 and 1,250,000 rifles each year.[3]

In this chapter, I investigate whether the increased exportation of REMs effects the level of SALWs that states import. I apply the initial argument of my REM-backed aggression theory and argue that a rise in REM exports provides states with a source on non-tax revenue that they can use to buy more SALWs. However, I also argue that this effect only occurs in personalist and non-personalist autocracies. Their need for a strong military outweighs the financial incentive that REMs provide states to refrain from buying more weapons. Moreover, as personalist autocracies have the greatest motivation to buy more

[2]Estimations based upon REM-royalty revenue for Ghana between 2010 and 2014 [Gajigo et al., 2012, OEC World, 2024].

[3]Estimations based upon rifle prices in 2003 [Wezeman, 2003]. Estimations do not take into consideration price inflation.

arms, I argue that the effect of REM exports on SALW transfers will be greatest in such regimes.

The remainder of this chapter is structured as follows. First, I outline the theory and findings of the previous chapters before discussing how the increased exportation of REMs may enable states to buy more SALWs. Second, I present the methodological approach used to empirically examine the key arguments. Third, I present the results of this empirical examination. Fourth, I discuss the significance of the findings. Fifth, I conclude with a brief outline of the main results.

6.2 REM and Arms Transfers

6.2.1 A Summary of the Relationship

The initial analysis of this thesis aimed to establish whether the increased exportation of REMs effects arms transfers and MID initiation in a similar mechanism to that of oil [Basedau and Lay, 2009, Chan, 1980, Le Billon and El Khatib, 2004, Lopes da Silva and Tian, 2023, Perlo-Freeman and Brauner, 2012, Vézina, 2021]. I theorised that, like oil, the exportation of such resources provides states with a significant source of revenue via state-based exports and royalty payments. As both sources of revenue are considered to be non-tax, the money they generate for states comes under less public scrutiny than tax-dollars. This allows for its use in more unfavourable policies, including the purchase of foreign weapons.[4]

I subsequently argued that states seek to capitalise upon this financial freedom and use their REM-based revenue to expand their military capabilities by purchasing more weapons. In the initial analysis, I focused upon the transfer of MCWs. This was dictated by the data used to measure arms transfers. However, the results did not support my argument. Instead, the increased exportation of REMs reduces the level of MCWs that states import.

[4]See Chapter 3, Section 3.3 for more information regarding REM-based royalties.

These results demonstrate the importance of leader motivations in the arms transfer process. Simply having the money to purchase more arms is not enough to push leaders into buying more weapons. Decision makers must also have incentives to use the money in this way. Moreover, as increased REM exportation provides financial incentives to import less arms, the motivation of leaders to pursue a policy of increased procurement must also outweigh any alternative incentive. This was not the case in the initial analysis.

Much research has however found that the structure of a state's regime type creates different incentives for increasing their military expenditure [Conrad and Souva, 2020, Dunne and Perlo-Freeman, 2003, Fordham, 2004, Hewitt, 1991, Mulligan et al., 2004, Töngür et al., 2015, Yildirim and Sezgin, 2005]. Additionally, these arguments are also relevant to arms transfers.[5] As such, the original theory of this thesis was re-specified with the separation of different regimes. Specifically, I theorised that when REM exports increase, democratic states import less arms. This was considered to be the case as they have few incentives to buy more weapons given that their survival depends upon the general public, who mostly disapprove of such expenditures. Moreover, as economic performance – a key determinant in the likelihood of democratic leaders re-election [Balaguer-Coll et al., 2015, Brender and Drazen, 2008] – is both improved by the exportation of REMs and reduced by the importation of arms, the incentive of democracies to import less weapons when REM exports increase was hypothesised to outweigh any incentive that they may have to buy more MCWs.

In contrast, as the survival of personalist and non-personalist autocracies depends upon a well-armed military, due to the high chance that they will be removed from office via the use of force, I hypothesised that when REM exports increase, such leaders would use the money to buy more arms. I argued that the desire of leaders to ensure their personal and professional survival outweighs the financial motivations that encourage them to buy less weapons. As personalist autocracies are considered to be at most at risk of domestic conflict [Grundholm,

[5]See Chapter 5, Section 5.2.2 for more information.

2020], are most effected by a successful rebellion [Radtke, 2020], and have fewer options for expanding their military power, it was also hypothesised that they would import more weapons than their fellow autocracies.[6]

The results did not support these arguments. Whilst arms imports were shown to decrease when democratic states exported more REMs, the same was also true for both personalist and non-personalist autocracies. Thus, the effect of REMs on arms transfers was negative, regardless of regime type. Such results were highly surprising as they suggest that even if a regime's survival and the leader's life depends upon increasing their military arsenal, decision makers still elect not to use the REM-based revenue in this way.

6.2.2 An Explanation

One explanation as to why states do not import more arms when REM exports increase – even if they have significant incentives to do so – is simply that such exports do not provide enough money to buy the weapons studied so far. As noted, the original and subsequent analyses have focused upon MCWs. However, MCWs are expensive, regularly costing several hundred million dollars. In 2014, for example, Saudi Arabia purchased 108 armoured vehicles from Canada in a deal worth more than $129 million per vehicle. Similarly, China paid almost $2 billion for 24 Suki Su 35 fighter jets - roughly $83 million per jet [Theohary, 2016]. Although the REM-market has grown considerably since the beginning of the renewable energy transition – with annual exports increasing by almost $300 billion between 1995 and 2014 – states generally only see a fraction of this income owing to the over reliance upon royalty payments for revenue generation.[7] Although states can still generate significant revenue from REM exportation, it is possible that it is not enough to fund the purchase of MCWs.

Additionally, whilst some MCWs are more affordable – costing less than $10

[6]More information regarding the relationship between REMs, regime type, and arms imports can be found in Chapter 5, Section 5.2.3.

[7]Estimations of REM exports based upon data taken from OEC World [2024]. See Figure 5.1.

million – they are often sold in batches, driving up the overall cost. In 2005, Pakistan agreed a deal to purchase Harpoon missiles from the U.S for roughly $3 million per missile. Although a single missile is relatively inexpensive, they were sold in a batch of 60, leading to an overall cost of more than $150 million [Grimmett, 2006]. Therefore, even if states could afford a solitary MCW, the process is likely unaffordable for many as the weapons are mostly sold in batches. For example, Burkina Faso generated an estimated $4.4 million from REM-based royalties in 2014.[8] Whilst this would be enough to buy a single Harpoon missile from the U.S, it is insufficient to buy the entire unit purchased by Pakistan in 2005.

Therefore, even if states, such as personalist autocracies, have incentives to buy more MCWs, the level of income from REM exports means that it is not possible to use the associated revenue to buy high-cost weapons. Even if states could afford to buy a single lower-value MCW, they could not afford the batch costs. Thus, in such circumstances, when REM exports increase, any incentive that states and leaders may have to reduce their level of MCW transfers is likely to be successful as the alternative is not a viable option.

6.3 REMs and SALW Transfers

6.3.1 SALWs

Whilst the previous chapters have shown that there exists a negative relationship between REM exports and MCW imports, they are not the only type of weapons available to states. There also exists another classification of arms for which there may exist a different effect; SALWs. As outlined by the United Nations [1997], SALWs are weapons and associated equipment that can be operated by either an individual or a small group of people. Amongst such weapons and technologies are machine guns, explosives, rifles, and ammunition. Table 6.1 demonstrates

[8]Royalty estimations based upon REM export data from OEC World [2024] and royalty statistics reported by Gajigo et al. [2012].

the full list of weapons and equipment considered as SALWs by United Nations [1997].

Table 6.1: Small Arms and Light Weapons recognised by United Nations [1997].

Small Arms	Light Weapons
Revolvers and self-loading pistols	Heavy machine guns
Rifles and carbines	Hand-held under-barrel and mounted grenade launchers
Submachine guns	Portable anti-aircraft guns
Assault rifles	Portable anti-tank guns
Light machine guns	Portable launchers of anti-tank missiles and rocker systems
	Portable launchers of anti-aircraft missiles systems
	Mortars of calibres of less than 100mm
	Ammunition and explosives
	Cartridges (rounds) for small arms
	Shells and missiles for light weapons
	Mobile containers with missiles or shells for single action anti-aircraft and tank systems
	Anti-personnel and anti-tank hand grenades
	Landmines
	Explosives

Following the conclusion of the Cold War in the latter stages of the 20th century, SALWs spread rapidly throughout the world as states sold off their left over weapons [Boutwell and Klare, 2000]. As shown by Figure 6.1, this resulted in an expanding market with the total value of transfers exceeding $6 billion in 2014, almost double that of 2001 [Florquin, 2020]. Whilst this has generally been driven by trade in the Americas and Europe, the increasing trend can be observed in all regions. Even in Africa, the lowest SALW importing region, the total value of transfers almost tripled between 2001 and 2013, with 13 states importing more than $10 million worth of arms in at least one of the thirteen years [Holtom and Pavesi, 2017].

Owing to their low material, technological, and manufacturing costs, SALWs can be purchased for very little. An AK-47, for example, can be bought for as little as $15 [Boutwell and Klare, 2000]. Even the more expensive weapons are affordable with the Canadian manufactured LRT-3 sniper rifle costing roughly

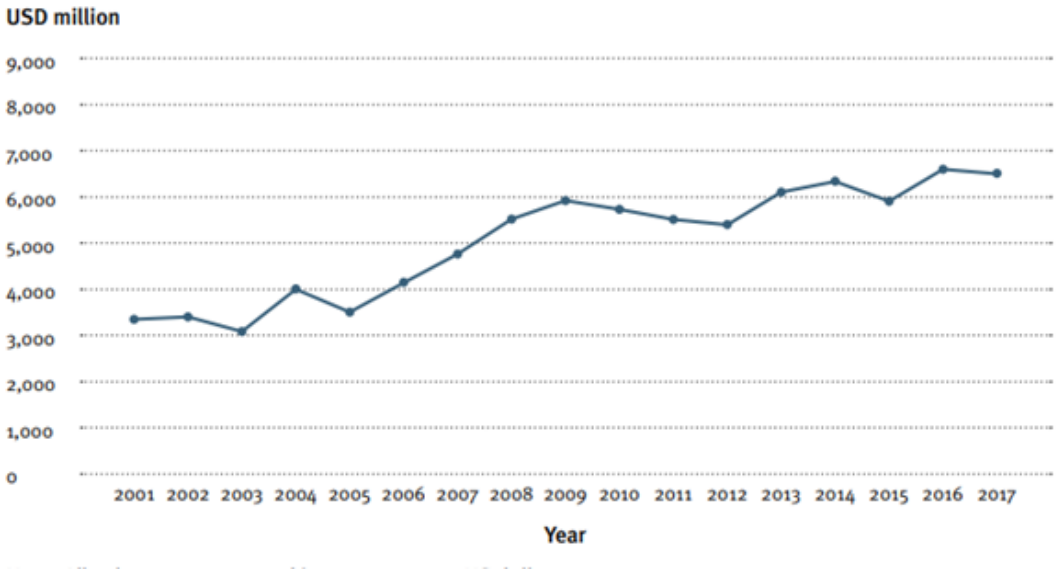

Figure 6.1: The annual value of global SALW transfers measured in million USD, 2001 - 2017 [Florquin, 2020].

$8,000 [Picard et al., 2021]. In comparison to the highly expensive MCWs, SALWs are considerably more affordable; an AK-47 is roughly 200,000 time cheaper than a single Harpoon missile. Due to their more affordable price range, SALWs are more accessible to states as they do not place a significant financial burden upon them.

In this chapter I argue that whilst REMs may not provide states with enough money to buy more MCWs, it does provide them with enough to purchase more SALWs, even when royalty rates are taken into consideration. In 2014, for example, Guinea received an estimated $29 million in REM-based royalties. Based upon the premium paid by Saudi Arabia in the same year, Guinea would need to save their REM-based revenue for more than 4 years to afford a single armoured vehicle from Canada. Additionally, if both revenue and vehicle price were to remain annually consistent, they would need to save for more than 400 years to buy the entire fleet ordered by the Saudi government. However, with their revenue from 2014 alone, Guinea could instead purchase 200 million AK-47s or more 3,600 LRT-3 sniper rifles.

The affordability of SALWs from REM-based revenue can also be observed

beyond the example of Guinea. In 2014, as shown by Figure 6.1, the global annual value of small arms transfers was estimated to be roughly $6 billion. In the same year, exports of REMs exceeded $200 billion [OEC World, 2024]. Even if states made 3% of this revenue, as is possible given the reliance upon royalties that have an average rate of 3.5%, it would still be sufficient to fund the entire SALW market.[9] This revenue is sufficient enough to import more SALWs. Moreover, the revenue is non-tax and as such, states have the fiscal freedom to pursue risky policies, such as the procurement of small arms.

6.3.2 The Role of Regime Type

Whilst it is likely that the exportation of REMs provides states with enough money to purchase more SALWs, and that the non-tax nature of the revenue provides them with the financial freedom to do so, the arguments outlined in Chapter 5 are still applicable here; just because leaders have money that they can use to buy more weapons does not necessarily mean that they will choose to do so. For this to be the case, leaders must have the motivation to use the money in this way. Moreover, such motivations must outweigh the incentives to reduce a state's level of imported SALWs when REMs increase.

I argue that this is not the case for democratic states. As noted by Conrad and Souva [2020], democratic leaders are most regularly removed from power by way of elections. As such, leaders have incentives to base their decisions upon the views of the average citizen. However, owing to the increased threat to civilian life associated with military expenditures, the average voter is thought to be generally opposed to an increase in this form of spending, preferring social allocations instead.

In the previous chapter it was argued that the anti-military expenditure preferences of the public also extend to the transfer of arms as they are a costly outlay that can create regional instability [Sample, 1998]. I argue that this is

[9]The average royalty rate is based upon the known rates for sub-Saharan Africa [Gajigo et al., 2012].

true for SALWs as research has shown that their importation can increase the severity of intrastate conflicts [Mehrl and Thurner, 2020]. Given the potential to negatively impact the average citizens life, the general public will be just as opposed to the procurement of SALWs. Thus, when REM exports increase and states are provided with a source of revenue to spend, democracies will have few incentives to use it to buy more SALWs.

Democratic leaders instead have incentives to reduce the level of SALWs they import when REM exports increase. I argue that such is the case as leaders want to keep the public on side and secure re-election. Additionally, the increased exportation of REMs encourages economic development. Research has however shown that this can be negatively impacted by disruptive activities such as the increased procurement of arms [Polachek and Sevastianova, 2012]. As leaders are more likely to be re-elected when the economy is performing well [Balaguer-Coll et al., 2015, Brender and Drazen, 2008], they have incentives to refrain from engaging in any activity that may jeopardise their states stability. Thus, when democracies export more REMs, the incentives to purchase more SALWs does not outweigh the incentive to buy less.

In contrast to democracies however, I argue that both personalist and non-personalist autocracies have significant incentives to import more SALWs. Moreover, these motivations likely outweigh any counter incentives that may exist. I argue that such is the case as leaders of both regimes are more at risk of being removed from power by way of domestic conflict than they are from elections [Conrad and Souva, 2020]. Thus, their survival is not dependent upon their capacity to appease the populace but rather on preventing and winning violent attempts to remove them from office.

Whilst there are numerous ways in which this can be achieved, some recent research has observed that an increase in SALW transfers can help prevent the outbreak of intrastate conflict by ensuring the police are well armed [Mehltretter, 2022]. Accordingly, this means they are better able to provide security and stability to the public, ensuring domestic compliance. Moreover, scholars highlight

that most domestic conflicts are fought with Small Arms and Light Weapons. When discussing the outbreak of civil wars since the 1990s, Boutwell and Klare [2000, p. 48] note that;

"Little of the destruction was inflicted by the tanks, artillery or aircraft usually associated with modern warfare; rather most was carried out with pistols, machine guns and grenades."

The Rwandan civil war serves as a prime example of such an idea as the Tutsi genocide is thought to have been carried out with such weapons [Boutwell and Klare, 2000, Enuka, 2012, Human Rights Watch, 1994]. Some reports note that in the months preceding the massacres, the Hutu government imported a significant number of SALWs from France, Egypt, and South Africa which far exceeded the security requirements of their police force [Boutwell and Klare, 2000, Enuka, 2012]. They were subsequently distributed to militias and used alongside clubs and machetes to round up and execute Tutsi and moderate Hutu. Whilst the total number of those slaughtered with SALWs is unknown, Enuka [2012] estimates that it is close to 1 million.

Given that SALWs are associated with preventing the onset of civil wars and are the main type of weaponry used to fight in these conflicts, and as such disputes are the main threat to the survival of both personalist and non-personalist autocracies, I argue that such regimes have significant incentives to pursue a policy of greater arms procurement. Moreover, such incentives likely outweigh any alternative motivations as the regime's survival can be considered to be of the upmost importance. As such, there must be little that leaders would prioritise over ensuring its endurance. Thus, when awarded the financial freedom from increased REM exportation to buy more SALWs, I argue that there is little which would sway them from using the money in this way.

Therefore, I expect that the effect of increased REM exports on the transfer of Small Arms and Light Weapons varies between democracies, personalist au-

tocracies, and non-personalist autocracies. Specifically, I hypothesise that:

Hypothesis 7a: *As REM exportation increases, the level of Small Arms and Light weapons that democracies import decreases.*

Hypothesis 7b: *As REM exportation increases, the level of Small Arms and Light Weapons that personalist and non-personalist autocracies import increases.*

However, as noted in Chapter 5, variation also exists between the different types of autocracy with research showing that personalist regimes are more likely to experience civil wars [Grundholm, 2020, Gurses and Mason, 2010]. Moreover, such regimes are more likely to experience negative consequences – such as death, exile, and imprisonment – should they be ousted from power by way of violent revolution [Radtke, 2020]. To deal with the threat of military coups, personalist regimes also keep their militaries structurally weak; thus, limiting their options for improving their military capabilities. As such, I argue that personalist regimes have significantly greater motivations to import more SALWs than their non-personalist counterparts. Thus, when REM exports increase, I argue that they will use the revenue to buy more SALWs than non-personalist autocracies so as to better safeguard their regime. Therefore, I also hypothesise that:

Hypothesis 8: *As REM exportation increases, personalist autocracies import more Small Arms and Light Weapons than non-personalist autocracies.*

6.4 Research Design

6.4.1 Data and Methodology

To test the arguments outlined above, this analysis once more makes use of the original data set constructed for this thesis. Using this data set, I conduct a

series of generalised linear regression models, specified with a gaussian distribution. This methodology was used in the initial stages of the previous empirical analyses. As the theoretical considerations here are similar to those outlined previously, with only a change to the type of weapon that states import, I believe that it is best to maintain a consistent empirical strategy. This allows for a thorough analysis of the first step in my REM-Backed aggression theory. It also enables a comparison between the effect of REMs on MCW and SALW transfers respectively.

To ensure a robust examination of the hypotheses, models are originally specified with random effects. They are then specified with state-year fixed effects to account for any discrepancies between states that do not change over time. To enable greater analytical capacity, baseline models – in which the key independent variables are excluded – are first conducted. Models are then specified with an interaction between the key independent variables, REM exports and regime type.

6.4.2 Dependent Variable

The dependent variable for this analysis is the total level of Small Arms and Light Weapons transferred to a state, measured in current USD: *SALW Transfers*. To control for any delay between SALW order, payment, and delivery, this variable is expressed as a 3-year forward moving average. In the previous analyses, a 5-year rolling average for MCW imports was used as such transfers are infrequent with long delays between purchase and receipt. However, as SALWs are more easily ordered and delivered each year, such an average measurement is not necessary. Nevertheless, as there can still be delays, a 3-year average is appropriate.[10] Furthermore, to account for significant variation between states and control for any potential outliers, the variable is also log transformed.

Data for this variable is drawn from the Norwegian Initiative on Small Arms

[10]As a robustness check, a variant dependent variable measuring single year SALW transfers is used.

Transfers (NISAT). Formed in 1997, NISAT uses various information sources to produce more than 1.3 million observations of small arms transfers between states from 1962 to 2015. As such, it is one of the most widely respected sources of SALW data, used in various important and related research [De Soysa et al., 2009b, 2010, Mehltretter, 2022].

6.4.3 Independent Variables

REM Exports

The first independent variable used in this analysis is once more REM exports. More specifically, it is the level of REMs exported by a state each year, expressed as a percentage of their GDP: *REM Exports % GDP (log)*. The variable is measured in this way to account for the possibility that it is not the monetary value of exports that are important but rather the contribution to a state's economy. It is calculated using REM export data from OEC World [2024] and GDP data from World Bank [2024]. To account for variation in material wealth and extraction capabilities between states, it is log transformed. Additionally, it is lagged by 1 year to control for the likelihood of a delay between material exportation and receipt of payment.

As a robustness check, a variant of REM exports is also utilised. This variant measures REM exports in current USD: *REM Exports USD (log)*. It is also log transformed and lagged by 1 year to remain consistent.

Regime Type

The second independent variable used in this analysis is regime type. As was the case in Chapter 5, I use 3 individual dummy variables with a value of '1' allocated to each of the following regime types: personalist autocracy, non-personalist autocracy, and democracy. The data set consists of 287 personalist autocracies, 269 non-personalist autocracies, and 358 democracies.

The data for these variables is taken from Geddes et al. [2014] as it best

overlaps with the limited time frame of this analysis.[11] Geddes et al originally differentiate between states as either party-based autocracy, military autocracy, monarchical autocracy, oligarchical autocracy, personalist autocracy, transitional democracy, or democracy. I re-code these categories as either personalist autocracy, non-personalist autocracy, or democracy. Democracies are used as the baseline regime type for this chapter to allow for a clear analysis of the hypotheses. Table 6.2 establishes how each regime type is coded.

[11]Geddes et al. [2014] provides data between 1946 and 2010.

Table 6.2: A breakdown of the regime type variables.

Re-coded Regimes	Geddes Regimes	Desciption	Examples
Personalist Autocracies	Personalist Autocracies	Autocratic regimes with power over policy and the public held by a single individual, civilian or military.	Teodoro Obiang Nguema Mbasogo (Equitorial Guinea)
Non-Personalist Autocracies	Party-based Autocracies Military-based Autocracies Monarchical Autocracies Oligarchical Autocracies	Autocratic regimes with power over policy and the public held by a group, faction, or institution.	ZANU-PF party (Zimbabwe) President Buyoya (Burdundi) Dlamini Royal Family (Eswatini)
Democracies	Democracies Transitional Democracies	States not assigned to any autocratic regime type.	African National Congress (South Africa)

6.4.4 Control Variables

In this analysis, I also control for several other factors that could impact the level of SALWs that states imports. Table 6.3 presents such variables, their definitions, and some descriptive statistics. Given that the same empirical strategy that was employed in the previous chapters is also specified here, these controls are carried over from the prior analyses. However, such variables also warrant their inclusion given their application in similar SALW research. For example, De Soysa et al. [2009b] finds that trade dependency and population are negatively associated with SALW transfers, whilst oil exportation has a positive relationship. Similarly, Baronchelli et al. [2022] demonstrate that both GDP and civil war involvement are positively correlated with the transfer of small arms.

Table 6.3: Chapter 6 control variables.

Variable	Description	Observations	Mean
GDP/cap (log)	The log transformed annual GDP of a state, divided by their mid-year population estimates.	895	6.74
Total Population Size (log)	The log transformed annual mid-year estimates of a state's total population.	944	15.66
Polity V Score	A measurement of how autocratic/democratic a state is, estimated on a scale of -10 (autocratic) to +10 (democratic).	903	1.44
Trade Openness (log)	The log transformed annual sum of a state's total imports and exports divided by their GDP and expressed as a percentage.	947	4.06
Oil Exports USD (log)	The log transformed annual sum of crude oil exported by a state and measured in current USD.	944	8.39
Contiguous Alliances	The number of formal alliances a state has each year with those whom they share a contiguous land border with.	960	1.96
Contiguous UN Ideal Point Difference	The maximum difference in UN ideal voting points from states that share a contiguous land border.	797	0.59
Sub-Saharan African Diplomats	The annual number of diplomats hosted from sub-Saharan African states.	943	8.79
Civil War	A dummy variable measuring whether was a state involved in a civil war each year, lagged by 1 year.	945	0.19

The data for *GDP/Cap (log)* and *Total Population (log)* is drawn from the WDI database [World Bank, 2024]. The *Polity V Score* measurements are naturally drawn from the 'Polity5' data set [Marshall and Gurr, 2020] whilst *Trade Openness (log)* data comes from Our World in Data. OEC World [2024] provides the necessary information for the *Oil Exports USD (log)* variable. Observations for *Contiguous Alliance* are constructed using the COW's 'Formal Alliance' data set and the 'Direct Contiguity' data set [Correlates of War Project, 2017, Gibler, 2009]. *Contiguous UN Ideal Point Difference* is also calculated using the Correlates of War Project [2017] 'Direct Contiguity' data set and UN ideal voting point data published by Bailey et al. [2017]. Finally, the 'Diplometrics' data set [Moyer et al., 2021] provides the observations for *Sub-Saharan African Diplomats* whilst information regarding *Civil War* is drawn from the UCDP/PRIO 'Armed Conflict' data set.

6.4.5 Limitations

As this chapter builds upon the theory and empirical strategy of those which precede it, the limitations of the prior analyses are also applicable here.[12] However, a further limitation also comes from the use of SALW transfers as the dependent variable. Due to a lack of funding, the source of data for SALWs, NISAT, has not been updated since 2017. As such, observations only run until 2015. Given that SALW transfers for this analysis are expressed as a 3-year moving average, observations for 2014 cannot be calculated. Naturally this further restricts the data set by removing tens of observations from the analysis. Thus, the analytical capacity of the research is hampered. Nevertheless, as there are still several hundred observations, the results of this chapter are still valid.

6.5 Results

Table 6.4 presents the results of the generalised linear regression analysis used to test this chapter's hypotheses. Models 1 and 2 are baseline analyses in which only

[12]See Chapter 1, Section 1.2 and Chapter 5, Section 5.5 for more information.

the control variables are utilised. In Models 3 and 4, the explanatory variables, REM exports, regime type, and their interaction are included. As democracies are once more the baseline category for regime type, the coefficients for *REM Exports % GDP (log)* demonstrates the effect that the increased exportation of REMs has upon the level of SALWs that such states import. Additionally, the interaction coefficients indicate the effect that increased REM exportation has on SALW transfers for both types of autocratic states, in comparison to democracies.

In line with the expectations of Hypothesis 7a, the effect of increased REM exports within democracies is negative in Model 3. As demonstrated by Figure 6.2, this indicates that when REM export's contribution to a democratic state's annual GDP increases by 1%, the 3-year average level of small arms that they import reduces by 0.350 USD. However, whilst this negative effect remains consistent when state-year fixed effects are applied in Model 4, neither coefficient is statistically significant. As such, the null hypothesis that the increased exportation of REMs has no effect upon the level of SALWs that democracies import cannot be rejected. Thus, the results do not support Hypothesis 7a.

Similarly, the results do not provide support for Hypothesis 7b. In the random effects models, the interaction effect between REM exports and personalist autocracies is positive. This indicates that when such exports increase, personalist autocracies import more SALWs on average than their democratic counterparts. However, whilst such states may import more SALWs than democracies when REM exports increase, the overall trajectory of the relationship remains negative, as shown by Figure 6.3. This trajectory is in opposition to that which was theorised in Hypothesis 7b.

The same conclusion can also be drawn for non-personalist autocracies. In Model 3, the interaction effect between such regimes and REM exports is also positive. This indicates that, like personalist autocracies, they import more SALWs on average than democratic states when exporting more REMs. However, as indicated by Figure 6.4, this once more leads to an overall negative relationship. This remains the case when fixed effects are also specified.

Table 6.4: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log).

Dependent Variable: SALW Transfers - 3-Year Average (log)				
	Model (1)	Model (2)	Model (3)	Model (4)
REM Exports % GDP (log)			−0.350	−0.860
			[0.457]	[0.772]
Personalist Autocracy			1.038.	0.774
			[0.540]	[1.341]
Non-Personalist Autocracy			−0.411	−0.605
			[0.494]	[0.609]
REM Exports % GDP (log) X Personalist Autocracy			0.008	−0.085
			[0.468]	[0.692]
REM Exports % GDP (log) X Non-Personalist Autocracy			0.002	0.035
			[0.559]	[0.887]
GDP/Cap (log)	0.873***	1.303	0.842***	1.352
	[0.174]	[0.903]	[0.179]	[0.815]
Total Population Size (log)	0.835*	−0.121	0.735*	−2.812
	[0.332]	[5.954]	[0.329]	[5.688]
Polity V Score	0.018	−0.017	0.059	0.003
	[0.037]	[0.102]	[0.046]	[0.098]
Trade Openness (log)	−0.801*	−0.707	−0.592	−0.406
	[0.334]	[0.797]	[0.369]	[0.793]
Oil Exports USD (log)	0.056***	0.052.	0.051**	0.040
	[0.016]	[0.029]	[0.017]	[0.030]
Contiguous Alliances	0.001	−0.098	−0.079	−0.154
	[0.082]	[0.191]	[0.087]	[0.195]
Contiguous UN Ideal Point Difference	−0.917*	−0.680	−0.561	−0.320
	[0.404]	[0.994]	[0.424]	[1.028]
Sub-Saharan African Diplomats	0.015	−0.130	0.029	−0.183
	[0.046]	[0.124]	[0.047]	[0.133]
Civil War	−0.471.	−0.520	−0.477.	−0.584
	[0.276]	[0.330]	[0.282]	[0.359]
Fixed Effects	No	Yes	No	Yes
Sample size	721	721	676	676
Log-likelihood	−1653	−1568	−1540	−1458

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

More importantly however, in neither model are the interaction effects for either personalist or non-personalist autocracy statistically significant. As such, it can be concluded that the observed effects in these regimes are not empirically different to that of democracies. Given that the results of the generalised lin-

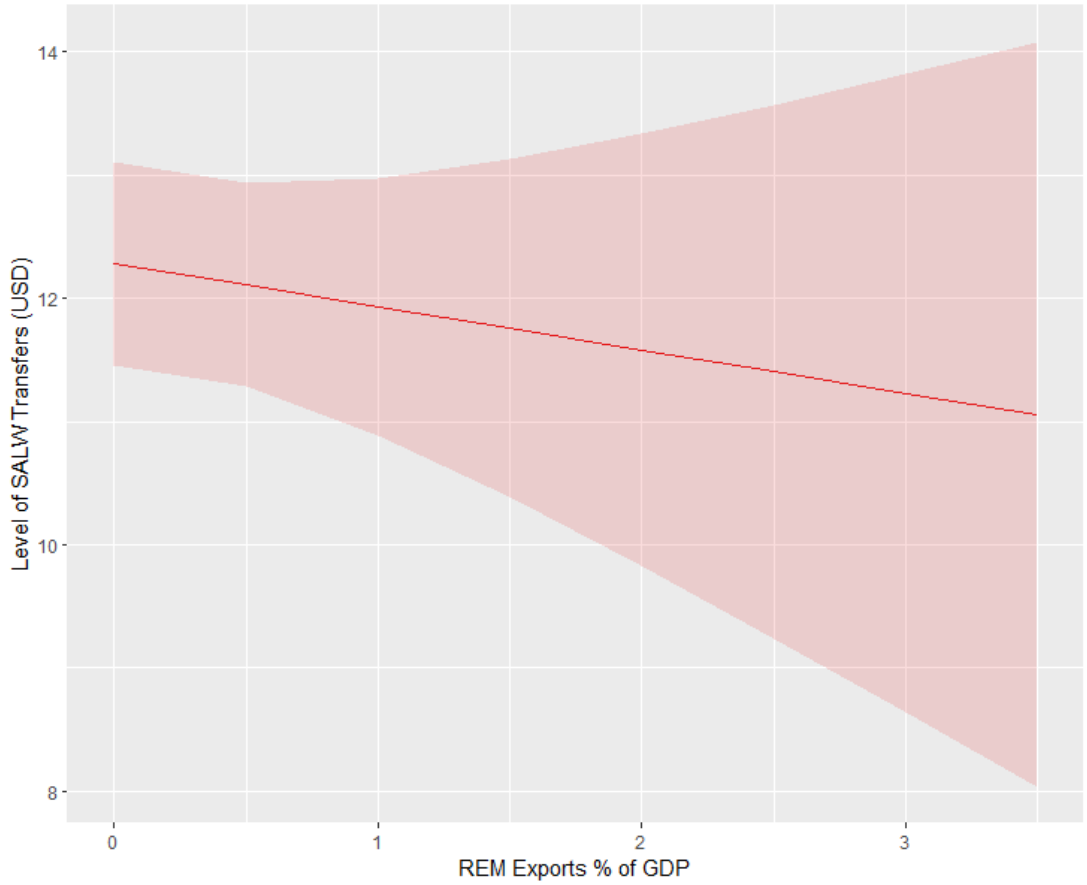

Figure 6.2: Effect of REM Exports % GDP (log) on SALW Transfers - 3-Year Average (log) in Democracies with 95% confidence intervals.

ear regression analysis are unable to provide empirical evidence in support of a relationship between REMs and SALWs for democracies, it also fails to provide evidence of an effect for both personalist and non-personalist autocracies.

Hypothesis 8 is also not supported by this analysis. As the effect in neither autocratic regime is empirically different to that observed in democracies, it stands to reason that they are not empirically different from each other. Moreover, given the inability of this analysis to reject the possibility that there is no effect of REM exports in either regime, it is not possible to say that one autocracy imports more SALWs than the other. This finding is further demonstrated by Figure 6.3 and Figure 6.4 as the confidence intervals for both autocracies are largely overlapping. Thus, Hypothesis 8 is not supported.

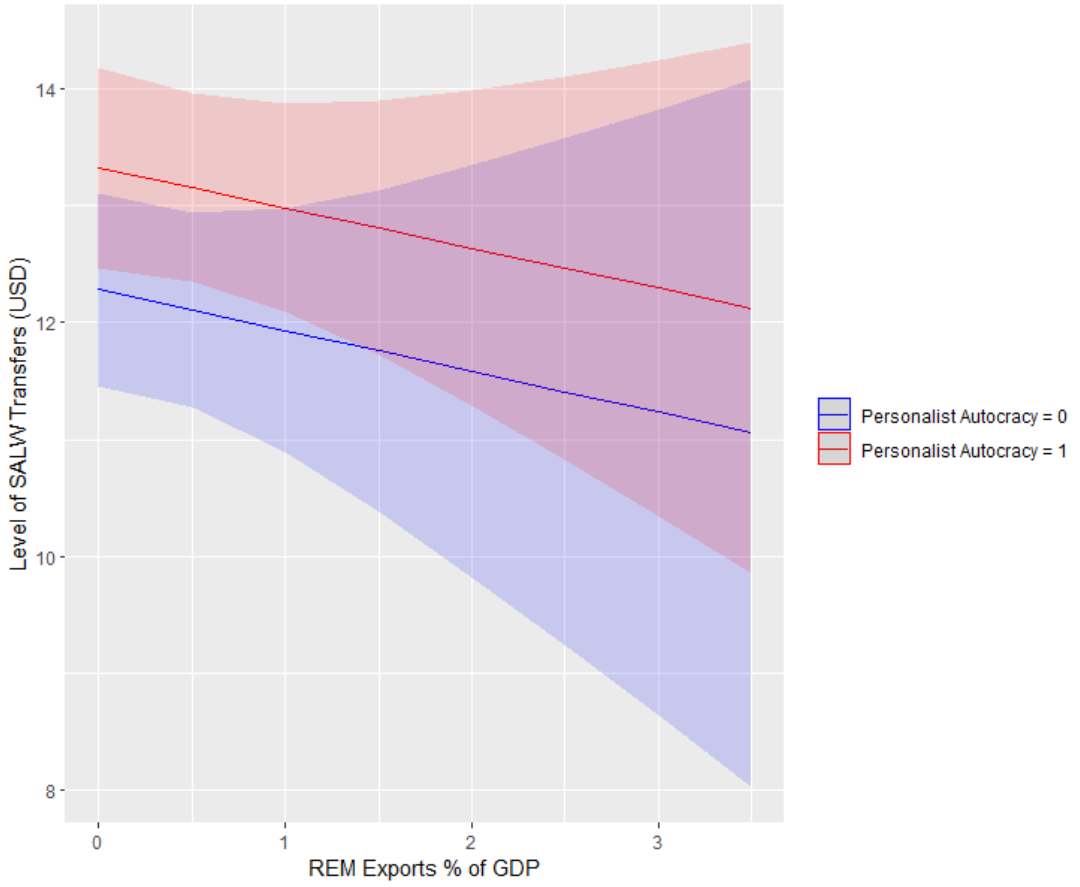

Figure 6.3: Interaction effect of REM Exports % GDP (log) and Personalist Autocracies on SALW Transfers - 3-Year Average (log) with 95% confidence intervals.

These findings are supported by the results of the control variables. The results of Models 3 and 4 are largely in line with those observed in the baseline analyses.[13] However, there are a few exceptions. In Model 3, the negative effect observed for *Trade Openness (log)* and *Contiguous UN Ideal Point Difference* in Model 1 are no longer statistically significant. Furthermore, when compared to the baseline models, both *Polity V Score* and *Contiguous Alliance* experience a change in the direction of their effect. However, as neither change in statistical significance, such an alteration does not have a particular influence upon the overall findings. Thus, the controls provide support for the investigative results.

[13] *GDP/Cap (log)*, *Total Population Size (log)*, *Oil Exports USD (log)*, *Sub-Saharan African Diplomats*, and *Civil War* have the same effects in both baseline and investigative models.

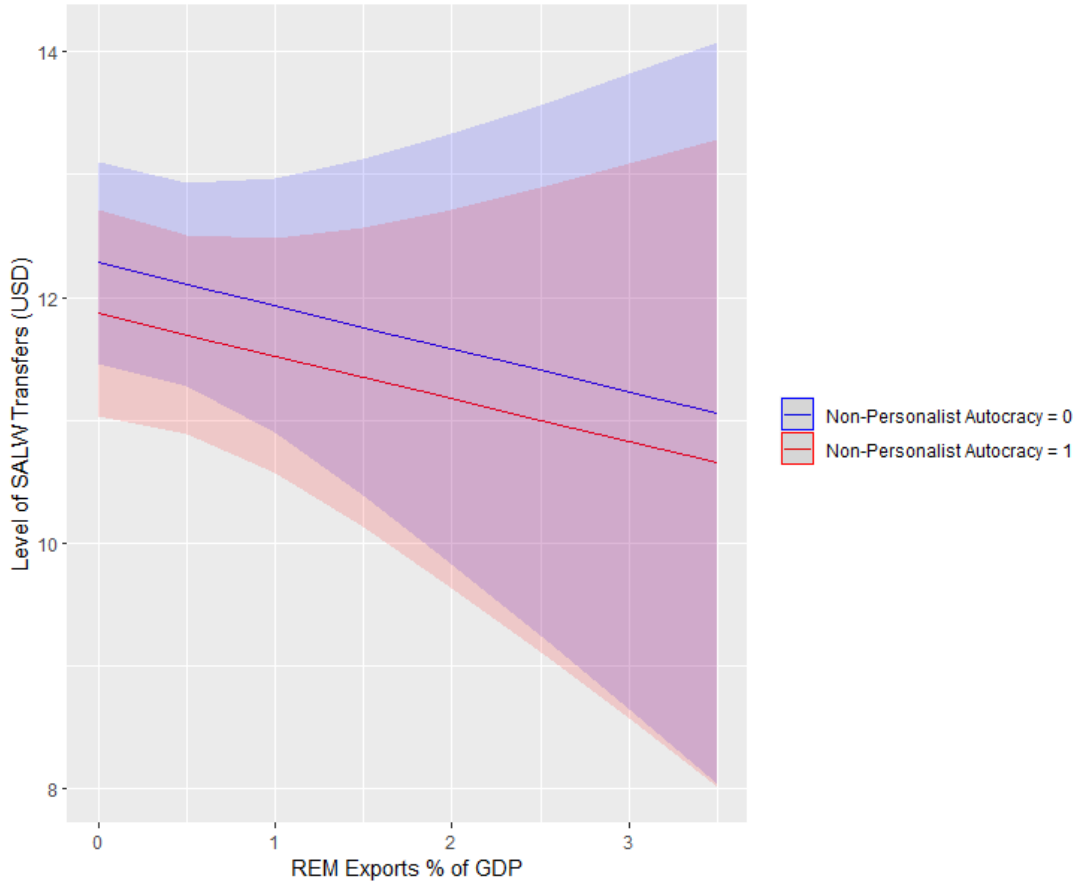

Figure 6.4: Interaction effect of REM Exports % GDP (log) and Non-Personalist Autocracies on SALW Transfers - 3-Year Average (log) with 95% confidence intervals.

Additionally, whilst the results are largely in line with the baseline analyses, some of the control findings differ from those observed in prior research. In particular, *Total Population Size (log)* and *Civil War* produce different effects to those found in the literature [Baronchelli et al., 2022, De Soysa et al., 2009b]. This can perhaps be explained by the narrowed focus of this research. Whilst previous literature has examined these factors on a more global scale, and used larger data sets that cover a longer time period, this analysis focuses solely on sub-Saharan Africa between 1995 and 2014. It is therefore possible that variation may exist between regions with regards to the effect of these controls. Moreover, the results presented here may only provide an important snapshot of their effect

in a larger picture. This however does not make the results any less insightful. They capture a crucial time period in the expansion of renewable energy and demand for REMs. Thus, whilst the control findings are not entirely in line with existing research, they are still relevant and provide support for the overall conclusions of this paper.

Robustness

The analysis presented above is also subjected to a series of robustness checks. In the first of such checks, the personalist and non-personalist autocracy variables are re-categorised as military and non-military autocracies. This is enables an examination of the possibility that variation exists instead between autocracies in this form. Table 6.5 presents the results of this analysis. When REM exports increase, both military and non-military autocracies import more SALWs than democracies. Moreover, as indicated by Figure 6.5, the overall trajectory for military autocracies is positive. This lends support to the idea that military autocracies, rather than personalist regimes, provide the required incentives to use REM-based revenue in such a way.

However, in no regime is the effect of increased REM exportation statistically significant. As such, it cannot be claimed that there is an effect in any of the re-specified regimes. Thus, the findings from the main analysis continue to hold here; increased REM exports have no effect upon the level of SALWs that states imports, regardless of regime type. Nevertheless, once more data becomes available, future research should seek to re-examine the relationship between military autocracies and REM exports.

In a further test, the independent variable *REM Exports % GDP (log)* is replaced with *REM Exports USD (log)*. This check is included to determine if variation exists between the monetary value of REM exports and their contribution to a state's economy. However, this alternative specification has no significant impact upon the overall findings of the primary analyses. The same is also true when the dependent variable, *SALW Transfers - 3-year Average (log)*, is replaced

Table 6.5: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Regime Type re-specified as Military Autocracy, Non-Military Autocracy, and Democracy.

Dependent Variable: SALW Transfers - 3-Year Average (log)		
	Model (5)	Model (6)
REM Exports % GDP (logged)	−0.389	−0.900
	[0.455]	[0.758]
Military Autocracy	−1.773*	−1.647
	[0.819]	[1.318]
Non-Military Autocracy	0.649	0.581
	[0.473]	[1.038]
REM Exports % GDP (logged) X Military Autocracy	1.203	1.125
	[0.796]	[0.671]
REM Exports % GDP (logged) X Non-Military Autocracy	0.042	0.013
	[0.450]	[0.579]
GDP/Cap (logged)	0.792***	1.262
	[0.182]	[0.829]
Total Population Size (logged)	0.789*	−2.916
	[0.338]	[5.633]
Polity V Sore	0.051	0.005
	[0.046]	[0.099]
Trade Openness (logged)	−0.670.	−0.455
	[0.371]	[0.817]
Oil Exports USD (logged)	0.052**	0.038
	[0.017]	[0.030]
Contiguous Alliances	−0.041	−0.140
	[0.087]	[0.194]
Contiguous UN Ideal Point Difference	−0.555	−0.291
	[0.423]	[1.014]
Sub-Saharan African Diplomats	0.012	−0.166
	[0.047]	[0.134]
Civil War	−0.417	−0.543
	[0.282]	[0.330]
Fixed Effects	No	Yes
Sample size	676	676
Log-likelihood	−1540	−1457

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

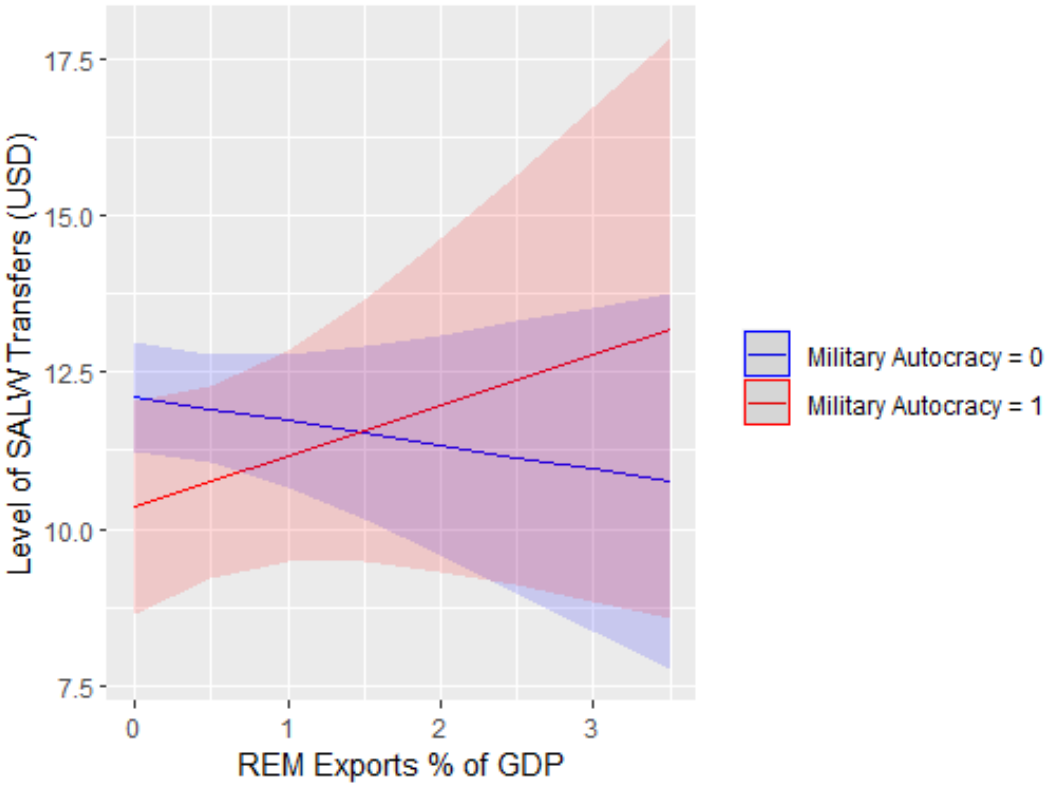

Figure 6.5: Robustness check: Interaction effect of REM Exports % GDP (log) and Military Autocracies on SALW Transfers - 3-Year Average (log) with 95% confidence intervals.

with a single year observation; thus, providing support for the robustness of this analysis.

Finally, an array of checks are conducted in which further controls are added or originals replaced. A full list of such checks can be found in the Appendix D. There is no significant change to the overall findings of this chapter in such tests. Whilst there are some changes in the direction of effects for the explanatory variables, no coefficient becomes statistically significant. As such, the findings from the primary analyses of this chapter are highly robust.

6.6 Discussion

This chapter has produced important and interesting findings. In opposition to what was hypothesised, increased exportation of REMs has no observable effect on the level of SALW transfers for any regime type. Increased exportation leads to a decrease in the level of SALWs that democratic states import. However, this effect is not statistically significant. As the effect in both personalist and non-personalist autocracies is also not statistically different to that observed for democracies, there is no evidence to suggest that REMs have any effect in such states. Therefore, it can be asserted that an increase in REM exportation's contribution to a state's GDP is not associated with an increase or decrease in the level of small arms that states purchase.

These results have several implications. First, the argument of this chapter is inaccurate. REMS may provide states with a source of revenue that leaders can use to buy more SALWs, but leaders do not choose to use it as such, even if they have significant incentives to do so. Such findings point to the wider inaccuracies of the REM-backed aggression theory. In the previous chapters it was shown that increased REM exportation does not lead to an increase in the level of MCWs states import. It was then theorised in this chapter that this was in part due to the fact that REM-based revenue is not sufficient enough to enable states to buy more of these weapons. However, the results presented above demonstrate that this is not the case. REMs don't lead to an increase in arms transfers of any kind, even those that states can afford.

As previously discussed, one explanation for these findings' centres around economic development. Whilst REMs enable states to buy more Small Arms and Light Weapons, it also provides them with financial incentives not to do so by encouraging economic development. Given that increased arms transfers of any kind can effect state and regional stability, which in turn influences economic performance, states are motivated to avoid such actions. Although this chapter theorised that the incentives of autocratic leaders to stay in power outweigh these economic motivations, this is evidently not the case.

It is possible that the observed results of this chapter are unique. This research has solely focused upon sub-Saharan Africa; a region constructed of developing states. It is therefore possible that such states place a higher value on economic development and prioritise it as such. Nevertheless, given that 152 states are considered developing, it is likely that any value on economic development assigned by sub-Saharan states will also be shared with the majority of nations. Thus, the findings can be generalised.

However, the results once more offer a positive indication that the international system may become more peaceful as the renewable energy transition progresses. As previously discussed, existing literature has shown that the arms transfers market is heavily influenced by oil rich states and the exportation of petroleum. On the other hand, this chapter has shown that this does not seem to be the case for REMs. As such, when the transition progresses, oil's influence reduces and REMs increases, it is possible that the SALW market may see a slight decline as a major source of funding is replaced with a dissociated alternative. This possibility coupled with the negative relationship between REM exports and MCW transfers may result in a more peaceful environment for international relations.

It is once more important to note that this is only a possibility. This analysis only captures a brief period at the start of the renewable energy transition. As it progresses and REMs become more valuable, and exporters more rich and powerful, there may be a change in the observed relationship. For now though, this chapter gives some hope for an international system in which small arms are less prominent.

6.7 Conclusion

I sought to establish whether the increased exportation of REMs influences the level of SALWs that states import. Moreover, I sought to determine whether variation exists between democracies, personalist, and non-personalist autocra-

cies with regards to this effect. In the previous chapters, results indicated that increased REM exportation is associated with a reduction in the level of MCWs states import, even when they have significant incentives to buy more weapons. As shown, there was reason to believe that is the case as it is not financially possible for leaders to use their REM-based revenue to buy arms of this nature.

However, I argued that the exportation of REMs would provide sufficient funds to enable leaders to buy a cheaper classification of weapon; SALWs. Moreover, I hypothesised that both personalist and non-personalist autocracies would use the REM-based revenue as such, given the likelihood that they will be removed from office by way of a conflict that is mainly fought with small arms. The effect was also expected to be greatest in personalist autocracies given that they are more likely to be removed from power by way of violent revolutions, are more likely to suffer post expulsion consequences, and have fewer options available to them for increasing their military strength. Owing to democracies reliance upon the public and elections to maintain power and given the public and economic consequences associated with arms transfers, it was also hypothesised that the increased exportation of REMs in such states would result in a decrease in the level of SALWs that they import.

The findings of this analysis however did not support my arguments. The results indicate that in all regimes, the general trajectory of the effect for REM exports on SALW transfers is negative. However, as no effect is statistically significant, the conclusion is drawn that when REM exports increase, there is no impact upon the level of SALWs that states import. This result holds for all regime types regardless of whether they are a democracy, personalist autocracy, or non-personalist autocracy.

Chapter 7

Conclusion

7.1 Introduction

The increase in global temperature, predominantly brought about by the burning of fossil fuels, has led world leaders to implement a series of polices designed to aid with the decarbonisation process [Dimitrov, 2016, EEA, 2021, Tian et al., 2022, UNFCC, 2023]. These policies have kick-started a global energy transition in which oil, coal, and gas are replaced with more environmentally conscious means of power generation. This has led to a decline in oil's share of globally produced energy whilst renewable energy production has increased three-fold since the 1970s [International Energy Agency, 2021a].

However, renewables require significant natural resources, such as copper and iron, to manufacture the technologies that enable the production of clean energy. Due to the increased application of renewable energy, demand for the required resources has dramatically increased [International Energy Agency, 2021b]. Moreover, demand is predicted to rise further as the clean energy transition continues [Carrara et al., 2020, Hund et al., 2020, International Energy Agency, 2022a]. For example, exports of copper and silver are expected to increase by more than a third between 2022 and 2050 [Calvo and Valero, 2022].

Research has established that energy-related natural resources can impact

interstate conflict processes. Specifically, literature has shown that oil can lead to conflict initiation for states by enabling leaders to increase their military capabilities and political autonomy [Colgan, 2010, Strüver and Wegenast, 2018]. However, despite growing in importance, limited scholarly work has investigated whether REMs also effect interstate conflict processes. In this thesis, I address this oversight.

Due to similarities with oil, I theorised that REMs have a similar conflict inducing effect. Specifically, I argued that the exportation of REMs provides nations with a source of non-tax revenue from state-based exports and royalty payments. As the money is non-tax, leaders have greater scope to spend it in unpopular ways, such as the procurement of foreign weapons. This REM-induced increase in military capabilities then increases the opportunity and willingness of states to initiate an MID as it raises the odds that they will be successful. Thus, I hypothesised that an increase in REM-exportation is associated with an increase in the likelihood that states will initiate an interstate conflict.

However, REMs can also enhance economic development, providing incentives for states to avoid any action that may jeopardise their economic growth. As the increased importation of arms is considered to be one such action, when exports increase leaders have incentives not to use their REM-based revenue to buy more weapons. Nevertheless, in personalist and non-personalist autocracies, leaders are regularly ousted from power via the use of force. As their regimes survival is dependent upon a well armed military, they have significant incentives to increase their military capabilities. I argued that this need for a strong military provides autocratic leaders with the level of motivation required to overrule the financial incentives that REMs provide states to import less weapons. I argued that this was not the case for democracies as in such states a leader's control of power is dictated by electoral competition. Thus, they have few incentives to import more arms.

Based on such arguments, I theorised that variation exists between regime types with regards to the effect of REM exports on arms transfers. I hypoth-

esised that only in personalist and non-personalist regimes does the increased exportation of REMs increase the level of arms that states import. By extension, I argued that when REM exports increase, the likelihood that personalist and non-personalist autocracies will initiate an MID also increases. As personalist regimes have the greatest need for strong military capabilities, I hypothesised that the effect of REM exports on both arms transfers and MID initiation would be greatest in such states.

Below, I outline the key findings associated with these arguments. I then address the real world and academic implications that accompany the results. Finally, I provide a discussion on the limitations of this thesis and offer some suggestions for future work.

7.2 Summary of Key Findings

7.2.1 REMs and Arms Transfers

The first significant finding of this thesis is that an increase in the exportation of REMs is associated with a *decrease* in the level of arms that states import. This result is in opposition to that which was hypothesised in the first step of my REM-backed aggression theory, as outlined in Chapter 3.[1]

However, this finding only applies to the transfer of Major Conventional Weapons. The increased exportation of REMs has no effect upon the level of Small Arms and Light Weapons that states import. This suggests that the observed decrease in arms transfers is not the result of REMs' inability to provide the financial resources required to make such purchases. This is implied as states choose not to use their REM-based revenue to buy the more affordable SALWs. Instead, the effect of REMs offers financial incentives that are so great that they discourage states from using the revenue to buy more arms. [2]

[1] Hypothesis 1: As REM exportation increases, the level of arms that states import increases.

[2] The finding of REM exports on the importation of MCWs only holds when arms transfers are expressed as a 5-year rolling average and REM exports are measured as a percentage of a state's GDP.

7.2.2 REMs and MID Initiation

The second major finding of this thesis is that an increase in the exportation of REMs has no effect upon the likelihood that states will initiate an MID. Once more, this result is not in line with original expectations. However, it is in line with the overall logic of the REM-backed aggression theory as it can be explained by the prior finding. As the exportation of REMs does not increase the level of arms that states import, it also does not lead to a rise in a state's military capabilities. By extension, there is no change to the opportunity and willingness of leaders to initiate an interstate conflict as their chances of successfully achieving their foreign policy goals by way of violence do not increase. Thus, states are no more likely to initiate an MID when REM exports increase.[3]

7.2.3 Regime Type and REM-Backed Aggression

The final finding of this thesis is that the relationship between REMs, arms transfers, and MID initiation does not vary between different regime types. More specifically, an increase in the exportation of REMs is associated with a *decrease* in the level of arms states import, regardless of their status as either a personalist autocracy, non-personalist autocracy, or a democracy.[4] Similarly, a rise in the level of REMs exported by states has no effect upon the likelihood of any regime type initiating an MID. These results are in opposition to the arguments presented in Chapter 5. Additionally, they point to the strength of the economic incentives that REMs provide states to refrain from using the revenue to buy more arms. Even when leaders' lives depend upon increasing their military strength, they still refrain from using the money in this way.

[3]I also find that an increase in the level of REMs that states export has no effect upon the likelihood that states will participate in an MID.

[4]The effect holds for military autocracies, non-military autocracies, and democracies.

7.3 Implications

Whilst the findings of this thesis do not support the arguments made, they have significant implications for international relations and its study. First, as the renewable transition progresses, the international system may become more peaceful. The decline in the application of oil in the global energy system may reduce the potential for states to engage in acts of petro-aggression.[5] Less application means less exportation, less exportation means less revenue, and less revenue means less opportunities to initiate MIDs. If fossil fuels are made obsolete by the energy transition, oil-based aggression will be left in the petro-era. In this thesis, I have shown that REMs do not trigger acts of resource-backed aggression like oil. Therefore, as the market begins to expand and REMs' influence over international policy grows, it is possible that there will be fewer disputes, particularly related to natural resources.

The potential for a more peaceful international system is further indicated by the effect that REM exports have on the transfer of MCWs. As discussed in Chapter 2, the number of REM exporting states has steadily increased since 1995 [OEC World, 2024].[6] This is likely to continue with significant recent investment in resource exploration [International Energy Agency, 2022b]. If the number of exporting states continues to increase as expected, the reducing effect of REMs on arms transfers will be observed in more nations. Moreover, as export rates rise, the number of weapons that states purchase will fall further. Therefore, a reduction in the global transfer of arms signifies a more peaceful international environment as it implies that states will have less means to employ violence as a foreign policy strategy. Additionally, it reduces the chance of regional tensions by limiting concerns of military buildups in neighbouring nations [Choulis et al., 2022, Sample, 1998].

It is once more important to stress that such peace is only a possibility.

[5]For more information on petro-aggression see Colgan [2010, 2013] and [Strüver and Wegenast, 2018].

[6]See Chapter 2, Section 2.2 for more information.

The renewable energy and REM markets will experience major changes as the transition progresses. Whilst this thesis has shown that REMs so far do not impact interstate conflict processes, it is not to say that it will always be this way. Additionally, there could be other ways in which the growing application of clean energy influences interstate conflicts that have not been covered by this thesis. Thus, whilst the findings of this research offer hope for both the environment and international relations, it is important to proceed with cautious optimism.

Nevertheless, this thesis can offer some guidance to policy makers and intergovernmental organisations. With no observed relationship between REMs and MID initiation, greater focus should be placed upon the more pressing areas of conflict concern, such as the territorial disputes in Ukraine and Palestine. There is less need to worry about REM-related conflicts. As such, both international policies and actions should reflect this. REMs must not be neglected entirely however, as the changing market could lead to greater concern in the future.

Second, this thesis helps to further the understanding of recent interstate conflicts in sub-Saharan Africa. As noted in Chapter 1, sub-Saharan Africa is the world's most conflict affected region. It has also witnessed the average number of disputes that states are involved in each year increase since mid-1990s. Whilst coinciding with the REM-mining boom in the region, this thesis has shown that there is no relationship between REM exports and MID initiation. Thus, the average increase observed since 1995 is not a consequence of the renewable transition or the increased REM exportation. This thesis makes a contribution to international relations by helping to narrow the field of potential explanations as to why sub-Saharan Africa remains a conflict prone region.

Third, from an academic perspective, this thesis helps to fill a gap within the international relations literature regarding the relationship between natural resources and interstate conflict. Whilst much scholarly work has examined the role that other resources, such as oil, play within international relations, this thesis – to my knowledge – is the first piece of empirical research to investigate

the effect of REMs on interstate conflict processes. This is an important first step. The growing value and importance of REMs has the potential to shape international relations in the near future. Thus, understanding the influence that they have is of the upmost importance. Although this thesis does not fill the gap in understanding completely, it should mark the start of an academic effort to do so.

Fourth, this chapter moves the needle of understanding with regards to oil's effect on interstate conflict processes. Despite similarities, I have shown that REMs do not effect interstate conflict in the same way as oil is theorised to do so. Thus, this research reaffirms the possibility that oil's capacity to inspire conflict is unique.

Nevertheless, there is still a question as to why this is the case. A possible explanation is that the financial incentives to reduce the level of arms that states import are greater for REM exports than for oil. Oil has been essential to both national and international development for decades. This may have provided resource rich states with a certain level of control and influence over the international system. States always need oil. Therefore, whilst interstate actors may disapprove of petro-backed aggression, threats of financial consequences for violent activities may hold little weight. For example, the US and United Kingdom imposed sanctions upon Russia in 2022 following their invasion of Ukraine [BBC News, 2022]. Despite these sanctions, exports of Russian oil increased by more than 17% in 2022 [OEC World, 2024].

In contrast to oil, REM-rich states do not have the same level of sway over the international system. The markets are highly diverse, the resources can be recycled, and there are various material alternatives [Habib et al., 2016, Lovins, 2017, Overland, 2019]. As such, international actors have greater scope to enforce financial consequences for inappropriate behaviour. Such consequences may be so great that they discourage interstate violence.

However, an alternative explanation is simply that oil exports produce revenue for states that is significantly larger than that of REMs. In 2022, global

exports of REMs were estimated to be worth $306 billion [OEC World, 2024]. In the same year, exports of crude petroleum oil exceeded $1.45 trillion; almost 5 times greater than that of REMs. Additionally, as the oil industry is largely nationalised, whereas the REM market is generally privatised, petroleum exporting states see a greater level of the revenue made from their resource exportation; thus, affording them a greater opportunity to buy more weapons. However, it is important to stress that this may change as demand for REMs increases in the coming decades.

7.4 Limitations and Suggestions for Future Work

This thesis is not without its limitations. As discussed during the empirical analyses, the investigative capacity of my research is restricted by the availability of important data. Most notably, reliable observations for conflict initiation are only available until 2014. Since then, exports of REMs have risen dramatically as efforts to decarbonise have intensified. As such, a crucial period in the growth of REM demand is omitted from this thesis. However, as the transition had already begun pre-2014, and demand for REMs had already begun to increase, this analysis is justified. Nevertheless, future research should seek to re-examine the effect of REM exports when more data becomes available.

A further data-related limitation involves the under reporting of Chinese arms transfers. Due to a lack of transparency, data sources – such as SIPRI – cannot accurately measure the level of weapons that China exports. Given China's REM-based interest in the region, and their willingness to use arms transfers as a means of securing natural resources, it is possible that sub-Saharan states receive more weapons from China than originally recorded. As such, the total level of weapons that states import may be under reported in this thesis. Should more transparent arms transfer data become available, scholars may wish to re-examine this analysis.

The exclusive focus upon sub-Saharan Africa could also be viewed as a fur-

ther limitation. Whilst the region is a clear candidate for investigation, owing to its history with conflict and its place within the REM-mining boom, a broader empirical analysis may also have been beneficial as it would have allowed for greater generalisation of the results. However, I believed that as the transition is still in its relative infancy, it was more prudent to examine a region that would have been directly influenced by the growth of REM demand and exports. This would help give a clearer idea of how the rest of the world may act when REMs eventually reach a greater level of importance. Additionally, by focusing upon sub-Saharan Africa, I was able to hold economic development relatively constant. Still, I encourage others to expand upon my research and investigate the relationship between REM exports and interstate conflict processes in a more global context.

In this thesis, I have also kept a very narrow definition of REMs so as to enable a clear and thorough analysis. However, this categorisation could be expanded in future work to include the materials used in renewable energy technologies that I have not classed as REMs. Furthermore, whilst this thesis focuses solely upon the resources required to produce renewable energy, there are others that are equally as important to the decarbonisation process. Lithium, for example, is essential to the deployment of electric vehicles, owing to its use in long-life batteries [Calvo and Valero, 2022, Hund et al., 2020]. It is also a resource that has witnessed a recent spike in demand. Consequently, scholars have raised questions over its role in future conflicts [Rothkopf, 2009]. Therefore, an investigation in which the categorisation of REMs is expanded would be both prudent and interesting.

A further limitation of this thesis is the narrow examination of the REM-backed aggression theory. Despite suggestions of a potential relationship, in no empirical analysis do I examine the accuracy of the resource competition theory. This omission was dictated by the availability of data. It is indicative of the argument that it is a nation's material wealth that leads them to a greater level of conflict involvement, not their level of exports. It would therefore require exten-

sive data on REM stores and reserves to fully explore this argument. However, such data is not readily available. Whilst the U.S. Geological Survey provides some information, it does not extensively cover reserves in sub-Saharan Africa during the period of study. Should more data become available however, future research should seek to examine the resource competition argument in reference to REMs.

Finally, whilst I have focused upon REMs' effect on militarised interstate dispute processes, there are other forms of conflict. Although REMs do not lead states to initiate MIDs, they may lead to an increased involvement in economic disputes. Such conflicts have already taken place. In 2010, China and Japan used export restrictions and trade agreements to settle a dispute rather than bombs and bullets [Barteková and Kemp, 2016]. Scholars may therefore wish to determine whether REM-related conflicts will be fought in boardrooms rather than battlefields.

Furthermore, research should examine the possibility that REMs increase the likelihood of intrastate conflicts. In this thesis I have established that REM exports do not increase the number of weapons that states import. However, this does not rule out the possibility of the export revenue being used to finance other methods of civilian repression. As Bove and Brauner [2016] note, successful repression of civilians requires the loyalty of the nation's military. Therefore, leaders who rely upon repression to maintain power may use the revenue to pay soldiers an efficiency wage so as to limit the likelihood a violent revolution [Acemoglu et al., 2010]. Whilst the international community may still be opposed to such actions, and the associated regional instability may encourage states to refrain from using the money in this way, such a possibility is worthy of further investigation.

Despite these limitations, the findings of this thesis indicate that the renewable energy transition offers promise for a more peaceful world. I find evidence to suggest that the exportation of REMs is associated with the reduced procurement of Major Conventional Weapons. More importantly however, I find no

evidence that REM exports are linked to the initiation of Militarised Interstate Disputes.

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Appendix A

Introduction

Sub-Saharan African States

Angola

Benin

Botswana

Burkina Faso

Burundi

Cabo Verde

Cameroon

Central African Republic

Chad

Comoros

Democratic Republic of Congo

Congo

Cote D'Ivorie

Equitorial Guinea

Eritrea

Eswatini

Ethiopia

Gabon

Gambia

Ghana

Guinea

Guinea-Bissau

Kenya

Lesotho

Liberia

Madagascar

Malawi

Mali

Mauritania

Mauritius

Mozambique

Namibia

Niger

Nigeria

Rwanda

Sao Tome and Principe

Senegal

Seychelles

Sierra Leone

Somalia

South Africa

South Sudan

Sudan

Tanzania

Togo

Uganda

Zambia

Zimbabwe

Appendix B

REM-Backed Aggression: Empirical Analysis

Major Conventional Weapons as Defined by the SIPRI Arms Transfers Database

Aircraft: Helicopters and fixed-wing aircraft

Air defense systems: Land-based surface-to-air missile systems and anti-aircraft guns (minimum 40 mm calibre or combined 70 mm for multi-barrel weapons).

Anti-submarine warfare weapons: Rocket launchers and antisubmarine mortars (minimum 100 mm calibre).

Armoured vehicles: Tanks, tank destroyers, armoured cars, armoured personnel carriers, armoured support vehicles, and infantry fighting vehicles.

Artillery: Howitzers, rocket launchers and mortars (minimum 100 mm calibre), and towed guns (naval, fixed and self-propelled).

Engines: Engines for military aircraft, combat ships and armoured vehicles.

Missiles: Powered guided missiles and torpedoes and unpowered guided bombs and shells.

Sensors: land, aircraft, ship-based radar and surveillance systems (minimum 25 km range), fire control radars and anti-submarine warfare and anti-ship sonar systems.

Satellites: Reconnaissance satellites.

Ships: Ships (minimum 100 tonnes standard tonnage), ships with artillery (minimum 100 mm calibre, torpedoes or guided missiles), and ships (maximum 100 tonnes where maximum speed in kmh exceeds 3500 when multiplied by full tonnage).

Other: Turrets for armoured vehicles (minimum 12.7 mm calibre ore with guided anti-tank missiles), turrets for ships fitted with a gun (minimum 57 mm calibre), turrets for ships fitted with guns (minimum 57 mm calibre combined), and air refueling systems.

Renewable Essential Materials and Their Harmonized System Codes

Aluminium Ore (HS4 2606)

Chromium Ore (HS4 2610)

Copper Ore (HS4 2603)

Iron Ore (HS4 2601)

Lead Ore (HS4 2607)

Manganese Ore (HS4 2602)

Molybdenum Ore (HS4 2613)

Nickel Ore (HS4 2604)

Rare-Earth Metal Compounds (HS4 2846)

Silver Ores and Concentrates (HS6 261610)

Zinc Ores (HS4 2608)

Table B.1: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 5-Average (log). Includes additional variables, Total Diplomats and Total Alliances.

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (4.1)	Model (4.2)	Model (4.3)	Model (4.4)
REM Exports % GDP (log)	−0.365***	−0.322*	−0.364***	−0.337*
	[0.092]	[0.151]	[0.093]	[0.158]
GDP/Cap (log)	0.416***	0.286	0.388***	0.340
	[0.064]	[0.302]	[0.066]	[0.244]
Total Population Size (log)	0.440***	3.119**	0.569***	3.501*
	[0.133]	[1.035]	[0.126]	[1.298]
Polity V Score	−0.009	0.011	−0.016	0.007
	[0.014]	[0.036]	[0.014]	[0.039]
Trade Openness (log)	0.143	0.158	0.129	0.140
	[0.120]	[0.208]	[0.124]	[0.188]
Oil Exports USD (log)	0.007	0.007	0.009	0.008
	[0.006]	[0.006]	[0.006]	[0.007]
Contiguous Alliances	0.093**	0.101.	0.053	0.152
	[0.031]	[0.058]	[0.045]	[0.126]
Total Alliances			0.004	−0.027
			[0.011]	[0.038]
Contiguous UN Ideal Point Difference	−0.120	−0.301	−0.136	−0.343
	[0.143]	[0.348]	[0.145]	[0.344]
Sub-Saharan African Diplomats	−0.043	−0.036	0.031.	0.055
	[0.027]	[0.069]	[0.017]	[0.055]
Total Diplomats	0.034***	0.044.		
	[0.010]	[0.026]		
Civil War	0.099	0.119	0.104	0.107
	[0.096]	[0.123]	[0.097]	[0.109]
Fixed Effects	No	Yes	No	Yes
Sample size	724	724	724	724
Log-likelihood	−899	−802	−904	−807

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.2: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 5-Average (log). Includes tests in which Sub-Saharan Diplomats and Contiguous Alliances are replaced with Total Diplomats and Total Alliances.

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (4.5)	Model (4.6)	Model (4.7)	Model (4.8)
REM Exports % GDP (log)	−0.365***	−0.314*	−0.352***	−0.321*
	[0.093]	[0.155]	[0.092]	[0.146]
GDP/Cap (log)	0.395***	0.275	0.388***	0.291
	[0.062]	[0.296]	[0.065]	[0.280]
Total Population Size (log)	0.415**	3.196**	0.604***	3.697**
	[0.132]	[1.084]	[0.119]	[1.284]
Polity V Score	−0.011	0.011	−0.017	0.001
	[0.014]	[0.037]	[0.014]	[0.039]
Trade Openness (log)	0.117	0.144	0.167	0.198
	[0.119]	[0.207]	[0.119]	[0.215]
Oil Exports USD (log)	0.008	0.008	0.009	0.009
	[0.006]	[0.007]	[0.006]	[0.006]
Contiguous Alliances	0.091**	0.103.		
	[0.031]	[0.059]		
Total Alliances			0.014.	0.005
			[0.008]	[0.019]
Contiguous UN Ideal Point Difference	−0.132	−0.321	−0.129	−0.330
	[0.143]	[0.346]	[0.145]	[0.358]
Sub-Saharan African Diplomats			0.028.	0.036
			[0.016]	[0.055]
Total Diplomats	0.021***	0.035.		
	[0.006]	[0.018]		
Civil War	0.100	0.124	0.108	0.128
	[0.096]	[0.122]	[0.097]	[0.113]
Fixed Effects	No	Yes	No	Yes
Sample size	724	724	724	724
Log-likelihood	−900	−803	−905	−811

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.3: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 5-Average (log). Includes tests in which Trade Openness (log) and Oil Exports USD (log) are replaced with WDI Trade Openness (log) and Oil Exports % GDP (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (4.9)	Model (4.10)	Model (4.11)	Model (4.12)
REM Exports % GDP (log)	−0.348***	−0.333*	−0.448***	−0.429*
	[0.094]	[0.151]	[0.099]	[0.188]
GDP/Cap (log)	0.369***	0.274	0.490***	0.452
	[0.065]	[0.308]	[0.073]	[0.293]
Total Population Size (log)	0.562***	3.339*	0.614***	3.299.
	[0.124]	[1.302]	[0.131]	[1.749]
Polity V Score	−0.012	0.005	−0.023	−0.016
	[0.014]	[0.039]	[0.014]	[0.032]
Trade Openness (log)	0.068	0.132		
	[0.123]	[0.193]		
WDI Trade Openness (log)			0.259.	0.245
			[0.155]	[0.222]
Oil Exports USD (log)			0.007	0.007
			[0.006]	[0.006]
Oil Exports % GDP (log)	0.177**	0.131		
	[0.069]	[0.128]		
Contiguous Alliances	0.069*	0.082	0.066*	0.074
	[0.030]	[0.062]	[0.030]	[0.060]
Contiguous UN Ideal Point Difference	−0.131	−0.318	−0.346*	−0.484
	[0.145]	[0.348]	[0.150]	[0.356]
Sub-Saharan African Diplomats	0.030.	0.049	0.030.	0.074.
	[0.016]	[0.054]	[0.017]	[0.044]
Civil War	0.113	0.141	0.067	0.112
	[0.097]	[0.115]	[0.098]	[0.117]
Fixed Effects	No	Yes	No	Yes
Sample size	715	715	655	655
Log-likelihood	−896	−802	−801	−711

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.4: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 3-Average (log).

Dependent Variable: Arms Transfers - 3 Year Average (log)		
	Model (4.13)	Model (4.14)
REM Exports % GDP (log)	−0.249*	−0.247
	[0.116]	[0.165]
GDP/Cap (log)	0.486***	0.403
	[0.080]	[0.358]
Total Population Size (log)	0.552**	1.971
	[0.177]	[1.330]
Polity V Score	−0.006	0.022
	[0.018]	[0.043]
Trade Openness (log)	0.025	−0.039
	[0.150]	[0.243]
Oil Exports USD (log)	−0.004	−0.002
	[0.007]	[0.010]
Contiguous Alliances	0.021	0.056
	[0.037]	[0.065]
Contiguous UN Ideal Point Difference	0.045	−0.141
	[0.176]	[0.393]
Sub-Saharan African Diplomats	0.034	0.059
	[0.022]	[0.072]
Civil War	0.180	0.182
	[0.117]	[0.186]
Fixed Effects	No	Yes
Sample size	724	724
Log-likelihood	−1048	−953

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.5: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - Binary.

Dependent Variable: Arms Transfers - Binary		
	Robust Model (4.15)	Robust Model (4.16)
REM Exports % GDP (log)	0.017	−0.018
	[0.034]	[0.067]
GDP/Cap (log)	0.154***	0.068
	[0.027]	[0.084]
Total Population Size (log)	0.162***	1.257**
	[0.035]	[0.408]
Polity V	−0.009.	−0.011
	[0.005]	[0.011]
Trade Openness (log)	0.022	0.030
	[0.051]	[0.076]
Oil Exports USD (log)	−0.001	−0.005
	[0.003]	[0.004]
Contiguous Alliances	−0.002	−0.009
	[0.012]	[0.024]
Contiguous UN Ideal Point Difference	0.039	−0.087
	[0.069]	[0.106]
Sub-Saharan African Diplomats	−0.004	0.011
	[0.005]	[0.020]
Civil War Onset	0.108*	0.072
	[0.052]	[0.064]
Fixed Effects	No	Yes
Sample size	724	724
Log-likelihood	−447	−394

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.6: Robustness check: Generalised linear regression analysis for the effect of REM Exports % GDP (log) on Arms Transfers - 5 Year Average (log). Includes additional Binary Year variables.

Dependent Variable: Arms Transfers - 5 Year Average (logged)	
	Robust Model (4.17)
REM Exports % GDP (log)	−0.316***
	[0.095]
GDP/Cap (log)	0.541***
	[0.092]
Total Population Size (log)	0.688***
	[0.136]
Polity V	−0.008
	[0.015]
Trade Openness (log)	0.175
	[0.123]
Oil Exports USD (log)	0.008
	[0.006]
Contiguous Alliances	0.070*
	[0.030]
Contiguous UN Ideal Point Difference	−0.152
	[0.151]
Sub-Saharan African Diplomats	0.026
	[0.017]
Civil War Onset	0.126
	[0.100]
1997	0.042
	[0.179]
1998	−0.046
	[0.178]
1999	0.019
	[0.185]
2000	−0.047
	[0.185]
2001	−0.078
	[0.186]
2002	−0.028
	[0.188]
2003	−0.031
	[0.185]
2004	−0.221
	[0.187]
2005	−0.309

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Table B.6 – continued from previous page

Dependent Variable: Arms Transfers - 5 Year Average (logged)	
	Robust Model (4.17)
	[0.191]
2006	−0.193
	[0.196]
2007	−0.259
	[0.200]
2008	−0.210
	[0.206]
2009	−0.052
	[0.206]
2010	−0.167
	[0.210]
2011	−0.299
	[0.218]
2012	−0.266
	[0.217]
2013	−0.446*
	[0.220]
2014	−0.540*
	[0.220]
Fixed Effects	No
Sample size	724
Log-likelihood	−897

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.7: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation. Includes additional variables, Total Diplomats and Total Alliances.

Dependent Variable: MID Initiation				
	Model (4.18)	Model (4.19)	Model (4.20)	Model (4.21)
REM Exports % GDP (log)	−0.019	−0.036	−0.024	−0.033
	[0.022]	[0.023]	[0.022]	[0.023]
GDP/Cap (log)	−0.052**	−0.057	−0.058**	−0.076
	[0.019]	[0.053]	[0.019]	[0.059]
Total Population Size (log)	0.020	0.067	0.016	0.061
	[0.024]	[0.240]	[0.022]	[0.224]
Polity V Score	−0.007*	−0.001	−0.007*	−0.002
	[0.003]	[0.006]	[0.003]	[0.006]
Trade Openness (log)	−0.007	0.016	0.013	0.023
	[0.034]	[0.054]	[0.036]	[0.054]
Oil Exports USD (log)	0.003.	0.003	0.003	0.003
	[0.002]	[0.003]	[0.002]	[0.003]
Contiguous Alliances	−0.011	−0.001	−0.018.	−0.029
	[0.008]	[0.018]	[0.010]	[0.022]
Total Alliances			0.003	0.010
			[0.002]	[0.007]
Contiguous UN Ideal Point Difference	0.067	−0.028	0.070	−0.026
	[0.046]	[0.071]	[0.046]	[0.067]
Sub-Saharan African Diplomats	0.006	0.027*	0.006*	0.031*
	[0.005]	[0.013]	[0.003]	[0.012]
Total Diplomats	−0.001	0.003		
	[0.002]	[0.004]		
Civil War	0.087*	0.040	0.083*	0.051
	[0.036]	[0.049]	[0.036]	[0.049]
Fixed Effects	No	Yes	No	Yes
Sample size	724	724	724	724
Log-likelihood	−172	−121	−171	−119

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.8: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation. Includes tests in which Sub-Saharan Diplomats and Contiguous Alliances are replaced with Total Diplomats and Total Alliances.

Dependent Variable: MID Initiation				
	Model (4.22)	Model (4.23)	Model (4.24)	Model (4.25)
REM Exports % GDP (log)	−0.020	−0.042.	−0.027	−0.036
	[0.022]	[0.024]	[0.022]	[0.023]
GDP/Cap (log)	−0.052**	−0.048	−0.053**	−0.067
	[0.019]	[0.053]	[0.019]	[0.058]
Total Population Size (log)	0.019	0.009	0.007	0.024
	[0.024]	[0.221]	[0.022]	[0.224]
Polity V Score	−0.007*	−0.001	−0.007*	−0.001
	[0.003]	[0.007]	[0.003]	[0.006]
Trade Openness (log)	0.003	0.026	−0.002	0.012
	[0.033]	[0.053]	[0.035]	[0.050]
Oil Exports USD (log)	0.003.	0.002	0.003	0.003
	[0.002]	[0.003]	[0.002]	[0.003]
Contiguous Alliances	−0.010	−0.002		
	[0.008]	[0.019]		
Total Alliances			0.001	0.004
			[0.002]	[0.005]
Contiguous UN Ideal Point Difference	0.067	−0.012	0.072	−0.029
	[0.046]	[0.069]	[0.047]	[0.066]
Sub-Saharan African Diplomats			0.006*	0.035*
			[0.003]	[0.013]
Total Diplomats	0.002	0.010*		
	[0.001]	[0.004]		
Civil War	0.092*	0.036	0.090*	0.047
	[0.036]	[0.048]	[0.036]	[0.049]
Fixed Effects	No	Yes	No	Yes
Sample size	724	724	724	724
Log-likelihood	−173	−123	−173	−120

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.9: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation. Includes tests in which Trade Openness (log) and Oil Exports USD (log) are replaced with WDI Trade Openness (log) and Oil Exports % GDP (log).

Dependent Variable: MID Initiation				
	Model (4.26)	Model (4.27)	Model (4.28)	Model (4.29)
REM Exports % GDP (log)	−0.016	−0.037	−0.017	−0.040
	[0.022]	[0.022]	[0.023]	[0.026]
GDP/Cap (log)	−0.049**	−0.060	−0.046*	−0.044
	[0.019]	[0.050]	[0.021]	[0.084]
Total Population Size (log)	0.019	0.045	0.027	0.206
	[0.023]	[0.239]	[0.023]	[0.301]
Polity V Score	−0.007.	−0.002	−0.004	−0.001
	[0.003]	[0.006]	[0.003]	[0.007]
Trade Openness (log)	−0.006	0.004		
	[0.034]	[0.054]		
WDI Trade Openness (log)			−0.013	0.000
			[0.043]	[0.074]
Oil Exports USD (log)			0.004*	0.003
			[0.002]	[0.003]
Oil Exports % GDP (log)	0.019	0.054		
	[0.016]	[0.033]		
Contiguous Alliances	−0.009	0.000	−0.013.	0.000
	[0.008]	[0.019]	[0.008]	[0.019]
Contiguous UN Ideal Point Difference	0.069	−0.024	0.068	−0.027
	[0.047]	[0.067]	[0.048]	[0.080]
Sub-Saharan African Diplomats	0.006.	0.032*	0.000	0.038*
	[0.003]	[0.013]	[0.004]	[0.015]
Civil War	0.088*	0.044	0.078*	0.038
	[0.036]	[0.047]	[0.037]	[0.055]
Fixed Effects	No	Yes	No	Yes
Sample size	715	715	655	655
Log-likelihood	−175	−123	−157	−107

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.10: Robustness check: Binomial logistic regression analysis for the effect of REM Exports USD (log) on MID Initiation.

Dependent Variable: MID Initiation		
	Model (4.30)	Model (4.31)
REM Exports USD (log)	−0.002	−0.002
	[0.002]	[0.004]
GDP/Cap (log)	−0.047*	−0.058
	[0.019]	[0.052]
Total Population Size (log)	0.025	0.122
	[0.022]	[0.229]
Polity V Score	−0.007*	−0.002
	[0.003]	[0.007]
Trade Openness (log)	0.000	0.010
	[0.031]	[0.052]
Oil Exports USD (log)	0.003.	0.003
	[0.002]	[0.003]
Contiguous Alliances	−0.011	−0.003
	[0.007]	[0.019]
Contiguous UN Ideal Point Difference	0.067	−0.034
	[0.046]	[0.071]
Sub-Saharan African Diplomats	0.005.	0.033*
	[0.003]	[0.013]
Civil War	0.086*	0.041
	[0.036]	[0.050]
Fixed Effects	No	Yes
Sample size	725	725
Log-likelihood	−172	−121

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.11: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation. Includes additional Binary Year variables.

Dependent Variable: MID Initiation	
	Model (4.32)
REM Exports % GDP (log)	−0.020
	[0.022]
GDP/Cap (log)	−0.053*
	[0.022]
Total Population Size (log)	0.015
	[0.023]
Polity V	−0.007*
	[0.003]
Trade Openness (log)	−0.006
	[0.033]
Oil Exports USD (log)	0.003
	[0.002]
Contiguous Alliances	−0.009
	[0.008]
Contiguous UN Ideal Point Difference	0.066
	[0.047]
Sub-Saharan African Diplomats	0.005.
	[0.003]
Civil War Onset	0.092*
	[0.037]
1997	0.182
	[0.069]
1998	0.120.
	[0.069]
1999	0.053
	[0.071]
2000	0.008
	[0.070]
2001	0.037
	[0.071]
2002	0.148*
	[0.071]
2003	0.023
	[0.070]
2004	0.129.
	[0.069]
2005	0.148*
	[0.070]

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Dependent Variable: MID Initiation	
	Model (4.32)
2006	0.088
	[0.071]
2007	0.098
	[0.071]
2008	0.058
	[0.072]
2009	0.077
	[0.072]
2010	0.052
	[0.073]
2011	0.122.
	[0.074]
2012	0.030
	[0.073]
2013	0.159*
	[0.074]
2014	0.053
	[0.073]
Fixed Effects	No
Sample size	724
Log-likelihood	−161

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.12: Robustness check: Binomial logistic regression analysis for the effect of REM Exports % GDP (log) on MID Initiation. Includes additional cubic polynomial variables for Time Since Last MID.

Dependent Variable: MID Initiation		
	Model (4.33)	Model (4.34)
REM Exports % GDP (log)	−0.013	−0.048.
	[0.021]	[0.024]
GDP/Cap (log)	−0.042*	−0.067
	[0.019]	[0.058]
Total Population Size (log)	0.012	0.316
	[0.021]	[0.313]
Polity V	−0.006.	0.000
	[0.003]	[0.007]
Trade Openness (log)	−0.005	0.021
	[0.032]	[0.070]
Oil Exports USD (log)	0.003	0.003
	[0.002]	[0.003]
Contiguous Alliances	−0.009	0.000
	[0.007]	[0.019]
Contiguous UN Ideal Point Difference	0.073	−0.031
	[0.045]	[0.073]
Sub-Saharan African Diplomats	0.004	0.034*
	[0.003]	[0.013]
Civil War Onset	0.090*	0.051
	[0.036]	[0.052]
Time Since Last MID	−0.521	0.861
	[0.447]	[0.609]
Time Since Last MID^2	0.493	−0.483
	[0.382]	[0.379]
Time Since Last MID ^{3}	−0.412	0.027
	[0.346]	[0.402]
Fixed Effects	No	Yes
Sample size	703	703
Log-likelihood	−176	−125

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix C

The Role of Regime Type in REM-Backed Aggression

Table C.1: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 5-Average (log). Includes additional variables, Total Diplomats and Total Alliances.

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (5.1)	Model (5.2)	Model (5.3)	Model (5.4)
REM Exports % GDP (log)	−0.437**	−0.367*	−0.418**	−0.358**
	[0.133]	[0.141]	[0.134]	[0.149]
Personalist Autocracy	−0.247	−0.411	−0.215	−0.281
	[0.194]	[0.270]	[0.194]	[0.272]
Non-Personalist Autocracy	−0.559**	−0.741*	−0.525**	−0.780*
	[0.179]	[0.353]	[0.181]	[0.372]
REM Exports % GDP (log) X Personalist Autocracy	0.170	0.114	0.151	0.059
	[0.151]	[0.170]	[0.152]	[0.187]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.060	0.126	0.019	0.098
	[0.169]	[0.183]	[0.171]	[0.186]
GDP/Cap (log)	0.411***	0.337	0.384***	0.397.
	[0.064]	[0.286]	[0.066]	[0.225]
Total Population Size (log)	0.365**	2.925**	0.510***	3.301*
	[0.139]	[0.972]	[0.131]	[1.248]
Polity V Score	−0.023	−0.013	−0.029.	−0.018
	[0.016]	[0.037]	[0.016]	[0.041]
Trade Openness (log)	0.110	0.130	0.075	0.129
	[0.129]	[0.203]	[0.131]	[0.191]
Oil Exports USD (log)	0.006	0.007	0.008	0.008
	[0.006]	[0.006]	[0.006]	[0.007]
Contiguous Alliances	0.083*	0.098.	0.043	0.146
	[0.032]	[0.053]	[0.046]	[0.123]
Total Alliances			0.004	−0.025
			[0.012]	[0.037]
Contiguous UN Ideal Point Difference	−0.057	−0.193	−0.080	−0.251
	[0.145]	[0.344]	[0.147]	[0.347]
Sub-Saharan African Diplomats	−0.041	−0.040	0.039*	0.055
	[0.028]	[0.067]	[0.017]	[0.056]
Total Diplomats	0.037***	0.047.		
	[0.010]	[0.024]		
Civil War	0.080	0.115	0.092	0.105
	[0.096]	[0.120]	[0.097]	[0.105]
Fixed Effects	No	Yes	No	Yes
Sample size	714	714	714	714
Log-likelihood	−879	−783	−886	−788

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.2: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 5-Average (log). Includes tests in which Sub-Saharan Diplomats and Contiguous Alliances are replaced with Total Diplomats and Total Alliances.

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (5.5)	Model (5.6)	Model (5.7)	Model (5.8)
REM Exports % GDP (log)	−0.430**	−0.354*	−0.414**	−0.353*
	[0.133]	[0.151]	[0.134]	[0.144]
Personalist Autocracy	−0.228	−0.395	−0.199	−0.295
	[0.193]	[0.269]	[0.193]	[0.257]
Non-Personalist Autocracy	−0.559***	−0.744*	−0.505***	−0.736.
	[0.179]	[0.357]	[0.180]	[0.387]
REM Exports % GDP (log) X Personalist Autocracy	0.161	0.102	0.158	0.080
	[0.151]	[0.179]	[0.152]	[0.170]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.049	0.122	0.025	0.095
	[0.169]	[0.183]	[0.171]	[0.184]
GDP/Cap (log)	0.392***	0.326	0.384***	0.345
	[0.063]	[0.280]	[0.066]	[0.263]
Total Population Size (log)	0.341*	3.013**	0.536***	3.482**
	[0.137]	[1.021]	[0.125]	[1.239]
Polity V Sore	−0.024	−0.013	−0.028.	−0.021
	[0.016]	[0.039]	[0.016]	[0.041]
Trade Openness (log)	0.082	0.116	0.097	0.175
	[0.128]	[0.204]	[0.128]	[0.209]
Oil Exports USD (log)	0.006	0.008	0.008	0.008
	[0.006]	[0.007]	[0.006]	[0.006]
Contiguous Alliances	0.081*	0.101.		
	[0.032]	[0.054]		
Total Alliances			0.012	0.004
			[0.008]	[0.019]
Contiguous UN Ideal Point Difference	−0.071	−0.217	−0.075	−0.230
	[0.146]	[0.342]	[0.147]	[0.356]
Sub-Saharan African Diplomats			0.037*	0.039
			[0.017]	[0.055]
Total Diplomats	0.025***	0.036*		
	[0.006]	[0.017]		
Civil War	0.083	0.121	0.095	0.124
	[0.096]	[0.118]	[0.097]	[0.108]
Fixed Effects	No	Yes	No	Yes
Sample size	714	714	714	714
Log-likelihood	−880	−783	−886	−792

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.3: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 5-Average (log). Includes tests in which Trade Openness (log) and Oil Exports USD (log) are replaced with WDI Trade Openness (log) and Oil Exports USD (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)				
	Model (5.9)	Model (5.10)	Model (5.11)	Model (5.12)
REM Exports % GDP (log)	−0.390**	−0.342*	−0.576***	−0.517**
	[0.135]	[0.141]	[0.148]	[0.186]
Personalist Autocracy	−0.235	−0.357	−0.221	−0.362
	[0.194]	[0.263]	[0.190]	[0.269]
Non-Personalist Autocracy	−0.503**	−0.779*	−0.581***	−0.745.
	[0.181]	[0.382]	[0.176]	[0.380]
REM Exports % GDP (log) X Personalist Autocracy	0.163	0.068	0.226	0.146
	[0.152]	[0.181]	[0.156]	[0.172]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.028	0.067	0.129	0.210
	[0.172]	[0.195]	[0.175]	[0.185]
GDP/Cap (log)	0.360***	0.323	0.481***	0.521
	[0.065]	[0.295]	[0.073]	[0.274]
Total Population Size (log)	0.499***	3.122*	0.567***	3.280.
	[0.128]	[1.247]	[0.134]	[1.709]
Polity V Sore	−0.023	−0.021	−0.038*	−0.042
	[0.016]	[0.041]	[0.016]	[0.034]
Trade Openness (log)	0.001	0.095		
	[0.133]	[0.190]		
WDI Trade Openness (log)			0.261.	0.246
			[0.156]	[0.229]
Oil Exports USD (log)			0.006	0.007
			[0.006]	[0.005]
Oil Exports % GDP (log)	0.195**	0.169		
	[0.071]	[0.132]		
Contiguous Alliances	0.055.	0.080	0.051	0.072
	[0.032]	[0.058]	[0.031]	[0.055]
Contiguous UN Ideal Point Difference	−0.065	−0.219	−0.289.	−0.371
	[0.148]	[0.351]	[0.152]	[0.356]
Sub-Saharan African Diplomats	0.038*	0.051	0.038*	0.078
	[0.017]	[0.055]	[0.018]	[0.046]
Civil War	0.106	0.142	0.056	0.105
	[0.097]	[0.111]	[0.098]	[0.113]
Fixed Effects	No	Yes	No	Yes
Sample size	705	705	645	645
Log-likelihood	−876	−782	−781	−693

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table C.4: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 3-Average (log).

Dependent Variable: Arms Transfers - 3 Year Average (log)		
	Model (5.13)	Model (5.14)
REM Exports % GDP (log)	−0.268.	−0.234
	[0.163]	[0.152]
Personalist Autocracy	0.047	0.025
	[0.237]	[0.299]
Non-Personalist Autocracy	−0.460*	−0.668*
	[0.220]	[0.319]
REM Exports % GDP (log) X Personalist Autocracy	0.079	−0.002
	[0.186]	[0.181]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.054	−0.029
	[0.207]	[0.231]
GDP/Cap (log)	0.482***	0.463
	[0.080]	[0.350]
Total Population Size (log)	0.470*	1.768
	[0.183]	[1.347]
Polity V Sore	−0.007	0.010
	[0.020]	[0.044]
Trade Openness (log)	−0.050	−0.052
	[0.160]	[0.235]
Oil Exports USD (log)	−0.005	−0.002
	[0.007]	[0.010]
Contiguous Alliances	−0.010	0.027
	[0.039]	[0.054]
Contiguous UN Ideal Point Difference	0.113	−0.031
	[0.178]	[0.396]
Sub-Saharan African Diplomats	0.044.	0.061
	[0.023]	[0.071]
Civil War	0.170	0.178
	[0.116]	[0.178]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−1025	−931

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.5: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports USD (log) and Regime Type on Arms Transfers - 5-Average (log).

Dependent Variable: Arms Transfers - 5-Year Average (log)		
	Model (5.15)	Model (5.16)
REM Exports USD (log)	0.010	0.020
	[0.011]	[0.015]
Personalist Autocracy	−0.060	−0.176
	[0.227]	[0.259]
Non-Personalist Autocracy	−0.311	−0.579
	[0.214]	[0.377]
REM Exports USD (log) X Personalist Autocracy	−0.013	−0.020
	[0.013]	[0.019]
REM Exports USD (log) X Non-Personalist Autocracy	−0.028*	−0.023
	[0.013]	[0.024]
GDP/Cap (log)	0.370***	0.344
	[0.068]	[0.280]
Total Population Size (log)	0.504***	3.389**
	[0.134]	[1.206]
Polity V Sore	−0.034*	−0.023
	[0.016]	[0.039]
Trade Openness (log)	−0.020	0.053
	[0.129]	[0.197]
Oil Exports USD (log)	0.009	0.011.
	[0.006]	[0.006]
Contiguous Alliances	0.052	0.082
	[0.032]	[0.064]
Contiguous UN Ideal Point Difference	−0.154	−0.272
	[0.151]	[0.329]
Sub-Saharan African Diplomats	0.040*	0.062
	[0.017]	[0.053]
Civil War	0.092	0.143
	[0.097]	[0.124]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−891	−792

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.6: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports GDP (log) and Regime Type on Arms Transfers - Binary.

Dependent Variable: Arms Transfers - Binary.		
	Robust Model (5.17)	Robust Model (5.18)
REM Exports % GDP (logged)	0.018	−0.011
	[0.066]	[0.052]
Personalist Autocracy	0.030	0.042
	[0.081]	[0.077]
Non-Personalist Autocracy	−0.077	−0.277
	[0.078]	[0.142]
REM Exports % GDP (logged) X Personalist Autocracy	−0.003	−0.078
	[0.074]	[0.055]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.008	0.066
	[0.088]	[0.111]
GDP/Cap (logged)	0.157***	0.095
	[0.028]	[0.082]
Total Population Size (logged)	0.151***	1.246**
	[0.036]	[0.409]
Polity V Sore	−0.009	−0.019
	[0.007]	[0.013]
Trade Openness (logged)	0.004	0.044
	[0.055]	[0.079]
Oil Exports USD (logged)	−0.002	−0.005
	[0.003]	[0.003]
Contiguous Alliances	−0.008	−0.007
	[0.013]	[0.022]
Contiguous UN Ideal Point Difference	0.015	−0.083
	[0.074]	[0.110]
Sub-Saharan African Diplomats	−0.001	0.011
	[0.005]	[0.021]
Civil War Onset	0.104*	0.070
	[0.052]	[0.067]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−441	−387

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.7: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on Arms Transfers - 5-Average (log). Includes additional Binary Year variables.

Dependent Variable: Arms Transfers - 5 Year Average (logged)	
	Robust Model (5.19)
REM Exports % GDP (logged)	−0.357**
	[0.135]
Personalist Autocracy	−0.226
	[0.193]
Non-Personalist Autocracy	−0.635***
	[0.183]
REM Exports % GDP (logged) X Personalist Autocracy	0.110
	[0.152]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.054
	[0.173]
GDP/Cap (logged)	0.574***
	[0.094]
Total Population Size (logged)	0.659***
	[0.142]
Polity V Score	−0.024
	[0.016]
Trade Openness (logged)	0.169
	[0.133]
Oil Exports USD (logged)	0.007
	[0.006]
Contiguous Alliances	0.059.
	[0.032]
Contiguous UN Ideal Point Difference	−0.094
	[0.154]
Sub-Saharan African Diplomats	0.035*
	[0.017]
Civil War Onset	0.114
	[0.100]
1997	0.059
	[0.177]
1998	−0.012
	[0.177]
1999	0.061
	[0.183]
2000	−0.034
	[0.183]
2001	−0.066
	[0.185]

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Dependent Variable: Arms Transfers - 5 Year Average (logged)	
	Robust Model (5.19)
2002	−0.010
	[0.187]
2003	−0.043
	[0.185]
2004	−0.251
	[0.186]
2005	−0.339
	[0.191]
2006	−0.212
	[0.198]
2007	−0.282
	[0.203]
2008	−0.251
	[0.209]
2009	−0.098
	[0.208]
2010	−0.238
	[0.212]
2011	−0.380
	[0.221]
2012	−0.356
	[0.221]
2013	−0.516*
	[0.224]
2014	−0.582**
	[0.226]
Fixed Effects	No
Sample size	714
Log-likelihood	−877

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.8: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes tests with the additional variables, Total Diplomats and Total Alliances.

Dependent Variable: MID Initiation				
	Model (5.20)	Model (5.21)	Model (5.22)	Model (5.23)
REM Exports % GDP (log)	−0.015	−0.042	−0.020	−0.036
	[0.044]	[0.037]	[0.044]	[0.036]
Personalist Autocracy	0.003	−0.038	0.005	−0.057
	[0.052]	[0.068]	[0.052]	[0.065]
Non-Personalist Autocracy	0.009	−0.062	0.017	−0.059
	[0.049]	[0.154]	[0.050]	[0.152]
REM Exports % GDP (log) X Personalist Autocracy	0.009	0.013	0.007	0.010
	[0.049]	[0.039]	[0.049]	[0.035]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.038	0.015	−0.034	0.010
	[0.059]	[0.048]	[0.060]	[0.048]
GDP/Cap (log)	−0.048*	−0.056	−0.055**	−0.078
	[0.019]	[0.061]	[0.019]	[0.067]
Total Population Size (log)	0.018	0.055	0.014	0.052
	[0.024]	[0.246]	[0.023]	[0.231]
Polity V Sore	−0.007	−0.004	−0.006	−0.005
	[0.004]	[0.006]	[0.004]	[0.006]
Trade Openness (log)	−0.016	0.016	0.003	0.019
	[0.036]	[0.057]	[0.038]	[0.057]
Oil Exports USD (log)	0.003.	0.003	0.003	0.003
	[0.002]	[0.003]	[0.002]	[0.003]
Contiguous Alliances	−0.012	0.000	−0.017.	−0.030
	[0.009]	[0.020]	[0.010]	[0.024]
Total Alliances			0.003	0.010
			[0.003]	[0.007]
Contiguous UN Ideal Point Difference	0.065	−0.021	0.065	−0.018
	[0.049]	[0.076]	[0.050]	[0.070]
Sub-Saharan African Diplomats	0.007	0.026.	0.006.	0.030*
	[0.005]	[0.013]	[0.003]	[0.012]
Total Diplomats	−0.001	0.003		
	[0.002]	[0.004]		
Civil War	0.090*	0.041	0.085*	0.052
	[0.037]	[0.051]	[0.036]	[0.051]
Fixed Effects	No	Yes	No	Yes
Sample size	714	714	714	714
Log-likelihood	−170	−121	−170	−119

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.9: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes tests in which Sub-Saharan Diplomats and Contiguous Alliances are replaced with Total Diplomats and Total Alliances.

Dependent Variable: MID Initiation				
	Model (5.24)	Model (5.25)	Model (5.26)	Model (5.27)
REM Exports % GDP (log)	−0.015	−0.050	−0.019	−0.037
	[0.044]	[0.036]	[0.044]	[0.036]
Personalist Autocracy	0.005	−0.048	−0.009	−0.054
	[0.052]	[0.065]	[0.051]	[0.064]
Non-Personalist Autocracy	0.018	−0.060	0.021	−0.068
	[0.049]	[0.158]	[0.049]	[0.148]
REM Exports % GDP (log) X Personalist Autocracy	0.007	0.021	0.005	0.006
	[0.049]	[0.039]	[0.049]	[0.032]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.038	0.017	−0.041	0.010
	[0.059]	[0.048]	[0.060]	[0.046]
GDP/Cap (log)	−0.049**	−0.049	−0.051**	−0.068
	[0.019]	[0.061]	[0.019]	[0.066]
Total Population Size (log)	0.017	−0.001	0.005	0.014
	[0.024]	[0.227]	[0.022]	[0.229]
Polity V Sore	−0.006	−0.003	−0.007	−0.004
	[0.004]	[0.006]	[0.004]	[0.006]
Trade Openness (log)	−0.004	0.024	−0.011	0.010
	[0.035]	[0.056]	[0.037]	[0.054]
Oil Exports USD (log)	0.003.	0.002	0.003	0.003
	[0.002]	[0.003]	[0.002]	[0.003]
Contiguous Alliances	−0.009	−0.002		
	[0.008]	[0.020]		
Total Alliances			0.001	0.004
			[0.002]	[0.006]
Contiguous UN Ideal Point Difference	0.066	−0.006	0.070	−0.022
	[0.049]	[0.073]	[0.050]	[0.069]
Sub-Saharan African Diplomats			0.006.	0.034*
			[0.003]	[0.013]
Total Diplomats	0.001	0.010*		
	[0.001]	[0.005]		
Civil War	0.094*	0.037	0.092*	0.049
	[0.037]	[0.050]	[0.037]	[0.050]
Fixed Effects	No	Yes	No	Yes
Sample size	714	714	714	714
Log-likelihood	−171	−122	−171	−120

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.10: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes tests in which Trade Openness (log) and Oil Exports USD (log) are replaced with WDI Trade Openness (log) and Oil Exports % GDP (log).

Dependent Variable: MID Initiation				
	Model (5.28)	Model (5.29)	Model (5.30)	Model (5.31)
REM Exports % GDP (log)	−0.012	−0.039	−0.021	−0.062
	[0.045]	[0.034]	[0.050]	[0.045]
Personalist Autocracy	0.004	−0.040	0.002	−0.035
	[0.053]	[0.068]	[0.053]	[0.068]
Non-Personalist Autocracy	0.011	−0.068	−0.004	−0.068
	[0.050]	[0.155]	[0.051]	[0.157]
REM Exports % GDP (log) X Personalist Autocracy	0.011	0.012	0.016	0.025
	[0.050]	[0.036]	[0.054]	[0.043]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.044	0.005	−0.025	0.042
	[0.061]	[0.047]	[0.063]	[0.052]
GDP/Cap (log)	−0.047*	−0.060	−0.045*	−0.039
	[0.019]	[0.057]	[0.021]	[0.096]
Total Population Size (log)	0.014	0.025	0.027	0.196
	[0.023]	[0.248]	[0.024]	[0.304]
Polity V Sore	−0.006	−0.004	−0.004	−0.004
	[0.004]	[0.006]	[0.004]	[0.006]
Trade Openness (log)	−0.016	0.002		
	[0.037]	[0.057]		
WDI Trade Openness (log)			−0.007	0.014
			[0.044]	[0.076]
Oil Exports USD (log)			0.004*	0.003
			[0.002]	[0.003]
Oil Exports % GDP (log)	0.021	0.058.		
	[0.016]	[0.034]		
Contiguous Alliances	−0.009	0.000	−0.015.	0.000
	[0.008]	[0.020]	[0.009]	[0.020]
Contiguous UN Ideal Point Difference	0.068	−0.017	0.070	−0.019
	[0.050]	[0.071]	[0.051]	[0.086]
Sub-Saharan African Diplomats	0.006.	0.032*	0.001	0.037*
	[0.003]	[0.013]	[0.004]	[0.014]
Civil War	0.090*	0.045	0.080*	0.037
	[0.037]	[0.049]	[0.038]	[0.056]
Fixed Effects	No	Yes	No	Yes
Sample size	705	705	645	645
Log-likelihood	−173	−123	−155	−107

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.11: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports USD (log) and Regime Type on MID Initiation.

Dependent Variable: MID Initiation		
	Model (5.32)	Model (5.33)
REM Exports USD (log)	−0.005	−0.005
	[0.003]	[0.004]
Personalist Autocracy	0.002	−0.008
	[0.063]	[0.083]
Non-Personalist Autocracy	−0.056	−0.153
	[0.068]	[0.129]
REM Exports USD (log) X Personalist Autocracy	0.001	−0.001
	[0.004]	[0.005]
REM Exports USD (log) X Non-Personalist Autocracy	0.005	0.009
	[0.004]	[0.006]
GDP/Cap (log)	−0.047*	−0.057
	[0.019]	[0.058]
Total Population Size (log)	0.025	0.211
	[0.023]	[0.252]
Polity V Sore	−0.007	−0.004
	[0.004]	[0.006]
Trade Openness (log)	−0.009	0.014
	[0.036]	[0.056]
Oil Exports USD (log)	0.003.	0.003
	[0.002]	[0.003]
Contiguous Alliances	−0.011	−0.003
	[0.008]	[0.019]
Contiguous UN Ideal Point Difference	0.059	−0.003
	[0.049]	[0.072]
Sub-Saharan African Diplomats	0.006.	0.031*
	[0.003]	[0.013]
Civil War	0.088*	0.042
	[0.037]	[0.052]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−170	−118

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.12: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes tests in which the Regime Type variables are Military Autocracy, Non-Military Autocracy and Democracy.

Dependent Variable: MID Initiation		
	Model (5.34)	Model (5.35)
REM Exports % GDP (log)	−0.023	−0.056
	[0.045]	[0.035]
Military Autocracy	0.152	0.242
	[0.105]	[0.211]
Non-Military Autocracy	−0.016	−0.144.
	[0.047]	[0.080]
REM Exports % GDP (log) X Military Autocracy	−0.065	−0.104
	[0.099]	[0.089]
REM Exports % GDP (log) X Non-Military Autocracy	0.004	0.038
	[0.049]	[0.032]
GDP/Cap (log)	−0.049**	−0.057
	[0.019]	[0.048]
Total Population Size (log)	0.017	0.146
	[0.023]	[0.227]
Polity V Sore	−0.008.	−0.004
	[0.004]	[0.006]
Trade Openness (log)	−0.007	0.009
	[0.036]	[0.057]
Oil Exports USD (log)	0.003.	0.003
	[0.002]	[0.003]
Contiguous Alliances	−0.010	−0.001
	[0.008]	[0.020]
Contiguous UN Ideal Point Difference	0.061	−0.028
	[0.050]	[0.074]
Sub-Saharan African Diplomats	0.005.	0.030*
	[0.003]	[0.012]
Civil War	0.082*	0.038
	[0.037]	[0.048]
Fixed Effects	No	Yes
Sample size	714	714
Log-likelihood	−170	−115

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.13: Robustness check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes additional Binary Year variables.

Dependent Variable: MID Initiation	
	Model (5.36)
REM Exports % GDP (log)	−0.020
	[0.044]
Personalist Autocracy	0.002
	[0.052]
Non-Personalist Autocracy	0.010
	[0.049]
REM Exports % GDP (log) X Personalist Autocracy	0.013
	[0.049]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.034
	[0.059]
GDP/Cap (log)	−0.052*
	[0.022]
Total Population Size (log)	0.012
	[0.023]
Polity V	−0.007.
	[0.004]
Trade Openness (log)	−0.014
	[0.035]
Oil Exports USD (log)	0.003
	[0.002]
Contiguous Alliances	−0.010
	[0.008]
Contiguous UN Ideal Point Difference	0.063
	[0.051]
Sub-Saharan African Diplomats	0.006.
	[0.003]
Civil War Onset	0.094*
	[0.037]
1997	0.181**
	[0.069]
1998	0.120.
	[0.069]
1999	0.053
	[0.071]
2000	0.008
	[0.070]
2001	0.039
	[0.071]

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Dependent Variable: MID Initiation	
	Model (5.36)
2002	0.147*
	[0.071]
2003	0.028
	[0.070]
2004	0.131.
	[0.070]
2005	0.151*
	[0.070]
2006	0.096
	[0.071]
2007	0.106
	[0.072]
2008	0.064
	[0.073]
2009	0.083
	[0.072]
2010	0.057
	[0.073]
2011	0.130.
	[0.074]
2012	0.042
	[0.075]
2013	0.151*
	[0.075]
2014	0.072
	[0.075]
Fixed Effects	No
Sample size	714
Log-likelihood	−160

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C.14: Robustness Check: Binomial logistic regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on MID Initiation. Includes additional cubic polynomial variables for Time Since Last MID.

Dependent Variable: MID Initiation		
	Model (5.37)	Model (5.38)
REM Exports % GDP (log)	0.006	−0.057
	[0.044]	[0.040]
Personalist Autocracy	−0.005	−0.028
	[0.049]	[0.073]
Non-Personalist Autocracy	0.020	−0.058
	[0.046]	[0.161]
REM Exports % GDP (log) X Personalist Autocracy	−0.003	0.016
	[0.048]	[0.040]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.073	0.023
	[0.061]	[0.053]
GDP/Cap (log)	−0.035.	−0.065
	[0.019]	[0.066]
Total Population Size (log)	0.006	0.300
	[0.021]	[0.324]
Polity V	−0.005	−0.002
	[0.004]	[0.007]
Trade Openness (log)	−0.015	0.022
	[0.033]	[0.073]
Oil Exports USD (log)	0.002	0.003
	[0.002]	[0.003]
Contiguous Alliances	−0.009.	0.000
	[0.008]	[0.021]
Contiguous UN Ideal Point Difference	0.082	−0.027
	[0.048]	[0.078]
Sub-Saharan African Diplomats	0.004	0.033*
	[0.003]	[0.014]
Civil War Onset	0.097**	0.051
	[0.036]	[0.053]
Time Since Last MID	−0.543	0.859
	[0.439]	[0.623]
Time Since Last MID^2	0.679.	−0.472
	[0.404]	[0.397]
Time Since Last MID^3	−0.483	0.033
	[0.350]	[0.421]
Fixed Effects	No	Yes
Sample size	693	693
Log-likelihood	−173	−125

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix D

Renewable Essential Materials and the Transfer of Small Arms

Table D.1: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports USD (log) and Regime Type on SALW Transfers - 3-Year Average (log).

Dependent Variable: SALW Transfers - 3-Year Average (log)		
	Model (6.1)	Model (6.2)
REM Exports USD (log)	−0.025	−0.046
	[0.031]	[0.066]
Personalist Autocracy	0.949	0.529
	[0.629]	[1.781]
Non-Personalist Autocracy	−0.417	−0.843
	[0.591]	[0.964]
REM Exports USD (log) X Personalist Autocracy	0.008	0.013
	[0.038]	[0.084]
REM Exports USD (log) X Non-Personalist Autocracy	−0.002	0.013
	[0.038]	[0.076]
GDP/Cap (log)	0.891***	1.360
	[0.188]	[0.839]
Total Population Size (log)	0.816*	−2.079
	[0.334]	[5.828]
Polity V Sore	0.057	−0.014
	[0.046]	[0.097]
Trade Openness (log)	−0.609.	−0.548
	[0.365]	[0.769]
Oil Exports USD (log)	0.052**	0.042
	[0.017]	[0.028]
Contiguous Alliances	−0.086	−0.168
	[0.087]	[0.194]
Contiguous UN Ideal Point Difference	−0.623	−0.414
	[0.430]	[0.918]
Sub-Saharan African Diplomats	0.030	−0.176
	[0.047]	[0.125]
Civil War	−0.483.	−0.592
	[0.283]	[0.383]
Fixed Effects	No	Yes
Sample size	676	676
Log-likelihood	−1540	−1460

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D.2: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers.

Dependent Variable: SALW Transfers		
	Model (6.3)	Model (6.4)
REM Exports % GDP (log)	−0.252	−0.658
	[0.359]	[0.414]
Personalist Autocracy	0.222	−0.089
	[0.417]	[0.870]
Non-Personalist Autocracy	−0.244	−0.092
	[0.386]	[0.455]
REM Exports % GDP (log) X Personalist Autocracy	0.192	0.381
	[0.380]	[0.343]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.029	0.142
	[0.435]	[0.554]
GDP/Cap (log)	0.718***	0.449
	[0.150]	[0.431]
Total Population Size (log)	0.551*	1.891
	[0.247]	[3.084]
Polity V	0.027	−0.015
	[0.035]	[0.048]
Trade Openness (log)	0.176	0.233
	[0.287]	[0.458]
Oil Exports USD (log)	0.040**	0.037*
	[0.013]	[0.017]
Contiguous Alliances	−0.004	−0.103
	[0.067]	[0.114]
Contiguous UN Ideal Point Difference	−0.795*	−0.898
	[0.337]	[0.550]
Sub-Saharan African Diplomats	0.024	−0.056
	[0.033]	[0.095]
Civil War	−0.152	−0.157
	[0.216]	[0.336]
Fixed Effects	No	Yes
Sample size	611	611
Log-likelihood	−1207	−1125

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D.3: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Includes tests with the added variables, Total Diplomats and Total Alliances.

Dependent Variable: SALW Transfers - 3-Year Average (log)				
	Model (6.5)	Model (6.6)	Model (6.7)	Model (6.8)
REM Exports % GDP (log)	−0.369	−0.868	−0.315	−0.875
	[0.455]	[0.773]	[0.457]	[0.773]
Personalist Autocracy	1.020.	0.666	1.124*	0.883
	[0.539]	[1.360]	[0.537]	[1.323]
Non-Personalist Autocracy	−0.436	−0.577	−0.495	−0.623
	[0.492]	[0.624]	[0.493]	[0.609]
REM Exports % GDP (log) X Personalist Autocracy	0.019	−0.018	0.017	−0.088
	[0.466]	[0.700]	[0.466]	[0.701]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.069	0.101	−0.037	0.036
	[0.558]	[0.866]	[0.557]	[0.883]
GDP/Cap (log)	0.857***	1.350	0.938***	1.460
	[0.181]	[0.826]	[0.185]	[0.896]
Total Population Size (log)	0.525	−3.211	0.743*	−2.684
	[0.341]	[5.611]	[0.324]	[5.665]
Polity V Sore	0.065	0.010	0.057	0.008
	[0.046]	[0.099]	[0.045]	[0.096]
Trade Openness (log)	−0.508	−0.417	−0.733*	−0.427
	[0.370]	[0.796]	[0.374]	[0.806]
Oil Exports USD (log)	0.048**	0.038	0.052**	0.039
	[0.017]	[0.029]	[0.017]	[0.030]
Contiguous Alliances	−0.030	−0.122	0.083	−0.021
	[0.090]	[0.194]	[0.116]	[0.231]
Total Alliances			−0.061*	−0.048
			[0.030]	[0.104]
Contiguous UN Ideal Point Difference	−0.523	−0.266	−0.581	−0.354
	[0.423]	[1.021]	[0.422]	[0.986]
Sub-Saharan African Diplomats	−0.086	−0.314*	0.022	−0.176
	[0.075]	[0.120]	[0.047]	[0.131]
Total Diplomats	0.053*	0.066.		
	[0.027]	[0.038]		
Civil War	−0.472.	−0.606.	−0.511.	−0.632.
	[0.282]	[0.357]	[0.282]	[0.362]
Fixed Effects	No	Yes	No	Yes
Sample size	676	676	676	676
Log-likelihood	−1538	−1457	−1538	−1458

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table D.4: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Includes tests with the added variable, MID Onset.

Dependent Variable: SALW Transfers - 3-Year Average (log)		
	Model (6.9)	Model (6.10)
REM Exports % GDP (log)	−0.327	−0.839
	[0.458]	[0.773]
Personalist Autocracy	1.032.	0.781
	[0.539]	[1.343]
Non-Personalist Autocracy	−0.404	−0.597
	[0.494]	[0.604]
REM Exports % GDP (log) X Personalist Autocracy	−0.012	−0.109
	[0.468]	[0.692]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.014	0.021
	[0.559]	[0.888]
GDP/Cap (log)	0.857***	1.367
	[0.180]	[0.817]
Total Population Size (log)	0.720*	−2.870
	[0.329]	[5.686]
Polity V Sore	0.061	0.003
	[0.046]	[0.098]
Trade Openness (log)	−0.597	−0.414
	[0.369]	[0.793]
Oil Exports USD (log)	0.051**	0.040
	[0.017]	[0.030]
Contiguous Alliances	−0.071	−0.147
	[0.087]	[0.195]
Contiguous UN Ideal Point Difference	−0.547	−0.295
	[0.424]	[1.022]
Sub-Saharan African Diplomats	0.028	−0.187
	[0.047]	[0.133]
Civil War	−0.493.	−0.601
	[0.283]	[0.358]
MID Onset	0.198	0.188
	[0.260]	[0.192]
Fixed Effects	No	Yes
Sample size	676	676
Log-likelihood	−1539	−1458

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D.5: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Includes tests in which Sub-Saharan Diplomats and Contiguous Alliances are replaced with Total Diplomats and Total Alliances.

Dependent Variable: SALW Transfers - 3-Year Average (log)				
	Model (6.11)	Model (6.12)	Model (6.13)	Model (6.14)
REM Exports % GDP (log)	−0.353	−0.816	−0.318	−0.876
	[0.454]	[0.747]	[0.458]	[0.773]
Personalist Autocracy	1.056	0.792	1.149	0.884
	[0.536]	[1.356]	[0.538]	[1.326]
Non-Personalist Autocracy	−0.459	−0.604	−0.481	−0.630
	[0.490]	[0.598]	[0.493]	[0.617]
REM Exports % GDP (log) X Personalist Autocracy	0.013	−0.087	0.024	−0.091
	[0.466]	[0.686]	[0.467]	[0.698]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.040	0.062	−0.023	0.036
	[0.558]	[0.883]	[0.557]	[0.881]
GDP/Cap (log)	0.816	1.266	0.936	1.467
	[0.176]	[0.802]	[0.185]	[0.858]
Total Population Size (log)	0.465	−2.717	0.803	−2.715
	[0.329]	[5.733]	[0.317]	[5.605]
Polity V Sore	0.066	0.013	0.058	0.009
	[0.046]	[0.102]	[0.046]	[0.097]
Trade Openness (log)	−0.577	−0.515	−0.676	−0.434
	[0.364]	[0.794]	[0.366]	[0.792]
Oil Exports USD (log)	0.049	0.043	0.052	0.039
	[0.017]	[0.031]	[0.017]	[0.030]
Contiguous Alliances	−0.032	−0.097		
	[0.089]	[0.192]		
Total Alliances			−0.047	−0.052
			[0.022]	[0.075]
Contiguous UN Ideal Point Difference	−0.542	−0.422	−0.587	−0.356
	[0.423]	[1.014]	[0.422]	[0.988]
Sub-Saharan African Diplomats			0.017	−0.174
			[0.047]	[0.129]
Total Diplomats	0.029	−0.014		
	[0.016]	[0.040]		
Civil War	−0.476	−0.571	−0.516	−0.635
	[0.282]	[0.352]	[0.282]	[0.363]
Fixed Effects	No	Yes	No	Yes
Sample size	676	676	676	676
Log-likelihood	−1358	−1461	−1538	−1458

. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D.6: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Includes tests in which Trade Openness (log) and Oil Exports USD (log) are replaced with WDI Trade Openness (log) and Oil Exports % GDP (log).

Dependent Variable: SALW Transfers - 3-Year Average (log)				
	Model (6.15)	Model (6.16)	Model (6.17)	Model (6.18)
REM Exports % GDP (log)	−0.290	−0.846	−0.748	−1.390
	[0.465]	[0.756]	[0.487]	[0.911]
Personalist Autocracy	0.958.	0.735	1.038.	0.895
	[0.546]	[1.338]	[0.532]	[1.316]
Non-Personalist Autocracy	−0.397	−0.650	−0.545	−0.290
	[0.499]	[0.609]	[0.488]	[0.508]
REM Exports % GDP (log) X Personalist Autocracy	0.033	−0.074	0.270	0.179
	[0.471]	[0.679]	[0.475]	[0.713]
REM Exports % GDP (log) X Non-Personalist Autocracy	−0.109	−0.025	0.357	0.277
	[0.569]	[0.893]	[0.566]	[0.793]
GDP/Cap (log)	0.849***	1.392	0.762***	0.437
	[0.186]	[0.833]	[0.204]	[1.048]
Total Population Size (log)	0.774*	−3.100	0.947**	0.148
	[0.336]	[5.784]	[0.342]	[8.524]
Polity V Sore	0.068	0.002	0.051	0.008
	[0.047]	[0.100]	[0.047]	[0.095]
Trade Openness (log)	−0.656.	−0.440		
	[0.382]	[0.799]		
WDI Trade Openness (log)			0.042	−0.063
			[0.445]	[1.091]
Oil Exports USD (log)			0.049**	0.047
			[0.017]	[0.030]
Oil Exports % GDP (log)	0.405*	0.396		
	[0.194]	[0.354]		
Contiguous Alliances	−0.071	−0.151	−0.130	−0.197
	[0.088]	[0.193]	[0.086]	[0.195]
Contiguous UN Ideal Point Difference	−0.444	−0.201	−0.658	−0.658
	[0.428]	[0.991]	[0.436]	[1.240]
Sub-Saharan African Diplomats	0.028	−0.182	0.017	−0.135
	[0.048]	[0.130]	[0.048]	[0.145]
Civil War	−0.426	−0.551	−0.499.	−0.446
	[0.283]	[0.371]	[0.288]	[0.368]
Fixed Effects	No	Yes	No	Yes
Sample size	667	667	609	609
Log-likelihood	−1523	−1441	−1367	−1291

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table D.7: Robustness check: Generalised linear regression analysis for the interaction effect of REM Exports % GDP (log) and Regime Type on SALW Transfers - 3-Year Average (log). Includes additional Binary Year variables.

Dependent Variable: SALW Transfers - 3 Year Average (log)	
	Model (6.19)
REM Exports % GDP (logged)	−0.207
	[0.461]
Personalist Autocracy	0.966.
	[0.534]
Non-Personalist Autocracy	−0.530
	[0.496]
REM Exports % GDP (logged) X Personalist Autocracy	−0.054
	[0.467]
REM Exports % GDP (log) X Non-Personalist Autocracy	0.030
	[0.565]
GDP/Cap (logged)	1.126***
	[0.247]
Total Population Size (logged)	0.893**
	[0.339]
Polity V Score	0.069
	[0.046]
Trade Openness (logged)	−0.480
	[0.372]
Oil Exports USD (logged)	0.050**
	[0.017]
Contiguous Alliances	−0.029
	[0.089]
Contiguous UN Ideal Point Difference	−0.434
	[0.439]
Sub-Saharan African Diplomats	0.024
	[0.046]
Civil War Onset	−0.467
	[0.292]
1997	0.149
	[0.507]
1998	0.472
	[0.506]
1999	0.554
	[0.524]
2000	0.233
	[0.522]
2001	−0.010
	[0.527]

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Dependent Variable: SALW Transfers - 3 Year Average (log)	
	Model (6.19)
2002	−0.546
	[0.532]
2003	0.375
	[0.527]
2004	0.648
	[0.528]
2005	0.427
	[0.540]
2006	−0.104
	[0.557]
2007	−0.532
	[0.570]
2008	−0.315
	[0.585]
2009	−0.239
	[0.583]
2010	−0.549
	[0.594]
2011	−0.399
	[0.614]
2012	−0.328
	[0.616]
2013	−0.669
	[0.624]
Fixed Effects	No
Sample size	676
Log-likelihood	−1531

. p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001