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Civil wars are primarily fought with small and light arms, but the availability of major conventional weapons to states and rebels can alter the nature of the war being fought. This study explores the impact of major conventional weapons transfers on civil war severity and duration. By using a recipient based approach to arms transfers, I find rebel acquisition of major conventional weapons from international sources leads to conflict escalation and deadlier conflicts. State importation of major conventional weapons is associated with longer conflicts. These findings provide researchers a means to account for rebel capabilities in civil war research and policy makers insight to limit the destructiveness of civil wars.

KEYWORDS *arms transfers, battle deaths, civil war*

Popular iconography has made the image of a rebel soldier the picture of a young man brandishing an AK-47. Byman et al. (2001) describe small and light arms, like the AK-47, as the defining technology of insurgents. Though most civil wars are fought with these small and light weapons, rebel groups and states acquire major conventional weapons to use in intrastate conflicts. Table 1 shows the types of major conventional weapons acquired by rebel groups involved in this study. Of the 114 civil wars used in this study, states are able to receive almost any type of weapons system during conflicts. Rebel groups, however, are limited in the types of systems available to them. Rebel groups are more likely to get missile systems, usually shoulder-launched systems, than other forms of major conventional weapons because

Replication data can be found at http://dvn.iq.harvard.edu/dvn/dv/internationalinteractions.

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TABLE 1 Major Conventional Weapons Transferred to Rebel Groups

Weapon Type	Number of Groups Receiving Weapon Type
Armor/Artillery Pieces	8
Missiles (Anti-air and anti-armor)	16
Aircraft (Helicopters, Transport Planes, Combat Aircraft)	6

of their portability. Several groups receive heavy armor and artillery pieces like tanks and multiple rocket launchers. Aircraft are the least commonly available form of weapons system to rebels. Understanding how major conventional weapons can shape the intensity and duration of civil wars is an important task for conflict scholars and policymakers alike. Access to major conventional weapons has been linked to an increased likelihood of the use of force (Petrovsky 1995:xvii), and the international community is increasingly attempting to regulate the trade of conventional weapons to reduce the death toll associated with conventional weapons proliferation.

Previous research has focused on the relationship between arms transfers and interstate conflict (for example, Brzoska and Pearson 1994; Craft 1999; Kinsella 2002). Scholars have recently begun to reexamine arms acquisition by rebel groups. This study seeks to add to our understanding of arms and civil conflict by investigating how the transfer of major conventional weapons to states and rebel groups involved in civil wars shapes conflict severity and duration. By developing a recipient based approach to weapons acquisition, this study sheds empirical light on the types of arms control policies necessary to decrease the destruction caused by conventional weapons proliferation.

Collier and Hoeffler (2004:569) describe arms as a form of "violence specific capital" that is necessary for armed rebellion to take place. Obtaining weapons is the most important task for a potential rebel group because weapons acquisition enables violence and the type of weapons shapes the nature, intensity, and duration of conflict (Marsh 2007:54). This study looks at sources of major conventional weapons for states and rebel groups in order to determine if the availability of major conventional weapons will make civil wars costlier in terms of lives lost and duration. By examining arms transfers to states and rebel groups in civil wars I find that the transfer of major conventional weapons to rebel groups is associated with deadlier conflicts, whereas the transfer of major conventional weapons to governments is associated with longer civil wars.

This study will proceed in six parts. First, I examine the role of weapons in civil conflicts. Second, I discuss the role of major conventional and the type of major conventional weapons rebel groups use. Third, I provide an overview of the different sources of insurgent weapons and explain why major conventional weapons transferred from other sources play a major role in shaping the severity and duration of conflict. Fourth, I discuss why

major conventional weapons transfers increase the severity and duration of civil wars. Fifth, I present several statistical models to measure the effect of major conventional weapons transfers on conflict intensity and duration. Finally, I discuss the implications of these findings for future research as well as policy concerns involving the transfer of conventional weapons.

ARMS AND INSURGENCY

The ability of a rebel group to arm itself is crucial for rebellion to take place. Not only does the availability of weapons provide a group the means for insurgency, it can also militarize the group toward violent solutions. Previous studies on how rebel groups obtain arms have found that the majority of weapons used in civil conflicts are obtained through theft from government stockpiles (Duquet 2009; Jackson 2010; Marsh 2002). The state's monopoly on violence in many places makes the availability of arms very limited. Thus many groups begin armed insurgencies using readily available hunting and sporting weapons and then rely on theft from government stockpiles as the rebellion spreads. As the conflict continues, rebel groups need to find better sources of weapons in order to achieve military parity with the government. Part of achieving parity with more advanced armed forces is acquiring major conventional weapons which differ from small and light arms typically associated with civil wars.

This study uses the Stockholm International Peace Research Institute's (SIPRI) definition of major conventional weapons. Major conventional weapons cover aircraft, armored vehicles, artillery, sensors, air defense systems, missiles, ships, engines, and other equipment designed for military use (SIPRI 2010). Small and light arms typically include hand-held weapons such as pistols, rifles, and machine guns and can also include recoilless rifles, and rocket propelled grenades (Graduate Institute of International Development Studies 2009:3). The SIPRI definition of major conventional weapons is preferred for two reasons. First, it captures the major distinction between the design purposes of weapon types: small and light weapons are designed to use against individuals, major conventional weapons are designed to be used against armies and the machinery of war. Second, the SIPRI definition of major conventional weapons is commonly accepted and their data on major conventional weapons transfers has become the standard data for the study of arms transfers (Durch 2000; Pearson 1994).

The nature of many insurgencies causes a reliance on small and light arms as opposed to major conventional weapons. Rebel groups will initially focus on small arms because these weapons best suit the needs of the organization to stay mobile and concealed and are more readily available. The ability to obtain arms is at times more important than winning the support of the greater population. If groups are able to obtain weapons that make their

capabilities equal to government forces, there is less of a need for public support (Young 1996). The ready supply of small and light arms to states and rebel groups has allowed many dormant ethnic and civil conflicts to erupt in violence (Klare 1996). Beyond stealing the weapons from governments, groups are also able to obtain a number of weapons through international grey and black market sources (Marsh 2002; Sislin et al. 1998). Rebel arms procurement is limited by a group's resources and the willingness of others to sell to the group (Wezeman 2002). Since major conventional weapons are more sophisticated they are difficult to manufacture and steal, making the sources of such weapons an important consideration. The next section of this paper looks at the types of major conventional weapons groups are able to acquire and the effect these weapons will have on conflicts.

MAJOR CONVENTIONAL WEAPONS AND INSURGENCY

Although the majority of rebel groups do not have access to major conventional weapons, most governments do have access and use these weapons in civil conflicts. Although some groups have been able to acquire major conventional weapons through capturing government weapons (such as the Liberation Tigers of Talim Eelam, the Sudan People's Liberation Movement, and anti-Gadaffi rebels in Libya), governments have regularly employed the use of major conventional weapons in civil conflicts including in urban combat settings (Wezeman 2002). Governments use of major conventional weapons gives them a great advantage in direct confrontations with rebel groups. The technical sophistication, along with the protection most major conventional weapons provide against small arms fire, makes it difficult for rebel groups to confront government forces. If rebel groups want to defeat the government militarily, it is necessary for them to achieve some level of parity (Marsh 2007). Conflicts that involve major conventional weapons are likely to be far more dangerous than those involving only small and light weapons because these conflicts are more likely to draw in other states and escalate into larger conflicts (Durch 2000:17).

Groups that have been able to obtain major conventional weapons have done so through a number of various channels. Examining the arms registries from SIPRI indicates that there is not a unique threshold of organizational strength in order for groups to gain weapons from international sources. Most groups are only able to receive major conventional weapons only after the fighting has begun. Once the fighting begins, groups will seek multiple paths to obtain major conventional weapons. Sources of weapons vary greatly from conflict to conflict. During the Cold War, both the United States and Soviet Union were willing to provide weapons to relatively weak opposition groups in order to destabilize a rival government. The Soviets provided heavy support for communist forces in Laos in the early 1960s in

order to help bolster an emerging communist insurgency against U.S.-backed government forces. The U.S. provided extensive support for the contras in Nicaragua, sending enough arms and ammunition available to the group to allow it to go from an unorganized resistance to a major fighting force

Groups unable to find state sponsors are able to find a number of other channels for major conventional weapons. Tamil rebels in Sri Lanka were able to acquire a number of major conventional weapons from unofficial channels. The LTTE was able to get weapons sold onto the black market by Cambodian officers. Weapons sources are shaped by the international nature of the conflict as well as the ability of rebel groups to make connections to nontraditional sources of arms transfers.[1] The growing availability of black and grey market weapons systems makes it so the only limit on the acquisition of some systems is the lack rebel financing (Wezeman 2002).

SOURCES OF REBEL WEAPONS

When considering the potential impact of major conventional weapons on civil conflict, it is important to examine not only if a fighting force has the ability to acquire the weapons, but also if that access channel encourages the integration of the weapons into the military doctrine of the force (Bourne 2007). Integration of weapons into military doctrines and structures is the final phase of weapons acquisition (Bourne 2007:21), and without proper integration the weapons can become largely useless. This section identifies the different sources of major conventional weapons and explains why in the case of rebel groups, those weapons gained from international transfer are the most likely to be integrated into the group's fighting doctrine. Small and light weapons can be easily integrated because of their simplicity and their ease of use. Major conventional weapons face higher barriers to integration because of training and maintenance requirements.

Rebels acquire weapons from four separate sources. Many insurgencies begin with weapons that are readily available such as hunting and sporting weapons. A second source of weapons comes from weapons caches left over from previous (Marsh 2007). The third source of weapons, which scholars believe is the primary weapon source for most insurgencies, is the ability of insurgents to steal weapons from the government (Marsh 2002; Duquet 2009; Jackson 2010). As insurgencies begin, victories against government forces allow rebels to increase their own capabilities by acquiring weapons from fallen government soldiers or through the capture of government stockpiles. The final source of weapons is from international suppliers including

[1]SIPRI trade registers were generated for each rebel group used in this study which show the types of systems acquired as well as the sources of those systems. The registries include cases where it is known that deliveries have begun or taken place (SIPRI 2010).

grey and black market transfers. Each source has its strengths and weaknesses, but the ability of a rebel organization to obtain international supplies of major conventional weapons from supportive governments should have a greater effect on civil war severity than other sources.

The struggle between rebel forces and the Libyan government in 2011 provides a case in point for why looted weapons cannot provide rebels with adequate military capabilities. At the beginning of the struggle rebel forces were able to acquire stockpiles of major conventional weapons from government depots and defecting government troops, but the lack of training and command structure among the rebel factions made the weapons largely useless (Li 2011). The more sophisticated the weapons, the less competent rebel forces appeared to be at using them on the battlefield (Hosenball 2011). Another problem rebels face when deploying looted weapons is that they lack the proper spare parts and mechanics to sustain the deployment of many systems (Levison and Rosenberg 2011). Despite easy access to weapons, rebel forces were not able to effectively integrate them into their fighting force. Libyan rebels were only successful with the help of NATO intervention.

Weapons obtained from international sources offer several advantages to weapons looted from government stores. Marsh (2007) identifies three potential problems associated with looted weapons. First, stolen weapons only provide a short-term source of rebel arms since many governments will make moves to better secure their weapons once the conflict begins. Second, control of the supply of weapons is key to creating a command structure within rebel organizations. If individual soldiers are able to acquire weapons on their own, rebel movements risk fractionalizing around multiple leaders as opposed to a single well organized group emerging to control the insurgency. Rebel groups are less likely to become fragmented as a result of arms supplies in states with limited quantities of weapons. Rebel groups are even less likely to experience this fragmentation by depending on international suppliers for weapons since it is difficult for individuals to obtain arms from international sources. Third, Marsh (2007) argues, in order to escalate the conflict, rebel organizations will look to international suppliers of weapons to expand weapons access and obtain specific systems that would be otherwise unavailable from domestic theft. The ability to obtain international supplies is thus an important hurdle for rebel groups to overcome in order to escalate conflicts.

Obtaining weapons from international suppliers carries several advantages for rebel organizations. Unlike looted weapons, rebels are often able to obtain training from state suppliers to better use their weapons (Stedman 1996:249). Training allows for more effective use of weapons and enables rebel groups to use a wider variety of weapons. Second, states support for rebel groups can provide a critical enabler step that allows looting to happen in the first place. Weapons looting tends to happen primarily in weak

states with relatively weak militaries, and international sources of weapons can give groups the capabilities necessary to challenge more powerful governments (Byman et al. 2001:10–11). Previous research has identified a connection between weapons transfers and civil war onset (Craft and Smaldone 2002) and how states use transfers of weapons to insurgents as a means of destabilizing the target government (Byman et al. 2001; Harbom and Wallensteen 2005:629). Although stealing from government stockpiles may be the primary source of weapons for many insurgent groups, the acquisition of arms from international sources represents a transition from low-level insurgency, to an escalated and more sustained form of rebellion (Kalyvas and Balcells 2010). Finally, by obtaining weapons from international suppliers, groups are able to request the types of weapons they are familiar with and that they need for their conflict. Stolen and looted weapons do not offer the luxury of choice. Surface-to-air missiles provide a good example of why international transfers are superior to other weapons sources.

The acquisition of surface-to-air missiles is important to rebel groups because air defenses are necessary to reduce the asymmetry between rebel and government forces (Bevan and Schroeder 2008). The example of Afghani insurgents fighting occupying Soviet forces is perhaps one of the best known cases of rebel acquisition of portable air defense systems decreasing the vulnerability of rebel forces to air attacks (Kuperman 1999). Although the acquisition of these systems alone did not defeat the Soviets, it solved an important capabilities gap between a rebel group and a major power's military. The government monopoly on violence is much more absolute in terms of air power.[2] For government forces, airpower provides a huge advantage against insurgents. Governments with effective air forces are able to limit insurgent military options, provide rapid responses to insurgent attacks, gain tactical initiative in confronting insurgents, and, if effective, create a sense of hopelessness for insurgents who cannot effectively counter government air power (Dunlap 2006; Vick et al. 2006).[3]

Surface-to-air missiles also provide an example of why transferred weapons are superior to stolen or looted domestic caches. Although many groups have been able to obtain the shoulder launched surface-to-air-missiles through theft and caches from previous conflicts, most of the

[2]Of the groups covered in the SIPRI data only six were able to acquire some form of aircraft. The aircraft tended to be basic transport aircraft and few in numbers.

[3]Portable missiles are sometimes also classified as small and light weapons, but this categorization is more focused on their size and portability rather than their technological sophistication. On the battlefield antitank and aircraft missile systems are more akin to major conventional weapons. First, these weapon systems are very sophisticated and cannot be acquired by rebel groups unless they are stolen or provided by an external supplier. Second, they are designed to be used in conventional military engagements against military vehicles as opposed to most small and light arms that are anti-personnel weapons. These weapons systems meet SIPRI's definition for major conventional weapons and are coded accordingly.

systems that groups have been able to acquire are difficult to use effectively and easily countered. This is in stark comparison to the advanced system the United States and United Kingdom provided to Afghani rebels (Schroeder 2010). The provision of these advanced systems came with specialized training that allowed Afghani rebels to effectively use the weapons against Soviet air assets. Many insurgents will not know proper handling or how to use more advanced systems without extensive training in the maintenance and firing of such systems. Thus, most of the surface-to-air systems available for looting or stored in caches are less advanced and do not pose a major threat to modern air forces (Hunter 2001). Although the weapons may be available, their reliability and their usefulness is limited.

MAJOR CONVENTIONAL WEAPONS AND CIVIL WAR SEVERITY

Lacina (2006) represents the most comprehensive explanation to date of civil war casualties. Lacina examines civil war casualties in the framework of "opportunity and impetus" (p. 280) arguing the conditions that cause the fighting to occur will impact the severity of the conflict. Of particular interest in Lacina's study is the finding that wars in the Cold War have significantly higher levels of battle deaths than those in the post–Cold War era. The explanation of the difference between the Cold War and post–Cold War era is explained by Lacina as a result of the "availability of military assistance to states and rebel groups" (p. 285). Kalyvas and Balcells (2010) support this claim arguing that the international assistance made available during the Cold War explained the prevalence of conventional civil wars as opposed to small scale insurgencies.

Previous work on the connection between arms and civil wars has found mixed results. Suzuki (2007) argues there is no significant relationship between state arms imports and intrastate conflict, but does not examine the transfer of weapons to rebel groups. Others have argued weapons availability will increase conflict deaths (Garcia 2009; Pearson, Brzosak, and Crantz 1992; Sidel 1995), but these studies make the argument without formal statistical analysis. Sislin and Pearson (2001) provide bivariate analysis of arms acquisition and conflict intensity, finding heavy weapons increase intensity by creating higher levels of collateral damage. If rebels are capable of escalating the conflict, it also creates incentives for government forces to crack down and escalate their brutality towards civilian populations (Valentino et al. 2004). This is supported by Sislin and Pearson's (2006) case study of the conflict in Sri Lanka that found that rebel arms acquisitions proceeded conflict escalations and created arms races with government forces. Finally, others have argued that proxies for rebel funds increase the duration and intensity of conflicts because these funds can translate into increased rebel arms (Regan and Aydin 2006; Walter 2006).

Others have treated arms transfers as a form of intervention in intrastate conflicts. Studies on conflict intervention have found third-party interventions are likely to prolong civil wars (Balch-Lindsay and Enterline 2000; Regan 1996, 2002). Although intervention strategies may include arms transfers, not all arms transfers are interventions. First, rebel groups are able to acquire weapons through sources not seeking to intervene in the conflict, but simply seeking profit from arms sales. Two examples of how transfers occur without state intervention are the LTTE rebels in Sri Lanka, who were able to gain most of their major conventional weapons through illicit markets in Southeast Asia, and the Revolutionary United Front (RUF). The RUF in Sierra Leone were able to illegally acquire quantities of major conventional weapons through illegal transfers of weapons originally sent from the Ukraine to Burkino Faso. In terms of transfers to states, not all weapons transferred are intended for the conflict. India has experienced multiple civil wars over the past 50 years, while at the same time facing enduring rivalries with Pakistan and China. India imported a large quantity of major conventional weapons, most of which never saw action against domestic opponents to the regime.

Separating arms transfers from other forms of intervention offers the advantage of overcoming the endogeneity problem associated with the study of civil war and intervention. In terms of conflict intensity, endogeneity is a problem because we do not know if intervention increases casualties, or if interventions are the result of high levels of casualties (Gilligan and Stedman 2003; Lacina 2006). The study of arms transfers avoids this problem because the relationship between arms and casualties only goes one way. Weapons are a necessary component of political violence (Craft and Smaldone 2002), and as a result, more weapons should lead to more deaths and not more deaths leading to more weapons (Craft 1999:21–22).

It is important to approach the proliferation of weapons to civil wars from a recipient based perspective. Previous studies have proxied the supply of weapons to rebel groups by arguing weapons made available to the state will become available to rebels through looting (for example, Craft and Smaldone 2002), but the strength of this relationship has been not been established. Focusing on who receives the weapons initially gives better insight to the relationship between arms transfers, political violence, and conflict processes. Failure to make this distinction can lead to misleading findings and bad arms control policies. States acquire weapons for a myriad of reasons and weapons acquisition can deter conflict by building up state capacity (Craft 1999). Transfers of weapons are used by states to help maintain regional military balances as well as strengthen the internal stability of the recipient country (Hammond et al. 1983). If states can deter violence by making the cost of political violence too high, then weapons transfers can have the effect of decreasing the casualties associated with civil wars. As the capabilities of a state weaken and the capabilities of the rebel group grow,

the risk of violence increases (Benson and Kugler 1998). The development of competent military and police forces is seen as a necessary condition to prevent civil conflicts based on predation from an opportunistic few (Mueller 2003, 2004). The risk of civil wars is less likely in strong states (Fearon and Laitin 2003). However, once violence breaks out, deterrence is replaced with actual fighting. Rather than providing the means to prevent conflict, weapons acquisitions become a means to increase the severity of conflict.

Rebel arms acquisition differs greatly from that of states. Rebel groups rarely maintain large stockpiles of arms for future use. Although some groups may wait until they have an adequate supply of arms in order to initiate conflict, these stockpiles tend to be small and light arms. Although some rebel groups are able to obtain major conventional weapons before a conflict begins, most are only able to receive transfers of such weapons after the fighting has started. This creates an incentive for rebels to use the weapons immediately in combat situations. Since rebel acquisition entails a use it or lose it mentality, the effect of the transfer of arms to rebels is likely to be immediate. Governments, on the other hand, do not face this pressure. Many governments will build weapons stockpiles in anticipation of possible conflicts, making the escalatory potential of arms transferred during the conflict less likely. States will also receive weapons for other defense needs, making them unlikely to use every weapon transferred in a civil conflict. Although arming either side should increase conflict severity, we should expect weapons transferred to rebels to have a greater likelihood of increasing the severity of conflict than those weapons transferred to states. Thus:

H1: *The transfer of major conventional weapons to rebel groups engaged in civil wars will increase the severity of conflict.*
H2: *The transfer of major conventional weapons to states engaged in civil wars will increase the severity of conflict.*

ARMS AND CIVIL WAR DURATION

The relationship between major conventional weapons and civil war duration is also understudied. Cunningham, Gleditsch, and Salehyan's (2009) study looks at the relative strength of rebels compared to the government, but their measure of rebel capability is very rough. In order to code rebel arm procurement, their study examined historical documents to obtain a measure of arms procurement ranging from low to high. There is no distinction in the data for types of weapons or volume. Although the Expanded Uppsala Armed Conflict Data used in the study represents a huge step forward in attempts to measure rebel capabilities, it cannot explain any sort of volume or variation across groups capable of obtaining weapons. Other

studies of civil war duration have looked primarily at the effect of structural conditions on civil war duration (for example, Balch-Lindsay and Enterline 2000; Buhaug, Gates, and Lujala 2009; Collier, Hoeffler, and Söderbom 2004; de Rouen and Sobek 2004). This study seeks to add the ability of rebels and the government to obtain major conventional weapons as an important indicator of the duration of civil wars.

The acquisition of major conventional weapons by rebel groups can shape the duration of conflict in a number of ways. First, previous research on rebel capabilities has found that strong rebels tend to produce shorter conflicts (Cunningham, Gleditsch, and Salehyan 2009). Major conventional weapons can substantially boost a rebel group's strength by allowing the group to directly engage government forces and military equipment beyond attacking only personnel. Recall the earlier examples of the importance of air defense to insurgents. The inability to strike back at government air forces makes insurgents extremely vulnerable and operating in the open nearly impossible. Without the ability to engage government forces that have superior military technology, rebel groups are forced to resort to more "irregular" forms of warfare (Louise 1995).

Groups that are reliant on low-level and guerilla style attacks will tend to be relatively weaker than the government, but that weakness does not translate shorter conflicts. Weak rebel forces will lead to governments being unwilling to negotiate settlements to disputes out of fear of encouraging other armed rebellions (Walter 2006). Second, weak rebel groups do not pose a credible threat to state survival, thus the government may be willing to allow low levels of insurrection to continue rather than pay the high cost of eradicating the insurrection altogether (Cunningham, Gleditsch, and Salehyan 2009). Finally, research on terrorist organizations shows that there is an inverse relationship between the level of influence and activities a rebel group can carry out and its relative security. Since many rebel groups that rely on guerilla style insurgencies will operate in underground settings rather than in the open, security is enhanced through secrecy making it more difficult for government forces to end the conflict (McCormick 2003). Thus weaker groups tend to have longer conflicts.

Government acquisition of major conventional weapons from abroad should strengthen government forces. States will transfer arms to governments facing internal threats in order to keep a friendly regime in power. Although we should expect this strength to shorten the length of conflict, previous research has shown this to not be the case. First, the impact of government support is not as great as support for rebels because the government starts many civil conflicts with a large resource advantage. Aiding a government also produces countervailing pressures to support rebel groups (Balch-Lindsay and Enterline 2000). The data used in this study provides some confirmation of this claim. Of 114 different conflicts, no rebel group was the recipient of a major conventional arms transfer unless

the government also received arms. Of the conflicts where governments were the recipients of major conventional weapons transfers, 25% of those conflicts saw transfers to rebel groups. Government strength also creates incentives for the government not to settle and attempt to eliminate the rebel group (Fearon 2004). The impact of major conventional weapons on conflict duration will be mixed. Thus:

H3: *The transfer of major conventional weapons to rebel groups fighting civil wars should decrease conflict duration.*
H4: *The transfer of major conventional weapons to governments fighting civil wars should increase conflict duration.*

RESEARCH DESIGN AND DATA

The primary interest in this study is the impact the transfer of major conventional weapons has on the severity and duration of civil conflicts. In order to do so, two separate statistical tests using the same data are used. First, to test the impact of major conventional weapons on conflict severity, I use ordinary least squares regression to see if the supply of major conventional weapons to government or rebel forces during a civil war increase the number of battle deaths. In order to test the effect of major conventional weapons on the duration of civil wars, I use a Cox proportional hazard model. The flexibility of the Cox model's baseline hazard rate makes it preferable to other duration models (Box-Steffensmeier and Jones 2004).[4] The Cox model also controls for censoring that results from civil wars continuing after the data collection stops.

Lacina (2006) represents the most comprehensive attempt thus far to determine conflict severity. Using the same data as Lacina, I test to see if the supply of weapons to the combatants in a civil conflict results in an increased number of conflict fatalities. The unit of analysis of the study is a civil war. The data contains 114 different civil wars based on information from the Uppsala/PRIO armed conflict data (Eriksson,Wallensteen, and Sollenberg 2003; Gleditsch et al. 2002). The dependent variable is the number of deaths in a civil war. Data on the number of deaths is obtained from Lacina and Gleditsch (2005) and the best estimate indicator of the number of deaths is used. The variable estimates the number of battle deaths in civil wars between 1946 and 2002 where at least 900 people were killed. As in Lacina's (2006) model, the variable is logged to account for its distribution. Although the total number of battle deaths may not be the best indicator of the costs of conflict, it provides a measurement of the cost of war that is easily observable by those who make the decisions to continue fighting as

[4]Models were also run using a Weibull specification with no discernable difference in the results.

well as a measure that is most closely related to the outcome of civil wars (Walter 2002).

The Cox models use the duration of the civil wars, in years, as reported by Lacina (2006). The Cox model estimates the effect of the major explanatory variables on the hazard of the civil war ending. Thus, the coefficients reported will appear to be counterintuitive at first glance. A negative coefficient indicates a decreased hazard of the civil war coming to an end which translates into longer civil war duration. This reporting is similar to other studies on civil war duration (see Balch-Lindsay and Enterline 2000). Since duration is also linked to conflict severity (Lacina 2006), the logged value of the duration variable is included in the models of civil war severity.

The primary explanatory variables I test are the total amount of major conventional weapons transferred to the government side of a civil war and the total amount of arms transferred to rebel groups in a civil war. Data on the transfer of arms to states and rebel groups is obtained from the SIPRI Arms Transfer Database.[5] SIPRI uses "trend indicator values" which do not express the financial value of the arms transferred, but instead represent the volume of arms transferred and the military implications of those transfers. The focus on the military value of the weapons is important for several reasons. First, TIV values include all transfers, including aid, gifts, and discounted sales which would be underestimated in financial values of the arms transfers. Second, TIV measures the military utility of the weapons transferred which is the primary concern of this study. The issue is not the profitability of weapons transfers, but the military capacity that is being transferred. This is the best data available for the study of arms transfers and accurately reflects the reality of international arms transfers (Durch 2000:243; Pearson 1994:24; Moore 2010:598–599). Since many weapons have a long shelf life, I created two measures of arms transfers. The first includes all transfers to states and rebel groups engaged in civil wars during the duration of the conflict. The second measure includes all transfers to states and rebel groups engaged in civil conflict during the duration of the conflict and five years prior to the onset of the conflict. Because of the distribution of these variables they are logged in the models.

CONTROL VARIABLES

The control variables used in this study are the same variables used in Lacina's (2006) study to determine the severity of conflict. Population is included as a control variable since larger countries have the potential for larger number of participants being involved in the conflict. A measure of military quality is developed by dividing the size of the military by military

[5]Information from the SIPRI Arms Transfers Database (http://armstrade.sipri.org/).

expenditure and is thought to be the best indicator of counter-insurgency capabilities of the state (Bennet and Stam 1996). Following Lacina, the variable is log transformed and lagged a single year. Data on military spending and size are taken from the Correlates of War National Military Capabilities dataset (Singer 1988; Singer et al. 1972). To measure state capacity, logged gross domestic product per capita adjusted for purchasing power and inflation is used. Data for this variable come from Fearon and Laitin (2003) and the World Bank (2003). Finally, since rough terrain has been found to increase rebel capacity, percent of the country considered to be mountainous terrain is used as a control. This data is also from Fearon and Laitin (2003) and is logged.

The models also include several dummy variables from Lacina's data. There is a dummy variable for the existence of ethnic fractionalization as well as a dummy variable for the existence of religious fractionalization. These are defined as having an ethnic or religious minority that compromises at least eight percent of the total population using Fearon and Laitin's (2003) data. Democratic regimes are also marked by a dummy variable based on a score of six or higher on the Polity IV scale (Marshall and Jaggers 2009). A dummy variable for the Cold War is included to proxy for the availability of assistance to warring parties. Since the Cold War variable is meant to proxy major differences in the types of conflicts, availability of intervention, and the availability of assistance to warring parties, it provides an easy way to capture features such as intervention without endogeneity problems. For this data set, all wars before 1989 are marked as being during the Cold War. Since previous studies have closely linked arms and intervention, several models are included using a dummy variable to control for intervention. This variable (coded from Regan (2000) and used in Lacina (2006) for similar comparisons) captures the endogenous aspects of conflicts involving interventions that may make them deadlier or longer. All variables are coded and used the same as the original Lacina (2006) study. Because of problems with coding the data for the Vietnam War, this conflict is excluded from the study since it is impossible to determine what would be a transfer of weapons to rebels and states. Lacina (2006) also runs models excluding this conflict and the civil war in China because they are extreme outliers and finds her models perform similarly without the conflicts. Since several of the conflicts occur before the SIPRI data begins, they are excluded from the models as well.[6]

Although civil war severity and duration have separate dynamics, authors used the same variables to explain both processes. The variables used by Lacina (2006) to explain civil war severity, have also been used in

[6]Diagnostics were run to ensure that the missing cases were not influencing the outcomes. Running the original replication model with only the cases used in this study produces similar results. Since several of the conflicts start within five years of 1950 they are excluded from the third model.

quantitative studies of civil war duration. Studies of duration have focused on wealth and state capacity (Fearon 2004; de Rouen and Sobek 2004), external intervention (for example, Regan 2000, 2002; Regan and Aydin 2006), ethnic divisions (Balch-Lindsay and Enterline 2000), characteristics of the state (Collier, Hoffler, and Söderbom 2004), and the balance of forces between the government and rebels (Brandt et al. 2008). A recent duration study of the duration of civil wars uses almost the same specification as this study (Montalvo and Reynal-Querol 2010), making the variables used in the severity models appropriate for the duration models. Because the processes of duration and severity have differences, we should expect the control variables to have different effects in the models.

RESULTS

The results of ordinary least squares (OLS) regressions are presented in Table 2. Model 1 shows the results of Lacina's (2006) original study as a point of comparison for the models that include arms transfers. Model 2 presents the results for arms transferred only during the years of conflict. Model 3 presents data including arms transfers five years prior to the beginning of the conflict. Due to the low number of observations (less than 100), I report significance levels at $p < .1$. The results for all three models are consistent and the addition of the arms transfers variables provides a better model fit (adjusted R-squared scores) than the original Lacina (2006) model.

The models in Table 2 provide strong evidence for H1 that the provision of major conventional weapons to rebels increases the severity of civil wars. In every model this variable is positive, significant, and close to the same value. On average, a 1% increase in the volume of major conventional weapons transferred results in a .4% increase in the number of casualties. There is wide variability in the volumes of major conventional weapons transferred to rebel groups, but these findings support that the quantity transferred is an important predictor of the potential for a civil war to escalate. As rebel groups are able to acquire more major conventional weapons, they are able to escalate the conflict leading to more battle deaths. The evidence from Models 4 and 5 indicate that this effect is significant even when other forms of intervention are controlled for.

Table 2 also provides limited evidence for H2 that providing states with major conventional weapons may increase the severity of civil wars. This effect, however, seems to be limited to when we control for the 5 years prior to civil war onset. The lack of consistency between the models including transfers 5 years prior to civil war onset and only those transfers that occur during the war, suggests that the relationship between arming states

TABLE 2 OLS Models of Civil War Severity

Variables	Lacina replication model Model 1	Imports only during fighting Model 2	Imports including 5 years before onset Model 3	Intervention model: Imports only during fighting Model 4	Intervention model: Imports including 5 years before onset Model 5
State Arms Imports (logged)		0.0715	0.573*	0.0880	0.639**
		(0.0731)	(0.336)	(0.0698)	(0.321)
Rebel Arms Imports (logged)		0.410***	0.391***	0.422***	0.399***
		(0.136)	(0.132)	(0.129)	(0.125)
Duration (logged)	0.807***	0.543***	0.531***	0.429***	0.416***
	(0.119)	(0.145)	(0.134)	(0.143)	(0.133)
Population (logged)	−0.0444	−0.0716	−0.152	0.0214	−0.0694
	(0.0807)	(0.120)	(0.125)	(0.118)	(0.122)
Military Quality (Logged)	0.101	0.186	0.267**	0.163	0.236**
	(0.120)	(0.122)	(0.120)	(0.116)	(0.115)
GDP (logged)	−0.191	−0.208	−0.420**	−0.159	−0.368**
	(0.175)	(0.173)	(0.183)	(0.165)	(0.175)
Cold War	0.667**	0.492	0.552*	0.374	0.422
	(0.313)	(0.297)	(0.296)	(0.285)	(0.285)
Mountainous Terrain (Logged)	0.101	0.0269	0.0580	0.0521	0.0737
	(0.120)	(0.109)	(0.114)	(0.104)	(0.108)
Democracy	−0.871**	−0.954**	−0.867**	−0.922**	−0.822**
	(0.358)	(0.394)	(0.407)	(0.375)	(0.387)
Ethnic Polarization	−0.980***	−0.877**	−0.912**	−0.900**	−0.933**
	(0.339)	(0.377)	(0.375)	(0.359)	(0.357)
Religious Polarization	0.119	0.401	0.219	0.312	0.164
	(0.323)	(0.328)	(0.328)	(0.314)	(0.313)
Intervention				0.847***	0.809***
				(0.275)	(0.272)
Constant	9.543***	9.313***	11.05***	7.295***	9.260***
	(1.975)	(2.548)	(2.589)	(2.512)	(2.536)
Observations	105	94	87	94	87
Adjusted R-squared	0.396	0.462	0.509	0.513	0.617

Standard errors in parentheses. ***$p < .01$, **$p < .05$, *$p < .1$.

with major conventional weapons and civil war severity is a more complex phenomenon than the arming of rebels. Inclusion of the 5 years prior to onset may capture the ability of threatened governments to effectively stockpile arms in anticipation of conflict, and shield themselves from the effects of international arms embargoes that are put in place after fighting has begun.

Results for the control variables are fairly consistent across the models. The differences though, provide some evidence for how the transfer of major conventional weapons impacts civil wars. First, the Cold War variable is no longer significant in Models 2, 4, and 5 and only approaches significance in Model 3. The variable was theorized by Lacina (2006) to represent the increased support available to combatants in civil wars during the Cold War. The inclusion of major conventional weapons transfers in the model seems to capture most of the effects of the Cold War on civil war severity. This is not to say that major conventional weapons represent the key form of support available to groups, as other scholars have studied the types of assistance made available to rebel groups (for example, Bapat 2006; Salehyan 2010). The transfer of major conventional weapons could also serve as a proxy for other forms of rebel support. For example, it is likely a state that is willing to provide major conventional weapons to a rebel group will also provide that group with small and light weapons and financial support. The only other variable that changes significantly is the control for GDP. In the final model it becomes significant and negative indicating that states with greater levels of development will see less severe levels of conflict. The most likely scenario for this is that the better developed a state, the greater its capacity to fight insurgency, which may deter potential supporters from joining the rebellion (Lichbach 1995). The significant and negative direction of the military quality variable in Model 3 also provides limited evidence for a deterrent effect, although the lack of robustness of these findings makes this evidence rather weak.

The results of the Cox models are presented in Table 3. The models provide no support for H3. There is not any evidence that the provision of major conventional weapons to rebels increases the duration of conflict. The models do provide robust support for H4. The provision of major conventional weapons to governments increases the length of civil wars. Given the relationship between civil war duration and severity, this may help explain some of the relationship between state acquisitions of major conventional weapons and increased severity. The effect of duration on civil wars is greater when we take into account the ability of the government to stockpile arms prior to the conflict. Using the results of Model 6, the coefficient for state arms imports is −0.333 with translates into a hazard ratio of .717. These results show that, on average, a 1% increase in the volume of arms transferred to the government during a conflict predicts a 28.3% increase in the duration of the conflict. Including the arms imported 5 years

TABLE 3 Cox Models of Civil War Duration

Variables	Imports only during fighting Model 6	Imports including 5 years before onset Model 7	Intervention model: Imports only during fighting Model 8	Intervention model: Imports including 5 years before onset Model 9
State Arms Imports (logged)	−0.333*** (0.0636)	−1.445*** (0.305)	−0.320*** (0.0636)	−1.432*** (0.305)
Rebel Arms Imports (logged)	−0.0160 (0.122)	0.0438 (0.122)	−0.0398 (0.122)	0.0176 (0.122)
Population (logged)	0.313*** (0.120)	0.371*** (0.138)	0.248* (0.130)	0.314** (0.143)
Military Quality (Logged)	−0.0338 (0.126)	−0.0296 (0.136)	−0.0219 (0.130)	−0.00705 (0.141)
GDP (logged)	0.186 (0.167)	0.314 (0.192)	0.161 (0.167)	0.272 (0.189)
Cold War	0.648* (0.339)	0.510 (0.355)	0.691** (0.336)	0.595* (0.349)
Mountainous Terrain (Logged)	−0.0649 (0.103)	−0.209* (0.118)	−0.0811 (0.103)	−0.214* (0.118)
Democracy	−0.345 (0.405)	−0.801* (0.452)	−0.405 (0.416)	−0.958** (0.480)
Ethnic Polarization	0.712* (0.391)	0.461 (0.375)	0.676* (0.394)	0.461 (0.377)
Religious Polarization	−0.116 (0.339)	−0.00262 (0.351)	−0.0880 (0.341)	0.0533 (0.355)
Intervention			−0.383 (0.289)	−0.538* (0.288)
LR χ^2	31.82***	26.09***	33.53***	39.51***
Observations	94	87	94	87

Standard errors in parentheses. ***$p < .01$, **$p < .05$, *$p < .1$.

prior to the onset of the civil war (Model 7), the −1.445 coefficient for arms imports produces a hazard ratio of .236, Thus, on average, a 1% increase in the volume of arms transferred to the government predicts a 86.4% increase in conflict duration.

CONCLUSION

The results presented in this study provide valuable insights for the future of civil war research. First, the transfer of major conventional weapons to rebel organizations leads to deadlier conflicts. The transfer of major conventional weapons is more likely to cause conflicts to escalate because, unlike looted weapons, transferred weapons are more likely to be integrated into rebel fighting doctrines. Second, the transfer of major conventional weapons to

states and rebels represents a unique form of foreign policy that is not explained by an intervention framework alone. Although some examples of arms transfers may be forms of conflict intervention, not all transfers are interventions. Results from the statistical models provide evidence that the transfer of major conventional weapons have a unique impact on the severity and duration of intrastate conflicts. Giving major conventional weapons to recipients makes conflicts deadlier, and giving major conventional weapons to states is associated with longer conflicts. In either case, the transfer of major conventional weapons to those engaged in, or about to engage in, a civil war does not make for an effective conflict management strategy. It is likely to only make conflicts worse.

Understanding the effect of major conventional weapons transfers also provides valuable insights to the capabilities of rebel groups. Groups that are able to obtain major conventional weapons through arms transfers are more likely be able to use these weapons in conflicts and transform a conflict from a guerilla insurgency to a conventional battle. Even small quantities of major conventional weapons can close the gap between rebel and government forces. As shown in the case of surface-to-air missiles, the ability to challenge the government control of airspace can give rebel groups significant strategic space that they would otherwise be denied. Rebels reliant on small and light weapons can only hope to defeat the weakest of government forces. If rebels are unable to match government forces, the result is usually rapid rebel defeat or a long and drawn out low intensity conflict. Future research on civil wars needs to consider the types of weapons available to rebel groups if scholars are going to take rebel capabilities seriously. The relative capabilities of rebel groups and state can explain why some conflicts escalate into major conflagrations, while other groups are reliant solely on low level hit and run tactics. Continued research into understanding the differences in rebel capabilities can provide insights to other areas of civil war research including civil war recurrence and outcomes.

From a policy perspective, the findings here suggest the transfer of weapons to rebel groups should be opposed to prevent the escalation of conflicts. Although there may be a desire to protect groups from oppressive regimes, arming groups only creates more bloodshed and does not have an effect on ending the conflict earlier. The results also suggest that the provision of major conventional weapons to governments involved in civil wars also can worsen the conflicts. As international progress continues toward a conventional arms control regime, these results provide support for those who wish to enforce stronger weapons embargoes against warring parties. Rebel groups and states have been able to gain major conventional weapons through unofficial channels, which means an effective control regime will have to go beyond efforts to block official transfers. Failure to do so risks changing the public image of the insurgent from the lone rebel with an AK-47 to a column of tanks rolling into the capital.

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