Joint Military Exercises

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Joint military exercises (JMEs) are an indicator of military cooperation that has the potential to reveal much about the nature of the international system's underlying relationships. States participate in JMEs for a variety of reasons and receive a host of benefits, ranging from improved military coordination during natural disasters to disguising troop buildups in advance of military operations. Quantifying this interaction is valuable because it provides an insight into latent relationships in the international system that are not revealed when examining higher-cost options such as formal alliances or arms transfers. However, quantifying them also presents a host of challenges due primarily to their high frequency of occurrence and the fact that JMEs are not always newsworthy events. This article of record presents the first systematic attempt at collecting data on all JMEs from 1970 through 2010. During this time period, 1,479 JMEs have been recorded. Generally, JMEs appear to be proliferating in both time and space, although the data themselves do contain certain biases. Importantly, these data do not express the same underlying relationships represented by formal alliances and arms transfers, two other indicators of military cooperation. Thus, JMEs are shown to be a distinctly important indicator for measuring the nature of cooperative relationships in the international system.

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Introduction

Joint military exercises (JMEs) are an indicator of military cooperation that has the potential to reveal much about the nature of the international system's underlying relationships. States participate in JMEs for a variety of reasons and receive a host of benefits, ranging from the practical enhancement in performing military operations to their deceptive role in disguising troop buildups. These interactions reveal important characteristics of a dyad's relationship that are not expressed by other actions or agreements. Unfortunately, JMEs are not frequently studied in quantitative IR and thus little empirical evidence related to them has accumulated.

As a confidence and security building measure, JMEs offer states a politically low-cost option for establishing a relationship with one another. Quantifying this interaction is valuable because it provides an insight into latent relationships in the international system that are not revealed when examining higher-cost options such as formal alliances or arms transfers. However, quantifying them also presents a host of challenges due to their high frequency of occurrence and the fact that JMEs are not always news-worthy events.

This article of record presents the first systematic attempt at collecting data on all JMEs from 1970 through 2010. During this time period, 1,479 JMEs have been recorded. Generally, JMEs appear to be proliferating in both time and space, although the data themselves do contain certain biases. Importantly, these data do not express the same underlying relationships represented by formal alliances and arms transfers, two other indicators of military cooperation. Thus, JMEs are shown to be a distinct and integral indicator of this broader concept.

Due to time and resource constraints, these data have not been fully validated and it is certainly true that the dataset does not contain an entry for every JME that has taken place from 1970 through 2010. However, these 1,479 observations provide a sound foundation for future research. This article demonstrates that the study of JMEs is relevant to the field of IR and that data on JMEs can be collected and can be expressive of the underlying relationship of military cooperation for which they are intended to be used.

While these data only measure one indicator of military cooperation, the goal of the larger project is to measure and combine several indicators to construct a map of the networks of military cooperation that exist in the international system. Such a network map can be used to better

understand and predict state behavior by examining various network effects, such as constraints imposed on state behavior because of the state's level of network integration or connectivity. Prior to constructing this network map, however, the indicators of military cooperation must be accurately specified and measured.

JMEs: Definition and Value

States cooperate militarily for a variety of reasons and in a variety of ways. For example, states with a common enemy may see value in engaging in cooperative activity with one another. Or, a set of states that have recently experienced a rise in tensions might want to demonstrate to one another and to the world that their relationship is improving. Still others have compatible foreign policies and they may simply want to promote military cooperation in an effort to jointly pursue such policies.

The dataset introduced here is of one particular type of military cooperation: joint military exercises (JMEs). JMEs are a frequent, strategic interaction in the international system. States decide with whom they will participate, they decide on the type of signal to be sent from the exercise, and they decide on the practical coordination that is pursued. Two or more states make the decision to participate in a JME under the assumption that it will not only influence their relationship but it could also affect the behavior of others who might see the exercise as threatening.

Joint military exercises (JMEs), or war games, take place when the militaries from more than one state interact in such a way as to enhance their ability to carry out military operations. Although they have a wide range of practical purposes, JMEs also have political implications ranging from boosting a states status to disguising military buildups. Different types of exercises serve different purposes: while some are meant to signal a commitment or a willingness to get involved in a conflict or to deter states from further escalations towards conflict, others may be held primarily as a coordination exercise among members of the same international organization.

JMEs provide a depth of insight into the nature of the relationships observed in the international system that is unique from other commonly used indicators of military cooperation such as formal alliances and arms transfers. In terms of politics, JMEs are a low-cost foreign policy option that does not entail a long-term commitment. This is in contrast to the high-cost, long-term commitment

associated with a formal alliance. As a result, states are able to participate in JMEs without having to have a long time-horizon in mind. Furthermore, since formal alliances are essentially promises to act a certain way in the event of a military conflict, they have limited applicability in terms of signaling nuances in any particular relationship. JMEs, on the other hand, are held for a variety of reasons that may express the subtleties underlying the many types of relationships present in the state-system.

In comparison to arms transfers, JMEs again offer a different expression of military cooperation. Because their length is measured in days and weeks, states may participate in JMEs with partners whose future is uncertain without the risks associated with arms transfers. This is particularly important for cultivating relationships with states whose regime's are unstable. While arms transfers signal support, the supplier may soon find that those arms are turned against them should a regime transition occur. Or, should the arms fall into the wrong hands, the supplier may inadvertently aid a group that is actively fighting against the current regime. As a foreign policy option, JMEs do not inherently contain such risks.

Thus, JMEs can yield insights into the relationships of the international system that are expressed in neither formal alliances nor arms transfers. JMEs are also distinguishable from other mutually beneficial forms of military-to-military contact, such as military training. It is common for more advanced states to assist other less-advanced ones by directly training their military personnel. For example, a military training operation is being undertaken by the European Union Training Mission to Mali, where many European states have contribute personnel for the purposes of training the Malian army.

Another related form of military-to-military interaction is international military education (Moskos, 2004), a variable that has been explored in the IR literature as an indicator of military aid and whose effects on democratization have been theorized and tested by Gibler and Ruby (2003) and Ruby and Gibler (2010). Furthermore, at least in the United States, funds for international military education are allotted on a case-by-case basis and thus reflective of the underlying relationship (Gibler and Ruby, 2003). Student exchange programs represent another type of military education that have been explored in the quantitative IR literature (Atkinson, 2006, 2010).

JMEs are distinguished from these and other types of related interactions because of their focus on improving the execution of military operations. Military training is typically focused on a par-

ticular weapons system or, in the case of Mali, the advancement and improvement of the institution of the military in general. International military education is further removed from military operations and the benefits are largely had from a combination of personal contacts and encouraging the spread of ideas, placing it closer to the concept of soft power (Nye Jr., 2004; Atkinson, 2010). Although not explicitly a form of hard power, when states participate in JMEs they directly engage in training and coordination activity in response to a potential threat or situation. In contrast to revealing partners that a state is willing to train or educate, joint participation in a JME reveals partners a state is willing to carry out military operations with.

JMEs: A Signaling Tool

In addition to their practical purposes, adding to their value as a concept of interest in IR is the value of JMEs as a signaling tool. Among other things, JMEs are used to signal deterrence, an improvement in relations, and to signal status. They are generally a confidence and security building measure, but can also be used for more malicious signaling purposes such as to divert international attention away from troop buildups, weapons tests, or the construction of military-based infrastructure.

During the Cold War, it was routine for the superpowers to hold JMEs whose primary purpose was deterrence. In 1969 NATO held Reforger I, the first in a series of Reforger exercises aimed at improving NATO's ability at fortifying Germany in the event of an attack from the Soviet Union (Blackwill and Legro, 1989). Reforger would continue to occur annually through 1993 when it was canceled in the wake of the end of the Cold War. These exercises were loud, they were large, and they were held close to the border to ensure the Soviet Union received the proper message (Blackwill and Legro, 1989; Caravelli, 1983).

Comparable signaling was undertaken by the United States on the Korean Peninsula through the JME known as Team Spirit. Korea was a Cold War battleground: the North was allied with the Soviet Union and China while the South was (and still is) allied with the United States. Although an armistice was signed in 1953, North and South Korea have technically been at war since 1950. It is in this context that Team Spirit was held.

The purpose of Team Spirit was not just to improve the ability of the Americans and South

Koreans to repel an attack from North Korea, but also to credibly signal American willingness to defend South Korea in the hopes of deterring any potential North Korean attacks, especially any conflict that may have garnered the support of China or the Soviet Union. "With over 200,000 personnel participating in 1986, 1988 and 1989, Team Spirit became the free world's largest military exercise" (Farrell, 2009). This was much to the dismay of North Korea (D'Orazio, 2012). For example, "A U.S. official who visited Pyongyang in 1993 said the Great Leader's (Kim Il Sung) voice quivered and his hands shook with anger when he discussed Team Spirit in a conversation with Representative Gary Ackerman" (Oberdorfer, 2001, p. 273). Even more so than Reforger, Team Spirit signaled resolve.

The Warsaw Pact also conducted JMEs of its own, sometimes in the form of troop rotations (Blackwill and Legro, 1989) and sometimes as field training exercises similar to that of Reforger (Caravelli, 1983). However, consistent with other research on the Cold War, sending the signal of deterrence was not as important to the Pact states as it was to NATO (George and Smoke, 1974). The Warsaw Pact exercises were less frequent, smaller, and typically not held as close to the border (Blackwill and Legro, 1989). In contrast to NATO exercises, the Soviet exercises were as much of a signal to Pact states and potential defectors as they were to NATO.

The Soviet Union's use of JMEs highlights another feature: the demonstration of support to a friend or ally. For example, during the Berlin Crisis of 1961, which culminated with the construction of the Berlin Wall, the Soviet Union used JMEs to consolidate support among the government of East Germany and other Warsaw Pact states (Adomeit, 1982; Caravelli, 1983; Simon, 1985). In the Poland Crisis of 1980-81, rather than directly intervening with its military as it had in Hungary in 1956 and Czechoslovakia in 1968, the Soviet Union allowed the government of Poland to respond to dissent – the Solidarity movement – on its own. However, as Caravelli (1983) notes, "it appears that exercises again have figured prominently in a Soviet attempt to discipline and control a wayward ally – in this case Poland" (p. 423). Through the use of JMEs, the Soviets discouraged further dissent from Solidarity, expressed support for the Communist government of Poland, and did not have to make the politically costly decision t intervene militarily.

The United States engaged in a similar type of behavior with respect to the Sandinistas in Nicaragua. The United States' opposition to the Sandinista Movement is well-known and well-documented (see Smith (1996) for an example and background). Less-known is that, as a means of

signaling opposition to Nicaragua and support for Honduras, the United States routinely conducted military exercises in the region. These exercises often involved live-fire training and the deployment of several naval vessels, two common methods for increasing the visibility of an exercise. One such exercise, Universal Trek85, was held jointly by the US and Honduras in 1985. The exercise involved 8-10 naval vessels and the two states drilled amphibious landings (Associated Press, *US Planning Another Military Exercise in Honduras*). According to one observer, Universal Trek85 and other regional exercises "allowed President Reagan to accomplish three objectives: providing cover support for Contra operations, waging psychological war on the Sandinistas, and building the infrastructure to make overt military intervention possible and the threat credible" (Dougherty, 2012, p. 108). This diversion-based feature of JMEs was also used during the Cold War by the Soviet Union, particularly to disguise troop buildups.

According to Blackwill and Legro (1989), "it is a standard technique of deception to use exercises as a pretext for the massing of men and materiel before an attack" (p. 74). Prior to the 1968 Warsaw invasion of Czechoslovakia, the Soviet Union did precisely this (Caravelli, 1983; Blackwill and Legro, 1989). Large-scale, highly publicized Warsaw Pact JMEs were announced and held in August of 1968 involving the Soviet Union, Bulgaria, East Germany, Poland, and Hungary. These exercises were merely a distraction; their purpose was to provide Warsaw states with a shorter time from mobilization to attack and to ensure that NATO would not have time to intervene.[1]

This behavior is not unique to the Cold War, as the United States coordinated its military buildup preceding the invasion of Iraq with a series of large-scale military exercises in early 2003. Although these exercises were not uniquely for the purpose of disguising the buildup, they certainly contributed to the uncertainty felt by Iraq and the international community with respect to the number of troops that the United States had sent to the region. Furthermore, although I do not have direct evidence of this, the Gulf exercises of early 2003 could have certainly disguised the construction of military infrastructure meant to facilitate the attack.[2]

Military exercises themselves also have the potential to bring unintended consequences. For example, the Cold War-era JMEs mentioned above would frequently heighten the security dilemma

[1] US Department of State, Office of the Historian. "Soviet Invasion of Czechoslovakia, 1968." `http://history.state.gov/milestones/1961-1968/soviet-invasion-czechoslavkia`. Accessed May 14, 2013.

[2] In fact, because this feature of military exercises is to divert attention elsewhere, it would be particularly difficult to prove they have been used for such a purpose.

between states. Exercise Able Archer is perhaps the most famous example. Able Archer was the NATO exercise held in 1983 that came at a time of heightened East-West tensions and nearly triggered a nuclear war (Fischer, N.d.). Exercise Tiger is another, more tragic example that took place in April of 1944. American and British troops were preparing for the invasion of Normandy with a JME exercise when undetected German U-boats opened fire, resulting the death of 946 members of the US military (Small, 1988).

To avoid some of the risks due to misinterpretation, states have adopted a protocol for the execution of military exercises. First laid out in the Helsinki Accord of 1975 and then expanded on in the Stockholm Accord of 1986, the basic protocol is that if a state or states are conducting military exercises, they must let neighboring states know within some reasonable time frame given the size of the exercise. The larger the exercise, the more time they must let neighboring states know in advance. It is also commonplace to invite non-participants who may feel threatened to come and observe the exercise taking place. Interestingly, doing so also has an information provision role by revealing the relative strength or weakness of the participating state or states.

Since the end of the Cold War, joint military exercises of the size of Reforger and Team Spirit have all but disappeared. However, JMEs in general have proliferated. Just in the last decade, China has begun engaging in JMEs with Russia, Pakistan, India, Singapore, Turkey and Japan, to name a few. The United States has continued participating in JMEs with South Korea, as well as other states such as Morocco, Sri Lanka, Thailand, India and Israel, among many others. In 2010, the United States signed an agreement with Brazil allowing for JMEs between the two states. A central element of NATO's Partnership for Peace program, a plan for integrating certain former Soviet states and members of the Warsaw Pact into NATO, was to conduct JMEs with those select states.

Having established the importance of JMEs as a measure of military cooperation as well as a foreign policy option of theoretical importance for the study of IR, the remainder of this paper focuses on the data collection and descriptions of the JME data.

Data Collection: Procedures and Coding Rules

Collecting data on JMEs is straightforward yet time-consuming. Because it is relatively easy to recognize their occurrence, coding JMEs does not require an expansive knowledge of the concept. This is in contrast to most other data projects in IR, such as the Militarized Interstate Dispute project (Ghosn, Palmer and Bremer, 2004). However, because of their high frequency of occurrence and short duration, it is a time-consuming process and can be quite resource-intensive.

To collect the data with limited resources, I follow the example of D'Orazio et al. (2012) by combining a mixture of human-coding and automated document classification. The initial document set to be searched for information on JMEs is comprised of news reports and it is made to be large and very inclusive. However, it is certainly the case that some JMEs that took place during that time period will not be contained in this set. The resulting bias, as well as other potential biases, are discussed and explored below.

To collect data on JMEs, LexisNexis was queried using the following search string:

> ((mil! OR war!) AND (exercis! OR train! OR simulat!) AND NOT (sports OR lifestyle OR tax cuts OR entertainment OR Wall Stree OR baseball)

The four sources queried are The Associated Press, Agence France Press, Interfax News Agency, and Xinhua General News Agency. This process returns a total of 256,734 documents, far too many to manually read through with the finite resources at my disposal. Therefore, to decide which documents are to be manually read and which are to be discarded, the entire set has been ranked using the support vector machine algorithm (Vapnik, 1998; Burges, 1998; Joachims, 2002). SVMs are capable of handling the high dimensional, sparse datasets, the kind commonly seen when working with text. Furthermore, SVMs have been widely used for text classification purposes in the machine learning literature (Kolari, Finin and Joshi, 2006; Joachims, 1998; Aggarwal and Zhai, 2012).

These documents have been represented as data using a relatively standard approach: named entities have been removed, features are unigrams that have been stemmed using the Porter stemmer (Porter, 1980), stopwords have been removed, document frequency thresholding has been used to reduce dimensionality, and all weighting has been done using the term frequency inverse docu-

ment frequency method.[3] All text representation has been done using PreText, original software written in Perl for representing text as data.

After ranking all documents, the top five percent have been extracted and manually read through and coded for relevant information. This subset, consisting of 12,837 documents, has a precision of 21.6%, meaning roughly one out of every five documents is about a JME. The subset of documents ranked between six and ten percent has a precision of 12.34%, which is considerably high and deserving of coding. Unfortunately, this data collection project has been done with limited time and resources and the decision to only code the top five percent is a matter of practicality.

Coders read through the document set and, when encountering a story about a JME, filled out a pre-defined Google Forms sheet. Using Google Forms has several advantages over the traditional hard-copy or Microsoft Word coding sheet. First, it enables the PI to keep track of an RA's progress because at any time the PI can access and view all work that has been completed. Second, a Google Forms document can be transformed into a spreadsheet, enabling instant structuring of the data. Third, the codesheets are preserved in electronic form for at least as long as Google exists, meaning they can easily be backed up or transferred upon request.

Several variables were collected for each observation of a JME including the location, the participants, the time and duration, the type of exercise (field training or simulation), and whether or not the exercise was part of NATO's Reforger. The participants have been coded according to their three letter ISO-3166 country code. Initially, the contribution of each participating state was to be collected, but this information proved unreliable and inconsistently provided so this variable was done away with as coding proceeded. Additionally, each observation includes a list of unique key(s) corresponding to the document(s) where the information for that JME had been coded. Because of this, all data and coding decisions can be reviewed and validated from the source.

Descriptive Statistics

The data demonstrate some interesting trends over both time and space. Specifically, JMEs have been proliferating over the past 40 years and it is now commonplace for states to hold routine JMEs for the practical and strategic reasons discussed above. However, the data collection process also

[3]The representation and classification are discussed in further detail in the Feature Selection chapter.

exhibits some glaring biases that will need to be corrected prior to an official release.

Using the process discussed above, 1,479 JMEs have been collected with global coverage. Figure 1 shows the number of JMEs in the international system each year from 1970-2010. The total number of JMEs through the 80s and early 1990s is relatively unchanging, fluctuating around a total number of 35 or so. In the late 1990s, we observe a large increase, due in no small part to NATO's Partnership for Peace Program that began in 1994. Partnership for Peace is a post-Cold War plan for improving relationships among NATO states and those of the former Warsaw Pact and Soviet Union. Vital to this plan has been that the long-standing NATO members hold JMEs with these states for the stated purpose of integrating their militaries and improving their ability to carry out joint operations.

Potential biases are also revealed in Figure 1, particularly with respect to the 1970s and the last 2000s. In the 1970s, there is very little data on JMEs. This is due in large part to the reliance on electronic news documents for collecting the data. News aggregators such as LexisNexis simply do not have a large selection of election documents in the 1970s. Just a quick skimming of articles written on the subject of military exercises, such as Caravelli (1983) or Blackwill and Legro (1989), reveals that more exercises took place during this time period than are being represented by these data. However, with respect to these same articles and the coverage in the 1980s, it appears that the data are much more reliable since many if not all the exercises mentioned by name in those articles are contained in the data.

The late 2000s reveal another potential bias in the data. Given the levels of military cooperation pursued by states to meet 21st Century challenges such as terrorism and cyber-warfare, we might expect that JMEs should be increasing over time rather than decreasing. Figure 1 does not support this claim, however. Instead, it reveals that JMEs peak in 2005 and drop by two-thirds in 2006! This massive decrease in the number of JMEs requires a closer look.

There are two general explanations for the observed decrease: One, the data are not biased and there is an actual decrease beginning in 2006 and two, the data are biased. If the data are biased, it could be either because of human error or because the system did not perform as intended. A brief post hoc evaluation of each of these possibilities has been conducted, but as of yet there is not a satisfactory explanation for this observed decrease in frequency.

For the year 2010, the stories manually coded have been re-examined and an additional three

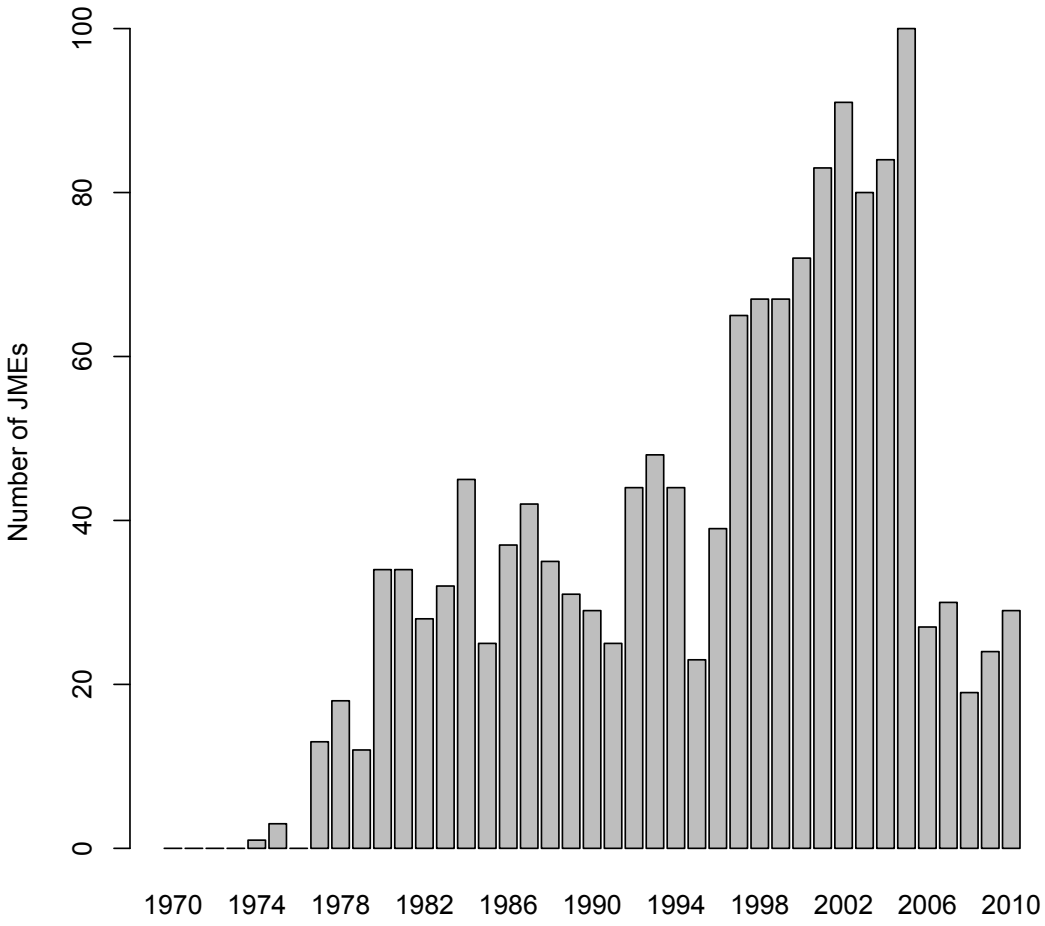

Figure 1: Number of JMEs Over Time

JMEs have been discovered. Although disconcerting, at this stage this project is being undertaken with the assumption that the data will not perfectly measure the concept of a JME. Furthermore, three JMEs will not cause the dramatic decrease that is observed.

The classification system could be the cause of the decrease, but if the process worked for the 1990s and early 2000s there is no reason it should fail in the late 2000s unless LexisNexis returns fewer documents for this time period. A LexisNexis query of "joint military exercise" using all English news returns 947 documents for 2004 and 1,852 for 2005. In 2006, the same search returns 1,515. Without delving into the documents themselves, it does not appear that LexisNexis is the

problem: 1,281 are returned in 2007, 1,219 in 2008, 1,583 in 2009, and 2,958 in 2010. In sum, there is not a systematic drop in the number of documents post-2005.

Another possibility is that the data are not biased and the number of JMEs has simply decreased in 2006. However, anecdotal evidence suggests that the number of NATO's Partnership for Peace exercises has diminished, due in part to Russia's re-exertion of influence and in part to the fact that many of these states are now members of NATO and thus the Partnership for Peace exercises are no longer necessary. Without further research, this cannot be confirmed or denied.

In addition to their proliferation over time, as seen in Figure 1, JMEs have also been proliferating in terms of the number of states that are choosing to pursue this policy option. Figure 2 plots the number of dyads that have participated in a JMEs each year from 1971 – 2006.[4] A similar trend is observed in that the number of dyads participating in a JME in each year is relatively constant in the 1980s and early 1990s and then increases dramatically in the late 1990s. This coincides with NATO's Partnership for Peace program, which may explain most of this dramatic increase in the late 1990s.

However, the number of dyads participating in exercises also appears to be increasing through 2006. Although this is only one year, in Figure 1 2006 is the year that the massive decrease in the number of JMEs is observed. Taken at face value, this means that although fewer exercises are being held, a larger number of states are participating in them. Again, without delving too much into the data, it could be that NATO's Partnership for Peace program has ceased and the new member of NATO have been incorporated into pre-existing exercises.

Despite the biases over time, JMEs, by definition, require at least two states and many involve ten or more states. Data on 1,479 unique JMEs produce a lot of dyadic interactions: 14,594, to be exact. Above I have argued that JMEs are theoretically distinct from other types of military cooperation because of factors such as their cost and utility for states as a policy option. However meaningful in theory, if the data are not distinguishable from data on other indicators of military cooperation than they will at best provide slightly more accurate estimates and may not be worth the effort. Below, the data are further explored in comparison to data on arms transfers and formal alliances.

[4]These data have a different range than previous data because the figure has been constructed using the dyadic data for the dissertation, which ranges from 1971 – 2006

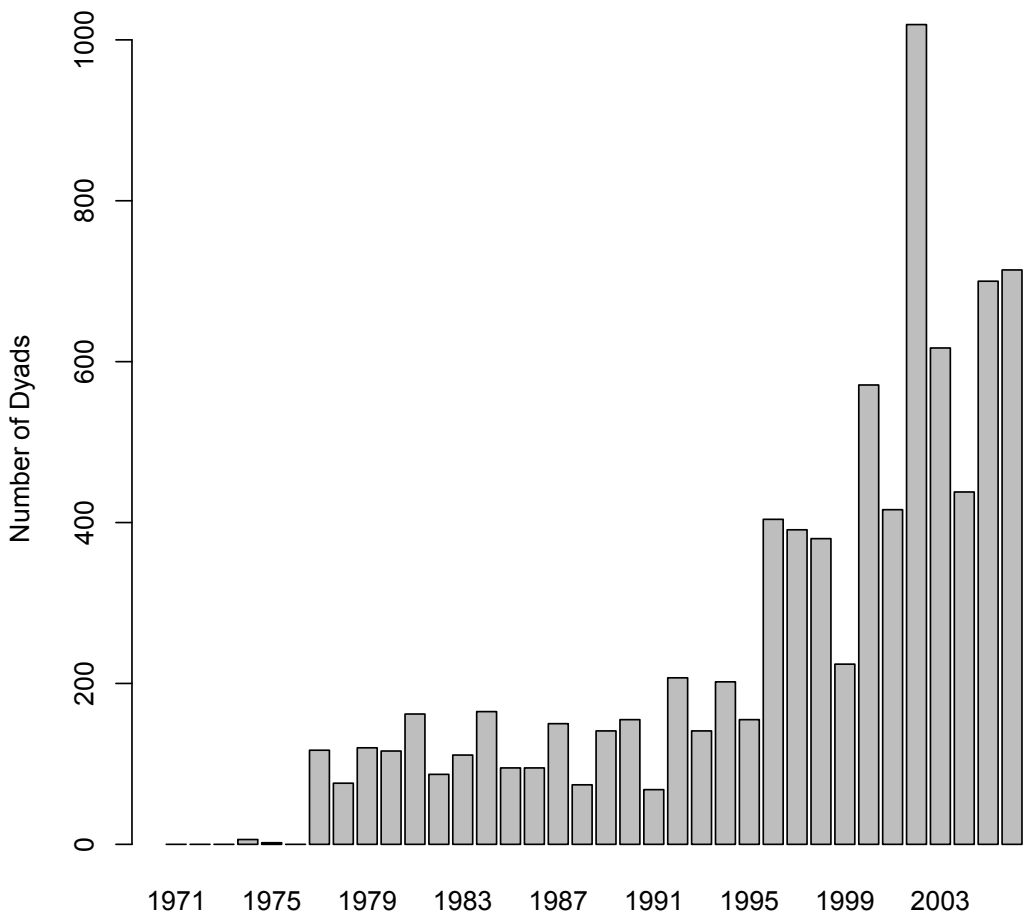

Figure 2: Number of Dyads Participating in a JME: 1971–2006

Comparison with Alliances and Arms Transfers

JMEs are an integral component for constructing a coherent picture of military cooperation. Two others that are more common in the IR literature include formal alliances and arms transfers. If JMEs are indeed meaningful as a measure, then it should be shown that they capture an aspect or dimension of military cooperation that is not reflected in other indicators. Although this has been done briefly in a qualitative sense above, it must also be the case empirically if these data are to be valuable for the field.

The data on formal alliances is provided by the Correlates of War project (Gibler and Sarkees,

2004; Gibler, 2009). Arms transfers data is provided by the Stockholm International Peace Research Institute and is available at `http://www.sipri.org/databases/armstransfers`. Due to temporal differences, the data that are compared below all range from 1971 through 2006, rather than through 2010 as above.

A basic method for comparing a set of variables is to look at their correlation. Variables that are correlated very highly and positively convey similar information, while those that are negatively and highly correlated mean they convey opposite information. Each of these variables are linked by the concept of military cooperation, so ideally JMEs will not be negatively and highly correlated with either alliances or arms transfers. However, if they are too highly correlated than any further analysis using JMEs will provide very similar results to an analysis with one of the other indicators. Therefore, supporting the notion to use JMEs as an additional indicator of military cooperation or as a meaningful phenomena in their own right would be a low, positive correlation, which is precisely what is seen in Table 1.

Table 1: Correlation of JMEs, Alliances, Arms Transfers

	JMEs	Alliances	Arms Transfers
JMEs	1.000	0.224	0.149
Alliances	0.224	1.000	0.074
Arms Transfers	0.149	0.074	1.000

Although Table 1 does not provide definitive evidence that JMEs are an indicator of military cooperation, it certainly supports these results. Furthermore, alliances and arms transfers are also positively correlated at a very low level, meaning that perhaps all three indicators are capturing something distinctive about military cooperation.

Looked at differently, there are 519,887 dyad-years in the data from 1971 – 2006. Of those, 8,319 contain at least one recorded JME, 35,048 have a formal alliance, and 10,635 have a recorded arms transfer. Figure 3 plots the various intersections of these variables in a Venn Diagram.

Figure 3 demonstrates that each of the indicators are, in fact, capturing dimensions of military cooperation that are not expressed by the other indicators. This is revealed by the substantial number of dyad-years that experience one of these three forms of military cooperation but not any other. With respect to JMEs, 3,557 dyad-years experience a JME and have neither a formal alliance nor an arms transfer. This amounts to 42.76% of all JMEs. For alliances, the number is

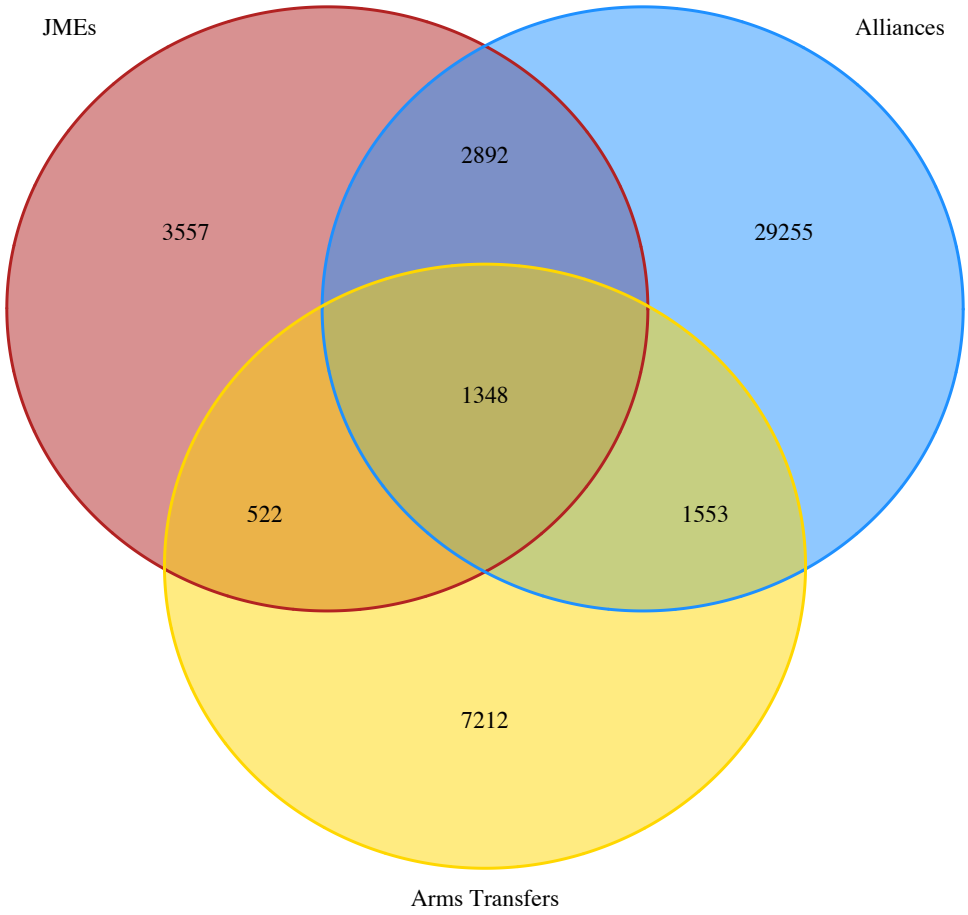

Figure 3: Three Indicators By Dyad-Year

29,255, or 83.47%. For arms transfers, the number is 7,212, or 67.81%.

It is also evident in Figure 3 that there are many more dyad-years that contain an alliance than there are that experience either an arms transfer or a JME. This is reasonable considering that alliances are institutional agreements and once signed they tend to persist for decades. In contrast, arms transfers and JMEs are events with much shorter duration. Because of this difference, Figure 3 might be misleading in the sense that the number of unique dyads that participate in a common JME but do not maintain a formal alliance may be even higher.

There are 19,499 unique dyads in the data from 1971 through 2006. Only 1,419 contain an alliance, 1,756 register an arms transfer, and 2,237 participated in a JME. By aggregating the data by dyad rather than dyad-year, it appears that JMEs are a far more common interaction for a dyad than a formal alliance or arms transfer.

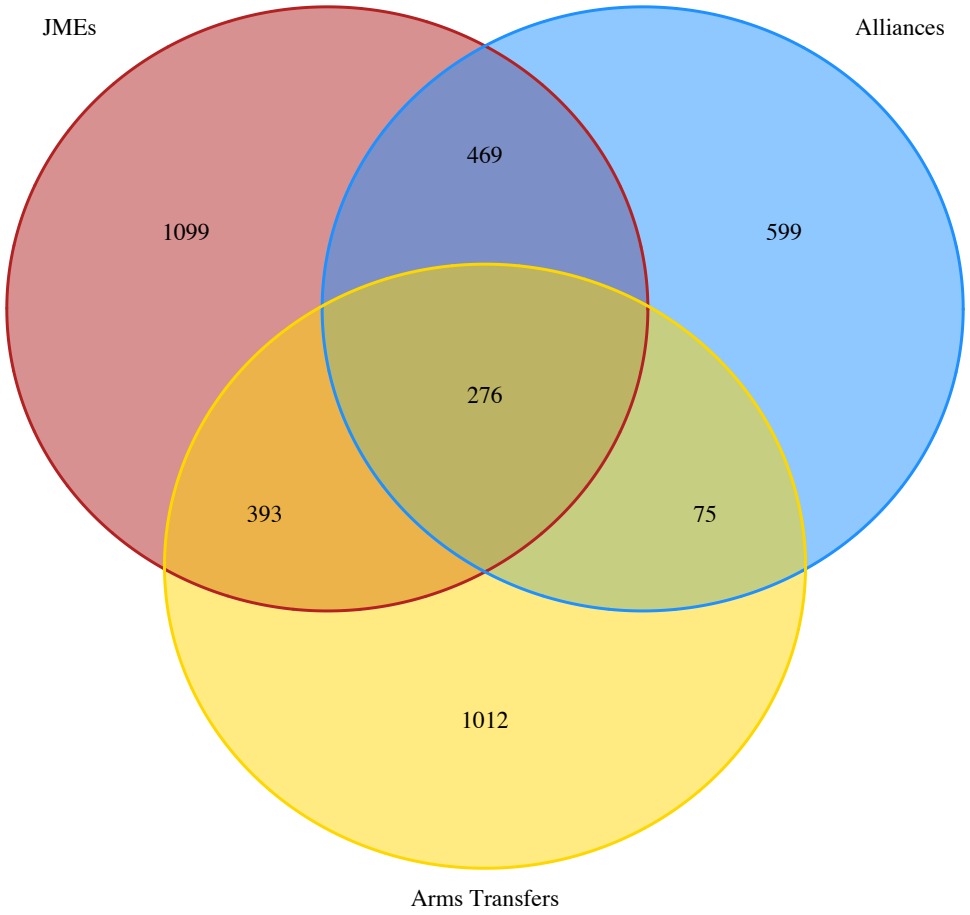

Figure 4: Three Indicators By Dyad

Figure 4 is a Venn Diagram of the number of dyads that experienced one of these three types of military cooperation. 1,099 unique dyads that have participated in a JME have never, during this time frame, been a part of either an arms transfer or a formal alliance. Data on formal alliances or arms transfers express these relationships as 0, or as not having a relationship. In terms of military cooperation, this is simply not true. These 1,099 dyads are cooperating militarily, they just have not reached the level of cooperation and integration necessary for signing a formal alliance.

In sum, JMEs are not simply a proxy for another form of military cooperation. They are theoretically and empirically distinct from formal alliances and arms transfers, two of the more commonly used indicators.

Conclusion

JMEs are both a practical and strategic foreign policy option for states to pursue. They serve a wide range of purposes and are increasingly present in the international system. Furthermore, JMEs are an integral component of military cooperation and reveal latent relationships that are not represented by other indicators such as formal alliances or arms transfers.

The data presented here range from 1970 through 2010, contain 1,479 instances of JMEs, and are the first publicly available data on this important state interaction. These data were collected by manually reading and coding a document set that had been downloaded from LexisNexis and had undergone a phase of automated document classification. Because of the process used to collect it, the data appear to have some temporal and (potentially) spatial biases.

Complicating the search for information about JMEs is the fact that most states do not routinely collect and make such data available to the public.[5]. Therefore, second-hand sources must be used and this brings along a set of problems common for collecting data from second-hand sources. One of the primary difficulties with collecting data from second-hand sources, in this case news sources, is that the phenomena of interest has to be newsworthy to make it into the data. This bias towards news-worthy events has the potential to bias the data towards larger JMEs, those involving particularly strong deterrent signals, and those undertaken by major power states, among others. There is also the potential to bias the data towards those states that have greater freedoms of the press and those that have higher concentrations of reporters.

This source of bias is less of an issue since the evolution of the Web, and future iterations of this data collection effort must take advantage of sources of information beyond traditional news reports. For this project, some of the datapoints have been validated simplying by Googling the name of the exercise and searching around official Defense websites. Another source of information are the official Twitter accounts of Defense departments and military commands. It is common for them to release information about military exercises through such outlets, and harvesting this information may prove fruitful in future iterations.

Additionally, future research should also include some measure of the visibility of the JME.

[5]One notable exception is Ukraine, whose Ministry of Defense provides information on many of the joint military exercises that Ukraine has participated in, particularly the Partnership For Peace exercises. This is available at `www.mil.gov.ua/index.php?part=international_exercises&lang=en`

Almost by definition, to signal commitment or deterrence JMEs need to be visible. Some common methods for increasing the visibility of JMEs includes holding them closer to a target state's border, such as NATO exercises in West Germany, increasing the live-fire part of the exercises so that they may be easily heard by the target state, and increasing the sheer size or length of time so that the JME may attract more media attention. Blackwill and Legro (1989), who compare NATO and the Warsaw Pact military exercises during the Cold War, also compare the timing of the operations, as many are made to coincide with major international events. Another factor that is commonly used to increase visibility is the presence of an aircraft carrier, a symbol of power in the current system. Any or all of these characteristics of a JME can be used to develop some measure for its visibility.

References

Adomeit, Hannes. 1982. *Soviet Risk-Taking and Crisis Behavior: A Theoretical and Empirical Analysis*. Boston, MA: Allen and Unwin.

Aggarwal, Charu C. and ChengXiang Zhai. 2012. A Survey of Text Classification Algorithms. In *Mining Text Data*, ed. Charu C. Aggarwal and ChengXiang Zhai. New York: Springer chapter 6, pp. 77–129.

Atkinson, Carol. 2006. "Constructivist Implications of Material Power: Military Engagement and the Socialization of States, 1972-2000." *International Studies Quarterly* 50:509–537.

Atkinson, Carol. 2010. "Does Soft Power Matter? A Comparative Analysis of Student Exchange Programs 1980-2006." *foreign Policy Analysis* 6:1–22.

Blackwill, Robert D. and Jeffrey W. Legro. 1989. "Constraining Ground Force Exercises of NATO and the Warsaw Pact." *International Security* 14(3):68–98.

Burges, Christopher J.C. 1998. "A Tutorial on Support Vector Machines for Pattern Recognition." *Data Mining and Knowledge Discovery* 2(2):121–167.

Caravelli, John M. 1983. "Soviet and Joint Warsaw Pact Exercises: Function and Utility." *Armed Forces and Society* 9(3):393–426.

D'Orazio, Vito. 2012. "War Games: North Korea's Reaction to US and South Korean Military Exercises." *Journal of East Asian Studies* 12(2).

D'Orazio, Vito, Steven T. Landis, Glenn Palmer and Philip Schrodt. 2012. "Separating the Wheat from the Chaff: Applications of Automated Document Classification to MID.". Presented at the MidWest Political Science Meeting, 2011. Available at `http://vitodorazio.weebly.com/papers.html`.

Dougherty, Kevin. 2012. *The United States Military in Limited War: Case Studies in Success and Failure, 1945–1999*. Jefferson, NC: McFarland and Company, Inc.

Farrell, John F. 2009. "Team Spirit: A Case Study on the Value of Military Ex- ercises as a Show of Force in the Aftermath of Combat Operations." *Air and Space Power Journal* 23(3):95–106.

Fischer, Benjamin B. N.d. "A Cold War Conundrum: The 1983 Soviet War Scare.". Unpublished monograph.

George, Alexander L. and Richard Smoke. 1974. *Deterrence in American Foreign Policy: Theory and Practice*. New York, NY: Columbia University Press.

Ghosn, Faten, Glenn Palmer and Stuart A. Bremer. 2004. "The MID3 Data Set, 1993-2001: Procedures, Coding Rules, and Description." *Conflict Management and Peace Science* 21(2):133–154.

Gibler, Douglas M. 2009. *International military alliances, 1648–2008*. Washington: CQ Press.

Gibler, Douglas M. and Meredith Sarkees. 2004. "Measuring Alliances: The Correlates of War Formal Interstate Alliance Data Set, 1816-2000." *Journal of Peace Research* 41(2):211–222.

Gibler, Douglas and Tomislav Z. Ruby. 2003. "Educating Foreign Officers." *Joint Forces Quarterly* 33(Winter):119–123.

Joachims, Thorsten. 1998. Text Categorization with Support Vector Machines: Learning with many Relevant Features. In *Tenth European Conference on Machine Learning*.

Joachims, Thorsten. 2002. *Learning to Classify Text Using Support Vector Machines: Methods, Theory and Algorithms*. Norwell, MA: Kluwer Academic Publishers.

Kolari, Pranam, Tim Finin and Anupam Joshi. 2006. SVMs for the Blogosphere: Blog Identification and Splog Detection. In *American Association for Artificial Intelligence Spring Symposium on Computational Approaches to Analyzing Weblogs*.

Moskos, Charles. 2004. "International Military Education and Multinational Military Cooperation.".

Nye Jr., Joseph S. 2004. *Soft Power: The Means To Success In World Politics*. New York, NY: PublicAffairs.

Oberdorfer, Don. 2001. *The Two Koreas: A Contemporary History*. 2nd ed. Basic Books.

Porter, Martin F. 1980. "An Algorithm for Suffix Stripping." *Program* 14(3):130–137.

Ruby, Tomislav Z. and Douglas Gibler. 2010. "US Professional Military Education and Democratization Abroad." *European Journal of International Relations* 16(3):339–364.

Simon, Jeffrey. 1985. *Warsaw Pact Forces: Problems of Command and Control.* Boulder, CO: Westview Press.

Small, Ken. 1988. *The Forgotten Dead: Why 946 American Servicemen Died Off The Coast of Devon in 1944 – And The Man Who Discovered Their True Story.* United Kingdom: Bloomsbury.

Smith, Christian. 1996. *Resisting Reagan: The U.S. Central America Peace Movement.* Chicago, IL: University of Chicago Press.

Vapnik, Vladimir N. 1998. *Statistical Learning Theory.* New York, NY: John Wiley and Sons.