

Aspects of global security – the measurement of power & its projection Results from twenty selected countries (2000-2013)

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Abstract. The end of the cold war marked the beginning of a new era, characterised by economic liberalisation and political freedom. This stimulated waves of regional integration around the world. The North Atlantic Free Trade Agreement (NAFTA) replaced the Canada-United States Free Trade Agreement of which Mexico became a part in 1994. A number of countries from the former Soviet East bloc signed association agreements and later joined the European Union (EU). The expansion of these two trade blocs together with the Association of South East Nations (ASEAN) connected the world and generated increased economic opportunities, which have improved standards of living in numerous countries. Yet, and ironically so, the world has witnessed increased tensions and a growing numbers of wars in the 21st century. All of them vary in terms of scale, duration, strategic approach and in their outcomes. The projection and/or defence against acts of war and aggression require a range of resources, which when combined together make up the components of a nations power. The objective of this paper is to apply an existing power model with added modifications to twenty selected countries from four different regions globally. Of central interest to this work is whether the reworked version of the model can be regarded as a realistic measure of a country's total power and in this regard what the results reveal about change over time.

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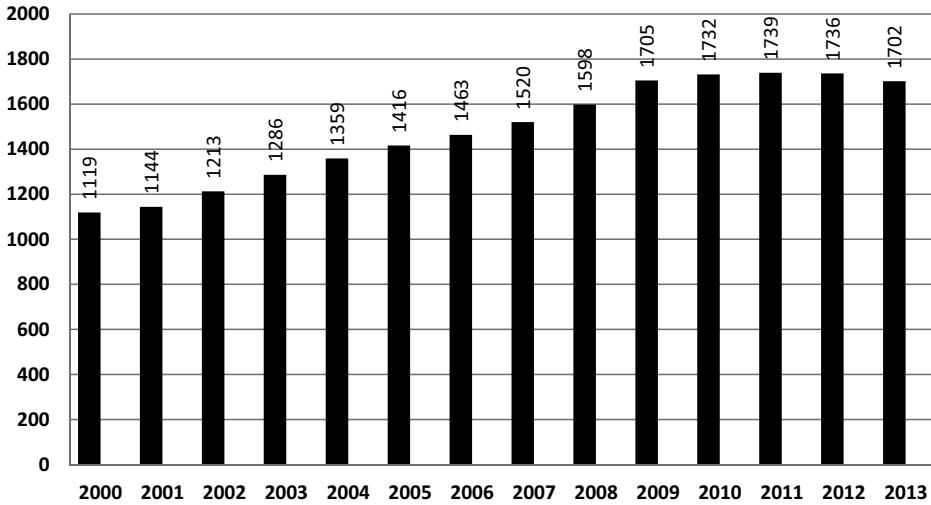
INTRODUCTION

In the twenty-first century the world has witnessed increased international tensions, a number of invasions and other acts of aggression, which come under the headings of war, hybrid warfare and terrorism.

To name a few these have been observed in Kosovo (2000), 9/11 New York (2001), Afghanistan (2001), Iraq (2003), Russo-Georgian war (2008), Islamic State of Iraq and the Levant (2013, 2014, 2015) and, not least, the seizure of Crimea and the regional spread of pro-Russian separatists into the more strategic areas of eastern Ukraine (2014-2015). These conflicts represent a small proportion of those faced by the wider world today, since numerous countries continue to face increased domestic tensions, violence, territorial divisions as well as ongoing threats from rogue states (Hoffman, 2007). All of the above conflicts have varied or continue to do so in terms of scale, duration, strategic approach and in their end outcomes. In response countries in response, regardless of their position in any given conflict or perceived threat, tend to increase military expenditure. The point of this paper however is that military strength forms a constituent component of a nation's total power, but its existence, development and projection in the case of conflict strongly depends on the capacity of a country's economy in terms of resources, infrastructure and economic output for it to achieve any degree of success – regardless of intentions. In light of this the objective of this research is to apply a model that will measure total power across a representative set of twenty countries globally for the years 2000 and 2013. The countries chosen are from Asia, Europe, North America and the Middle East and combined account for 76% of global defence spending.

OVERVIEW ON GLOBAL DEFENCE SPENDING

According to the Stockholm International Peace Research Institute (SIPRI) a total of twenty-three countries doubled their military spending in real terms during this century. They all differ in terms of size, development, geographical location, economic output and access to resources (Dunne, Perlo-Freeman & Smith, 2007; Ali & Abdellatif, 2015; Dunne & Tian, 2015; Carbonnier & Wagner, 2015). Graph one shows the changes in global defence spending between the years 2000 and 2013. Over this period total global expenditure increased from \$1.1 to \$1.7 trillion. However, from 2011 global defence spending fell with most of the reductions occurring in North America, Western & Central Europe and Oceania and this was partially due to the effects of the global recession (SIPRI, 2014). Most of the countries from the former two regions are members of NATO. In contrast defence spending increased in non-NATO countries such as China, Russia and India, but also in Saudi Arabia – reflecting the instability and ongoing conflicts in the Middle East. In the year 2013 the United States continued to dominate in terms of defence spending, accounting for 37% of the world total while China ranks second (11%) and Russia third (5%). These countries are then followed by the United Kingdom, France, Germany and Japan.



Graph 1. Defence spending globally in billions of dollars (2000-2013)

Source: SIPRI data, 2014.

The above named countries are included in the sample set of twenty from four different regions and whose military expenditure combined equates to 75.8% of the world total in 2013. The objective is to measure and compare these countries in terms of three core components – one of which is military strength and with a view to determining each country's ranking in terms of total power over time.

THEORY & ITS APPLICATION

Academics across a broad range of disciplines have been battling with the term “power” in terms of its measurement, its concept and its interpretation for a number of centuries. Power in the context of this research is defined as: *a state or country, especially one viewed in terms of its international influence and military strength* (Oxford Dictionaries, 2014). The measurement of power as applied in this work is made up of three components and they are: *critical mass*, *economic output* and *military strength*. The components, which are presented in the given model were first applied by Chang (2004), whose work focused on the measurement of power during the post-Soviet era. The model in its original form is given as:

$$\text{Power} = \left(\frac{\text{Critical Mass} + \text{Economic Potential} + \text{Military Strength}}{3} \right)$$

The model shows that a country's national power can be measured by summing each of the three components as given in brackets and dividing them by three. In the original model as introduced by Chang the source variables to each of the above three components are given as follows:

$$\text{Critical Mass} = \left(\frac{\text{Population}_t}{\text{Population}_w} \right) * 100 + \left(\frac{\text{Area}_t}{\text{Area}_w} \right) * 100$$

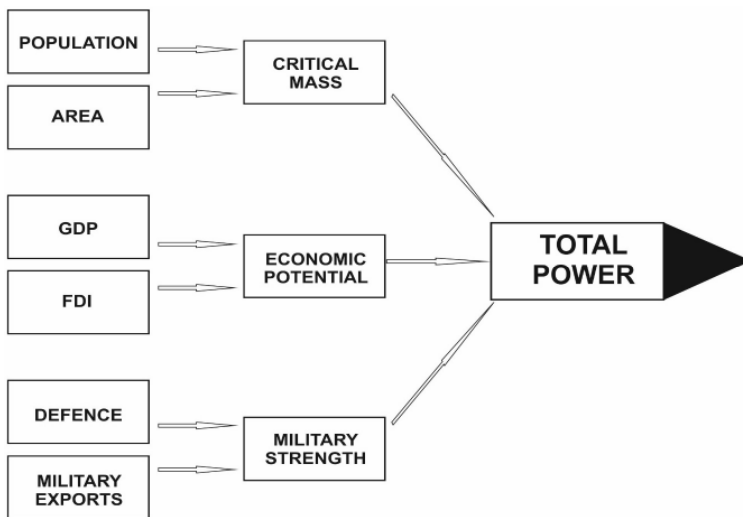
$$\text{Economic Potential} = \left(\frac{GDP_i}{GDP_w} \right) * 200$$

$$\text{Military Strength} = \left(\frac{Defence\ Spending_i}{World\ Total} \right) * 200$$

In terms of each component a given country's source variable is divided by the world total and multiplied by one hundred. For example, critical mass is determined by the sum of two source variables: population and the actual size of a given country in square kilometers. Economic potential and military strength are supplied by one source variable each: GDP and defence spending – both as a percent of the world total, respectively. The sum of all three components is calculated out of a total six hundred and then divided by three to form a total power index (out of two hundred) for each individual country. This enables us to rank and compare them.

MODIFICATIONS

This work maintains the three components as introduced by Chang (2004), but modifies the source variables. The following diagram shows the addition of two source variables and these have been integrated into the equation to reflect global economic change and integration since the end of the Cold War, particularly in respect of foreign direct investment as well as increased foreign trade.



Graph 2. The total power model & its components (2015)

Source: Own construction (2015).

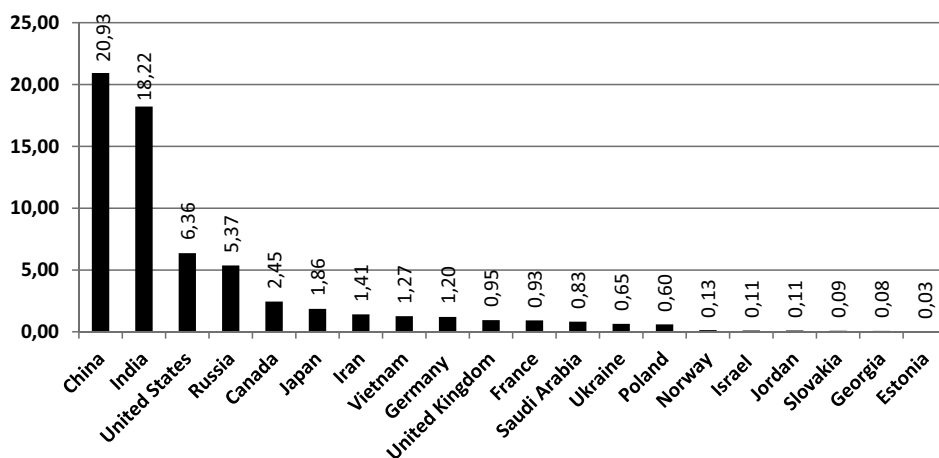
At the top of the diagram the first component of a nation's power (**critical mass**) comprises **population** and **area**. The second component (**economic potential**) is measured using the sum of gross domestic product (**GDP**) and foreign direct investment (**FDI**), while the third component (**military strength**) is taken as a measure of defence spending (**defence**) plus the value of defence armaments sold abroad (**military Exports**). The “**total power**” value derived for each country is the sum of all components measured out of two-hundred. Hence, if there was one single country called “world” with a fixed land mass, one population, a single value for GDP and supplied the world's total security, then the value for “world power” would be equal to two-hundred. This work will now discuss each of the components as given in the power model, the reasons for their inclusion and the results obtained for each country.

CRITICAL MASS

The two variables which make up the critical mass are **population** and **area** (country size). As shown in the equation below this can be calculated by measuring a country's population as a percentage of the world population and then adding it to the value obtained for a country's area. The latter is determined by dividing the square kilometer area – i.e. land mass of a given country by the total world area and, likewise, multiplying by one-hundred to obtain a percentage value. The sum of both variables together provide a value for critical mass. The equation below shows how each country's value is determined for this component and is measured out of a total two-hundred .

$$\text{Critical Mass} = \left(\frac{\text{Population}_i}{\text{Population}_w} \right) * 100 + \left(\frac{\text{Area}_i}{\text{Area}_w} \right) * 100$$

The two variables combine a country's supply of human capital and land resources and jointly form two of the most important factors of production (labour and land). While the productive capacity of human capital depends on education and investment, a country's area in terms of its nature, soil, climate, situation and the means in which it is managed determines its progress overall (Gylfason, 1999). The following graph (3) shows that two countries dominate when measured in terms of critical mass. These are China and India, which, in 2013, had populations of 1.3 and 1.2 billion, respectively. China's share of the world population stood at 19%, while India contributed 18% (World Bank, 2014). Russia's population in contrast (143 million) forms 2% of the world population. Its ranking on the given graph (fourth place) however is due to the size of its country, which is the largest in the world at 3.4% of the total world land mass. Canada is the second largest country forming 2%. The critical mass value for the United States (third) is the sum of its population share of the world total (4.4%) and its global land mass area in square kilometers (1.96%). The country's population is therefore the more dominant source variable in forming its critical mass.



Graph 3. Critical mass indicators combining population and country size (2013)

Source: Own calculations based on World Bank data, 2014.

While graph three reveals a clear dominance of China and India in the measurement of critical mass, it further shows that the entire group of countries in the range fall into three separate groups. Group one is made up of two countries whose indexes exceed a minimum of eighteen out of two-hundred, while the United States & Russia (group two) exhibit indexes, which are approximately three-times lower. The remaining sixteen countries assigned to group three, and led by Canada, have critical mass indexes ranging from 2.45 to 0.03 in Estonia. Interestingly, closer observation of graph three strongly indicates that there is clearly no ranking order or correlation when the countries of this latter group are considered in terms of geographical location or levels of development. Hence, the range order shows that group three is made up of countries whose sequence does not follow any pattern. Japan, which is an advanced country is followed by Iran (developing), which in turn is followed by Vietnam – a transforming/developing country. A key point of interest in respect of these findings is in how far the obtained values for critical mass, whose source variables make up two of the most important factors of production (labour and land), actually translate into higher economic potential.

ECONOMIC POTENTIAL

Economic potential forms the second component of the power model. The given equation shows that its two source variables are **GDP** and **FDI**. The system of measurement is identical to that given for critical mass and is measured out of a total two-hundred.

$$\text{Economic Potential} = \left(\frac{GDP_i}{GDP_w} \right) * 100 + \left(\frac{FDI_i}{World\ Total} \right) * 100$$

The first variable in the equation is GDP and measures the total output of goods and services produced during a period of one year. GDP is the most central of all source variables in the power model since its output provides a source of income to those who generate it (factors of production) and, via taxation, a crucial

source of government revenue. In terms of the latter this potentially provides governments with the capacity to invest in essential public services, such as infrastructure development (energy, roads, bridges, water, sanitation etc), healthcare, education, defence and national security. Hence, the component for economic potential functions almost as a centre of gravity in respect of this research since it operates between the use of resources (critical mass) and the provision of public services (military strength).

Foreign direct investment (FDI) is the second source variable chosen as a contributor to economic potential. This is because its role is not only one of inward supply, but its international transfer depends on a range of conditions existent in the host country. On the supply side, for example, the host country benefits from FDI in the form of varying levels of (low, medium, high) technological transfer. The presence and economic activity of foreign investors in host countries raises demand for local supply in terms of materials and natural resources as well as the main factors of production. A successful investment, once established and active, contributes positively to the labour market via the generation of employment, increases domestic competition and thereby plays a positive role in supporting a country's macroeconomic stability (Siebert 1997). However, the preconditions for investment include, among others, a comparatively well-developed infrastructure, economic incentives, rule of law in the form of investor protection and the provision of national security. Those countries able to satisfy these conditions, but which simultaneously exhibit good growth potential as well as long-run economic stability usually attract larger shares of inward foreign direct investment. In contrast, politically and economically unstable countries and/or those engaged in territorial disputes or conflict on the home front are less attractive for potential investors, unless of course the investment (which can include trade) focuses on the provision of, for example, military weapons.

Graph four shows that when GDP and FDI are both combined to form an index for economic potential, it is possible to group the top ten countries into three general categories:

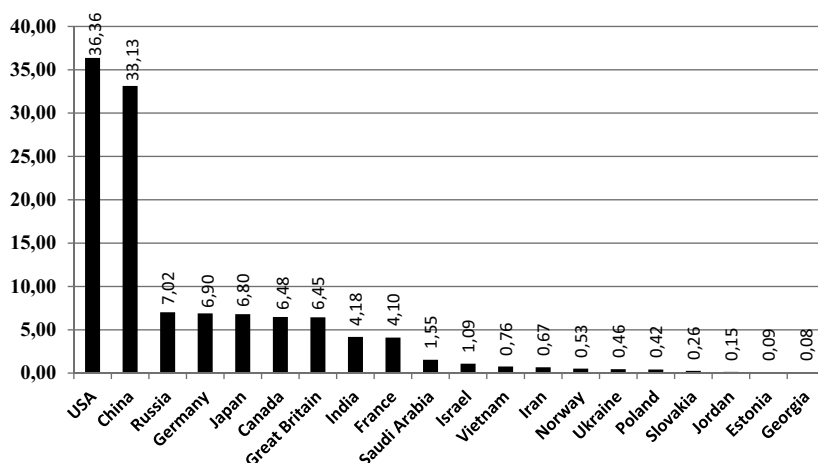
1. Advanced (United States, Germany, Japan, Canada, United Kingdom & France)
2. Highly populous (China & India)
3. Resource-rich (Russia & Saudi Arabia)

While group one countries have been developed and, comparatively speaking, technologically more advanced for longer in terms of time, group two countries possess the critical mass in terms of population, which enables them to generate larger volumes of GDP output and, given their market size, to attract large-scales of inward investment as they continue to grow and expand. This is particularly more evident in the case of China. In contrast, resource-rich Russia and Saudi Arabia of group three supplied 2.47% and 0.98% of global GDP output, respectively. In the case of Russia, subtracting its percentage GDP output from its economic potential index (see graph) reveals that it attracted 4.5% of world FDI flows in 2013, while Saudi Arabia accounted for 0.57%.

Out of groups one and two the United States and China dominate the entire range of countries with indexes of 36.3 and 33.1, respectively. This is four-times more than that of third placed Russia. At the time of writing GDP in the United States stood at \$16.2 trillion, representing 21.7% of the world total, while China supplied 11.9% of global output with a GDP of \$8.9 trillion (World Bank, 2014). Subtracting these percentage values from those shown in the graph sheds some light on the share of FDI attracted by each country.

Those countries which appear on the right-hand side of graph four (11-20) display indexes ranging from 1.09 (Israel) to 0.08 in Georgia. These can also be categorised according to the following:

1. Transitioning (Estonia, Georgia, Poland, Slovakia, Ukraine & Vietnam)
2. Resource rich (Norway & Iran)
3. Developing (Israel, Jordan & Iran)



Graph 4. Economic potential indicators combining GDP and FDI (2013)

Source: Own calculations based on world development indicators & bank data, 2014.

With the exception of resource-rich Norway, European countries such as Poland, Slovakia and Estonia are all members of the EU and NATO. Membership of these two institutions provides financial support for infrastructure development, a free trade arena and, in terms of the latter, security. As a result, these countries are on a convergence path towards economic development and a process of catch-up to levels observed among their western neighbours. Ukraine is not a member of the EU or NATO, though it does (see graph four) display an index for economic potential slightly above that of neighbouring Poland. Supporting this is Ukraine's population size, which is seven million higher. The country has a greater critical mass in terms of land mass (area) and it also borders Russia to the East. This is the major source of economic strength for Ukraine, especially given its more industrially concentrated and populated east. The two countries, however, are currently locked in political disputes directly related to the annexation of Crimea by pro-Russian separatists as well as their strongholds in the more strategic, eastern areas of the country. Territorial control also characterised the conflict that occurred in Georgia in 2008, suggesting that a path of independence coupled with eventual membership of the EU and/or NATO is contrary to Russian foreign policy. The downside, among other things, concerns the huge constraints that it places on economic potential in terms of output and each country's attractiveness to potential foreign investors.

Developing countries in the Middle East also face increasing barriers in realising their economic potential. Iran for example remains the focus of UN criticism due to its nuclear facilities as well as its uranium enrichment programme. The country has the second largest population in the region (78.4 mln) and has the fourth-largest volume of petroleum reserves in the world. Israel in contrast has the highest standard of living in the region, but borders countries which either pose a threat to its national security or with those currently at war or engaged in acts of terrorism. These include the current conflict in Syria and neighbouring Iraq, while more recent conflicts occurring during the past three years have included Egypt, Gaza, Israel, Palestine and Lebanon. Jordan, in contrast, while comparatively more stable and which signed a peace treaty with Israel in 1994, shares a lengthy border with neighbouring Syria to the North. In sum, economic potential and increased development is hindered in the region since none of the countries mentioned can be totally excluded from the threat of potential war or terrorism, which in terms of the latter are becoming increasingly more diversified in structure, common

in terms of number, complex to monitor and sometimes difficult to counter prevent. This presents a new set of challenges for public defence spending in terms of volume, structure and strategy.

MILITARY STRENGTH

The last subsection identified that some of the more acute reasons for the non-realisation of economic potential are conflict and war. While a number of the aforementioned comparatively weaker states are either engaged in military conflict of varying degrees or neighbouring the countries that are involved in them, it needs to be outlined that stronger states with higher economic potential and/or resources either directly or indirectly support some of them. Support can occur in the form of peace keeping operations or via the supply military and medical supplies to help countries defend themselves. However, some of the stronger states exert greater regional influence via their military presence, which on the one side can act as stabilising factor, but in the process can also destabilise and pose a threat to neighbouring countries.

The military expansion of China, for example, while viewed in the country as a means of avoiding backwardness is designed to protect the citizens of the country. However its strong presence at sea and in the air rings alarm bells in its diplomatic relations with Japan, South Korea, India and Taiwan. The very element of uncertainty in the meantime leaves countries with no option – the so-called “fear factor” – but to raise defence spending, though this may lead to a potential arms race. In terms of the latter this is frequently a part of the strategic game. Hence, military expansion raises international competition in the defence sector and stimulates greater research expenditure into new technology, increased productivity, foreign arms trade and, ultimately, the physical presence of a country’s military capability at sea, on land or in the air. Thus, the measurement and analysis of defence spending across countries provides orientation as to country-level goals and motivations.

Military strength is an important component of national power and its provision varies across countries from those content on purely defending national security interests to those protecting shipping lanes and foreign trade. Some countries however tend to project their respective defence capabilities and/or engage in arms trade, whether it be for reasons of strategy, international demand for arms or out of necessity as warranted by international security bodies. In this work we measure a country’s military strength by calculating its defence spending as a percentage of the world total. According to SIPRI (Stockholm International Peace Research Institute) the definition of military / defence spending includes expenditure on:

- The armed forces, including peace keeping forces
- Defence ministries and other government agencies engaged in defence projects
- Paramilitary forces when judged to be trained, equipped and available for military operations
- Military space activities

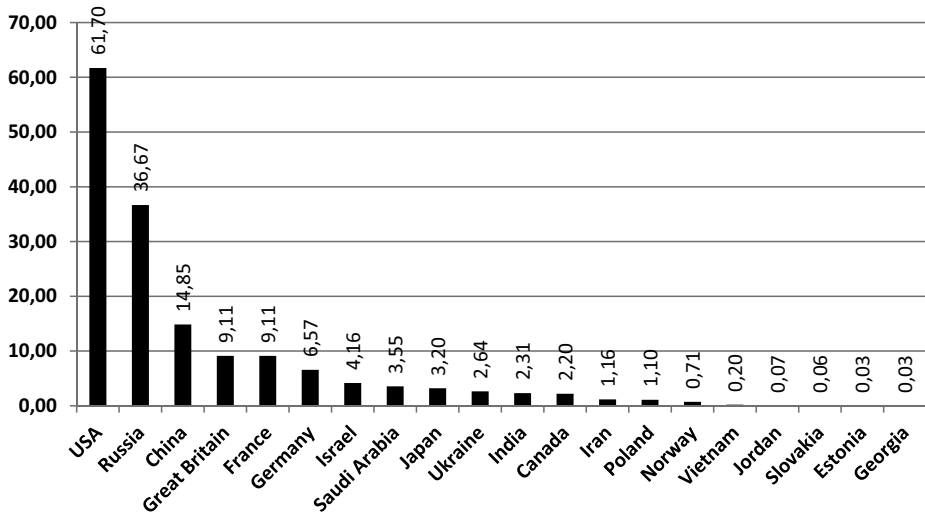
The second source variable included in this work is defence exports, which includes warships, submarines, military aircraft, tanks as well as a wide range of military weapons as used in conventional and other forms of warfare.

$$\text{Military Strength} = \left(\frac{\text{Defence Spending}_i}{\text{World Total}} \right) * 100 + \left(\frac{\text{Defence Exports}_i}{\text{World Total}} \right) * 100$$

The inclusion of defence exports in the measurement of military strength reflects the capacity of industry to produce beyond the possibility frontier. Hence, if a given country can produce for its own defence needs while simultaneously meeting export demand, then the industry is attracting investment. The sale and

export of defence armaments not only enables a country to earn sums far greater than those associated with the sale of standard consumer goods, but it also enables the defence producer as well the public sector of the exporting country to monitor the strengths and weaknesses of its own defence equipment during military engagement and also while in use by foreign armed forces.

Graph five reveals that, when measured out of a value of two-hundred, Ukraine and Israel enter the upper group of ten countries and replace India (11th) Canada (12th) when compared with graph four. This suggests that there is a positive correlation between economic potential and military strength. The United States with an index of 61.70 is clearly in a “super power” league of its own and this is confirmed by its defence spending, which accounted for 37% of the world total in 2013, while its exports accounted for almost a quarter (SIPRI, 2014). The world total for this particular year stood at \$1.7 trillion. In contrast, second placed Russia (index 36.67) accounted for 4.28% of world defence spending and ranks as the world’s number one exporter of military arms, accounting for 32.4% (Carbonnier et al., 2015). Russia has re-emerged as one of the world’s military powers, while China’s rapid military expansion is on a path of catch-up and convergence, consistent with its economic expansion.



Graph 5. Military strength indicators combining defence spending and exports (2013)

Source: Own calculations based on SIPRI data, 2014.

Western European countries (UK, France & Germany) rank in places from 4th to 6th on the world stage. Hence, four out of the upper six countries shown on the graph belong to NATO. The UK was marginally the largest defence spender out of these three European countries officially at almost 3.6% of the world total, though France records a slightly higher share (5.8%) of the world market for exports when compared with the UK (5.5%) and Germany (3.8%).

Of some significance to this research is the fact, that after the United States these three countries represent NATO’s larger European forces and, among others, are supported by the expansion of Poland’s military forces as well as Slovakia and Estonia (see graph). Poland is the larger country of the latter three and commands larger armed forces in contrast. It is geographically located on NATO’s East flank, bordering Ukraine

and is an important strategical partner in the alliance. Following the NATO summit in Newport, South Wales in 2014 as well as the follow up conference in Kraków (Institute of Strategic Studies and NATO), Poland has since raised its defence spending to 2% of GDP. This is consistent with the current conflict in Ukraine and these efforts have further been reinforced by the presence of NATO support units on Polish soil as well as in other East flank NATO countries. These developments, coupled with the implementation of western economic sanctions on Russia (Michta 2015), lend some weight as to the gravity of the security situation concerning the future stability of Ukraine as well as its implications for Europe.

The information thus far provided has compared and provided an overview of the three core components, which make up the total power of the twenty countries selected for this research. In respect of their critical mass, economic potential and military strength. However, for that power to be of effective and projected then military strength alone is insufficient without the addition and combined support of a nation's critical mass and economic potential. This work will therefore now provide the final results and analysis for total power – the sum of all three components for the years 2000 and 2013.

TOTAL POWER & EMPIRICAL RESULTS

Table one lists the twenty countries covered in this research and their results in respect of total power where the world is equal to two-hundred. The values for the years 2000 and 2013 are contained in columns three and six. The first observation concerns the fall in power indexes over the two years given. Ten out of the twenty listed countries observed falling power indexes - marked (*) and, out of these, eight of them are NATO members. This finding concurs with research carried out by SIPRI as shown at the beginning of this work in so far as North America, Western and Central Europe have all reduced defence spending in recent years. The remaining two (Georgia & Japan) both support NATO, while Japan is also involved in UN peace-keeping operations. In contrast the remaining ten out of the listed twenty countries increased their defence spending, though the more significant of these are more evident in the cases of China, Russia and also India. These three countries are placed 2nd, 3rd and 4th in table for the year 2013 with all three countries moving up in rank when compared with the year 2000. The rise of new super states such as China and India as well as the re-emergence of Russia as one of the global military powers is could have future implications for global security, since their rapid expansion both in terms of military expansion and space exploration tends place them all on the international radar as areas of interest. In sum, one could argue that these results do possibly reflect the current situation of the world in which we live.

Table 1

Country results and rankings for total power compared for the years 2000 & 2013

Rank (Year 2000)	Country	Power model	Rank (Year 2013)	Country	Power model
1	2	3	4	5	6
1	United States	44,77	1	United States	34,81 (*)
2	Germany	12,32	2	China	22,97
3	China	11,28	3	Russia	16,35
4	Russia	10,51	4	India	8,24
5	Great Britain	9,39	5	Great Britain	5,48 (*)
6	India	7,35	6	Germany	4,89 (*)
7	France	6,86	7	France	4,71 (*)

1	2	3	4	5	6
8	Japan	6,22	8	Japan	3,95 (*)
9	Canada	3,92	9	Canada	3,71 (*)
10	Israel	1,45	10	Saudi Arabia	1,98
11	Saudi Arabia	1,23	11	Israel	1,79
12	Poland	0,95	12	Ukraine	1,25
13	Ukraine	0,90	13	Iran	1,08
14	Iran	0,88	14	Vietnam	0,74
15	Norway	0,62	15	Poland	0,71 (*)
16	Vietnam	0,54	16	Norway	0,46 (*)
17	Slovakia	0,22	17	Slovakia	0,14 (*)
18	Georgia	0,16	18	Jordan	0,11
19	Jordan	0,09	19	Georgia	0,06 (*)
20	Estonia	0,03	20	Estonia	0,05

Sources: Calculations based on data obtained from the International Institute for Strategic Studies, the Stockholm International Peace Research Institute & the World Bank, 2013.

The results shown on table one raise questions as to the future direction of globalisation and in how far both NATO and non-NATO countries will help to shape it, especially in light of the increased numbers of conflicts and the overall deteriorating state of international security. The nature and very complexity of modern day threats span a wide spectrum ranging from conventional warfare to hybrid warfare, terrorism in its various forms and also cyber terrorism. The frequency and geographical spread of these acts of aggression represent a global issue and not one confined to a particular country or region. As a result countries are forced into raising their respective national security, state alert threats as well as spending on defence and national security.

IMPLICATIONS

The results shown on table one coupled with the knowledge concerning the state of security globally raises the inevitable question concerning the unfortunate likelihood of possible aggression and the projection of power by any country towards that of another. According to Chang (2014), for a country to stand a high probability of success as an aggressor at war, then it needs to project a level of “total power” that is between three and five times greater than that of the country that it plans to overcome. The decades of wars in the Middle East, for example, lend weight to this hypothesis; none of them can project a total power that is vastly superior to that of their neighbours. With this in mind one can observe that the United States (US) was in a far stronger position to overcome most nations in the world in the year 2000 than it was in 2013. The rise of China, Russia and India has closed the total power index gap over a thirteen year period. This suggests that, while the US remains the world’s most dominant military power the results indicate that most countries, regardless of size and capability, would choose to minimise risk and opt to search for a coalition partner or more. This was the position at the end of the cold war.

CONCLUSION

This research set out to measure, analyse and compare a group of countries in terms of total power. In doing so a sample set of twenty countries was selected whose military expenditure combined accounted for 75.8% of the world total in the year 2013. The countries used in the sample varied in terms of location, size, resources, development and military expenditure. The research was conducted with a particular focus on two particular years of the twenty-first century and driven by the desire to understand whether countries that spend more on the expansion of their military capabilities are necessarily more “powerful”. In order to achieve this it was necessary to construct a power model built up of three core components: critical mass, economic potential and military strength. Modifications to the source variables of these components were made and reconstructed for the purpose of this research.

The research firstly finds that the United States scored the highest index for total power and this was due to the fact that it ranked third in terms of *critical mass*, first for *economic potential* and first for *military strength*. China scored the second highest index for total power based on its rankings for critical mass (first), economic potential (second) and military strength (third). Russia, India and Great Britain form the remainder of the first five for total power. In light of this however the research does show that those countries, which appeared in the top ten for *economic potential* (see graph 4) also appeared in the top ten for *total power* in 2013. Out of these eight of them are also listed as revealing the highest military strength, suggesting a significant relationship between economic output, military dominance and total power.

The results for total power given in table one required elaboration in respect of interpretation and meaning and this was important for comparative purposes. For this reason the work of Chang, whose original research was the inspiration behind this paper provided useful guidelines. Accordingly, it was highlighted that an a country contemplating the invasion of another, regardless of reasons, would need to be able to project a total power approximately three-to-five times greater than that of the defending nation. Table one shows that the margins for total power between 2000 and 2013 have been closed significantly, especially higher up in the table. This leads to the conclusion that none of the leading powers would consider a full confrontation without the support of an ally or coalition, since attempting to do so could result in a waste of useful lives if the scale of the armed forces, levels of technology and the provision of intelligence are not sufficiently geared up to manage the task.

The results of this work find that the power model is a useful barometer for the measurement of a country's total power and it exhibits a positive relationship between the scale of the economy, its impact on the defence sector and in how far they interact in determining a nation's total power. However, future research in this area of specialisation recommends that the model be further modified in order to adequately account for the structure and size of a country's armed forces in order to reveal a value for total military capability. Ultimately, only with these additional defence parameters can a more suitable measure for military projection be determined. The salience of the subject illustrates the need for further research.

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