Inside NATO: Defence Spending, Collective Action Problems and Its Future

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ABSTRACT

NATO is a unique military and political international alliance that is well positioned to tackle problems that know no borders such as terrorism. However, it is facing collective action problems of free riding as well as of lack of credibility, which affects its efficiency. Interestingly, NATO has seemingly resolved both of its problems; free riding by presence of reciprocal actors and lack of credibility by adopting The Enhanced Forward Plan. Past defence spending of NATO member countries indicates that when GDP per capita of a country increases, the percentage of GDP spent on defence will slightly decrease. Similarly, social welfare and defence spending are negatively correlated while the percentage of population employed in manufacturing and defence spending have a positive correlation. NATO member countries are slowly moving towards reaching critical mass when it comes to following the treaty's spending goal, however in the future they will have to focus on the efficient and more effective allocation of defence funds.

Key words: NATO, international alliance, defence spending, collective action problem, free riding, credibility, counterterrorism

Znotraj NATA: proračun za obrambo, problem skupnega ukrepanja in njegova prihodnost

POVZETEK

NATO je edinstveno vojaško in politično mednarodno zavezništvo, ki je dobro vmeščeno da se sooči s problemi ki ne

poznajo meja, kot je terorizem. Vendar, se sooča s problemi skupnega ukrepanja kot sta zastonjkarstvo in pomankanje veredostojnosti, ki vplivajo na njegovo učinkovitost. NATO je obe težavi navidezno rešil; problem zastonjkarstva s prisotnostjo vzajemnih akterjev in pomanjkanje verodostojnosti s sprejetjem načrta za boljše napredovanje (Enhanced Froward Plan). Pretekli izdatki za obrambo držav članic NATO kažejo, da se bo z povišanjem BDP na prebivalca, odstotek BDP porabljen za obrambo, nekoliko zmanjšal. Podobno so izdatki za socialno varnost in obrambo medsebojno negativno povezani, medtem ko ima odstotek prebivalstva, zaposlenega v proizvodnji in obrambni proračun, pozitivno korelacijo. Države članice NATA počasi napredujejo k doseganju kritične mase finančnih sredstev določenih v sporazumu, vendar se bodo v prihodnosti morale osredotočiti na učinkovitejšo dodelitev obrambnih sredstev.

Ključne besede: NATO, mednarodno zavezništvo, proračun za obrambo, problemi skupnega ukrepanja, zastonjkarstvo, verodostojnost, protiterorizem

I. Opening Section

With the rise of the Islamic State, better known as ISIS, in 2015, Europe experienced an unprecedented number of "lone-wolf" terrorist attacks in the name of Allah all across the continent[1]. These attacks were almost unheard of prior to ISIS's rise. As a result, security at the airports and other public crowded places increased dramatically to prevent further attacks. Even though large scale Islamic State attacks are becoming increasingly rare, ISIS introduced a new decentralized form of terrorism through the means of the Internet. This means the problem of terrorism went beyond countries' borders and as such has to be tackled on an international scale.

North Atlantic Treaty Organization (NATO) with its purpose to ensure safety and security of all member countries using military and other political means, is a unique international alliance of powerful democracies with noble goals and it is ideally positioned to fight the war on terror. However, NATO is facing many

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[1] Paris terrorist attack in 2015, Brussels bombing in 2016, Berlin Christmas Market Attack in 2016, UK bombing 2017, Barcelona attacks 2017 etc.

internal problems and without their resolution it will not be able to tackle societal problems threatening the freedom and safety of individuals such as terrorism. President Trump has expressed his disagreement on multiple occasions with European countries that are not paying their full shares and during his 2016 campaign he even called NATO obsolete[2], but later changed his mind. Moreover, there is a lack of trust from other member countries with regards to the US respecting the treaty and actively responding to a possible attack on any of the smaller member countries. This is particularly important when looking at Russia's increased interest in Eastern Europe and inability of countries such as Lithuania, Latvia, and Estonia to defend themselves against Russia without any international help.

The goal of this paper is to explore the collective action problems that NATO is facing and to show that it is in the interest of both, the US and Europe to uphold their NATO membership requirements. Finally, I will discuss reasons and internal motives of both parties for the cooperation (one of them being counterterrorism) and explore what factors impact a country's allocation of funds towards defence. The US and Europe share similar democratic values and goals such as peace and free market economic policies, which makes the cooperation desirable. The US sees Europe as a vital ally and it is in its interest to ensure European safety. Europe, on the other hand, is more or less dependent on the US military power and there is no doubt that it greatly benefits from NATO. Despite this fact, most European countries as well as Canada and Turkey are not contributing as much as they had agreed to contribute to NATO. This creates a collective action problem of free riding, which the US is no longer willing to tolerate. Currently, there is an imbalance of power in terms of military strength leading to European dependence on the US, hence I expect to see movements towards resolution of the problem and more active European involvement in NATO in terms of economic and human resources. Moreover, the smaller European countries might not trust the US to actively respond in the case of an attack, which creates another collective action problem that could be resolved by credible commitments. I believe that once a critical mass of coun-

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[2] This Week Transcript: Donald Trump and Sen. Bernie Sanders. ABC News, 27 March 2016. http://abcnews.go.com/Politics/week-transcript-donald-trump-sen-bernie sanders/story?id=37949498, 4 August 2019. E-source.

tries that are paying their fair share is reached, more countries will feel obliged to contribute equally as well due to the presence of reciprocal actors.

I start this paper with an overview of NATO as an organization and I explain how it functions. I continue with a brief history of NATO and the reasons why it was formed. I describe the problems NATO is currently facing and discuss motives of Europe and the US to stay in NATO. Although NATO consists of the US, 25 European countries, Turkey and Canada, the focus of this paper is on the relationship between the US and European countries. I will use game theory to explain the relationship between the actors, model some gams and relate reciprocity, trust, credibility and critical mass to find plausible solutions to the collective action problems NATO is facing. I also include Olson's paper[3] about international alliances and use it to explain the disproportionate distribution of costs in NATO. In the empirical section I run different regressions to present a simple model that explains the level of spending on defence by each member country. Finally, I conclude with the discussion of current events, implications for the future of NATO and how NATO is uniquely positioned to target key societal international problems.

II. Descriptive Section

a) NATO as an organization

NATO stands for the North Atlantic Treaty Association and it currently consists of 28 countries. Its primary goal is "to safeguard the freedom and security of its members through political and military means[4]". Article 5 of the treaty specifies that if any of the member countries is attacked, that will be consider an attack on all the countries in NATO[5]. For example, if Russia attacked or declared war on Lithuania, that would be treated as a direct attack on all the other 27 countries in NATO and all of them would be obliged to respond. This does not only greatly increase the de-

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[3] Olson, & Zeckhauser, (1966). An Economic Theory of Alliances. The Review of Economics and Statistics, 48(3), 266-279. doi:10.2307/1927082.
[4] What is NATO? NATO. http://www.nato.int/nato-welcome/index.html, 4 August 2019. E-source.
[5] NATO Collective Defence - Article 5. NATO. http://www.nato.int/cps/cn/natohq/topics_110496.htm, 4 August 2019. E-source.

fence capability of countries with smaller military forces, but it also acts as a deterrence mechanism. Russia is significantly less likely to attack or annex a country in NATO as that would be considered directly attacking the United States of America, Turkey, France, the UK, Germany and other NATO members.

NATO does not only act as a very effective deterrence mechanism, it is also a promoter of democracy and a military body that managed to escape Robert Jervis's security dilemma[6], at least among the member countries. Security dilemma or a spiral trap occurs when a country increases its defence spending and military capabilities usually for security reasons. However by doing that it tends to scare other countries, which in response increase their defence mechanisms, again causing fear in the first country, that responds with even more activity in their defence sector. This creates a vicious cycle that has usually ended in wars, thus security dilemma is a fatal trap. However, NATO is a peculiar phenomenon in international relations as member countries are essentially encouraging each other to allocate more funds towards defence spending. Moreover, one of the prerequisites of NATO membership is a democratic regime, hence NATO indirectly spreads democratic values across the globe. It is exactly due to its democratic nature and political influence that NATO is in in a unique position to tackle societal problems that know no borders such as terrorism as well as preventing genocides, forced and illegal annexations of territories, human rights violations etc.

In 2006, member countries agreed to spend at least 2% of their GDP on defence and out of the 2% spent on defence at least 20% should be invested in military equipment and research and development of better defence equipment.[7] The other two categories are personnel expenses & pensions as well as research and operations, exercises and maintenance of already existing equipment and infrastructures[8]. By specifying the amount that should be spent on defence and especially on the equipment, NATO is not only ensuring the growth in terms of its military capabilities, but also that their equipment is modern and constantly improving. However, NATO admits that the guidelines are fairly vague

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[6] Jervis, (1978). Cooperation Under the Security Dilemma. World Politics, 30(2), 167-214. http://www.jstor.org/stable/2009958.
[7] Funding NATO. NATO. http://www.nato.int/cps/ro/natohq/topics_67655.htm, 4 August 2019. E-source.
[8] Ibid.

in terms of definitions on what defence expenditures are, hence some countries might not be spending their money efficiently[9]. Take Greece as an example. Jonathan Eyal for Foreign Affairs writes, "Greece meets the two-percent-of-GDP target, but wastes most of that money on maintenance, salaries, and pension liabilities rather than on building an effective fighting force[10]".

In 2014 at the Wales Summit, the 23 countries that are currently spending less than 2% of their GDP on defence, re-committed themselves to their spending goal and promised that they will all achieve that goal by 2024[11]. In 2016, there was already an improvement as 22 countries increased their spending[12] and in March 2019, The Economist[13] reported that 8 countries reached the defence spending goals of 2%. In 2016 at the Warsaw Summit, the countries agreed on Enhanced Forward Presence plan, which would commit both the American and European resources to Eastern Europe[14] According to the Enhanced Forward Presence plan, four battalions should be deployed to Latvia, Lithuania, Estonia and Poland in order to increase the presence of NATO in Eastern Europe and in June 2019, President Trump announced he will send even more soldiers to Poland to safeguard the Eastern border and also to reward the country for increasing its defence spending[15].

b) History of NATO and its goals

After the Second World War Europe was completely destroyed. Millions of people died during the war and those who survived were left homeless and starving. Houses and other infrastructure were demolished and most of European countries were financially exhausted. The Soviet Union started to actively spread com-

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[9] Ibid.
[10] Eyal, The Real Problems With NATO: What Trump Gets Right, and WrongForeign Affairs, 2 March 2017. https://www.foreignaffairs.com/articles/europe/2017-03-02/real-problems-nato, 12 May 2017. E-source.
[11] Kottasova, I. NATO in the crosshairs: Who's not paying their bills. CNN Money, 24 January 2017. http://money.cnn.com/2017/01/24/news/donald-trump-nato-spending/, 4 August 2019. E-source.
[12] Ibid.
[13] NATO members' promise of spending 2% of their GDP on defence is proving hard to keep. The Economist, 14 March 2019. https://www.economist.com/special-report/2019/03/14/nato-members-promise-of-spending-2-of-their-gdp-on-defence-is-proving-hard-to-keep, 6. August 2019. E-source.
[14] Eyal, The Real Problems With NATO: What Trump Gets Right, and Wrong. Foreign Affairs, 2 March 2017. https://www.foreignaffairs.com/articles/europe/2017-03-02/real-problems-nato, 12 May 2017. E-source.
[15] Groll, Seligman. Trump's Polish Message to NATO: New security agreement rewards Poland's commitment to defense spending. Foreign Policy, 13 June 2019. https://foreignpolicy.com/2019/06/13/trumps-polish-message-to-nato/, 4 August 2019. E-source.

munism and it was not hiding its ambitions to gain influence in Europe. Czechoslovakia fell under communism in 1948 and the US became more and more concerned about the whole situation. The US put the Marshall plan into effect in 1948, and although that was a greatly needed financial injection into Europe it was not enough. It was crucial to rebuild the continent and European trading as that was the only way for Europe to start functioning normally and independently once again. The Western European countries agreed that in order to return to pre-war prosperity military protection and security were essential. Hence, in 1948 they aligned themselves into Western Union whose purpose was collective defence[16]. However, it soon became clear that the only way to defy Stalin, was a transatlantic alliance. On April 4th, 1949, Belgium, Canada, Denmark, France, Iceland, Italy, Luxembourg, The Netherlands, Norway, Portugal, The UK, and the USA signed the North Atlantic Treaty that included Article 5 - an attack on any of the countries that had signed the treaty, will be considered an attack on all of member countries[17]. In 1949 when NATO was established, the alliance had three main goals[18]:

1. Prevent Soviet spread into Europe;

2. Keep an eye on Europe and control nationalistic movements within Europe that started both World Wars;

3. Encourage European political integration.

During the Cold War NATO was a passive organization whose main focus was preventing the Soviet Union from gaining influence in Europe. It followed the US policy of massive retaliation, which meant that any attack on any of the member countries, would result in a nuclear war[19]. After the end of the Cold War and the collapse of the USSR in 1991 the future of NATO was uncertain[20]. It was not clear whether the alliance was needed anymore as the threat of the Soviet Union was gone. However, shortly after the Soviet Union, Yugoslavia followed and collapsed, which brought to life numerous national conflicts in the Balkan peninsula. In or-

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[16] NATO Public Diplomacy Division. (2012). A short history of NATO. http://www.nato.int/nato_static/assets/pdf/pdf_publications/20120412_ShortHistory_en.pdf

[17] NATO Public Diplomacy Division. (2012). A short history of NATO. http://www.nato.int/nato_static/assets/pdf/pdf_publications/20120412_ShortHistory_en.pdf.

[18] Ibid.

[19] Office of the Historian https://history.state.gov/milestones/1945-1952/nato, 4 August 2019. E-source.

[20] NATO Public Diplomacy Division. (2012). A short history of NATO. http://www.nato.int/nato_static/assets/pdf/pdf_publications/20120412_ShortHistory_en.pdf.

der to maintain peace and stability in Europe, NATO refocused on its second and third goals and intervened in the Bosnian war and most recently in the war in Kosovo.

Throughout history NATO has been forced to adapt and 9/11 illustrated a new goal for the alliance - countering terrorism. In the 21st century de-centralized terrorism has been on the rise and NATO rapidly added counterterrorism to its list of goals. Politifact reported that, "in 2016 NATO created an assistant secretary general for intelligence and security to head a newly established Joint Intelligence and Security Division[21]". Due to the creation of the new terrorist-focused division, President Trump, also changed his opinion and at the press conference on April 27th, 2017 said, "The secretary general and I had a productive conversation about what more NATO can do in the fight against terrorism. I complained about that a long time ago, and they made a change. Now they do fight terrorism. I said it was obsolete. It's no longer obsolete[22]". Even though the creation of the new division was not a direct result of President Trump's complaints[23], it did reassure the US and demonstrated the need for NATO.

Since its establishment, the purpose of NATO has stayed the same – peacekeeping and peacemaking – however its goals have changed. Nowadays we can consider NATO to have five main goals:

1. Overall security, deterrence, defence, and consultations[24]: One of NATO's main goals and its mission is peacekeeping. It is important to note, however, that in the case of internal coups or civil wars, the member country is not eligible for NATO's protection[25].

2. Containment of Russia: Russia has once again become more aggressive and in 2014 forcefully annexed Crimea. As a result of Russia's increased presence at its western border, Latvia in 2016 spent 42% more on defence than in previous years and

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[21] Carroll, Trump no longer thinks NATO is obsolete. Politifact, 12 April 2017 http://www.politifact.com/truth-o-meter/statements/2017/apr/12/donald-trump/donald-trump-nato-i-said-it-was-obsolete-its-no-lo/ , 4 August 2019. E-source.

[22] Ibid.

[23] Ibid.

[24] For NATO membership, it is essential that a country is a democracy. In case of a humanitarian crisis or any crimes against humanity, genocide, or other war crimes, it is safe to assume NATO would interfere due to its purpose.

[25] Amadeo, NATO, Its Purpose, History, and Members: We Need NATO Now More Than Ever. The Balance, 12 December 2018. https://www.thebalance.com/nato-purpose-history-members-and-alliances-3306116, 4 August 2019. E-source.

Lithuania increased its spending by 34%[26] and more troops have been deployed to the Eastern border, most recently in Poland.

3. Counterterrorism including the fight against weapons of mass destruction and cyberattacks: Threats relating to terrorism know no borders, hence only a democratic and international cooperation can successfully tackle them.

4. Crisis Management: NATO (might) intervenes in political, military, or humanitarian crisis. So far it has helped managed the crisis during the Bosnian War in the early 1990s, followed by interventions in "Kosovo, North Macedonia, Afghanistan, the Mediterranean, off the Horn of Africa, over Libya and in support of the African Union"[27] as well as 9/11.

5. Partnership, international cooperation and proliferation of democratic values

c) Motives for the European (Canadian and Turkish) membership in NATO

There are two main reasons for European interest in NATO:
1. the combined military resources increase the defence capabilities of smaller nations;
2. the decreased cost of defence.
The United States military is with 1,358,193 active military personnel third biggest military in the world (preceded by China and India)[28]. The second largest NATO country is Turkey with 355,2000 people (14th in the world) followed by France (23rd in the world) with 202,700 people, and Germany with 178,600 active military personnel (27th in the world)[29]. There is no doubt that in terms of military strength, a clear power imbalance exists among the member countries. Iceland for example, does not even have an army. European countries, especially the smaller ones, greatly benefit from being in the alliance as it grants them access to the resources of all member countries including the large, experienced, and technologically advanced American military. Moreover, it is extremely beneficial for them to be spending only 2% of their GDPs

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[26] Kottasova, NATO in the crosshairs: Who's not paying their bills. CNN Money, 24 January 2017. http://money.cnn.com/2017/01/24/news/donald-trump-nato-spending/, 4 August 2019. E-source.
[27] Crisis management. NATO, 27 February 2018. https://www.nato.int/cps/en/natohq/topics_49192.htm, 6 August 2019. E-source.
[28] Dillinger, 29 Largest Armies In The World. World Atlas, 26 July 2019. http://www.worldatlas.com/articles/29-largest-armies-in-the-world.html, 4 August 2019. E-source.
[29] Ibid.

on defence, but in return benefitting from an army of more than 2 million people with the most advanced military technology. Finally, it is very valuable and advantageous for European countries to be a part of a strong alliance with so many countries that all share democratic values and see peacekeeping as their common goal[30]

d) Motives for the American membership in NATO

Since the end of the Second World War, the US has been trying to ensure European stability and independence from the Soviet Union and nowadays Russia. American interest in Europe is not surprising as they have multiple reasons to keep Europe as their closest ally:

1. Economic interest: The European Union ranked 1st as the export market and 2nd as the import market for the US in 2018[31]. According to the Office of the US Trade Representative, the total worth of American exports to the EU in 2018 was $319 billion dollars, which accounted for 19.1% of total exports. Similarly, the imports from the EU in 2018 represented 19.2% of total imports amounting to $488 billion[32]. The US has a vital economic interest in keeping Europe safe and secure because any instability, war, or large national conflict, could dramatically impact American economy.

2. European geopolitical position: Olson[33] argues that Europe acts as a buffer state between the US and the USSR/Russia. Europe's unique geopolitical position combined with common goals, values and to some extent history, makes Europe a perfect American ally, which at the same time spreads American soft power and limits Russian influence.

3. Containment of Russian influence and fear Russia would grow too strong with Europe as an ally: Olson discusses that larger members of the alliance are likely to fear losing other members of the alliance to the hostile forces. He argues that if the larger nation does not protect the smaller ones, they "would

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[30] What is NATO? NATO. http://www.nato.int/nato-welcome/index.html, 4 August 2019. E-source.

[31] Office of the United States Trade Representative – European Union. Executive Office of the President. https://ustr.gov/countries-regions/europe-middle-east/europe/european-union, 4 August 2019. E-source.

[32] Ibid.

[33] Olson & Zeckhauser, (1966). An Economic Theory of Alliances. The Review of Economics and Statistics, 48(3), 266-279. doi:10.2307/1927082.

then fall to the common enemy and thereby strengthen the enemy at the expense of the alliance[34]". From the US perspective, Russia is the common enemy and with its growing aggression and illegitimate annexation of Crimea, the US can be justifiably concerned for the future of the Baltic States, should the US leave NATO. Hence, it is in the US interest to remain in NATO and provide the necessary military support to assist European allies.

e) Description of the problem

NATO is facing two main collective action problems that this paper is going to focus on:
1. free riding of many countries;
2. lack of trust towards the United States of America.

Even though it is in the interest of all the member countries to remain in NATO and that NATO as an alliance continues to exist, most of the countries are not contributing the agreed-upon amount towards the collective goal of defence. In 2019, only 8 out of 28 countries reached the spending goal[35]. However, as illustrated in Figure 1, most countries have increased their spending since 2015 as promised at the Wales Summit. That being said, even with the recent increase the majority is still not even close to the agreed spending goal. Similarly, in 2016, only 9 countries spent 20% of their defence spending on equipment as seen in figure 2, making free riding a huge problem.
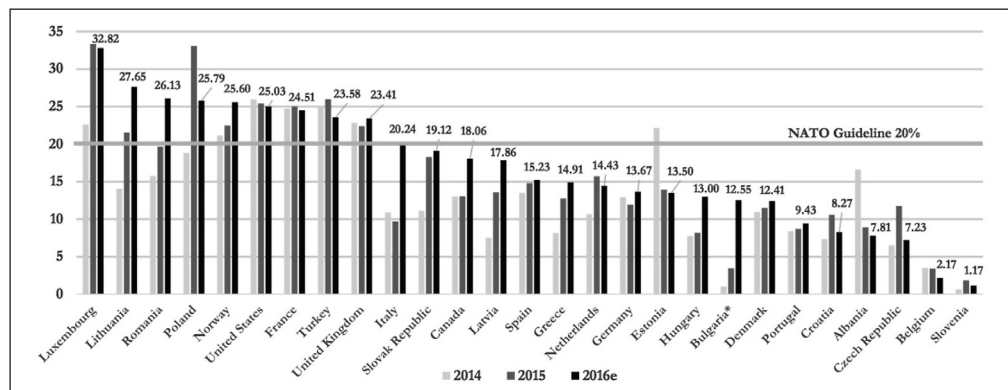
The second collective action problem is lack of trust towards the US. Smaller countries do not necessarily trust the US to react in the case of an actual attack, but they do almost completely rely on the American military power. Even though the US claims that it is committed to NATO and will react and follow the treaty if any of the member countries invoke article 5[36], the US verbal re-commitment is not seen as credible by the smaller countries, especially in the light of President Trump's constant critiques of the alliance and his threats to leave it.

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[34] Olson & Zeckhauser (1966). An Economic Theory of Alliances. The Review of Economics and Statistics, 48(3), 274. doi:10.2307/1927082.
[35] NATO members' promise of spending 2% of their GDP on defence is proving hard to keep. The Economist, 14 March 2019. https://www.economist.com/special-report/2019/03/14/nato-members-promise-of-spending-2-of-their-gdp-on-defence-is-proving-hard-to-keep, 6 August 2019. E-source.
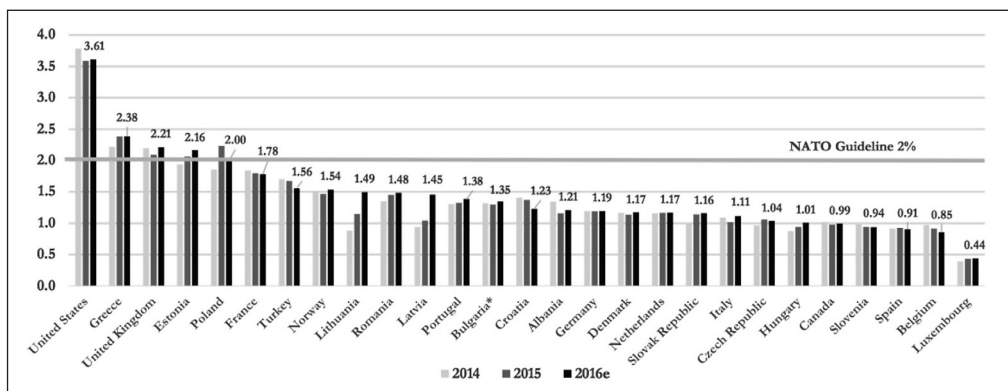[36] Press, P. S. Business Insider: Here's Who is Paying the Agreed-upon Share to NATO - and Who Isn't. Business Insider, 16 February 2017. http://www.businessinsider.com/nato-share-breakdown-country-2017-2, 4 August 2019. E-source.

Figure 1: Defence Expenditure as a share of Gross Domestic Product (in %) based on 2010 prices and exchange rates

Source: Defence Expenditures of NATO Countries (2009-2016)37

Figure 2: Equipment as share of Defence Expenditure (in %) based on 2010 prices and exchange rates

Source: Defence Expenditures of NATO Countries (2009-2016)38

III. Theoretical Section

The collective action problem (CAP) of free-riding can be simply modelled as a Prisoner's dilemma game (Table 1). NATO is providing a public good (defence) and each country has two choices – ei-

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37 Defence Expenditures of NATO Countries (2009-2016). NATO Press & Media, 4 July 2016. https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2016_07/20160704_160704-pr2016-116.pdf, 8 April 2017. E-source.
38 Ibid.

ther to spend at least the agreed-upon amount of 2% of their GDP on defence or to violate the treaty and spend less than 2%. The two players in the game below (Table 1) are any two member countries of NATO. As it is typical for a Prisoner's dilemma game, Nash Equilibrium of (spend less, spend less) gives the outcome of this game, which is different that the social optimum (spend 2%, spend 2%), where everyone would be better off. Because defence is a public good, it is not rival or excludable, players do not have to pay the cost to enjoy the benefits. Players are rational and are trying to increase their own material payoffs, hence they choose to not pay the costs. However, because they both (all) do that, the public good is either not provided at all or at least is not as good as it could be if both (all) players contributed the agreed-upon amount. Moreover, in this case the payoffs for all players are lower than they would be if they all shared the costs and spend 2% of GDP on defence.

Table 1: Simple PD game

	Spend 2% on defence	Spend less
Spend 2% on defence	2,2	0,3
Spend less	3,0	1,1

However, this is not the outcome that happens in the real life. Ever since the Wales Summit, countries have been increasing their spending on defence, which points to the existence of certain enforcement mechanisms that by altering the payoffs of the game, move the Nash Equilibrium.

One of the usual resolution of CAPs is a specification of (1) gains, (2) expected strategies of both players, and (3) sanctions in the form of a contract. The treaty itself, which was signed by all 28 countries, is a contract, however it is clearly not being respected by most of the member countries due to the second order collective action problem of enforcement. Ferguson[39] argues that the resolution of first order CAPs in this case spending on defence, can only be resolved by implementation of credible commitments that will resolve second order CAPs. He defines a credible commitment as "one that involved parties would find in their interest to honour
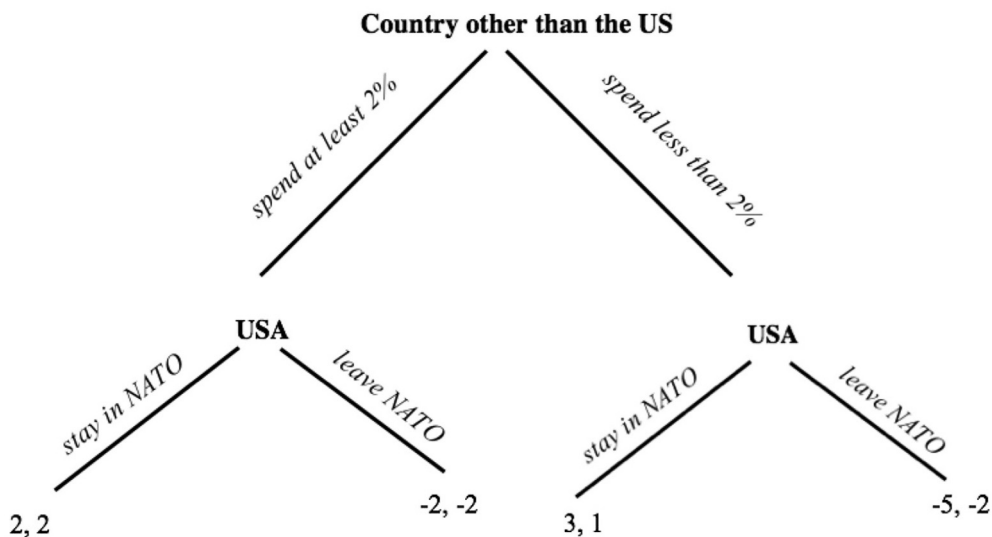
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[39] Ferguson (2013). Collective Action and Exchange: a Game-theoretic Approach to Contemporary Political Economy. Stanford, CA: Stanford economics and finance.

in any contingency (likely or not) for which adherence could be called for[40]" and that it "depends upon social mechanism that can somehow orchestrate coordination, enforcement, and trust[41]".

First enforcement mechanism that shapes NATO and plays a role in the resolution of the 2nd order CAPs is power, which can be broadly defined as an ability of one player to force the other player to do something, which the latter otherwise would not do[42]. There are two other important aspects of power that Ferguson mentions – (1) asymmetry of power and (2) use or threat of sanctions and the US has tried to use both to enforce the rules of the treaty.

The military strength of the US causes an asymmetry of power within NATO. Smaller European countries are militarily completely dependent on NATO and especially on the US. The power of the US comes from their access to resources and to a certain extent from their reputation as the leader of the free world, which is essentially their institutionalized power. The US could use its military superiority and power 1 to physically force other countries to start paying their fair shares. However, that is not how NATO functions, hence this paper will focus on power 2 and the use of a strategic threat.

Figure 3: A sequential game between a country in NATO that is not the US and the US

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[40] Ibid, page 43.
[41] Ibid, page 44.
[42] Ibid, page 65.

The US could use a negative sanction and threaten to leave NATO to try to enforce the treaty's rules. However, because this sanction would negatively impact everyone including the US, the threat itself is not credible. The situation can be modelled as a two-stage game (Figure 3) with smaller countries moving first deciding on how much money they are willing to allocate to defence. The US moves second choosing between remaining in NATO and leaving it. The dominant strategy of the US is to stay in NATO due to the motives discussed in the Descriptive Section. All in all, the strategic threat to leave NATO is not credible.

The backward induction equilibrium is to spend less than 2% for countries that are not the US, and for the US to stay in NATO. However, in 2014, all countries that were not paying their proportionate shares committed to reach the 2% rule by 2024 and in 2015, 22 of them increased their spending on defence[43]. The power asymmetry and use of power 2 are clearly not enough to explain this recommitment to the goal. However, it can be explained by the presence of reciprocal actors who do not solely care about their material payoffs, but also have social preferences that provide incentives for wanting to contribute.

Ferguson defines intrinsic reciprocity as an "intrinsic desire to reward behaviour that appears to be kind or fair and likewise punish seemingly unkind or unfair behaviour[44]". In the past 5 years, countries that are not fulfilling their responsibilities have received a lot of negative media attention mostly by the American media and sharp criticism by President Trump, whereas they recognize the 8 countries who are following and respecting the treaty[45]. This can be interpreted as the US publically ostracizing, denouncing and punishing the defectors and rewarding the contributors. It is because of the (1) presence of reciprocal actors and (2) guilt of countries that are not paying their fair shares, that all countries have been slowly increasing their spending and recommitted to

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[43] Kottasova, NATO in the crosshairs: Who's not paying their bills. CNN Money, 24 JANUARY 2017. http://money.cnn.com/2017/01/24/news/donald-trump-nato-spending/, 4 August 2019. E-source.

[44] Ferguson, (2013). Collective Action and Exchange: a Game-theoretic Approach to Contemporary Political Economy. Stanford, CA: Stanford economics and finance. Page 93.

[45] Primeri: Kottasova, NATO in the crosshairs: Who's not paying their bills. CNN Money, 24 January 2017. http://money.cnn.com/2017/01/24/news/donald-trump-nato-spending/, 4 August 2019. E-source; Press, P. S. Business Insider: Here's Who is Paying the Agreed-upon Share to NATO - and Who Isn't. Business Insider, 16 February 2017. http://www.businessinsider.com/nato-share-breakdown-country-2017-2, 4 August 2019. E-source; Military Spending by NATO Members. The Economist, 16 February 2017. http://www.economist.com/blogs/graphicdetail/2017/02/daily-chart-11, 6 August 2019. E-source.

the spending goal. Due to reciprocity, the new game looks more like an assurance than the Prisoner's Dilemma game. Similar to the game in Table 1, players in the game shown in Table 2 are any NATO member countries.

Table 2: Adjusted PD game with reciprocity

	Spend 2% on defence	**Spend less**
Spend 2% on defence	*2 + R, 2 + R*	*0 + r − p(n),* *3 − P(n) − g(n)*
Spend less	*3 − P(n) − g(n),* *0 + r − p(n)*	*1 − g,* *1 − g,*

R = reward from respecting the treaty
P = punishment from violating the treaty
r = reward from punishing the violator
p = cost from implementing the punishment
g = guilt from not respecting the treaty
n = number of countries that are respecting the treaty

Each actor receives a positive payoff if it (1) follows the treaty, (2) rewards others who do the same and (3) punishes violators. Now the chances of the Nash Equilibrium being that everyone follows the treaty and spends 2% of their GDP on defence are substantially higher and if R and P are large enough, the game will turn into an assurance game. This has been slowly happening in NATO and hopefully by 2024 all the countries will be contributing their fair shares. The above payoffs also introduce the idea that when more countries contribute, the punishment and feeling of guilt for not contributing increases, making defection less likely. Moreover, when more countries contribute, the cost of punishing the defectors becomes smaller as more countries share that cost.

Schelling[46] discusses critical mass, a phenomenon describing a sufficient number of participants in an activity so that the activity actually occurs. Eventually it becomes self-sustaining exactly because so many people are participating. In other words, critical mass is the tipping point that needs to be reached for a process to happen. If critical mass is never reached, the activity will never happen. However, if critical mass is reached, everyone will eventually participate. The critical mass concept in addition to social

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[46] Schelling, (2006). Micromotives and Macrobehavior. New York (N.Y.): Norton.

reciprocity is a possible solution to the NATO collective action problem as it would significantly increase social ostracism once the tipping point is reached. In that case, the feeling of guilt for countries that are spending less than 2% would become greater (see Table 2). Once it becomes large enough to reflect $3 - P(n) - g(n) < 2 + R$, the outcome would be all countries spending the agreed-upon amount on defence.

Exploring the rationale for international alliances, Olson argues that different sizes of nations result in different valuations of public goods, in this case defence. Bigger nations value defence higher than smaller ones. He provides two explanation for this; (1) bigger nations require a bigger military to defend themselves and (2) smaller nations feel that even if they contribute as much as they can, their contribution will not change the balance of power in the world[47]. Therefore, Olson concludes that smaller nations prefer pacifist ideologies and do not value military power as much as bigger nations. As a result, "... individual members may have an incentive to make significant sacrifices to obtain the collective good," Olson observes, "there will also be tendency for the "larger" members – the one that places the higher absolute value on the alliance good – to bear a disproportionate share of the burden[48]", which is clearly seen in the case of NATO[49].

The second collective action problem of NATO is the lack of trust and credible commitments. Smaller countries are completely dependent on the US and other bigger nations with great military power and they have to trust them to respond in a case of an attack. However, in times of peace, it is difficult and challenging to build a reputation of trustworthiness. The country that struggles with that the most is the US, whose president is known for his impulsiveness and fickle character. In order to truly prove its dedication to NATO and readiness to respond, it is crucial for the US to stop with the threats of leaving the alliance as well as to invest resources and by that signal a very credible commitment to NATO. The best option to do so, is realizing the Enhanced Forward Plan, which would mean that the US deploys some of its troops to Europe. In

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[47] Olson, & Zeckhauser, (1966). An Economic Theory of Alliances. The Review of Economics and Statistics, 48(3), 271. doi:10.2307/1927082.
[48] Ibid, page 268.
[49] For Olson's graphical representation, see the appendix A

the past year, the US alongside other Western European countries actively started to realize the plan. By sending its soldiers, the US does not only reassure its allies but also forces Europe to allocate more funds into the front-line troops. NATO is realizing the Enhanced Forward Plan and The Independent[50] reported that up to February 2017, 7000 soldiers from NATO countries have been deployed along the Russian border in Eastern Europe and recently the US sent additional 1000 troops to Poland[51].

IV. Empirical Section

A. Methodology and analytical techniques

I compiled my own data set by combining data from NATO Defence Expenditures[52], OECD Social Expenditures[53], The World Bank[54] and the Manifesto Project[55]. I created two data sets, but used the same dependent variable and unit of analysis for both.

1. First data set: Data for all the 28 countries in NATO over the time period 2009 to 2016. Independent variables were year, percentage spent on welfare, GDP per capita, percentage of working population employed in manufacturing, and a dummy variable for whether the country was a part of the Eastern bloc prior to 1991[56]. The unit of analysis was a country in NATO during the given time period and the dependent variable was the percentage of GDP spent on defence.

[50] Batchelor, The Map that Shows How Many NATO Troops are Deployed along Russia's Border. The Independent, 5. Februar 2017. E-source. .http://www.independent.co.uk/news/world/europe/russia-nato-border-forces-map-where-are-they-positioned-a7562391.html, 4. avgust 2019. E-source; For the map and break down of countries that have sent soldiers, see the apendix B

[51] Groll, Seligman, Trump's Polish Message to NATO: New security agreement rewards Poland's commitment to defense spending. Foreign Policy, 13 June 2019. https://foreignpolicy.com/2019/06/13/trumps-polish-message-to-nato/, 4 August 2019. E-source.

[52] NATO Press & Media. (2009, February 19). Financial and Economic Data Relating to NATO Defence (2004-2008), 19. Febraury 2009. http://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2009_02/2009_03_D34F22C9AE854B7FAA0BB409A21C90D3_p09-009.pdf, 12 May 2017; **Defence Expenditures of NATO Countries (2009-2016). NATO Press & Media, 4 July 2016.** https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2016_07/20160704_160704-pr2016-116.pdf, 8 April 2017. E-source.

[53] OECD. Social Expenditure - Aggregated data. https://stats.oecd.org/Index.aspx?DataSetCode=SOCX_AGG, 9 April 2017.

[54] The World Bank. Employment in Industry (% of Total Employment). http://data.worldbank.org/indicator/SL.IND.EMPL.ZS, 9 April 2017

[55] Volkens et al. (2017): The Manifesto Data Collection. Manifesto Project (MRG / CMP / MARPOR). Version 2017a. Berlin: Wissenschaftszentrum Berlin für Sozialforschung (WZB). https://doi.org/10.25522/manifesto.mpds.2017a, 9 April 2017.

[56] For more information about independent variables, see the appendix C

2. Second data set: Data for 26 NATO countries from 2004 to 2010 (Albania and Croatia joined NATO in 2009, hence they are excluded from this dataset). The dependent variable and unit of analysis remained the same as in the first dataset and so did all the independent variables. The only new independent variable is a measure of the ideological position of the government for each country from 2004 and 2010 called the "right-left" and it illustrates whether the government was leaning to the ideological right or left. The measure of the right-left position was calculated as a part of the Manifesto Project[57] and it contains values of all political parties over the course of more than 50 years for more than 30 countries. I was expecting to find out that more right-leaning governments spend more money on defence. For my independent variable that measure right-left positions, I used the position of the majority party in the government for each country between 2004 and 2010.

The right-level position variable is also the reason why I created two datasets and ran two slightly different regressions. The data for the right-left position measure was only available until 2010, but because free-riding is a current problem of NATO, I sought to see what has impacted a country's level of spending in the recent years. The only way to include both, the most recent years (up to 2016) and right-left position using STATA was to create two datasets with two different time periods and run two separate regressions.

I ran 4 regressions, 2 from each data set. As stated before, the dependent variable is the same in all 4 regressions.

a) 1st regression from the 1st dataset (years 2010-2016)

$$percentage\ of\ GDP\ spent\ on\ defence$$
$$= \beta_0 + \beta_1 2010 + \beta_2 2011 + \beta_3 2012 + \beta_4 2013 + \beta_5 2014 + \beta_6 2015 + \beta_7 2016$$
$$+ \beta_8 gdp\ per\ capita + \beta_9 eastern\ bloc$$
$$+ \beta_{10} percentage\ of\ gdp\ spent\ on\ welfare$$
$$+ \beta_{11} percentage\ of\ working\ population\ employed\ in\ manufacturing$$

b) 2nd regression from the 1st dataset (years 2010-2016): same as the regression in a, but controlled for yearly fixed effects

c) 1st regression from the 2nd dataset (years 2004-2010) – with the measure of right-left government positions

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[57] For the equation the Manifesto Project used, see the appendix D.

$$percentage\ of\ GDP\ spent\ on\ defence$$
$$= \beta_0 + \beta_1 2004 + \beta_2 2005 + \beta_3 2006 + \beta_4 2007 + \beta_5 2008 + \beta_6 2009 + \beta_7 2010$$
$$+ \beta_8 gdp\ per\ capita + \beta_9 eastern\ bloc$$
$$+ \beta_{10} percentage\ of\ gdp\ spent\ on\ welfare$$
$$+ \beta_{11} percentage\ of\ working\ population\ emplyoed\ in\ manufacturing$$
$$+ \beta_{12} right\_left\ measure$$

d) 2nd regression from the 2nd dataset (years 2004-2010) – with the measure of right-left government positions: same as the regression in c, but controlled for yearly fixed effects

B. Results

Results of the two regressions from the first dataset are presented in Table 3 and results of the regressions from the second dataset are presented in Table 4 with most variables being significant in both cases. I controlled for yearly fixed effects and used a generalized least squares random effects model to control for bias coming from the panel data for regressions in both datasets. Yearly fixed effects coefficients are relative to the baseline year 2009 in Table 3 and 2004 in Table 4[58].

In Table 3, after controlling for fixed effects all the variables except a year dummy for 2016 are statistically significant at the 5% level, most of the at the 1% level. The coefficient on GDP per capita is extremely low and surprisingly negative meaning that when the GDP per capita increases by a thousand dollars, the percentage of GDP spent on defence is predicted to decrease by 0.000725%. The coefficients for welfare spending and percentage of working population employed in manufacturing are not unanticipated; increase in welfare spending by 1% of GDP, would decrease the percentage of GDP spent on defence by 0.0317% and an 1% increase in percentage of working population employed in manufacturing would increase percentage of GDP spent on defence by 0.0362%. The recommitment to the goal at the Wales Summit in 2014 can also be seen in Table 3 as the spending in 2015 and 2016 slightly increased compared to 2014.

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[58] For country fixed effects cooeficients relative to the US, see the appendix E.

Table 3: Results of the 2 regressions using the first data set

VARIABLES	(1) % of GDP spent on defence	(2) % of GDP spent on defence, controlled for yearly fixed effects
2010.year	-0.109	-0.0637**
	(0.141)	(0.0320)
2011.year	-0.187	-0.138***
	(0.140)	(0.0333)
2012.year	-0.227	-0.150***
	(0.140)	(0.0364)
2013.year	-0.277*	-0.171***
	(0.142)	(0.0382)
2014.year	-0.312**	-0.181***
	(0.142)	(0.0390)
2015.year	-0.320**	-0.138***
	(0.145)	(0.0408)
2016.year	-0.525**	-0.0873
	(0.237)	(0.0620)
GDP per Capita	0.000204***	-0.000725***
	(1.26e-05)	(5.71e-05)
Eastern Bloc	0.172	-
	(0.107)	
% of GDP Spent on Welfare	0.000802	-0.0317***
	(0.00681)	(0.00964)
% of Working Population Employed in Manufacturing	0.00148	0.0362***
	(0.00802)	(0.0127)
Constant	1.255***	2.370***
	(0.271)	(0.443)
Observations	195	195
Number of Country2	0.604	28
R-squared		0.687

Standard errors in parentheses
*** *p<0.01, ** p<0.05, * p<0.1*

Table 4: Results of the 2 regressions using the second date set – with the measure of right-left government positions

VARIABLES	(1) % of GDP spent on defence	(2) % of GDP spent on defence, controlled for yearly fixed effects
2005.year	0.00446	-0.00916
	(0.228)	(0.0576)
2006.year	0.00920	0.000138
	(0.229)	(0.0588)
2007.year	0.0211	-0.00993
	(0.228)	(0.0596)
2008.year	-0.00739	-0.0550
	(0.228)	(0.0590)
2009.year	-0.319	-0.248***
	(0.279)	(0.0894)
2010.year	-0.434	-0.339***
	(0.282)	(0.0907)
GDP per Capita	-1.23e-05*	-6.61e-06***
	(6.27e-06)	(2.46e-06)
Eastern Bloc	-0.154	-
	(0.190)	
Right-Left	0.00269	-0.00332**
	(0.00386)	(0.00148)
% of GDP Spent on Welfare	-0.0154	0.0203
	(0.0119)	(0.0156)
% of Working Population Employed in Manufacturing	-0.00857	0.0124
	(0.0154)	(0.0190)
Constant	2.602***	1.084
	(0.551)	(0.712)
Observations	179	179
Number of Country2	0.042	26
R-squared	(1)	0.166

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Similarly to Table 3, more variables are significant when yearly fixed effects are controlled for. GDP per capita is significant at the 1% level, but the coefficient is, just as in Table 3, negative. Interestingly, welfare spending and percentage of working population employed in manufacturing are not significant in these 2 regressions. The measure of how right or left leaning governments were, is significant at the 5% level, however the coefficient is surprising. The more right-wing the government is, the less money will spend on defence. More specifically, a 1 point increase in right-left measure (the higher the number of right-left, the more right-leaning the government is) is predicted to result in 0.00332% decrease in the percentage of GDP spent on defence. This could be a result of right-wing governments' inclinations to spend less money overall or perhaps the measure of right-left position I used is not the best indicator of governments' ideological stances. Furthermore, Eastern bloc dummy is not significant in none of the regressions, however with more recent data this might change as the Enhanced Forward Presence plan motivated Eastern European countries to increase their spending.

V. Conclusion

NATO is an alliance desirable by all member countries. It is beneficial for everyone to be spending the agreed-upon amount on defence as by doing so they are investing in their own defence, soldiers, facilities and infrastructure as well as strengthening NATO. The benefits of NATO membership outweigh the costs, and despite the American threat of leaving, that is not in their interest. Prisoner's dilemma game when combined with the presence of reciprocal actors, changes into an assurance game. Reciprocity is slowly resolving the collective action problem of free-riding and once the critical mass is reached, every member country will spend the agreed funds on defence. In 2014, the countries recommitted to the spending goal agreeing that by 2024 they will be allocating at least 2% of their GDP towards defence. Moreover, it the recent years there has been a general increase in spending on defence. The 10-year timeline for the countries to reach the 2% is more realistic than demands to reach this goal right away as Eyal argues that even though European countries might have the political will to allocate more funds towards defence, "their defence

sectors often lack the capacity to absorb so much extra cash in a short period of time, since the time span required for procurement projects means that larger financial inputs take years before they are translated into real capability outputs" (Foreign Affairs, 2017). Moreover, the Enhanced Forward Plan put in place in 2016 reassured smaller European countries and at the same time encourage them to invest more resources.

Intriguingly, the regressions predicted that when a country's GDP per capita increases, its defence spending as the percentage of GDP will decrease. Another unexpected prediction was that the more right-leaning a government is, less money it will allocate towards defence, however, this could be a result of the commitment to an overall decrease in spending of right-wing governments. All other predictions were to be expected; (1) an increase in social welfare spending decreases the amount spent on defence and (2) an increase in the percentage of population employed in manufacturing, increases defence spending.

Even though NATO has seemingly resolved two of its biggest collective action problems and the future looks optimistic, member countries need to focus on effective and efficient spending. It is crucial to avoid wasting money like Greece is currently doing, despite reaching the spending goal. NATO will also need to streamline the command structure and make it more effective and organized[59]. With the rise of all forms of terrorism especially decentralized and cyberterrorism, migrant crisis, constant tensions in Africa and the Middle East combined with the Russia's territorial expansionism, NATO musts be prepared and resolve all internal struggles. Its democratic, international and unique position ensure NATO will play an important role in keeping the democratic world safe, unified and strong.

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[59] Eyal, The Real Problems With NATO: What Trump Gets Right, and Wrong. Foreign Affairs, 2 March 2017. https://www.foreignaffairs.com/articles/europe/2017-03-02/real-problems-nato, 12 May 2017. E-source.

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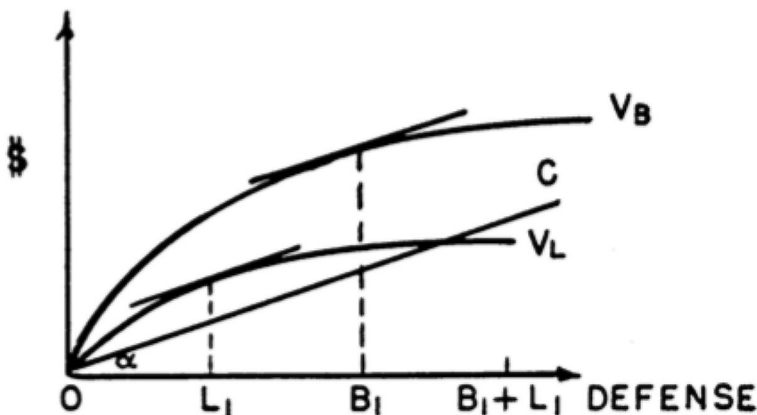
Acknowledgement

Appendix

A. Olson's Evaluation Curves Figure with his explanation of the figure

"This is shown in figure 3 below, which depicts the evaluation curves of two nations for alliance forces. The larger nation, called Big Atlantis, has the higher, steeper valua- tion curve, VB, because it places a higher absolute value on defense than Little Atlantis, which has evaluation curve VL. The CC curve shows the costs of providing defense capability to each nation, since both, by assumption, have the same costs. In isolation, Big Atlantis would buy B1 units of defense and Little Atlantis Li, for at these points their respective valuation curves are parallel to their cost functions. If the two nations continued to provide these outputs in alliance each would enjoy B1 plus L1 units of defense. But then each nation values a marginal unit at less than its marginal cost. Big Atlantis

FIGURE 3. — EVALUATION CURVES

will stop reducing its output of deterrence when the sum applied by the two nations together is Bi. When this amount (or any amount greater than Li) is available, it is not in Little Atlantis' interest to supply any defense whatever. The two nations are therefore simultaneously in equilibrium only when Big Atlantis provides B, of defense and Little Atlantis provides no defense whatever.[60]"

B. The Map that Shows How Many NATO Troops are Deployed along Russia's Border (Source: Batchelor, T. The Map that Shows How Many NATO Troops are Deployed along Russia's Border. The Independent, 5. Februar 2017. http://www.independent.co.uk/news/world/europe/russia-nato-border-forces-map-where-are-they-positioned-a7562391.html, 4. avgust 2019. e-vir

C. Table of independent variables used in all the regressions (References of "Source" can be found in the Empirical Section of this paper)

[60] Olson, M., & Zeckhauser, R. (1966). An Economic Theory of Alliances. The Review of Economics and Statistics, 48(3), 269. doi:10.2307/1927082.

Variable name	Unit of Measurement	Source
Country	/	NATO
Year	/	/
GDP	GDP per capita in thousands of USD, for the first data set in 2016 USD and for the second dataset in 2009 USD	NATO Defence Expenditures
Welfare	% of GDP spent on welfare	OECD and The World Bank
Eastern Bloc	A dummy variable based on the division made by the Iron Curtain	/
Manufacturing	% of working population employed in manufacturing	The World Bank
Right-left	Measured used the equation in appendix E	Manifesto Project Database

D. Equation used to measure right-left position of the governments from the Manifesto Project Database[61]

right-left = military positive + freedom and human rights + constitutionalism positive + political authority + free market economy + incentives positive + protectionism negative + economic orthodoxy + welfare state limitations + national way of life positive + traditional morality positive + law and order positive + civic mindedness – anti – imperialism – military negative - peace – internationalism positive – market regulation – economic planning – protectionism positive – controlled economy. nationalization – welfare state expansion – education expansion-labour groups – democracy (Manifesto Project codebook, p. 28)

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[61] Volkens, A. et al. (2017): The Manifesto Project Dataset - Codebook. Manifesto Project (MRG / CMP / MARPOR). Version 2017a. Berlin: Wissenschaftszentrum Berlin für Sozial- forschung (WZB). page 29.

E. Country fixed effects cooeficients relative to the US

	(1) % of GDP spent on defence, controlled for country fixed effects, omitted: the US
1. Albania	0 (.)
2.Belgium	-14.12*** (-15.64)
3.Bulgaria	-0.310 (-1.46)
4.Croatia	-13.45*** (-16.70)
5.Czech Republic	0.285 (1.20)
6.Denmark	-0.824** (-3.12)
7.Estonia	-13.92*** (-15.44)
8.France	-0.0794 (-0.47)
9.Germany	-11.56*** (-14.83)
10.Greece	-12.00*** (-15.92)
11.Hungary	-12.77*** (-14.40)
12.Iceland	-0.667*** (-3.65)
13.Italy	-15.75*** (-17.59)
14.Latvia	-12.99*** (-15.46)

15.Lithuania	-0.697*** (-7.57)
16.Luxembourg	-0.231 (-1.04)
17.Netherlands	-14.88*** (-16.95)
18.Norway	-13.61*** (-16.15)
19.Poland	-13.80*** (-15.60)
20.Portugal	0.344* (2.02)
21.Romania	-14.18*** (-15.32)
22.Slovak Republic	-0.0610 (-0.30)
23.Slovenia	-0.892*** (-3.65)
24.Spain	-0.506* (-2.50)
25.Turkey	-13.57*** (-16.15)
26.United Kingdom	-13.76*** (-15.65)
27.Canada	-11.47*** (-15.07)
28.United States	0 (.)
_cons	15.74*** (18.09)
N	195

t statistics in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001