Master's Thesis

The Revival of Military Keynesianism?

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Abstract

With the emergence of military conflicts on European soil, the economic implications of military expenditures have become increasingly relevant to study in the context of Europe. Using multiple specifications of spatial econometric models, this study analyses to which extent military expenditure has sparked economic growth across European countries over the past twenty years. The results indicate that the spatial lag of increased military expenditure negatively affects economic growth rates across European countries over time. When it comes to the in-country economic effects, military expenditure does not seem to be a significant predictor for economic growth, whereas total governmental spending significantly predicts decreased economic growth rates. Our findings add to the existing literature by introducing the use of spatial econometrics in the context of the economic effects of military expenditures across Europe.

Keywords: Military Keynesianism, Spatial Econometrics, Economic Growth, Military Expenditure.

Introduction

Military Keynesianism can be described as economic policies in which a government devotes large amounts of spending to defence budgets, in order to foster economic growth (Custers, 2010). There are many forms of military Keynesianism, some in which military investments can be regarded as the primary form of economic stimulus, other forms in which it is less apparent that the military plays a prominent role in regulating the business cycle. Externalized military Keynesianism, a form of Keynesianism in which the state encourages other nations to make military purchases from domestic companies is one form that is particularly underdeveloped within the modern literature, although it is believed by some to have the capacity of having a significant impact on the development of regional economies (Custers, 2010).

Although the concept of military Keynesianism has been named after British economist John Maynard Keynes, the idea of viewing military investments as a way of stimulating aggregate demand was first formulated by the Polish economist Michał Kalecki, two years prior to the release of Keynes his famous work on employment, interest and money in 1936. Kalecki looked at the economic implications of the war-industry that was created by Nazi-Germany in the 1930s. After the general Keynesian theory became widely accepted in the Western world, ideas of military Keynesianism were mainly applied to the economic policies of US administrations after the second world war. Ever since, the term military Keynesianism has been connected to US policies of regulating the business cycle through military expenditure, whilst European governments would largely opt to rely on other forms of public expenditure to increase aggregate demand in times of economic downturn. However, with the emergence of military conflicts on European soil as a consequence of Russian aggression towards Ukraine, thus bringing its arms closer to the borders of both NATO and EU member states, the economic implications of military investments have become increasingly relevant to study (Toporowski, 2023).

There is an important distinction within the field of military Keynesianism to be made, one that is particularly important for our analysis later on, as there is an important spatial feature to the concept of military Keynesianism, namely the possibility for externalized military Keynesianism. Modern European economies do not function as a closed system, but rather rely on trade with foreign countries, the same is true for the military economic sector. Countries that are actively involved in producing military equipment are constantly trying to ensure that their military products are being sold to foreign states (Custers, 2010). One of the main benefits to the countries that engage in selling their military equipment to other states, besides the economic benefits, is that of externalization of the wasteful effects of the arms production. In the country of production, multiplier effects are generated, fostering economic growth, whilst the negative consequences of arms production are externalized to the country that is buying the equipment. Although the buying country might be in need of military equipment, there will be a loss in financial resources as a result of the transaction (Custers, 2010). This information is particularly interesting when incorporating it with a spatial econometric model. In this case it would be expected that when military expenditures would rise in a region, so too would rise the economic benefits for nations that are extensively involved in the production of military equipment, considering that the extra military investments would be used to buy military equipment from those nations that would be both 1. Seen as a friendly country from the perspective of the domestic nation in question, and 2. Be considered specialized and skilled in the production of military equipment. Within this context, spatial econometric models have the capability of identifying whether there is a spatial component to the economic growth that might occur as a consequence of military expenditure. As far as the author is aware, the phenomenon of military Keynesianism has not yet been studied through the use of spatial econometric models, even though the current literature does hint at a spatial component in the spread of military expenditure (Yesilyurt & Elhorst, 2017).

There is a need to analyse the economic effects of externalized military Keynesianism in the context of Europe. Thus far, research towards military Keynesianism has not focused sufficiently on the exportation of military equipment but has rather only looked at domestic economic activity (Custers,

2010). Although this paper tries to apply the concept of military Keynesianism to the context of the European continent, Europe does not have a strong historical connection to the use of military expenditure as a measure to obtain economic growth. Whilst the United States is generally seen as the world's main western practitioner of military Keynesianism, the military industry still plays a significant role in Europe's flow of goods and international trade. Even though the military expenditure of the United States is nearly twice the size of that of all EU member states combined (including the UK), some scholars believe that a large amount of the EU-budgets for arms purchases lay much higher than official figures suggest (Custers, 2010). It is clear that, judging from military expenditure alone, the European business cycle does not rely as heavily on the armaments industry as compared to that of the US. However, two thirds of the EU's military spending (including the UK), belong to the three biggest economies of Europe, namely Germany, France, and the United Kingdom. And although these expenditures are not used as main driver of the business cycle for these countries individually, the combined multiplier effects that result from these spendings are still substantial in impacting Europe's economy (Custers, 2010). Germany, France, and the United Kingdom do have relatively large arms manufacturing companies that play a key role in the global supply of military equipment. With the increasing demand for advanced weaponry systems, it is likely that Europe's main powers are willing to seek to gain from the macroeconomic effects that these companies can supply them with.

Understanding the causal direction and significance of the relationship between military expenditure and economic growth can be important for future policy modelling. If it were to be established that military expenditure can be an effective way of regulating the business cycle, governments could become more effective in controlling economic cycles. Otherwise, if the causal relation between military expenditure and economic growth were to be the other way around (if there were to be a relation at all), military expenditure could be regarded as a strategy for countries to protect their wealth and people from external threats whilst strengthening their role in world affairs (Kollias, Manolas & Paleologou, 2004). National military expenditures are oftentimes responsive to external influences, particularly the actions of rivals as well as alliances (Treddenick, 1985). These responses can form a vicious circle, considering that rivals and alliances will also react to military expenditures by the domestic country. In other words, military expenditures of nations are expected to continuously influence one another, thus stimulating aggregate demand between countries when it comes to the military sector. This means that countries will have to import more raw materials, which means that countries will have to export more raw materials, stimulating economic activity. This paper tries to identify to which extent there exists a spatial component to this relation.

Within the literature on the effectiveness of military Keynesianism, those in favour of its effectiveness, build their arguments on the principle of the Keynesian multiplier effect, those opposing the effectiveness of military Keynesianism, rely on neo-classical economic theory to structure their arguments. According to neo-classical theory, military Keynesianism would not function as a mechanism that would stimulate economic growth (Inal et al., 2024). Advocates for the neo-classical approach would believe that the proper use of resources would be distorted by investing in military equipment. This would directly lead to the misallocation of capital and resources, limiting productivity and economic development. Also, considering that the demand for highly educated workers is high within the military sector, there would exist a lack of supply of human capital in other segments of the economy. In other words, governmental intervention in the labour market combined with the misallocation of resources would lead to reduced marginal revenue when looking at the whole economy. Overall, the current research in the topic of military Keynesianism reflects no common argument on its effectivity (Inal, 2024). Whilst there are various economic theorists who have shed their light on the topic, only very few empirical studies were conducted to confirm any of the theories. There is thus, to the best of the author's knowledge, no empirical study that combines spatial econometrics to the concept of military Keynesianism. We do believe however, judging from existing theory, that this study could fill a largely unmentioned gap in the literature. Many authors on the topic of military expenditures are calling for an elaborate debate on the use and effectiveness of military Keynesianism, informed by a

refined and thorough understanding of its mechanisms (Custers, 2010), particularly in light of recent increases in military expenditures within European nations.

In order to further understand the dynamics and argumentations of why and how military Keynesianism could foster economic growth, the following sections will respectively revolve around arguments why military Keynesianism would be effective in fostering economic growth and reasons why military Keynesianism would not be effective in fostering economic growth. This part can be used as a comprehensive overview of the current academic literature on the topic of military Keynesianism.

Why should Military Keynesianism work?

In order to fully grasp one of the possibilities that military Keynesianism can provide economies with, we must start with the explanation of a risk that is inherently connected to extreme forms of military Keynesianism, namely hyperinflation. Toporowski (2016), who builds upon the theoretical work of renowned post-Keynesian economist Michał Kalecki (1932) by reiterating both the advantages that military expenditure can have on macro-economic indicators such as increased employment, also understands the risks that go hand in hand with large-scale investments in massive public works and the military. As soon as fiscal inflation takes place as a consequence of a Keynesian style of military investments, disturbances in the rate of exchange will follow. Large military investments will lead to a rise in local output but will also instigate an increase in the supply of foreign raw materials. As employment in the military sector rises, so will domestic prices. The imbalance of payments will lead to the falling of exchange rates as well as the general purchase of foreign exchange, accelerating devaluation. A rise in prices of the foreign materials that will be required to fuel the military industry will lead to a rise in prices until the point of hyperinflation is reached (Kalecki, 1932). It is easy to see how extreme forms of military Keynesianism (when performed inadequately) inevitably leads to hyperinflation, merely weakening the economy as a whole. There is a way however, to overcome this difficulty of hyperinflation, namely for governments to jointly coordinate their efforts at fiscal stimulus. When coordination between nations on the topic of military expenditure would be directed centrally, aggregate demand would expand among trading partners, resulting in an increase in imports and, as a consequence, an increase in exports. When Kalecki looked at this solution, he deemed it as ‘’totally utopian’’ for governments to centrally coordinate fiscal inflation (Kalecki, 1932). However, nearly one hundred years later, this utopia has indeed become somewhat of a reality, particularly when looking at the example of the European Union, as the founding agenda of the European Union includes the coordination of the economic policies of member governments (Toporowski, 2016). It is the coordination of fiscal stimulation between countries, such as is the case for the European Union, which makes military Keynesianism a viable option of regulating the business cycle.

One benefit of military Keynesianism is that unlike other forms of government expenditure like infrastructure and educational services, it does not enter into competition with the private sector. It rather finances the private sector to consume, some might say waste, valuable resources (Toporowski, 2016). Another important aspect, particularly when looking at the economic benefits of neighbouring countries when military investments are made, is that military expenditure can be seen as a mechanism that indirectly forces the governments of neighbouring countries into rivalry. This is however not always the case, and the limitations of this mechanism will be handled in coming sections. The main takeaway here however, is that when looking at military Keynesianism in its purest form, not taking into account international relations between neighbouring countries, military investments will lead to the creation of employment in the country itself, as well as in neighbouring countries (Toporowski, 2016), purely because military expenditure sparks military expenditure in neighbouring countries, thus creating employment. The fact that military investments do not compete with the private sector, can be seen as one of the advantages of military Keynesianism. If a nation were to invest in say construction, such investments would be competing with the private sector, reducing the rate of capitalist profits. One could

say that the sheer incapacity of the armament industry to compete with the private sector, considering that it is only governments that can make military purchases, whilst civilians are incapable of merging with the market, is one of the main strengths of military Keynesianism (Toporowski, 2016).

Looney (1989) discusses how, using Keynesian theory, developed countries can use military expenditure to make use of excess capacity. Increased military expenditure can create additional demand and output, thus increasing capacity utilization. This theory opposes classical economic theory, and it is supported by evidence from studies that analysed industrial capacity in the United States. The economic prosperity that has been developed by the United States over the past century can be seen as an accumulation of successfully absorbing monetary surpluses by investing in their military (Looney, 1989). In other words, if it were the case that existing demand would not suffice in stimulating the business cycle, military spending is likely to be effective in creating aggregate demand, thus increasing total output, at least in the case of the United States. This mechanism is likely to be different for other nations. A factor that is expected to be important in predicting whether increased military expenditure will add to a countries economic growth, is the distinction between a country that is already involved in the production of arms (e.g. the United States) and a country that is not yet involved within this industry as such. This principle has been measured in previous studies; countries that are already active in producing arms are less likely to reduce their military expenditures (Looney, 1989). This indicates that the arguments that can be made against the production of arms are less impactful on the decision making with regards to military expenditure. Those countries that are already invested in their armaments production, will not relinquish the economic benefits in which they have already invested.

Through the use of spatial econometrics, Yesilyurt & Elhorst (2017) have analysed the spatial spread and impact of neighbouring countries on military expenditures. Their results are partly in line with the outcomes of previous studies, namely in the sense that it establishes that military spending in one country depends primarily on the spending of nearby countries, but not in every case. In their analysis, control variables for time- and period fixed effects of multiple types were included, and the results indicate that there is a spatial component at play when looking at the spread of military expenditures, in other words, they have established that military expenditures of neighbouring countries (oftentimes) affect one another. This result has previously been included in the vast literature that is devoted to explaining the ratio of a nation's military expenditure to its gross domestic product, also known as the defence burden. Authors writing on this topic have incorporated the military expenditures of neighbouring countries into their model for an extent amount of time, however, its validity has been improved by the spatial econometric analysis of Yesilyurt & Elhorst.

The Multiplier Effect

It has been known for a long time that military investments can function as an economic stimulus by way of the so-called multiplier effects that come along with governmental spending. Keynes has made a distinction between two forms of financial benefits in the form of multiplier effects. Firstly, military expenditure, or any governmental spending for that matter, can create an increase in aggregate demand of consumer goods and raw materials. Secondly, military expenditure can create job-opportunities for workers. Direct job opportunities would be created by increasing the demand for military personnel. Indirect job opportunities could be created by investing in high-tech military weaponry and technologies, increasing the demand for high-skilled workers (Custers, 2010). Keynes, however, noted that military expenditure was not the only possibility for increasing aggregate demand in economies. Keynesian theory on the multiplier effect was connected to many distinct types of government spending. It is the Keynesian idea that in times of economic downturn, such as in the 1930s United States, governments could resort to making public investments to increase aggregate demand in all sectors of the economy. It is the practicability of Keynesian theoretical framework that makes the practice of using the multiplier effect such an attractive measure for governments to implement in times of crises (Custers, 2010). Within the use of Military Keynesianism as a way of creating a multiplier effect that can counter periods of economic downturn, governments would have the possibility to choose

between two types of investments. The first type of investment would be one that undertakes short-term economic investments by buying relatively simple devices that can be related to the military industry such as arms, computers, uniforms, or ammunition. The second type of investment would include far larger-scale acquisitions of for example advanced weapon-systems. Such investments do not only require the raw materials to create them, but also the financing of an extensive research and development department. The creation of these larger-scale projects requires years of planning and research that will result in longer-term economic policy making as well as economic effects that will last for much longer periods of time (Custers, 2010). It is for this reason that most modern governments opt to choose for the latter alternative. This alternative does however require the existence of an advanced research and development sector within a nation, together with the possibility for a nation to sustain substantial amounts of investments towards the development of high-tech military projects.

Following Keynesian general theory of employment, interest and money, higher military spending can lead to significant multiplier effects, especially when the spending is concentrated on the purchase of military equipment from domestic manufacturers. The acquisition of domestic military equipment is likely to have positive effects on the non-military private sector (Looney, 1989). The increase in aggregate demand that is generated from the military expenditure has the capability of increasing output and thus increase the rate of return on investment, leading to growth. Besides, the investments made in the military sector are expected to trickle down to other economic sectors, considering that manufacturers that involve themselves with highly technological advancements are required for the development of military equipment, leading to a higher demand for human capital. Investments in research and development undertaken by the military industries worldwide have added to the general stock of scientific knowledge. This knowledge has been proven to be useful in both the military industry as well as in many civilian applications (Treddenick, 1985). In fact, spinoffs form military research and development have contributed to many new products that are being used in other branches of the economy (Inal et al., 2024). It is undeniable that military expenditures can play a vital role in the development of new systems and applications that can be important not only for the protection of nations, but also for the development of our scientific understanding and quality of life.

Emil Benoit was one of the first economists to extensively research the effects of military investments, he is the person after whom the Benoit hypothesis is named. This hypothesis states that military expenditure positively impacts economic growth. Considering that the Benoit hypothesis states a positive relation between military spending and economic growth, it is only logical that Benoit also had arguments supporting why military spending sparks economic growth. The first of these arguments would be the principle that spending on the military sector helps to develop modern skills and attitudes. Benoit believed that the investments that would be made in the military sector would trickle down to the technological development sector by creating demand for highly technical military equipment. Also, Benoit was convinced that the personal skills that a person would attain whilst being active in the military, would be useful skills to apply further on in life. This line of argumentation has been endorsed by Weede (1986). He describes that the military teaches useful skills such as discipline, which would be a form of human capital and be useful in maximizing productivity. this increase in productivity would lead to economic growth. It is also argued that in nations where there exists a high degree of military participation, there would be higher degrees of income equalization. Considering that the inclination to consume goods is higher for groups with lower income, total consumption would be higher, leading to GDP growth (Weede, 1986). The increased inflation that results from increased military expenditures is also likely to affect the spending patterns of civilians and might be more impactful than the mechanism described above (Looney, 1989). The second reason provided by Benoit for why military expenditure would be stimulative of the economy, would be that the military's capital expenditures (infrastructure) could also be used by civilians working in other sectors. Third, military spending, when done right, leads to a healthy amount of inflation which encourages the maximization of production within economies (Looney, 1989). Benoit was convinced that the positive effects described above would outweigh the negative effects of military spending. However, in studies that empirically tested the Benoit hypothesis

after 1973, there have been multiple authors that found evidence in favour of Benoit's hypothesis, as well as multiple authors that found evidence against the Benoit hypothesis (Inal et al., 2024).

Looney (1989) emphasizes that military expenditure can be useful as a tool of economic stabilization, but only for those countries that are already involved in the production of arms. For those countries that are not producers of military equipment, it would be wiser to look for alternative types of governmental expenditure that can function as a stabilization mechanism. Looney (1989) found a positive relation between a higher military expenditure of arms producing countries and their industrial output in third world countries. This can be an indication that military Keynesianism can be a useful way of attaining economic growth in developing countries. This research also opens the door towards the clear distinction that should be made between countries that are already involved in the production of arms on the one hand, and non-producing countries on the other hand. It was found that industrial output is less responsive to increases in military expenditures in countries that do not produce arms.

Pieroni, d'Agostino, & Lorusso (2008) empirically evaluated the Keynesian hypothesis that military expenditure positively affects aggregate output for the US and the UK. Their results show a slight indication that military expenditure may result in pro-cyclical economic effects in the UK, which can, dependent on the situation, be regarded as a useful mechanism for economic regulation. Their data provided consistent evidence that military expenditure is cointegrated with output and interest rates. Alongside these findings, they do acknowledge that this is not straightforward evidence that military spending directly stimulates economic growth. The positive response of total output to shocks of military spending in the UK is only slightly significant and seems to be dependent on a multitude of other factors.

When putting military Keynesianism into the context of regional development, it can be regarded as a functional measure for redressing geographical economic imbalances such as employment and income (Treddenick, 1985). Military expenditures are oftentimes regionally specific and can be centrally controlled to help develop economically underperforming regions. Military industries can relatively easily become part of a local economic structure and can oftentimes quickly create jobs for both highly- and low-educated workers. Gauchat et al. (2011) found that military expenditure produces economic benefits for metropolitan areas specifically. Decreased levels of military spending could result in a multitude of regional economic downsides such as diminished household income, increased income inequality and higher unemployment rates. The effects of a reduction in military spending would differ from region to region, however, in the case of the closing of a major military base, local economies could be heavily affected. On the other hand, these negative economic effects could be countered by investing in other types of public spending, ones that might lead to a net increase in employment in the long run (Gauchat et al., 2011), examples of replacing investments would be infrastructure and education. It is rather unknown however, how realistic it could be to replace an industry as specialized as the military industry, especially when this industry is deeply integrated into the regional economic cycle.

Regions can benefit from military expenditure through regional multiplier effects that result from military personnel spending and contract spending (Gauchat et al., 2011). Whilst the multiplier effects that result from increased military personnel spending have greater effects on agglomerations, the spending on military contracts has an economic effect on the wider region, as it increases demand for subcontractors throughout the wider geographical region, including regions outside the metropolitan areas. Military expenditure that is invested in an increase in military personnel, is likely to increase welfare in metropolitan areas, by way of consumption-driven multiplier effects. This happens because the increased total salaries that are paid to military personnel will trickle down into the civilian consumption sector. Besides, the spending on military personnel is likely to absorb a possible surplus of labour, fostering tighter regional labour markets. Tighter labour markets are generally beneficial for those working in metropolitan areas (Gauchat et al., 2011).

A panel data analysis by Inal (2024) finds that military expenditures increase the qualified workforce, encourages innovation, and provides economic growth by positively affecting other economic sectors with spillover effects. The paper argues that focusing on military research and development investments will make significant long term economic contributions in underdeveloped countries. The authors do not make a clear distinction between nations that are already involved in the production of arms, but generally suggest that investing in the military industry would be advantageous for overall economic growth in multiple economic sectors.

Why should Military Keynesianism not work?

There are many dynamics at work when looking at determining factors for military expenditure (Yesilyurt & Elhorst, 2017). Focusing on these dynamics is important when wanting to understand the relation between military expenditure and economic growth, considering the spiralling arms race between neighbouring countries that can take place when a nation has relatively high military expenditure. This arms race that is oftentimes likely to happen between countries with high military expenditure, is likely to affect the flow of goods between these countries, thus affecting growth rates. The first dynamic that we want to touch upon is that of the magnitude of a nation's arms stock and the manner in which this affects surrounding countries. It is the case that in the classical arms race as described by Richardson (1960), the greater a nation's military expenditure, the greater its neighbour's military expenditure is likely to be. This hypothesis has been assessed and supported many times (Yesilyurt & Elhorst, 2017). However, when looking at the case of the European Union, this effect might be heavily mitigated, considering that EU member states would normally not form a threat towards one another, it could thus be argued that the opposite effect would be in place. As has been discussed by Sandler & Hartley (2001), when several neighbouring countries form a military alliance, which would be the case for the EU, it is likely that some member states might even avoid spending increasing amounts on their militaries, this would be an example of free-riding behaviour. If it were to be true that such free-riding behaviour would be applicable to the situation of military expenditure in the European Union, it is much less likely that a spatial component would be identifiable when looking at the spread of military expenditure across nations. Another effect that such free-riding behaviour might have, is that the lack of competition in terms of military expenditure between EU member states, could diminish the flow of goods between nations, thus affecting economic activity in a negative way.

Another mechanism that is likely to be in play is that of the size of the economy. When two neighbouring countries are similar in size, it is likely that one will try to match the other's military spending. However, when two neighbouring countries differ in size, it is less likely that this mechanism would be in place (Yesilyurt & Elhorst, 2017). When we apply this to the context of the Europe, it would not be unlikely that this mechanism has historically been true. An example would be France and Germany recognizing each other as a threat during the first and second world war, thus adapting to each other's military investments. However, when putting this concept into the context of the 21st century, it seems less likely that two large European powers would try to match each other's military spending, considering that these two powers would be fighting a common threat instead of each other.

Looney (1989) did an assessment of non-military motivations for arms production; his results show that economic theory does not provide a conclusive prediction of the net impact of an increase in military expenditure for third world countries. Classical theory however denies the possibility for economic growth related to military expenditure, considering that the resource allocation towards the military will decrease civilian consumption and consequently reduce growth rates (Looney, 1989).

Coming back to the work of Emil Benoit, he after whom the Benoit hypothesis is named. This hypothesis states that military expenditure positively impacts economic growth. Although Benoit believed that military investments would positively affect economic activity, Benoit also understood the unfavourable consequences of large military expenditure. The three main downsides to military Keynesianism as formulated by Benoit are as follows. Firstly, as a consequence of increased military spending, an income shift will take place, as military expenditure will indirectly be financed by public taxes, decreasing the civilian domestic product. Secondly, average productivity will halter considering that governmental productivity is slower compared to the civilian sector. Third, military spending will essentially crowd out other types of public investments. At times when a military investment is made, there will always be the inability to spend that money on other useful goods.

The inflationary effects of increased military expenditure might be underestimated by many authors (Looney, 1989). It is known that military spending increases aggregate demand. However, it only increases supply in a limited number of ways, mostly only affecting a market that is out of sight for the general public. Some may therefore argue that military investments barely affect the future standards of living and functions merely as a driver of inflation. Modern literature is rather ambiguous when it comes to this point. However, considering that governments are often hesitant to raise taxes in order to be capable of financing increased military expenditures (Chan, 1985), they will opt to take on loans, which are likely to accelerate the process of inflation.

A study by Kollias, Manolas & Paleologue (2004) suggests that in the case of 7 EU member states, from a sample size of fifteen states, there was a causal ordering from economic growth to military expenditure, whilst finding not a sole case of a reverse causal relationship. This finding may suggest that military expenditure for EU member states is mostly determined by the state of the economy and not the other way around. Meanwhile, a bi-directional relationship was found for three out of the 15 EU member states, this finding could suggest an interdependency between military expenditure and economic growth as a consequence of possible multiplier effects.

A great financial risk that is involved with high investments in a large armaments industry, is the possibility that armaments companies cannot be assured of a constant flow of demand (Toporowski, 2023). Although there currently are large investments being made in the production of highly technological military systems, there always exists the paradoxical worry of peace breaking out, leaving the armaments industry with an unused production capacity. In other words, it can be risky for governments to invest in the establishment of an advanced military industry, when there always is the possibility of a lack of international demand for newly produced weaponry.

If an increase in military expenditure comes at the cost of other types of public expenditure, the negative consequences such as negative employment effects, should be subtracted from any positive effects that result from an increase in military expenditure (Treddenick, 1985). The same would be true if taxes would be increased in order to finance military investments, considering that an increase in taxes would result in a decrease in disposable income, resulting in reduced total consumption. These are indirect consequences of military Keynesianism that make it much more complex to calculate the net increase in welfare for a society after a particular increase in military expenditure has taken place. When, for example, unemployment is high in a particular economy, it would be less likely that an increase in military expenditure would result in a decrease in employment elsewhere in the economy (Treddenick, 1985). This would make military investments more of an attractive economic stabilizer for economies with low employment compared to economies with high employment rates. However, multiple studies have shown evidence that that increasing military expenditure is not an effective way of generating employment when compared to other types of public spending such as infrastructure and education (Treddenick, 1985).

Another, more technical, reason for why military expenditure might not result in positive economic development, is derived from the way in which the military market functions. Within this market, there is oftentimes a single buyer, the government, as well as a single (rarely a few) sellers. This means that the military market can oftentimes be identified as a bilateral monopoly. In such a market situation, the prices are rarely representative of the true price of resources (Treddenick, 1985). Usually, prices arise as a result of negotiation between the government and the single seller. Negotiations of this nature oftentimes result in a form of protection for the producer, considering the high technological risks that are involved with the production of military equipment. Such price formation leads to little incentive for the producer to minimize the costs of production, leading to a great inefficiency in resource allocation within the military industry. It is this inefficiency that reduces overall production growth and limits the economic growth that can result from military investments.

Conceptual Model

The spatial econometric model that will be specified in the following section, is expected to capture the spatial lag of our independent variable (military expenditure) in relation to our dependent variable (economic growth). By constructing this model, we attempt to provide an answer to the question whether military expenditure fosters economic growth in neighbouring countries across Europe over the past twenty years. Besides looking at the spatial lag of military expenditure in relation to economic growth, we are also interested in comparing the economic effects of military expenditure with the economic effects of total government spending, which is added as a separate independent variable. Formulating a hypothesis accordingly with our research question can be twofold. As we have deducted from the existing literature, there are multiple reasons for why military Keynesianism might be effective in fostering economic growth. There are also multiple reasons for why military Keynesianism might be less effective in fostering economic growth, for example when compared to other types of government spending. The aim of this research is to add to the existing literature by introducing a spatial econometric analysis in the context of military Keynesianism. Whether the described relation between military expenditure and economic growth will lean towards Keynesian arguments or neo-classical arguments is difficult to say beforehand. It is even unknown whether there exists an identifiable relation at all. The following methodology section will focus on all the implications that come into play when specifying a spatial econometric model.

Methodology

What this analysis is trying to get at, is whether there exists a spatial interaction among the geographical units that are included in this study, in this case that would be a selection of European nations. This spatial interaction is interpreted on the basis of the sign and significance of the spatial lags in our dependent variable, independent variable, and/or the error term from neighbouring countries. In establishing the significance of a spatial interaction among the nations included in this analysis, two spatial econometric components are required, namely the type of spatial lag that will be included in the model, as well as the specification of a weight (W) matrix that indicates which countries we call neighbours. One particular specification of a weight matrix may result in different results in terms of spatial interaction between nations, this is why it is crucial to identify one or more appropriate weight matrix specifications. Many spatial econometric studies tend to include merely one type of spatial lag, thus focusing on the spatial lag of either the dependent variable, or the independent variable, or the error term instead of including multiple models, many studies also do not test different weight matrices against each other (Yesilyurt & Elhorst, 2017).

When speaking of spatial lag of dependent and/or independent variables, there are three main types that can be used to explain GDP growth of a country as a possible consequence of military expenditure (Elhorst, 2014). Firstly, we might assume that economic growth in a country might be related to the economic growth of a neighbouring country, in this case we would speak of endogenous spatial lag, in which the economic growth for country i is dependent on the economic growth of neighbouring countries j as well as the other way around. This type of spatial lag results in the spatial autoregressive (SAR) model. When making use of such a model, it could be valuable to make use of panel data to allow the model to control for country- and time-specific effects (Baltagi, 2004).

Merely incorporating the spatial lag of the dependent variable itself would however not be sufficient in explaining the relationship between military expenditure and economic growth in neighbouring countries. One could opt for a spatial error model (SEM), which includes the spatial lag of the error terms, this could be of added value when one wants to control for countries having similar unobserved institutional environments (Yesilyurt & Elhorst, 2017). However, many authors describe the SEM model as odd considering that the spatial lag of the error term theoretically is rather insubstantial when looking for causality. In other words, the principle that special correlation would only matter for the error process of an independent variable is not likely in many cases (Beck, Gleditsch & Beardsley, 2006).

It is for this reason that this paper opts to incorporate exogenous spatial lags into the models when looking for a spatial correlation between military expenditure and economic growth in neighbouring countries. In this case, exogenous spatial lags can measure whether the economic growth of country i would be dependent on the explanatory variables of neighbouring countries j. Models containing exogenous spatial lags take the designation of a spatial lag of X and are thus called SLX models. SLX models are rather common and are used for all sorts of analyses, in the context of military expenditure however, they are less common (Yesilyurt & Elhorst, 2017).

One critical point that becomes clear when thinking of which model to use in order to be able to tackle the research question at hand, would be to define what a ‘’neighbouring country’’ should mean in its context. When looking at the context of how a nation might influence another nation at an economic level, it would be logical that this relationship is spatially more distant than merely countries that are literally neighbouring one another, otherwise we would say that Germany and Italy do not affect each other’s economy, considering they do not share the same border. This is however untrue knowing that there exist vast trade-relations between these two countries. One could even state that it is likely to assume that Italy affects Germany’s economy even more so than some of the countries that do in fact share a border with Germany, such as Switzerland. Even though Switzerland shares a border with Germany, Italy is a larger trading partner when looking at total volume of foreign trade. This implies that not only distance between countries i and j are of importance when looking at economic growth and military expenditure, also the size of the economies of the trading partners matters significantly. A key aspect to finding the overall greatest model specification thus lays in finding the right specification for W. Generally, spatial econometric studies do not test multiple specifications for W against one another. Whilst it is common to present and discuss the results for multiple weight matrix specifications to check for robustness, more effort should be put in identifying which of the specifications performs best in representing the situation at hand (Yesilyurt & Elhorst, 2017).

Some thoughts that should go into consideration when arguing for a particular type of W matrix that would be appropriate for our analysis, we should distinguish between local and global spillover effects as well as the scale to which we are applying these effects. Considering that we want to look at the local spillover effects of military expenditure on a European level, it would be logical to make use of a dense spatial weight matrix, in which many elements would be non-zero. A W matrix that would

be appropriate to use would be an inverse distance matrix, as it is more effective in capturing local spillover effects (Yesilyurt & Elhorst, 2017). Conversely, if we were to approach the economic effects of military expenditures between countries as a global mechanism, in which we would want to include nations from all parts of the world, it would be more logical to use a contiguity matrix, in which there would be a limited number of non-zero elements.

In terms of the considerations that should go into the creation of a spatial econometric model that estimates economic growth in terms of GDP growth over a certain time period, the share of government expenditure is added to the model as a control variable. This is of foremost importance, considering that the possible relation between military expenditure in country j and the economic growth in country i could be explained through a total increase in governmental expenditure in country j, not just the military expenditure. Adding military expenditure as a share of total government expenditure controls for the relation that total government expenditure in country j might have on economic growth in country i.

The variable of total GDP shall also be added to the model as a control variable. This variable will control for the principle that countries with lower GDPs are more likely to experience economic growth, considering that there will be more ''room'' for growth, compared to economically further developed nations. Less-developed economies will tend to grow at faster rates than more developed economies, considering that diminishing returns will not be as strong in developing economies as they would be in developed economies (Rassekh, 1998).

The considerations described above lead us to the following model specifications that can be used to identify the relation between military expenditure in countries j and the economic effects in countries i. We shall start off with the specification of a regular OLS model and will continue by adding spatial components to this base model, resulting in the SDM model.

OLS	SLX	SDM
$Y = \alpha\iota N + X\beta + \varepsilon$	$Y = \alpha\iota N + X\beta + WX\theta + \varepsilon$	$Y = \rho WY + \alpha\iota N + X\beta + WX\theta + \varepsilon$
No spatial component	Includes spatial lag of the independent variable	Includes spatial lag of the dependent variable and independent variable

Table 1. Types of model specifications.

The model specifications are descriptions of the following relation. Y denotes the dependent variable, in our case this will be economic growth, measured as Gross Domestic Product per capita (GDP) growth over a certain time period. ρWY denotes the spatial lag of the dependent variable. $\alpha\iota N$ denotes the intercept. $X\beta$ denotes the coefficient for the independent variables, for which our main independent variable would be military expenditure at a certain point in time for each country specific. $WX\theta$ denotes the spatial lag of the independent variable. ε denotes the error term. The models used in this analysis will not include the spatial lag of the error term. The main theoretical advantage that is included in the SDM model, whilst being excluded in the SLX model, is that of the spatial lag of the dependent variable, which is economic growth. Evidence has been found that the rate of growth of an economy is related to the rate of growth of its neighbours, meaning that it is likely that the SDM model would theoretically outperform the SLX model, as it would be capable of capturing an extra piece of information in the form of the spatial lag of the dependent variable (Elhorst, Piras & Arbia, 2010).

Control variables that are to be included in the regression analysis are, as previously discussed, military expenditure as a share of total governmental spending, as well as total GDP per country. Then,

the list of variables that will be included in the regression analysis that should control for other external influences on economic growth: Trade as the sum of exports and imports of goods and services measured as a share of GDP, as this variable is expected to affect economic growth for highly developed economies, considering that consumers in high-income countries spend a relatively larger share of their yearly income on goods and services, resulting in the principle that high-income economies will benefit more from international trade (Nigai, 2017). The control variable of Regulatory Quality captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, this variable is also expected to affect economic growth and will thus function as a control variable.

Causality is likely to remain a methodological problem in the case of the relationship between military expenditure and economic growth. It is for example possible that growth may be causally prior to an increase in military expenditure. In that case a country would allocate more funds towards the military as a consequence of high growth rates (Kollias, Manolas & Paleologou, 2004).

Description of Included Variables

Dependent Variable: Economic Growth: ‘’The annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources’’ (Source: World Bank national accounts data, and OECD National Accounts data files).

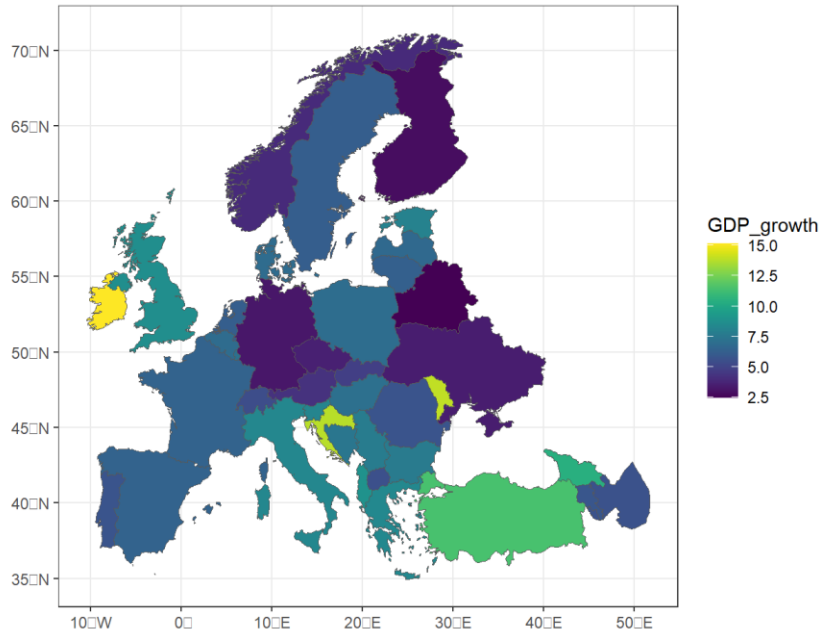

Figure 1. *Spatial distribution of the dependent variable for the year 2021.*

Independent Variable: Military expenditure as a share of total government expenditure: ‘’Military expenditures data from SIPRI are derived from the NATO definition, which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defence ministries and other government agencies engaged in defence projects; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities. Such expenditures include

military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid (in the military expenditures of the donor country). Excluded are civil defence and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons. This definition cannot be applied for all countries, however, since that would require much more detailed information than is available about what is included in military budgets and off-budget military expenditure items. (For example, military budgets might or might not cover civil defence, reserves and auxiliary forces, police and paramilitary forces, dual-purpose forces such as military and civilian police, military grants in kind, pensions for military personnel, and social security contributions paid by one part of government to another.)'' (Source: Stockholm International Peace Research Institute (SIPRI), Yearbook: Armaments, Disarmament and International Security). This variable was log-transformed in order to improve its statistical distribution. SIPRI acknowledges that this exact definition cannot be applied for all countries. This has led to the inevitability that some figures representing military expenditure used in our dataset can be seen as a slightly different definition when comparing one country to another. Using the data regardless, assuming that any deviations from the normal definition would lead to only minor differences in terms of deviations in regression results, was in this case seen as the only possibility. Examples of deviations from the normal definition of what military expenditure entails are cases in which: figures for countries do not include military pensions, figures for countries are for the adopted budget rather than for actual expenditure, and/or figures for countries do not include spending on paramilitary forces.

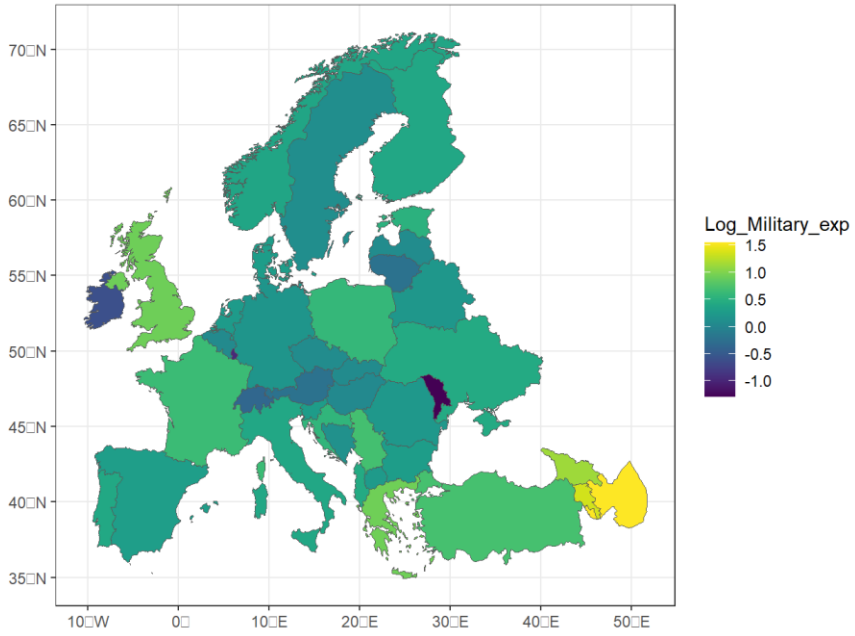

Figure 2. *Spatial spread of the main independent variable of military expenditure for the year 2021.*

Independent Variable: Total Government Expenditure: ''General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security but excludes government military expenditures that are part of government capital formation.'' (Source: World Bank national accounts data, and OECD National Accounts data files). This variable was log-transformed in order to improve its statistical distribution.

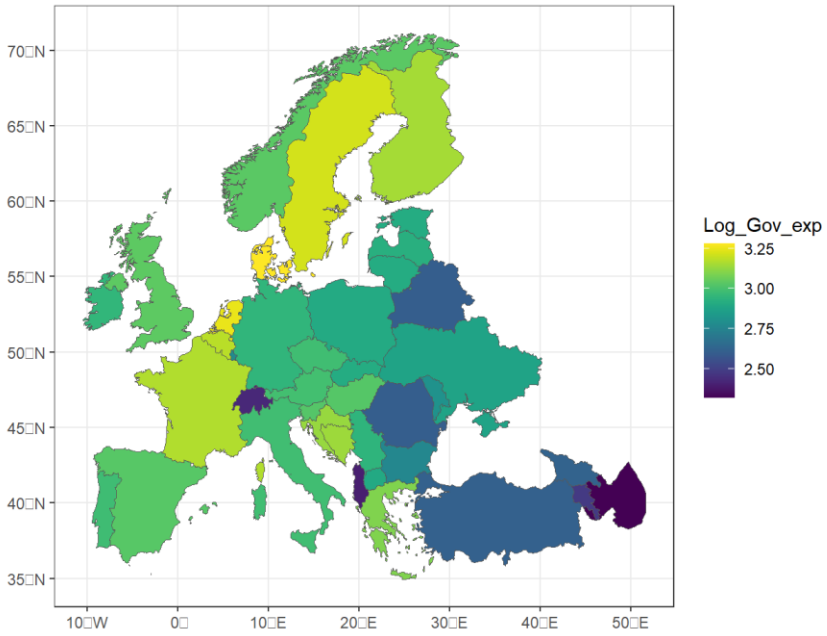

Figure 3. *Spatial distribution of the independent variable of total government spending for the year 2021.*

Independent (Control) Variable: GDP per Capita: ‘’GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2015 U.S. dollars.’’ (Source: World Bank national accounts data, and OECD National Accounts data files). This variable was log-transformed in order to improve its statistical distribution.

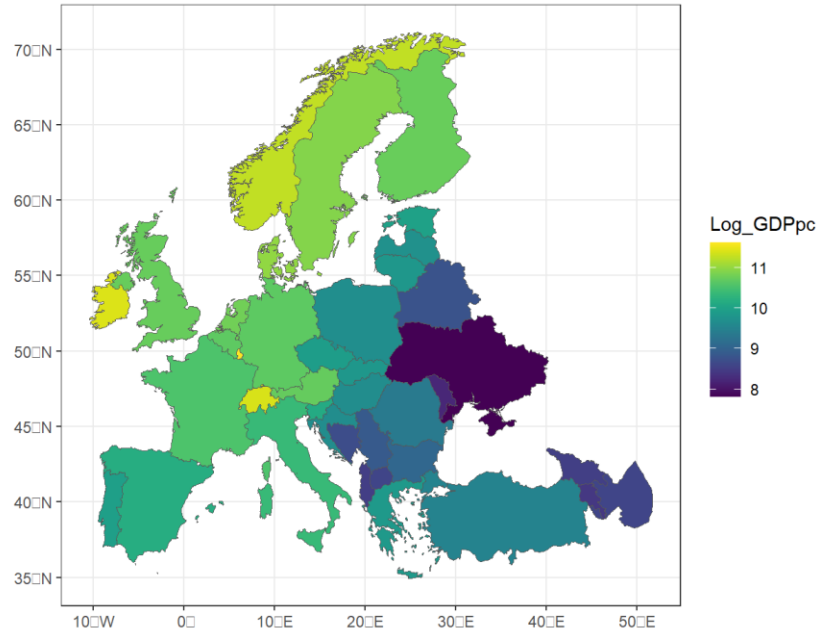

Figure 4. *Spatial distribution of the independent variable of GDP per capita for the year 2021.*

Independent (Control) Variable: Trade: ‘’ Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.’’ (Source: World Bank national accounts data, and OECD National Accounts data files). This variable was log-transformed in order to improve its statistical distribution.

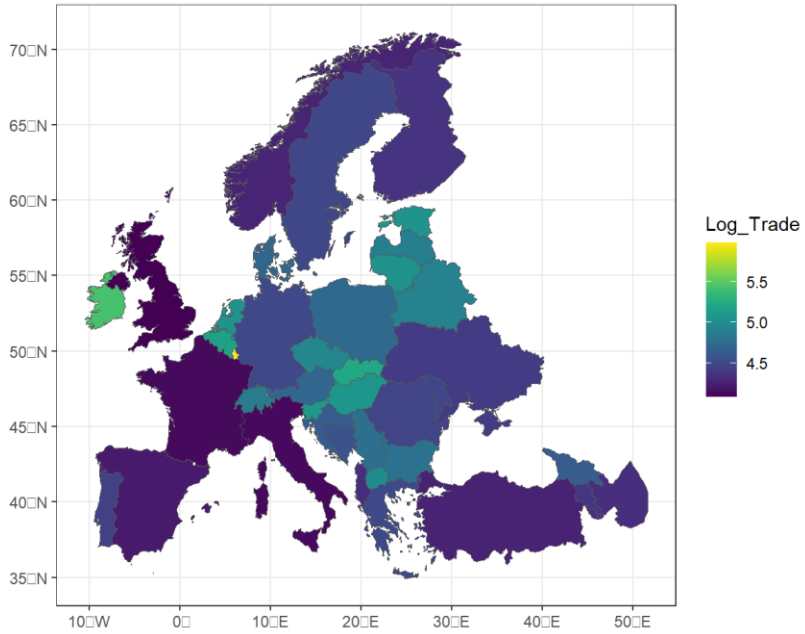

Figure 5. *Spatial distribution of the independent variable of Trade for the year 2021.*

Independent (Control) Variable: Regulatory Quality: ‘’ Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.’’ (Source: Kaufmann, Kraay, & Mastruzzi. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Paper No. 5430*).

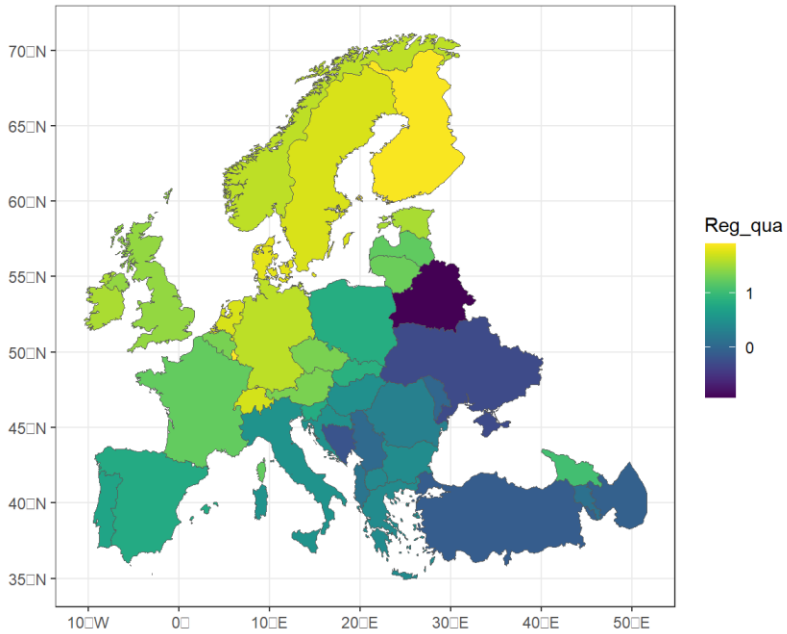

Figure 6. *Spatial distribution of the independent variable of Regulatory Quality for the year 2021.*

Time-Lagged Variables

Considering the high likelihood that the economic effects of military and general governmental expenditures can only be captured after an extent amount of time, it was decided to compile the data in such a way, so that the economic growth in year y, will be connected to the military and total governmental expenditures in the year y-10. As such, the possible economic effects of military and total governmental expenditures will be captured after a time-lag of ten years.

In the case of military expenditures at a national level, economic consequences are expected to require a series of changes that occur through systems that happen over an extent amount of time (Babin, 1989). It is thus highly unlikely that a country's military expenditure will have a short-term effect on economic performance. However, it is difficult to say which time lag should be used in the analyses in order to capture the economic effects of military expenditures to the greatest extent. One main advantage of incorporating time-lags for specific variables, is that it largely solves the problem of causal direction (Babin, 1989). In this case, considering that there exists a time lag of ten years between the military expenditure and the economic growth within a nation, it is difficult to argue that reverse causality would be at play.

Another argument in favour of incorporating longer-term time-lags in the case of looking at economic growth at a national level, is the principle that such economic growth usually involves technological changes that cannot occur swiftly (Kick & Sharda, 1986). Especially in the case of large-scale military projects, ones that require large-scale innovation and investments in the research and development sector, it can take years before the initial investment trickles down into other economic sectors. Whereas the relationship between military expenditure and economic growth might seem negative or insignificant in the short term, it might be clearly visible in the long run. Both Babin (1989) and Kick & Sharda (1986) had implemented a time lag of 12 years and found positive and significant relationships between military expenditure and measures of modernization (economic change). For this paper, it was opted to implement a time lag of 10 years for selected variables, as it is an arbitrary number that approximates the time lag that was implemented by previous similar studies.

The complete data set used for this study consists of data from 39 European countries, each county having ten data points spanning ten years, from the year 2011 until 2021, with the variables of military expenditure and total government spending being lagged by ten years. These variables thus span from the year 2001 until 2011. In total, the dataset consists of 390 observations. We shall now continue with the definitions for the included types of W-matrices used in this analysis.

Specifications of W-Matrices

Configurating multiple possible types of W-matrices, is of vital importance when trying to capture the spatial autocorrelation of variables between countries. There exist several competing approaches when it comes to the specification of W-matrices, each with its own benefits and theoretical limitations (Krisztin & Piribauer, 2023). This analysis will include a total of nine different W-matrix specifications. Three of these are distinct types of contiguity matrices, which are matrices based on a common border between countries. The other six specifications of W are different configurations of inverse distance matrices, which have been constructed using different criteria of a k-nearest neighbours-algorithm. All W-matrices used in the spatial econometric models are non-negative, row-standardized matrices and are based on a concept of neighbourhood either in the form of contiguity or distance between centroids of the included geographical units.

Figure 7. *Configurations of W-matrices based on common borders (first order, second order & third order contiguity).*

The first three types of W-matrices are illustrated above, these include W-matrices based on a common border. The illustration to the left represents a contiguity matrix based on common borders. The illustration in the middle represents a second-order contiguity matrix, in which countries are linked to their neighbours as well as to the neighbours of their neighbours. The illustration on the right is one that represents third-order contiguity, in which countries are linked to their direct neighbours, the neighbours of their neighbours, and also to the neighbours of the neighbours of their neighbours. A relevant limitation to these types of w-matrices, is that there exists a limit to the number of nations that countries can have, considering that some countries are distanced from the mainland of the European continent. These countries include Ireland, the United Kingdom, Norway, Sweden, and Finland. Increasing the order of contiguity does not affect the number of neighbours that these countries attain, this can be regarded as a limitation, considering that this does not realistically represent the flow of trade of military goods across Europe. Particularly the fact that the United Kingdom is not linked to the mainland of Europe is a massive deviation from reality, considering that this country is one of the most important importer and exporter within the military industry in Europe (Custers, 2010). It is for this reason that it was decided to construct other types of W-matrices to be used alongside the conventional contiguity matrices. The following figure shows these other versions of W-matrices, ones that are based on inverse distance, these have been constructed using different criteria of a k-nearest neighbours-algorithm (k=5 – k = 10).

Figure 8. *Configurations of W-matrices based on inverse distance (k=5, k=6, k=7).*

Figure 9. *Configurations of W-matrices based on inverse distance (k=8, k=9, k=10).*

In the above illustrated W-matrices that are based on inverse distance, each European nation is linked to k amounts of neighbours. Consequently, each particular link its weight is inversely related to the distance between the geographical units. This means that for a link between two nations that are geographically relatively close to one another, the link between these countries will count heavier in terms of the expected relationship between their respective variables, compared to the link that might exist with another geographical unit that is situated further away. By using this technique, we have introduced another variable that comes into play in our analysis, namely the distance between the geographical units. One main limitation to this type of W-matrix, is that the distance-decay parameter is applied uniformly across our study area (Lu & Wong, 2008). This can be a limitation, considering that the distance-decay relationship is constant for space, even though in reality this might not be the case. The geographical space across which our analysis takes place comes with many other obstacles than merely distance. In an ideal W-matrix, other spatial obstacles such as rivers, mountains, nature reserves, etc. would also be included. Weighting the present links between nations on variables like the ones mentioned previously is however a massive challenge.

Results

Before running any regression or spatial econometric model, a Pearson correlation matrix was constructed including all of the included variables. The matrix shown below can provide some indications as to how these variables are correlated to one another. For example, there seemingly exists a strong and positive Pearson correlation between GDP per capita of a nation and its regulatory quality. Also, military expenditure of a nation and the extent to which a country involves itself in international trade is seemingly negatively correlated. This table does not however provide any indication on the direction of causality of the presented correlations, leaving a lot open to be explained by the regression and spatial econometric models.

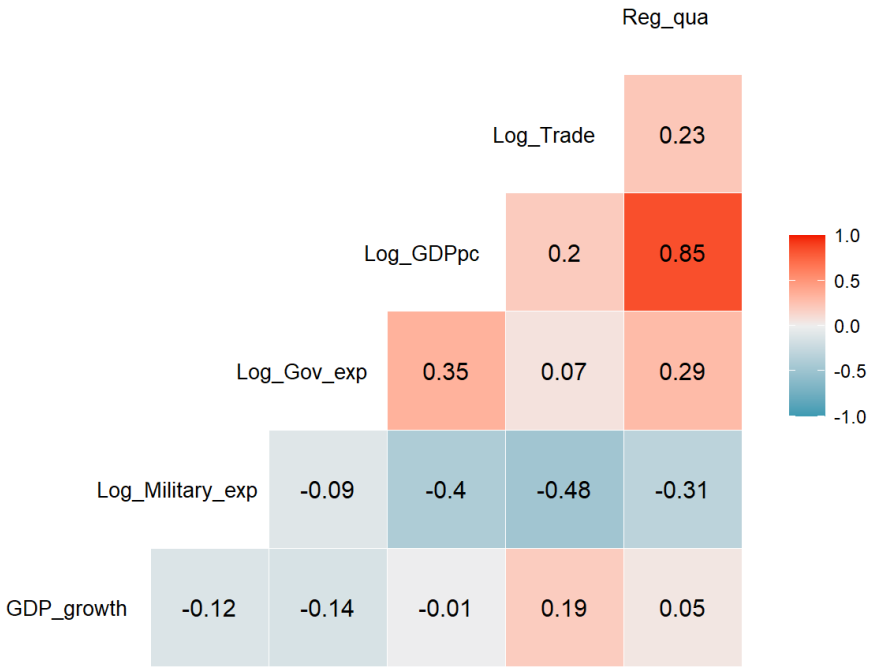

Figure 10. *Pearson Correlation Matrix for all included variables.*

The data was tested for heteroskedasticity using Breusch-Pagan tests and it was concluded that heteroskedasticity was not present in the dataset. It was still opted to make use of clustered robust standard errors, in order to diminish the problematic implications of near heteroskedastic data. The standard errors are clustered per country. The results from the most basic model that was included in the analysis, namely the OLS model, are shown in table 1 below. With the standard OLS model, there is no addition of a spatial component, the results shown below are thus indicative of within-country-effects only and not cross-country-effects.

Table 1

Results of Ordinary Least Squares Models with Clustered Robust Standard Errors.

Dependent Variable: GDP Growth

Independent Var.	(1)	(2)	(3)	(4)	(5)
Ln Mil. Exp.	-0.895	-1.000	-1.02	-0.358	-0.447
	(0.686)	(0.666)	(0.578)	(0.495)	(0.436)
Ln Gov. Exp.		-2.45 **	-2.42 *	-2.49 *	-2.48 *
		(0.915)	(1.110)	(1.190)	(1.140)
Ln GDP per capita			-0.0235	-0.026	-0.548
			(0.267)	(0.298)	(0.412)
Ln Trade				1.75 *	1.160 *
				(0.703)	(0.669)
Regulatory Quality					0.852 .
					(0.454)
Constant	2.48 ***	9.63 ***	9.78 ***	1.61	6.60
	(0.401)	(2.82)	(2.51)	(4.31)	(4.04)
Adjusted R-squared	0.000	0.022	0.043	0.073	0.072

*Notes. ***p < .001, **p < .01, *p < .05, . p < .10*

Sample Size: 390

Looking at the results from the OLS model, there are a few important observations to be made. Firstly, looking at the variable of military expenditure for each of the model specifications, there exists no significant relation between military expenditure in a nation for the year n-10 and the economic growth in a nation for the year n. whilst the sign of this predictor is indeed negative, it is not significant. When looking at the coefficient for total governmental spending, we observe a significant negative relation between a country's governmental spending in the year n-10 and its economic growth in the year n. When it comes to the in-country effects of military spending, lagged by ten years, we cannot conclude any results.

Trade seems to be a rather strong predictor of economic growth according to our OLS model. This would be in line with modern literature, especially since trade would be a deciding factor for highly developed economic countries, such as many of the ones included in our analysis, namely the highly developed western-European countries, whose economies rely heavily on international trade (Nigai, 2017).

The following table will show the results from the SDM model specifications, which includes the spatial lag of both the dependent and independent variables, which was run firstly using three different W matrices, namely the three specification of contiguity matrices that have elaborated upon in the methodology section. In the following models, (W1) represents the model using a W matrix of first order contiguity, (W2) represents the model using a W matrix of second order contiguity, and (W3) represents the model using a W matrix of third order contiguity. Each of the following SDM models make use of country fixed effects. Results from Hausman tests have indicated that fixed effects are most appropriate in our case, they control for spatial characteristics that are unchanged over time and can affect the dependent variable (Kopczewska, 2021).

Table 2

Results of the SDM Models, multiple specifications of Contiguity Matrices

Dependent Variable: GDP Growth

	Independent Var.	(W1)	(W2)	(W3)
Direct Effects	Ln Mil. Exp.	1.018	-0.153	-1.012
		(0.836)	(0.831)	(0.873)
	Ln Gov. Exp.	-2.846	-2.678	-1.342
		(1.939)	(2.036)	(2.024)
	Ln GDP per capita	11.236 ***	10.051 ***	10.057 ***
		(2.229)	(2.203)	(2.218)
	Ln Trade	6.191 **	8.359 ***	8.805 ***
		(2.363)	(2.305)	(2.261)
	Regulatory Quality	2.607 *	2.540 *	2.511 *
		(1.187)	(1.204)	(1.210)
Indirect Effects	Lag Ln Mil. Exp.	-2.378 .	-2.971	-3.838
		(1.372)	(1.892)	(2.507)
	Lag Ln Gov. Exp.	1.139	-3.569	-6.826
		(3.449)	(4.735)	(6.539)
	Lag Ln GDP per capita	-12.660 ***	-14.830 ***	-18.178 ***
		(2.807)	(3.330)	(3.984)
	Lag Ln Trade	0.531	10.799	20.051 *
		(4.275)	(7.480)	(9.279)
	Lag Regulatory Quality	-1.943	2.704	1.838
		(2.195)	(2.827)	(3.324)
	Spatial Autoregressive Coefficient	0.834 ***	0.609 ***	0.489 **
		(0.122)	(0.151)	(0.180)

*Notes. ***p < .001, **p < .01, *p < .05, . p < .10*

Sample Size: 390

When looking at the results from the SDM model specification, we can see how the coefficients are split up into two types: direct and indirect effects. The direct effects represent the correlation for each independent variable and the dependent variable for in-country effects. Meanwhile, the indirect effects represent the correlation for each independent variable and the dependent variable for neighbouring countries. The direct effects of military expenditure are not significant, which is similar to the results that we would get from an OLS model. It is once again interesting to note that our variables of Trade and Regulatory Quality are indeed positively affecting economic growth in terms of within-country effects. Although our variable of focus, namely the indirect effect of military expenditure is indeed negative, it is not consistently significant. This leaves us with the task to introduce different specifications of W matrices, as we can not know whether contiguity matrices are the most optimal type of W matrix to represent trading relations across Europe.

For this reason, we represent the following table, in which six different specifications of inverse distance matrices are integrated in the SDM models, with a range of number of neighbours (k) from five to ten. The results from these different specifications of W matrices are relatively stable.

Table 3

Results of the SDM Models, multiple specifications of Inverse Distance Matrices

Dependent Variable: GDP Growth

	Independent Var.	(k=5)	(k=6)	(k=7)	(k=8)	(k=9)	(k=10)
Direct Effects	Ln Mil. Exp.	0.963	0.788	0.691	0.700	0.588	0.601
		(0.775)	(0.753)	(0.752)	(0.746)	(0.742)	(0.745)
	Ln Gov. Exp.	-1.810	-1.674	-1.391	-1.386	-1.192	-0.956
		(1.829)	(1.772)	(1.789)	(1.769)	(1.766)	(1.764)
	Ln GDP per capita	12.065 ***	11.429 ***	11.073 ***	11.087 ***	10.643 ***	10.387 ***
		(2.294)	(2.212)	(2.208)	(2.188)	(2.180)	(2.169)
	Ln Trade	3.049	3.611 .	3.055	2.965	3.069	3.354 .
		(2.183)	(2.095)	(2.081)	(2.045)	(2.021)	(2.017)
	Regulatory Quality	2.713 *	2.849 **	3.039 **	2.888 **	2.850 **	2.766 **
		(1.101)	(1.067)	(1.068)	(1.065)	(1.056)	(1.056)
Indirect Effects	Lag Ln Mil. Exp.	-2.414 *	-2.633 *	-2.925 *	-2.812 *	-3.095 *	-3.329 *
		(1.200)	(1.232)	(1.310)	(1.327)	(1.388)	(1.470)
	Lag Ln Gov. Exp.	5.748 .	4.459	6.009 .	6.861 .	5.819 .	5.724
		(3.400)	(3.349)	(3.525)	(3.553)	(3.503)	(3.527)
	Lag Ln GDP per capita	-12.824 ***	-12.059 ***	-12.092 ***	-11.990 ***	-12.747 ***	-12.866 ***
		(3.017)	(2.922)	(2.905)	(3.007)	(3.096)	(3.216)
	Lag Ln Trade	-12.546 *	-11.139 *	-12.528 *	-13.541 *	-11.573 *	-11.797 *
		(5.273)	(5.282)	(5.928)	(5.720)	(5.673)	(5.682)
	Lag Regulatory Quality	-0.484	-0.606	-1.378	-2.007	-0.660	-0.533
		(2.590)	(2.704)	(2.868)	(2.975)	(3.062)	(3.241)
	Spatial Autoregressive Coefficient	1.150 ***	1.098 ***	1.144 ***	1.155 ***	1.129 ***	1.131 ***
		(0.111)	(0.099)	(0.103)	(0.094)	(0.085)	(0.080)

*Notes. ***p < .001, **p < .01, *p < .05, . p < .10*

Sample Size: 390

The results that we have obtained from running the SDM models using inverse distance matrices instead of contiguity matrices, are drastically different. The main difference is in the significance levels of our variables of focus, particularly the indirect effects of military expenditure, which is still negative in sign but now it is constantly significant over multiple specifications of k nearest neighbours. It would not be correct however to interpret this result as unambiguous evidence that military expenditure is causal of slower economic growth in neighbouring countries over a time lag of ten years, as the relation is much more nuanced than that. Making the switch from contiguity matrices to k nearest neighbours has not only led to significance levels for the spatial lag of our independent variable of focus, but it has also completely changed the direction of the spatial lag of our variable Trade. Whilst this can largely be explained through the expectation that there exist large problems with the third-order contiguity matrix in reflecting trade relationships in the military sector in Europe, it is also a clear example of how impactful a change in specification of W matrix can be. Whilst an inverse distance matrix can generally be regarded as a more advanced specification of W matrix than any contiguity matrix in the context of cross-border trade, we cannot definitively state that the W matrices used in the SDM models in table three are optimal either. Regardless, our main finding poses that the lagged indirect effects of military expenditure in relation to economic growth across European countries is more likely to be negative than it is to be a positive relation. This finding will be further elaborated upon in the discussion section of this paper.

Discussion

In the major European powers, arms exports are employed as an economic strategy for maintaining military-technological potentials and industrial capacity in the domestic military sector (Custers, 2010). The results from our study are indicative that increased military expenditure negatively affects economic growth in European countries. This finding comes with both many macro-economic policy implications as well as nuances.

Even though European countries such as France, Germany and the United Kingdom have developed a defence industry with a strong orientation towards export (Kollias, Manolas & Paleologou, 2004), the overall spatial effect of economic growth as a result from military expenditure is likely to be negative. This could in part be explained by the fact that our observation can be regarded as a European average of all European countries combined. It would be totally possible that when comparing regions on a smaller scale, the individual spatial effects would be clustered into particular regions where the effect might even be possible. For example, in this case it would be expected that the multiplier effects from military expenditures would cluster around western European countries like France, Germany and the UK, considering that their military industries are relatively more capable of fostering higher levels of innovation across multiple economic sectors. Meanwhile, military expenditures in countries such as Greece and Portugal, which are countries with comparatively little indigenous defence production capabilities (Kollias, Manolas & Paleologou, 2004), are likely to strengthen the negative spatial effect of military investment on economic growth. These countries rely heavily on imports for their military apparatus, meaning that economic benefits of military expenditure are externalized to those countries that do have a developed military industry. At the same time, these developed military industries tend to be further away for countries with a lesser-developed military industry, considering that these industries are spatially clustered, at least on a European level. This mechanic is likely to be responsible for the result that the relation between military expenditure and economic growth averages out as negative. Economic benefits can only be felt for those countries that do indeed produce military equipment, if such countries are relatively far away from the importing countries, local spillover effects will be diminished. As the main European military-industry producers are located in North-western Europe, it takes a relatively expanded W-matrix to capture the effects of military trade between a wide range of Eastern European countries and the main producers. It is likely that such an expanded W-matrix would come at the expense of the spatial component, as it is exactly the spatial clustering that has the focus of our analysis. Future research should however indeed make a distinction between the spatial lag of military expenditures for countries with a well-developed military industry compared to countries with a lesser-developed military industry. Problems with regards to such studies would be that it would be difficult to capture the military spending from countries that are not located in either of the regions, but still affect long-term innovation and economic growth in the producing countries.

In the classical arms race described by Richardson (1960), the greater a nation's military expenditure, the greater its neighbour's military expenditure is likely to be. This has proven to also be true for the case of the European Union, but perhaps to a lesser extent compared to other regions. The economic effects of military expenditure across nations are likely to be affected by the fact that European nations are (oftentimes) not as hostile towards on another compared to other parts of the world. Sandler & Hartley (2001) describe how it is likely that when countries form military alliances with each other, nations are less likely to react to their neighbouring countries' military expenditure as a form of free-riding behaviour. This principle has the implication that whilst the spatial lag of military expenditure works negatively towards economic growth for European countries, this finding should not be applied to the situation of other parts of the world. The lack of relatively advanced military industries in some European countries as a consequence of free-riding behaviour might lead to reduced advances in innovation. Then again, military expenditure does not have to be the main driver of a nation's business cycle for it to experience high growth rates. In fact, our results indicate no significant relation between military expenditure and in-country growth rates. Meaning that in the context of Europe as a whole, it

is not at all unlikely that military expenditure fosters economic growth, particularly for those aforementioned nations that have an advanced military industry sector.

Whilst our methodological framework is mostly based on Keynesian theory and the multiplier effect, our reflection with regards to the results takes more of a stance towards neoclassical economics. From a neoclassical perspective, it is highly unlikely that economic growth would be positively related to increased military expenditures, considering that resource allocation towards the military would decrease civilian consumption and reduce growth rates (Looney, 1989). Even though this hypothesis is not completely verified nor falsified, we would lean towards the arguments provided by neoclassical economics, considering the indication from our results that when military expenditures go up, the economic growth for neighbouring countries (trading partners), decrease.

The bilateral monopolistic market situation that is inherent with the military industry is a market situation that can be regarded as inefficient by definition (Treddenick, 1985). Price negotiations for military goods tend to be much higher than what their true prices should be. This has to do with the high technological risks that are connected to investments in military research and development. Producers within the military sector have little incentive to keep their production prices down, as there oftentimes exists time pressure from governments to deliver on time. This leads to inefficiency of resource allocation, limiting overall production growth. If it were to be true that the military industry as an economic sector is inherently less efficient in terms of production, one would expect alternative types of governmental spending to be more effective in fostering growth, this is however not what we have found when looking at the in-country growth rates for our OLS models as well as for our spatial econometric models. Whereas it is apparent that total governmental spending significantly negatively predicts lower economic growth rates after ten years for the country in which the spending takes place, no such relation is identified when looking at military expenditure as a predictor of economic growth. This is far from a definitive finding on the in-country economic effects of military spending; however, it can be regarded as a sign that military Keynesianism should not be considered a wasteful act of governmental spending. There are multiple reasons for why military spending can outperform alternative types of government spending as a form of innovation stimulator. Future research should continue to look for ways to assess the Benoit hypothesis and compare military spending to other types of governmental expenditure as a way of regulating the business cycle.

The finding that military expenditure outperforms other types of governmental spending in fostering economic growth, can be explained through the multiplier effects that can be caused by long-term research and development in the military sector. Investments that are made in the military sector are specifically expected to trickle down into other economic sub-sectors. Developments in the military sector are highly technological by nature, investments in research and development in the military industry have been useful for not only military applications, but also increase productivity and innovation in civilian applications (Dunne & Watson, 2005; Solarin, 2016). One could argue that the multiplier effects that result from investments in the military sector are greater than other types of governmental spending in terms of technological innovations, which can be a driver of economic growth. Our findings have been rather robust and will need further testing before a conclusion can be drawn whether military expenditure outperforms other types of governmental expenditure. It could be an improvement to split the variable of total governmental spending up into several specific types of governmental spending, which could provide a clearer picture of how these would weigh against one another.

Conclusions on the effectiveness of military expenditure can only be drawn when there exists a clear causal relation between military spending and economic growth. There exists little to no existing prove that there exists a causal relation between military expenditure and economic growth. Even though we have decided to lag our variable of economic growth with ten years compared to our variables of

military and governmental spending, if there exists no causal relation between the two, this lag would be based purely on the theoretical underpinning that one action (military spending) has happened before the outcome (economic growth). In their paper, Kollias, Manolas & Paleologou (2004) conclude that it is more likely that there exists a causal relation between the state of a nation's economy, and their military expenditure in European countries, instead of it being the other way around. The complete methodological approach to our spatial econometric models assumes that there must be some causal relation between military expenditure and economic growth. If it were to be proven that the causal direction is reverse, this methodological setup would have little ground to be standing on. It could however be argued that even though military expenditures might be mostly based on the economic state of a country, it does not mean that military expenditure consequently does not influence economic performance. The only downfall to such a theory would be that there can be a type of circular reasoning, in which military spending would decrease as a result of economic downturn, leading to decreased military spending, leading to more economic downturn. Future research should look into the reasoning behind military expenditure, so that a clear causal relation can be formulated, around which econometric models can be built.

It is unlikely to expect that military spending will actively increase in European countries purely as a mean of fostering economic growth. Increases in military expenditure are more likely to take place as a measure of being capable of protecting a country's borders. The results from this paper can be applied as a form of consciousness for policymakers to be able to know how changes in military expenditure might trickle down into other facets of the economy and how it might affect local economies, both in the country of interest, as well as for neighbouring countries. Increases in military expenditure might sometimes be inevitable, also for European nations. The results from this paper might be indicative of weaker economic growth as a result from increased military expenditure for European regions. However, with war and increased international political tensions comes more than only increased military expenditure. It is understood that it would be an arduous task to capture all the effects from increased political tensions in terms of variables to include in spatial econometric models. Negative economic effects that might take place at the same time as increased military spending cannot all be captured by our variable of military spending. Being able to control for all effects that occur as a consequence of increased political tensions would thus far be endeavours for future research.

Conclusion

It has been established that neighbouring countries impact each other's military expenditures. Keynesian economic theory predicts that as aggregate demand would expand among trading partners, as a consequence of increased military expenditure, all countries would import more and, as a consequence, all countries would export more, stimulating economic activity. This mechanism however, if it were to be present, is yet to be captured by econometric models, including the ones in this paper. On the contrary, our results indicate that the spatial lag of military expenditure is a significant predictor of decreased economic growth. For our models, we have made use of Spatial Durbin Models, using nine different specifications of W matrices. Whereas there exists no significant result with regards to the relation between military expenditure and economic growth for our OLS models, or for our SDM models using contiguity matrices, our SDM models based on nearest neighbours provide stable results using different specifications of k. Although there exist many uncertainties with regards to the methodological framework of our spatial econometric models, our results can provide insights for European policymakers when it comes to assessing the economic consequences of military expenditures. Although our methodological framework has largely been based on Keynesian economics, the application of neo-classical economics has been proven to be more appropriate in trying to explain the results from our models.

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