[Year]

US Military Spending Analysis

CMPT 353 E100

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Introduction

Picture a world where terrorism is a constant threat, where people fighting for freedom clash with those seeking power, and where countries with lots of oil are used as tools in a political game. This is the world we live in - where what governments decide and what extremist groups do, affect many countries along with countless individuals. This idea inspired our group to dive deeper into this and we stumbled upon an idea – a question that made all of us raise our eyebrows.

Is there something "fishy" going on with the number of "terrorist" attacks in the world, the amount of money US spends on a subset of its defence contractors, and the "freedom" index of countries in the world? By "fishy", we mean: Does the US government increase its defense spending when terrorist attacks occur in countries with low freedom indexes and significant oil reserves?

Our hypothesis is that **there is some correlation between the money the US government spends on defence each year (estimated by net sales of 2 of the largest US defence contractors), and the freedom index of a country with a considerable amount of oil.** This hypothesis stems from the controversial & historic invasions of countries by the United States government, into countries they deemed at least "communist" or "dictatorial" (both of which would have a low freedom index), and which also happened to have a lot of oil / natural resources. Examples of this include: Iraq (Oil), Afghanistan (Rare earth elements / minerals), Venezuela (Oil). Military spending is not the only way a powerful country like US can get what it wants. Another unsurprisingly good weapon are sanctions. The US never invaded Venezuela, they put numerous sanctions on them.

Our method here is not ideal, as the US government websites are so insanely broken, and so few links work, that they made sure no one ever gets the data that is supposedly "available" for the public, nevertheless, the question is interesting enough and we will explore it. There are too many correlations, and too many factors from the political world that we

aren't able to consider in this project. However, we will try our best to honestly analyze the data and present our findings.

Data

Data Collection:

Where we got the data "net sales":

Lockheed Martin

Only works if you modify the URL from 1995-2018 (inclusive)
https://www.lockheedmartin.com/content/dam/lockheed-martin/eo/documents/annual-reports/2004-annual-report.pdf
Later, they switched over to a different URL, where they tracked both yearly & quarterly earnings:
https://investors.lockheedmartin.com/financial-information/quarterly-results

General Dynamics

https://www.annualreports.com/HostedData/AnnualReportArchive/g/NYSE_GD_2004.pdf (pre 2003 data is not available on this site)
https://investorrelations.gd.com/financial-reports/annual-reports-archive/default.aspx
https://investorrelations.gd.com/financial-reports/sec-filings/default.aspx

Where we got data about oil:

https://www.worldometers.info/oil/oil-reserves-by-country/

Where we got data about terrorist attacks:

https://www.kaggle.com/datasets/willianoliveiragibin/terrorism-in-world/data

Where we got data about the freedom index:

https://www.kaggle.com/datasets/mlippo/freedom-economic-index

Could also include data on rare / valuable minerals (in addition to oil):

https://www.world-mining-data.info/?World_Mining_Data___PDF-Files

Emailed these goodfellas for some sanctions data:

https://www.globalsanctionsdatabase.com/
They said they will get back in 3 business days which probably means fuck all tbh

Data Preprocessing

1. US-defence.csv
    a. Manually built the csv file myself over ~4 hours, so there was no preprocessing to be done. The SEC filings were scattered everywhere.
2. oil_reserves_per_country.csv
    a. Manually built the file myself here as well. I needed to remove the extra commas that were present in the amount of barrels a country had (e.g. Jordan had : 1,000,000 so I needed to remove those 2 commas).
    b. Needed to standardize names of countries in the way that made sense to me. For example, Czech Republic was written like “Czech Republic (Czechia)”, so I removed the “Czechia” part. Ivory Coast was written in french, with the characters that are not easy to get to. Democratic Republic of Congo was written as “DR Congo”.
3. terrorist-attacks.csv
    a. Renamed “Czechia” to “Czech Republic”, changed the french spelling of Ivory Coast again.
    b. Deleted Czechioslovakia and Vanuatu, as they don’t appear anywhere else, and they didn’t have many terrorist attacks.
    c. Deleted all sub groupings of countries, like “World” “Western Africa”, “Asia”.
    d. Deleted everything that has a date of attack before 1994
4. freedom_index.csv
    a. Removed features which didn’t feasibly relate to the propensity for external interventions or the “promotion” of democratic values. Kept 'Government Integrity' , 'Judicial Effectiveness' , 'Trade Freedom' and 'Property Rights'. I believe these are enough for judging a country as not free / democratic.
    b. Similarly, I changed some of the countries’ names that didn’t sit right with me and didn’t match the other countries’ names in different csv files.
    c.

Ranking Variables

- Trade Freedom: This variable has the highest coefficient magnitude (0.5858) and a very low p-value (< 0.001), indicating strong significance.
- Percentage of World Reserves: Although it has a lower coefficient magnitude compared to Trade Freedom (0.2740), it still shows statistical significance with a low p-value (0.004).
- Terrorist attacks: While it has a lower coefficient magnitude (0.0117), it remains statistically significant with a very low p-value (< 0.001).
- Government Integrity: This variable has a moderate coefficient magnitude (-0.0637) and a p-value of 0.043, making it statistically significant but less so compared to the above variables.
- Entity: It has a moderate coefficient magnitude (0.0264) and a p-value of 0.032, indicating statistical significance, although slightly less than the other variables.

- Judicial Effectiveness: This variable has the lowest coefficient magnitude (-0.0270) and a relatively high p-value (0.293), making it the least significant predictor among the variables considered.

Results

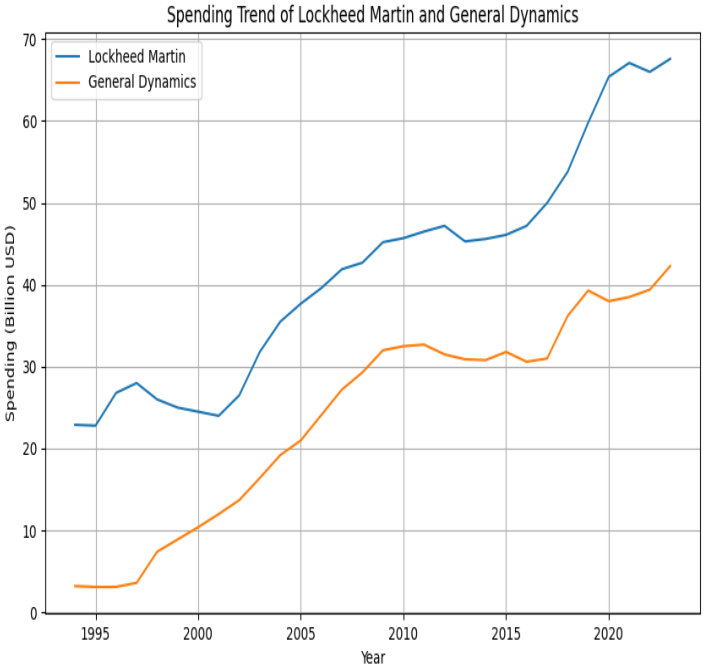

Figure 1: Annual Spending on Lockheed Martin & General Dynamics – Two major US Aerospace and Defence Companies

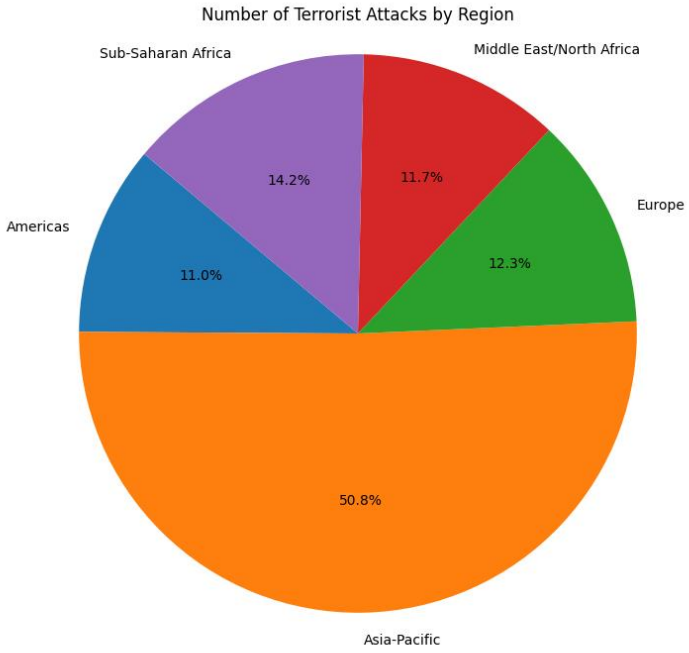

Figure 2: Baseline showing terrorist attacks by region

	Entity	Year	Terrorist attacks	Oil Reserves (Barrels)	Percentage of World Reserves	Country	Government Integrity	Judicial Effectiveness	Trade Freedom	Property Rights
0	Albania	1994	2	168332000	0.01	Albania	36.6	50.0	82.6	56.8
1	Albania	1995	0	168332000	0.01	Albania	36.6	50.0	82.6	56.8
2	Albania	1996	6	168332000	0.01	Albania	36.6	50.0	82.6	56.8
3	Albania	1997	41	168332000	0.01	Albania	36.6	50.0	82.6	56.8
4	Albania	1998	7	168332000	0.01	Albania	36.6	50.0	82.6	56.8
...	...	...	...	...	...	...	...	...	...	...
2335	Vietnam	2017	2	4400000000	0.27	Vietnam	38.7	35.4	79.8	49.6
2336	Vietnam	2018	1	4400000000	0.27	Vietnam	38.7	35.4	79.8	49.6
2337	Vietnam	2019	0	4400000000	0.27	Vietnam	38.7	35.4	79.8	49.6
2338	Vietnam	2020	0	4400000000	0.27	Vietnam	38.7	35.4	79.8	49.6
2339	Vietnam	2021	0	4400000000	0.27	Vietnam	38.7	35.4	79.8	49.6

Regression Results for General Dynamics (Billion USD):

OLS Regression Results

Dep. Variable:	General Dynamics (Billion USD)	R-squared (uncentered):	0.768
Model:	OLS	Adj. R-squared (uncentered):	0.767
Method:	Least Squares	F-statistic:	1545.
Date:	Thu, 11 Apr 2024	Prob (F-statistic):	0.00
Time:	22:27:53	Log-Likelihood:	-9220.3
No. Observations:	2340	AIC:	1.845e+04
Df Residuals:	2335	BIC:	1.848e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Terrorist attacks	0.0101	0.002	4.652	0.000	0.006	0.014
Oil Reserves (Barrels)	1.093e-11	5.02e-12	2.177	0.030	1.08e-12	2.08e-11
Trade Freedom	0.3414	0.010	34.286	0.000	0.322	0.361
Government Integrity	-0.0316	0.028	-1.130	0.259	-0.087	0.023
Judicial Effectiveness	-0.0202	0.023	-0.892	0.373	-0.064	0.024

Omnibus:	811.444	Durbin-Watson:	0.319
Prob(Omnibus):	0.000	Jarque-Bera (JB):	156.825
Skew:	-0.340	Prob(JB):	8.83e-35
Kurtosis:	1.930	Cond. No.	7.37e+09

...ce Indicators Across Countries

Figure 4: Regression Results for General Dynamics

Regression Results for Lockheed Martin (Billion USD):

OLS Regression Results

Dep. Variable:	Lockheed Martin (Billion USD)	R-squared (uncentered):	0.890
Model:	OLS	Adj. R-squared (uncentered):	0.890
Method:	Least Squares	F-statistic:	3776.
Date:	Thu, 11 Apr 2024	Prob (F-statistic):	0.00
Time:	22:27:53	Log-Likelihood:	-9486.3
No. Observations:	2340	AIC:	1.898e+04
Df Residuals:	2335	BIC:	1.901e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Terrorist attacks	0.0120	0.002	4.924	0.000	0.007	0.017
Oil Reserves (Barrels)	1.927e-11	5.62e-12	3.426	0.001	8.24e-12	3.03e-11
Trade Freedom	0.6020	0.011	53.956	0.000	0.580	0.624
Government Integrity	-0.0572	0.031	-1.822	0.069	-0.119	0.004
Judicial Effectiveness	-0.0356	0.025	-1.405	0.160	-0.085	0.014

Omnibus:	64.765	Durbin-Watson:	0.406
Prob(Omnibus):	0.000	Jarque-Bera (JB):	59.886
Skew:	0.343	Prob(JB):	9.91e-14
Kurtosis:	2.621	Cond. No.	7.37e+09

Figure 5: Regression Results for Lockheed Martin

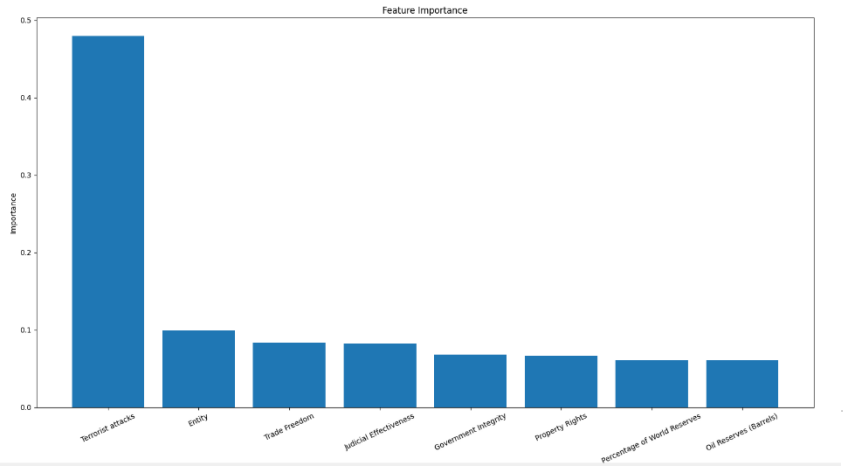

Figure 6: Feature importance - After removing the outlier columns that directly correlated, we get a more reasonable graph - with a higher mean squared error.

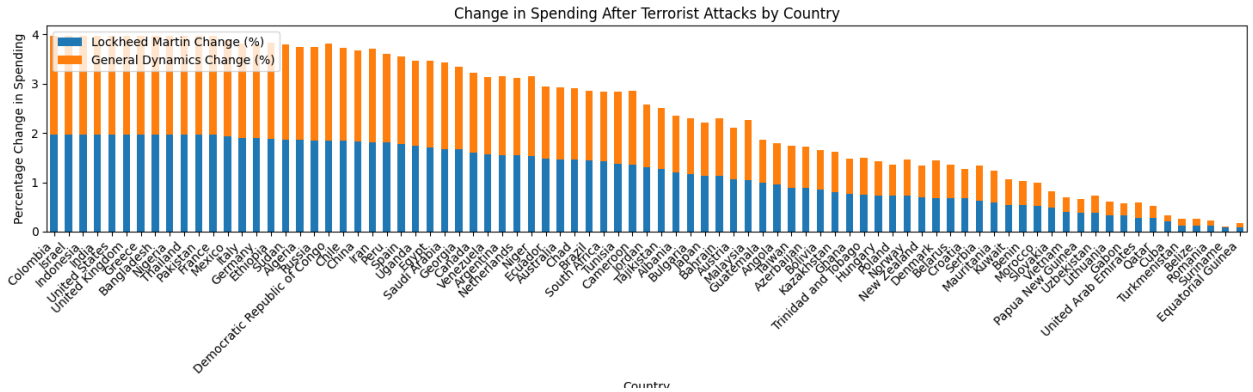

Figure 7

Conclusion

In conclusion, the analysis provides evidence supporting the hypothesis that a correlation exists between the US government's annual defense spending and the freedom index of countries possessing substantial oil reserves. Countries with greater trade freedom and a significant share of global oil reserves tend to see higher levels of US defense expenditure, particularly following terrorist attacks. However, variables like government integrity and judicial effectiveness have a less pronounced effect on US defense spending patterns.

Limitations

- Limited Scope: Our analysis was based on a specific set of variables. Other important variables, such as military alliances or geopolitical considerations, were not included
- Intangibles: There may be other reasons or factors may be the reason as to why there is a correlation of defence funding that we may be unable to notice or capture.
- Contextual Factors: Our analysis does not account for specific historical events that may have influenced defense spending over the period we viewed.

More time

If given more time, we could perhaps include or factor in military alliances and political relationships. Another factor could be comparing defense spending patterns across different countries to identify common trends and factors that may influence spending decisions on increased military funding.