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The Impact of Military Expenditures on Indebtedness of Finland and Sweden

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Abstract

This study investigates the long-term relationship between military expenditures and public indebtedness in Finland and Sweden over the period 2000–2024, in the context of rising defence spending linked to the Russian–Ukrainian conflict and NATO's 2% GDP target. The main objective is to examine whether a positive relationship exists between military expenditures and national debt. Estimating an autoregressive distributed lag (ARDL) framework with macroeconomic control variables, the results reveal a statistically significant positive long-run effect for Sweden, while Finland exhibits a negative relationship. The findings suggest that the fiscal impact of defence spending is country-specific.

KEY WORDS: *military expenditures, indebtedness, ARDL method*

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1. Introduction

European countries are currently under increasing pressure to raise military expenditures, driven not only by NATO's commitment to allocate 2% of GDP annually to defence spending, but primarily by the ongoing Russian–Ukrainian conflict. This shift is particularly significant for Finland and Sweden, two Nordic countries with a long tradition of military neutrality, whose security policies have undergone profound changes following their decisions to join NATO in response to the deteriorating geopolitical environment. Both countries have substantially increased their military expenditures in recent years, raising questions about the potential implications of this trend for public finances and government indebtedness.

The authors of this paper build on previous empirical studies that have predominantly confirmed a positive relationship between country's indebtedness and military expenditures. A substantial body of literature suggests that increased military spending creates additional pressure on public finances, often leading to higher levels of external or public debt [1]. In a related study on the Czech Republic and Lithuania, the same authors [2] found that military expenditures are highly sensitive to changes in the security environment and may generate heterogeneous fiscal effects, with a statistically significant positive relationship between defence spending and indebtedness confirmed only in the case of Lithuania, while no significant effect was observed for the Czech Republic. In line with this, Çolak and Özkaya [3] identified an adverse impact of military expenditures on economic performance and indebtedness in 12 transition economies. Similarly, Khan et al. [4] found that military expenditures in 35 arms-importing countries significantly increase foreign indebtedness. Okwoche and Nikolaidou [5] demonstrated that conflict, arms imports, and military spending have statistically significant positive effects on Nigeria's external debt, although no significant impact was observed on domestic debt. Azam and Feng [6] further highlighted the fiscal implications of defence expenditures in 10 selected Asian countries,

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emphasizing the link between military spending and external debt dynamics. In addition, Ghulam and Saunby [7] showed that higher levels of external debt are associated with increased default risk, underlining the macroeconomic vulnerability that may result from sustained debt accumulation. Building on this strand of research, Pekar et al. [8] analyse the rationality of defence expenditures in NATO's Bucharest Nine (B9) countries, highlighting the role of strategic and economic factors in shaping military spending decisions. Complementing this perspective, Prochazka et al. [9] employ cluster analysis to examine NATO member states and their cohesion, focusing on the alliance's internal and external determinants over the period 2002–2023.

Despite the growing empirical evidence on the relationship between military expenditures and indebtedness, limited attention has been paid to Nordic economies, particularly Finland and Sweden, in the context of the recent shift in the European security environment. This study seeks to fill this gap by examining the long-term relationship between military expenditures and government indebtedness in Finland and Sweden over the period 2000–2024.

Based on previous findings, the authors hypothesize that there is a statistically significant long-term relationship between military expenditures and public debt in these two countries, whereby increases in military expenditures are positively associated with higher levels of indebtedness. To test this hypothesis, the study employs an autoregressive distributed lag (ARDL) model, analysing the relationship between military expenditures and government indebtedness in Finland and Sweden, using nine variables that characterize economic development, including GDP, government spending, imports, and gross capital formation (GCF, representing overall investment in the economy).

2. The Mathematical Background

For the analysis itself, the authors of the paper used the ARDL model examining the link between the indebtedness of the economy and selected economic characteristics, namely military expenditures, GDP, exports, imports, total government spending, total investment, foreign investment and inflation [10]. The authors employed an autoregressive distributed lag model, denoted as ARDL (p, q_1, q_2,…, p_k), where p represents the number of lags of the dependent variable Y_t, and q_1, q_2,…, q_k denote the lag orders of explanatory variables X_{it}, for i = 1, 2,…,k. The model is specified as

$$Y_t = \alpha + \sum_{i=1}^{p} \gamma_i Y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j} \beta_{j,i} X_{j,t-i} + \varepsilon_t, \quad (1)$$

where ε_t is a one-dimensional zero mean error term. This formulation can be reparametrized into a long-run representation, which captures the equilibrium relationship between the dependent variable and the regressors over time [11,12]. The long-run coefficients are given by [10,13]

$$\hat{\theta}_j = \frac{\sum_{i=1}^{q_j} \hat{\beta}_{j,i}}{1-\sum_{i=1}^{p} \hat{\gamma}_i}. \quad (2)$$

A key advantage of the ARDL framework is that it provides both a dynamic specification and a basis for testing cointegration. In particular, a cointegrated system of time series can be estimated within the ARDL framework [13], allowing the included variables to be integrated of order I(0) or I(1) without requiring prior classification. For cointegration analysis, equation (1) can be expressed in first differences as

$$\Delta Y_t = \sum_{i=1}^{p-1} \gamma_i^* \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \beta_{j,i}^* \Delta X_{j,t-i} - \hat{\phi} EC_{t-1} + \varepsilon_t, \quad (3)$$

where the error-correction term is defined as $EC_t = Y_t - \hat{\alpha} - \sum_{i=1}^{k} \hat{\theta}_i X_{i,t}$, and $\hat{\phi} = 1 - \sum_{i=1}^{p} \hat{\gamma}_i$. Pesaran et al. [10] propose a bound testing procedure to assess the existence of a long-run relationship between the dependent variable and the regressors. This approach is based on the following representation

$$\Delta Y_t = \sum_{i=1}^{p-1} \gamma_i^* \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \beta_{j,i}^* \Delta X_{j,t-i} - \rho Y_{t-1} - \alpha - \sum_{j=1}^{k} \delta_j X_{j,t-1} + \varepsilon_t. \quad (4)$$

The null hypothesis of no long-run relationship is given by $\rho = 0$ and $\delta_1 = \delta_2 = \cdots = \delta_k = 0$. The distribution of the associated test statistic depends on whether the regressors are integrated of order $I(0)$ or $I(1)$. Pesaran et al. [10] provide critical value bounds for the cases in which all regressors are $I(0)$ and all are $I(1)$. These bounds can be used to evaluate more typical situations in which the regressors are a mixture of $I(0)$ and $I(1)$.

3. Investigation Results

To investigate mainly the association between military expenditures and external debt in the context of the two aforementioned countries, the authors used data from the time period 2000-2024, that is sufficient time frame to examine the relationship. The main source of the data of variables was International Monetary Fund. Table 1 contains variables: CPI

- rate of increase in prices, GOV_EXP – government expenditures, EXPORT – export of goods and services, FOREIGN_INV – investment from foreign countries, GCF – gross capital formation, total investment, GDP – gross domestic product per capita/per person, IMPORT – import of goods and services, MILEX – military expenditures, DEBT – government indebtedness. There was conducted the basic descriptive characteristics of the studied variables: n – number of measurements, Mean – arithmetic mean, Min – minimum value, Max – maximum value, Median – median, $Q_{0.25}$ – lower quartile, $Q_{0.75}$ – upper quartile, St. deviation – sample standard deviation, Skewness – skewness, Kurtosis – kurtosis (see Table 1).

Table 1

Descriptive statistics

Finland	n	Mean	Min	Max	Median	Q0.25	Q0.75	St. deviation	Skewness	Kurtosis
CPI	25	1.93	-0.16	7.17	1.58	0.98	2.66	1.59	1.43	2.33
GOV_EXP	25	52.33	46.23	57.68	52.85	48.27	55.7	3.87	-0.24	-1.54
EXPORT	25	3	-20.11	16.1	3.98	0.24	6.85	6.87	-1.32	3.12
FOREIGN_INV	25	3.62	-3.84	10.72	4.67	1.92	6.42	3.93	-0.36	-0.91
GCF	25	23.68	21.44	27.26	23.59	22.57	24.56	1.43	0.45	-0.49
GDP	25	54463.8	47478.19	58204.52	54673.39	53330.95	56834	3021.93	-0.77	-0.44
IMPORT	25	3.38	-17	14.86	4.34	1.12	7	6.47	-1.17	1.91
MILEX	25	1.47	1.14	2.3	1.45	1.36	1.49	0.24	1.87	4.15
DEBT	25	11.63	-9.89	38.64	9.46	-2.77	24.63	16.13	0.22	-1.52
Sweden	n	Mean	Min	Max	Median	Q0.25	Q0.75	St. deviation	Skewness	Kurtosis
CPI	25	2.01	0.21	8.06	1.72	1.02	2.04	1.7	2.15	4.66
GOV_EXP	25	50.31	48.31	52.96	49.77	49.3	51.68	1.39	0.38	-1.29
EXPORT	25	4.11	-15.41	12.71	3.81	1.62	7.04	5.98	-1.19	2.39
FOREIGN_INV	25	4.84	-1.05	22.93	3.36	1.8	7.51	4.97	1.81	4.33
GCF	25	23.34	20.46	26.92	23.24	21.99	24.48	1.69	0.16	-1.11
GDP	25	56620.52	48110.39	62729.17	56876.15	53424.31	59771.66	4470.42	-0.37	-1
IMPORT	25	4.2	-14.12	13.11	4.23	2.06	8.18	6.19	-0.92	1.01
MILEX	25	1.31	1.03	2	1.19	1.12	1.43	0.27	1.02	-0.09
DEBT	25	15.28	5.67	30.51	12.16	9.47	20.79	8.06	0.8	-0.96

The following figures display the development of public indebtedness and military expenditures in the selected countries over the period 2000–2024, see Figures 1 and 2.

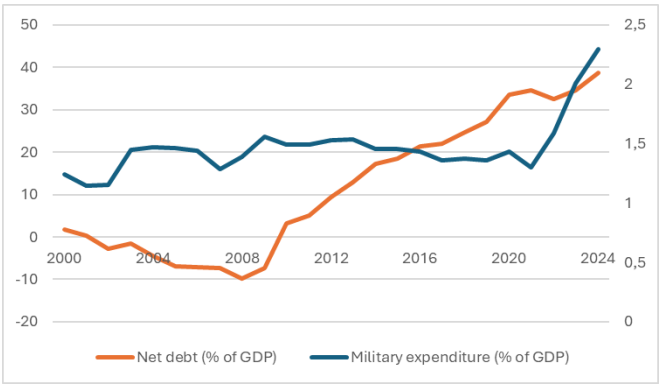

Fig. 1 Development of public indebtedness and military expenditures in Finland

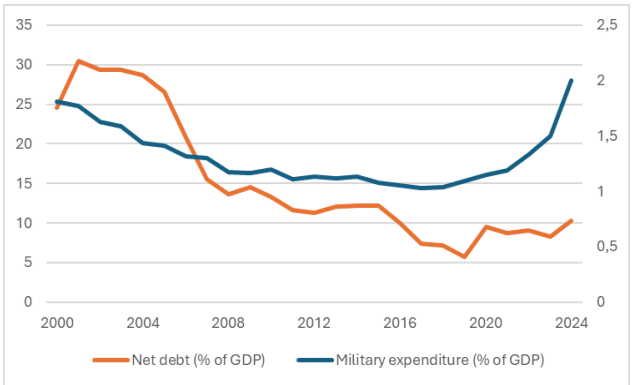

Fig. 2 Development of public indebtedness and military expenditures in Sweden

Between 2000 and the late 2000s, Finland maintained relatively low and stable public debt, supported by steady economic growth and prudent fiscal policy. The Global Financial Crisis led to a sharp economic downturn, after which public indebtedness increased significantly as the government implemented stimulus measures and faced declining revenues. Military expenditures remained modest for much of the period but exhibited a clear upward trend in the late 2010s and early 2020s, particularly in response to changing security conditions in Europe. Following events such as Russia's invasion of Ukraine, Finland accelerated defence spending, reflecting heightened geopolitical concerns and its accession to NATO.

Similarly, between 2000 and the late 2000s, Sweden maintained relatively low public debt, supported by strong economic growth and disciplined fiscal policy. The Global Financial Crisis led to a temporary increase in public indebtedness; however, Sweden's robust recovery and fiscal framework helped stabilize and gradually reduce debt levels in subsequent years. Military expenditures remained relatively restrained for much of the period but began to rise in the mid-2010s as security concerns in the Baltic region intensified. Following developments such as Russia's invasion of Ukraine, Sweden significantly increased defence spending, alongside its decision to join NATO.

Table 2 shows the estimation of the ARDL model. For both countries, the full model and the reduced final model are developed. In the models, all the parameters were displayed, and the significance of each variable was assessed, standard errors are in brackets. The final model was determined for each country separately using so called "backward selection".

Table 2

ARDL model (standard errors in parenthesis)

	Finland				**Sweden**			
Variable	**Full model**		**Final model**		**Full model**		**Final model**	
DEBT(-1)	0.80428	***	0.82341	***	0.43974	***	0.38170	***
	(0.04958)		(0.04133)		(0.08433)		(0.07010)	
MILEX	8.02811	*	5.29803		5.76647	***	3.61845	
	(3.95060)		(3.05284)		(1.07343)		(2.54874)	
MILEX(-1)	-10.89944	*	-7.25932				4.86971	
	(5.94532)		(4.84090)				(4.06343)	
GDP	0.00149		0.00195	***	-0.00053	***	-0.00039	***
	(0.00084)		(0.00061)		(0.00016)		(0.00013)	
GDP(-1)	-0.00208	**	-0.00235	***				
	(0.00074)		(0.00062)					
EXPORT	0.15277				0.04717			
	(0.23391)				(0.10706)			
IMPORT	-0.75366	***	-0.66069	***	0.00641		0.06113	
	(0.21653)		(0.14458)		(0.09484)		(0.06470)	
IMPORT(-1)	-0.27498	**	-0.27188	***	0.13838	***	0.14393	***
	(0.09011)		(0.07115)		(0.04325)		(0.03791)	
GOV_EXP	1.12540	***	1.04178	***	1.27273	***	1.20165	***
	(0.26563)		(0.22796)		(0.33536)		(0.29613)	
GOV_EXP(-1)					0.81029	**	0.81090	**
					(0.34290)		(0.28994)	
FOREIGN_INV	-0.07250				-0.02226			
	(0.12960)				(0.17919)			
GCF	2.34475	**	1.82086	***	0.28289			
	(0.81209)		(0.60256)		(0.32255)			
CPI	-0.26180				0.10909			
	(0.30350)				(0.27945)			
C	-72.22432	***	-68.01948	***	-81.66942	***	-82.03191	***
	(15.66002)		(13.63921)		(21.99755)		(19.41912)	
R^2	0.995		0.995		0.993		0.993	
R^2_{adj}	0.990		0.991		0.987		0.989	

***p < 0.01, ** p < 0.05,* p < 0.10

The authors used the ARDL model to analyse the relationship between the size of military expenditures and the country's indebtedness. The results of the estimated reduced ARDL model show the following equations describing the long-run relationship between variables. Table 3 illustrates the estimation of the long-run equilibrium relationship and contains the results only for the reduced final model for the two case-study countries.

Table 3

ARDL – long-run relationship (standard errors in parenthesis)

	Finland		**Sweden**	
Variable	Coefficient		Coefficient	
MILEX	-11.10671		13.72817	***
	(17.81538)		(2.37294)	
GDP	-0.00227		-0.00062	***
	(0.00145)		(0.00019)	
IMPORT	-5.28113	***	0.33164	**
	(1.27781)		(0.11880)	
GOV_EXP	5.89955	***	3.25497	***
	(0.96373)		(0.59265)	
GCF	10.31148	***		
	3.11735			
C	-385.19210	***	-132.67280	***
	(53.21662)		(35.43666)	

***p < 0.01, ** p < 0.05,* p < 0.10

Finland:
DEBT = –11.1067 MILEX – 0.0023 GDP – 5.2811 IMPORT + 5.8995 GOV_EXP + 10.3115 GCF – 385.1921

For Finland, the relationship between public indebtedness and military expenditures, GDP, imports, government expenditures, and investment (GCF) is illustrated by the above equation. The expected long-term effect of an increase in military expenditures on the country's indebtedness was not confirmed. In contrast, government expenditures (GOV_EXP) show a positive long-run effect, implying that higher public expenditure leads to increased debt. Similarly, gross capital formation (GCF) contributes positively to indebtedness, while GDP and imports show a negative relationship, indicating their debt-reducing effect in the long run.

Sweden:
DEBT = 13.7282 MILEX – 0.0006 GDP + 0.3316 IMPORT + 3.2550 GOV_EXP – 132.6728

For Sweden, the relationship between public indebtedness and military expenditures, GDP, imports, and government spending is captured by the above equation. The expected long-term effect of an increase in military expenditures on the country's indebtedness was confirmed. Government spending (GOV_EXP) also has a positive long-run effect, indicating that higher public expenditure increases debt. Imports likewise contribute positively, whereas GDP exhibits a negative relationship, suggesting a debt-reducing effect in the long run. Table 4 shows the dynamics of the model describing the short-run relationship between debt and the estimated variables for both countries.

Table 4

ARDL – short-run relationship (standard errors in parenthesis)

Variable	**Finland** **Coefficient**		**Sweden** **Coefficient**	
D(MILEX)	5.29803	**	3.61845	***
	(1.87384)		(1.17031)	
D(GDP)	0.00195	***		
	(0.00030)			
D(IMPORT)	-0.66069	***	0.06113	**
	(0.07472)		(0.02140)	
D(GOV_EXP)			1.20165	***
			(0.14582)	
CointEq(-1)*	-0.17659	***	-0.61830	***
	(0.01469)		(0.04450)	

***p < 0.01, ** p < 0.05,* p < 0.10

F-bound test for Finland 14.45, the critical value are 2.39 for $I(0)$ and 3.38 for $I(1)$. *F*-bound test for Sweden 24.13, the critical value are 2.56 for $I(0)$ and 3.49 for $I(1)$. Based on these results, the existence of cointegration can be assumed.

For Finland, the short-run results indicate that a positive change in military expenditures leads to an increase in public indebtedness, which is consistent with prior expectations. Specifically, the coefficient on MILEX is positive and statistically significant, confirming a short-term expansionary effect on debt. GDP also shows a positive and highly

significant effect, suggesting that short-term economic growth is associated with higher borrowing. In contrast, imports exhibit a negative and statistically significant relationship, indicating that increases in imports are associated with a reduction in public debt in the short run.

For Sweden, the short-run results indicate that an increase in military expenditures leads to a rise in public indebtedness, as the coefficient on MILEX is positive and statistically significant. Government spending (GOV_EXP) also has a positive and highly significant effect, suggesting that higher public expenditure contributes to increased debt in the short run. Imports likewise show a positive and significant relationship, indicating that increases in imports are associated with higher levels of public indebtedness.

4. Conclusions

The ARDL model results indicate that the long-run relationship between military expenditures and public debt differs significantly between Sweden and Finland. In Sweden, military expenditures have a positive and statistically confirmed long-term effect on public indebtedness, suggesting that higher defence spending contributes to increasing government debt. In contrast, for Finland, the expected positive long-term effect of military expenditures on public debt was not confirmed. The coefficient is negative, indicating that military spending does not contribute to higher indebtedness in the long run and may be associated with improved fiscal balance. In contrast, short-run dynamics show a consistent positive impact of changes in military expenditures on debt in both countries. Other fiscal variables, particularly government spending, play a significant role in increasing indebtedness across both cases.

Overall, the findings suggest that the impact of military expenditures on public debt is country-specific and depends on broader fiscal and macroeconomic conditions. The positive effect observed in Sweden may be associated with differences in fiscal structure, defence financing mechanisms, or the timing of expenditure shocks. In contrast, the negative coefficient in Finland may reflect more disciplined fiscal policy, different budgetary allocation strategies, or stronger economic offsets associated with defence spending. These contrasting findings highlight the importance of national context when evaluating the fiscal consequences of military expenditures. Future research could extend the analysis by using a broader panel of countries to allow for cross-country comparison and more robust inference. Additionally, examining the composition and efficiency of military spending may provide deeper insight into its implications for long-term fiscal sustainability and economic growth.

The study has several limitations. It focuses only on two countries, limiting the generalizability of the results. The period 2000–2024 includes major economic and geopolitical shocks that may introduce structural breaks not fully captured by the ARDL model. Potential endogeneity between military expenditures and public debt may also bias the estimates. In addition, the model does not reflect institutional and political factors, and the use of aggregated annual data may obscure short-term dynamics.

Despite these limitations, the results of this study suggest several directions for future research. Broadening the analysis to include a wider set of countries would allow for stronger cross-country comparisons and enhance the generalizability of the findings. Further research could also integrate institutional and policy-related factors to more comprehensively capture the determinants of the relationship between military expenditures and public debt. Moreover, examining the composition and efficiency of defence spending may provide deeper insights into its long-term fiscal and economic implications. Overall, the evolving European security environment offers a valuable context for continued empirical investigation of defence economics and fiscal sustainability.

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