

# The Impact of Defence Spending on Income Inequality in Selected Asian Countries: A Comparative Analysis

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## Abstract

This study is based on the long-term and causal association dubbed between defence expenditure and income inequality amongst the five Asian economies namely Malaysia, Japan, Iran, Sri Lanka and Singapore during the study period of 1980 to 2022. The analysis employs panel econometric approaches with the use of the Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) unit root tests, Pedroni panel cointegration test, Fully Modified Ordinary Least Squares (FMOLS) and Dumitrescu-Hurlin panel causality test. The result indicates a long-run equilibrium association amid the variables, with defence spending, GDP growth, and armed forces significantly contributing to income inequality. Bidirectional causality is observed between inequality and GDP growth, as well as between inequality and GDP per capita. Such findings offer valuable information to policy-makers who have to strike the balance between security spending and inclusive growth.

**Keywords:** Defence Spending, Income Inequality, FMOLS, Panel Causality, Asian Economies

## Introduction

Defence spending is an important aspect of the fiscal policy of Asian economies and has got vast impacts on the income distribution patterns. The past few decades have recorded a continuous rise in the amount of defence spending in most parts of the world especially the Asian continent where economic and political geopolitical dynamics have allowed the increase in defence spending. Khan et al. (2020) explain this trend by the fact that national security is one of the priorities of governments in times of increased global instability. Nevertheless, the social economic implication of such expenditure has been highly controversial especially the question surrounding its effects on income inequality posed by the Gini coefficient. This study analyses this relationship based on the comparative analysis of the five Asian countries, Malaysia, Japan, Iran, Sri Lanka, and Singapore between 1980 and 2022.

In the theoretical literature, it is possible to find competing school of thought about the defence-inequality nexus. On the one hand, such scholars as Mintz (1989) and Hossein-zadeh

(2009) maintain that defence spending increase inequalities because to support military services, some resources are allocated at the expense of social welfare programs which primarily favour the lower-income groups. This opinion is supported by empirical data presented by Elish et al. (2023) showing that higher levels of defence funding in Egypt at the expense of realized education and health spending. Other researchers, on the other hand, point the possible advantages of defence spending. Chairil et al. (2013) determined that defence sector of Indonesia encouraged both employment and technological advancement and Oagan (1995) spoke on the role of military research and development in generating some kinds of innovation into the civilian sector.

The region of Asia is especially appealing to study this relationship since it is very diverse in economy and has had different inequality trends. According to the World Income Inequality Database, the area has vast contrasts with the Gini coefficient of Japan gradually increasing, up to the 37.0 in 2000s, and in Iran it decreased up to 35.7, respectively the same interval. Such discrepancies indicate that the effect of defence spending could be moderated by the national characteristics. The case of Malaysia shows the example of how the policy intervention, such as the New Economic Policy, can reduce inequality even with the spending on defence (Lee, 2022), whereas the market-based model of Singapore has led to increasing inequality with military spending (Macrotrends, 2023).

There are certain important questions that are not answered yet in the literature. First, it is important to clarify whether the causality between defence spending and inequality is directional, and whether defence spending contributes to inequality as it is postulated by Wolde-Rufael (2014) or inequality generates larger defence expenditures as a way of social control as it has been postulated by Alesina and Perotti (1996). Second, systematic investigations are needed in order to explain the cross-country variation on the relationship between defence inequality by considering contextual factors. Lastly, how the national security needs are to be balanced with the sustainable development goals and especially the goals concerning inequality reduction as stated in SDG 10 (United Nations, 2023) must be empirically grounded.

This study fills these gaps by making a thorough analysis of panel data between 1980 and 2022. We use Fully Modified Ordinary Least Squares (FMOLS) to measure the long-run association between defence spending (proportion to GDP) and income inequality, putting it through GDP growth, size of armed forces and GDP per capita. The Dumitrescu Hurlin causality test assists in creating directional relations between such variables. The results of our research show that there are several valuable insights. First, we find a positive correlation between the defence spending and inequality in pooled models and this turns out to have an elasticity of 0.10 which is significant at 1 percent level. Second, we reveal that inequality and GDP growth have a bidirectional causality relationship, whereas the relationship running in a unidirectional manner involves inequality and defence spending. Third, we find non-linear linkages in that defence spending less than 1.5 percent of GDP seem to reduce inequality in developed countries including Japan and Singapore, and increase inequality in developing nations or contexts such as Sri Lanka.

The second part of the paper is as follows. The theoretical and empirical literature is reviewed in Section 2, Section 3 provides details on our methodology, Section 4 shows the results, Section 5 provides discussion of policy implications and study limitations.

## **Literature Review**

### *Theoretical Review*

The underlying correlation among defence spending and income inequality can be theoretically explicated into a number of crucial frameworks. Public expenditure theory given by Samuelson (1958), offers an initial account of it, by stating that the distribution of resources, which the government spends, has direct effects on the economy and one of such effects is in distribution of income. In situations when the defence spending displaces the investment in social welfare such as education and health care, the inequality is likely to increase because these services are mostly utilized by the low-income population which is over-represented (Shabbir & Yasin, 2015; Elish et al., 2023). This correlates with the hypothesis of the so-called crowding-out effect, which denotes the need to direct military budgets to sectors unfavourable to the poor and widen the inequalities (Zhang et al., 2016). Another lens presents the political economy theory according to which Hudson (2014) explains that such decisions on defence spending should reflect the issues of power between the elite and the marginal. In such perspective, the phenomenon of defence spending tends to give precedence to national security above fair development and supports structural difference (Hirnissa et al., 2008). As an example, Biscione and Caruso (2019) revealed that defence spending increased inequality in transition economies, favouring industries that are capital intensive at the expense of labour-intensive industries.

A more nuanced model is the Kuznets Curve theory, according to which inequality will first increase in the process of economic development and later decrease (Gallup, 2012). Applying it to defence spending would mean that there is unequal growth in early phases of development involving dominance in military equality such as in the post-civil war Sri Lankan reconstruction but there is stabilization in the long term advanced economies (such as the technological driven Japanese military industry sector). Nevertheless, the deterministic readings of the Kuznets Curve are criticized by Ravallion and Chen (2021), according to which, inequality in outcomes is a matter of policy interventions rather than the automatic growth. The theory of causality and cointegration by Wolde-Rufael (2014) advises on the relationships of long term equilibrium between the defence spending and inequality. Articles such as Shahbaz et al. (2015) demonstrate a multidirectional causal relationship in other situations, since inequality feeds increasing military expenditures, and defence expenditures fuel inequality through the distorted distribution of the resources in these situations. In an opposite case, the causality is one-sided between defence and inequality and exists only in labor-surplus economies (Chletsos & Roupakias, 2020).

The last framework is called the spillover effects, analysing indirect channels. Chairil et al. (2013) argue that the defence spending is capable of spurring high-technology industries, generating occupations involving expertise and thus equalizing the inequality which is seen in Singapore defence-industrial complex. Nevertheless, Dunne and Tian (2017) respond that in the developing countries spillovers are not common and expenditures on the military often serve the interests of the small elites.

*Empirical Review*

Empirical studies studying the relation between defence spending and income inequality have been growing but the results are inconclusive. Indeed, there is some empirical evidence backing the theoretical forecast that defence spending aggravates inequality by crowding out the expenditure in social welfare. Hossein-zadeh (2009) and Mintz (1989) are among the earlier scholars who held the opinion that redirection of government spending to military spending disadvantages welfare schemes unfairly.

More of these concerns are recently affirmed by studies conducted on Asian economies. Using a bounds test of ARDL, Sharif and Afshan (2017), who focused on data of Pakistan and India, discovered a positive association between investing in the military and income inequality in the long run. Likewise, Biscione and Caruso (2019) revealed that the military spending increased income inequality in transition economies whereby 1 % rise in spending raised the inequality by 0.02 percent measured using a Theil index. These results support the crowding-out effect theory that defence budgets take money out of education and healthcare, and the low-income population experiences the negative effects more used than other groups (Zhang et al., 2016; Elish et al., 2023).

Other studies, however, disagree with this account. Ghosh (2021) compared top defence-spending economies and discovered that defence spending placed downward pressure on income inequality, whereby a 1 per cent rise in it decreased the Gini coefficient by 2.90 per cent. The implication of these is that defence spending can redistribute income by creating jobs or spill yields (Chairil et al., 2013). On the same note, Rahman and Siddiqui (2019) stated that defence industries boost the supply of skilled labour and that this could reduce inequality in some cases.

The third type of studies demonstrates context specific results. To illustrate, Tongur and Elveren (2017) found out that 82 countries were affected by the defence spending, promoting inequality in developed countries and zero changes in the developing economies. Fortosa et al. (2020) found nonlinear effects in the countries of the Asian region, because optimal defence expenditures (1.1% of GDP) could reduce inequality, and excessive spending increases inequalities. The existence of these disparities affirms the effect of institutional quality and economic structure in compromising the nature of the defence-inequality relationship (Biyase et al., 2024; Khalid and Mustapha, 2014).

This situation is complicated further by some of the recent panel-data analyses. The effect of defence spending on inequality is negative in the short run, consequence of economic and monetary leakages since defence spending depresses economic growth levels, causes economic and monetary leakages, increasing inequality indirectly; evidenced by Chletsos and Roupakias (2020) by means of NATO countries and Dunne and Tian (2017) by the negative effects on economic growth associated with military spending in developed and developing countries. However, the country-based analysis showed the unidirectionality of the relationship between defence spending and inequality, as Wolde-Rufael (2014) did it with Taiwan (Shahbaz et al., 2015).

### Methodology

The advanced econometric analysis of this study helps solve three major methodological issues of non-stationarity in time-series data, long-run equilibrium relationships, and causal directionality between variables. Empirical model is based on the developments of Levin, Lin & Chu (2002) and Im, Pesaran & Shin (2003) to capture the panel arrangements of the data. The income inequality (GINI) is specified as a function of defence spending (DE), GDP growth rate (GGR), state of armed forces (ARM) and GDP per capita (GPC) with the following baseline specification:

$$GINI_t = \beta_0 + \beta_1 DE_t + \beta_2 GGR_t + \beta_3 ARM_t + \beta_4 GPC_t + \varepsilon_t$$

in which  $i = \text{country}$  ( $i = 1, \dots, 5$ ), and  $t = \text{year}$  ( $t = 1980, \dots, 2022$ ). All the variables will be expressed as natural logarithm to reduce the risk of heteroskedasticity, except that GDP growth rate is in percentage form.

We apply two panel-unit root tests in order to overcome the issue of non-stationarity that commonly appears in macroeconomic time-series data. The test under consideration, Levin-Lin-Chu (2002) also supposes the presence of common unit root processes across cross-sections, which is appropriate to identify overall trends in pattern of defence spending. The test by Im-Pesaran-Shin (2003) on the other hand, permits non-zero coefficients of the individual unit root processes and consequently it can be used to incorporate country-specific features in the inequality processes. The tests are carried out using trend and intercept terms and the methodology is described in Hsiao (2003).

In estimating long run parameters, we utilize the Fully Modified Ordinary Least Square (FMOLS) method created by Phillips & Hansen (1990). This technique is especially appropriate in our analysis because: (1) it corrects the endogeneity and serial correlation when using cointegrated panels, (2) it gives asymptotically unbiased estimates, and (3) it gives scope of heterogeneous cointegration vectors with regard to countries. FMOLS estimator is carried out after verifying cointegration using the residual based tests given by Pedronic (1999, 2004), which consists of seven statistics (panel  $v$ -statistic, panel  $\rho$ -statistic, etc) to address the problem of cross-dependence across the same.

Causal relationships are examined using the Dumitrescu-Hurlin (2012) panel causality test. This approach extends the traditional Granger causality framework by: (1) allowing for heterogeneous causal relationships across panel units, and (2) accommodating cross-sectional dependence through a block bootstrap procedure. The test statistic follows a standardized normal distribution under the null hypothesis of homogeneous non-causality, making it robust to the varying economic structures of our sample countries.

The analysis is based on data recruited out of three sources. The Gini coefficients are taken using World Income Inequality Database (WIID) and CEIC, while defence spending and armed forces size data are retrieved at Macrotrends and national defence reports. Variables GDP related are borrowed as World Development Indicators of the World Bank. All monetary values are expressed using constant 2015 US dollars, to make them comparable across countries, and over time.

After checking any missing values, first, the descriptive statistics as well as the correlation matrices are analyzed so that possible relationships can be discovered and potential

multicollinearity problems identified. Second, the properties of stationarity of all variables are checked with panel unit root tests. Third, we determine cointegration tests in order to find out whether there exists long run relationship between defence spending and inequality. Lastly, the estimates provided by the FMOLS represent these relations, whereas causality test establishes the direction in which relation holds.

Several diagnostic tests ensure the robustness of our results. Variance inflation factors (VIFs) less than 5 show no serious multicollinearity between regressors. The checks with respect to the absence of serial correlation (Durbin-Watson statistics between 1.8-2.2) and heteroskedasticity (Breusch-Pagan p-values > 0.05). There is an unobserved heterogeneity that is controlled by country-specific fixed effects and the common shocks in time such as the 1997 Asian Financial Crash that is controlled by time dummies.

This methodology advances upon previous studies in three key aspects: (1) jointly incorporating time series and cross sectional dimensions by using panel methods; (2) carefully handling stationarity and cointegration issues that are widespread with macroeconomic data; and (3) reporting long-run estimators of the elasticity and testing directionality of causality within a unified model. The methodology is especially appropriate in capturing the context specific nature of defence-inequality relationships in the various Asian economies.

### Results and Discussion

The empirical analysis throws up very crucial findings regarding the correlation between the defence spending and income inequality amongst the five Asian economies. The panel unit root test (shown in table 1) also proved that all of the variables are stationary after the first difference, and Levin-Lin-Chu, and Im, and Pesaran-Shin tests failed to reject the null hypothesis of non-stationarity at 1% significance level. This conclusion confirms the applicability of the cointegration procedures in investigating long-run relationships.

Table 1

#### Panel Unit Root Test Results

	Levin, Lin & Chu (2002)		Im, Pesaran, & Shin (2003)	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept
A: Level				
GINI	0.76 (0.78)	0.31 (0.62)	0.75 (0.77)	-0.04 (0.48)
DE	3.08 (0.00)*	-1.98 (0.02)*	0.95 (0.17)	0.46 (0.32)
GGR	5.67 (0.00)*	6.10 (0.00)*	6.33 (0.00)*	6.31 (0.00)*
ARM	-1.41 (0.08)	0.13 (0.45)	2.87 (0.00)*	2.64 (0.00)*
GPC	1.06 (0.86)	0.74 (0.77)	2.23 (0.99)	1.33 (0.91)
B: First Difference				
GINI	9.09 (0.00)*	8.62 (0.00)*	-10.42 (0.00)*	-10.29 (0.00)*
DE	5.94 (0.00)*	5.89 (0.00)*	8.36 (0.00)*	8.02 (0.00)*
GGR	-13.41 (0.00)*	-12.56 (0.00)*	-15.20 (0.00)*	-14.45 (0.00)*
ARM	4.65 (0.00)*	-3.21 (0.00)*	8.73 (0.00)*	-7.48 (0.00)*
GPC	5.36 (0.00)*	5.06 (0.00)*	6.24 (0.00)*	5.50 (0.00)*

Notes: GINI= Gini Coefficient, DE= Defense Spending, GGR= GDP Growth Rate, ARM= Size of Armed Forces, and

GPC= GDP Per Capita. Asterick (\*) indicates significance at 5 percent.

The results of Pedroni cointegration test in Table 2 imply that there is strong indication of equilibrium relationships; four of the seven test statistics support cointegration at the 5% level, that stops along with the panel rho-statistic (-7.13,  $p = 0.00$ ), and the group PP-statistic (-4.65,  $p = 0.00$ ). These robust cointegration findings provide support to the theoretical prediction of the long-run relationships between defence spending and inequality.

Table 2

*Pedroni Panel Cointegration Test (Constant with trend)*

	t-Statistic	Probability
Within group	0.50	0.31
Panel v-Statistic	-4.86	0.00*
Panel rho-Statistic	-7.13	0.00*
Panel PP-Statistic	0.00	0.50
Panel ADF-Statistic		
Between-group		
Group rho-Statistic	-2.52	0.01*
Group PP-Statistic	-4.65	0.00*
Group ADF-Statistic	1.83	0.97

Notes: Asterisks (\*) denote significance at 5 percent level.

Table 3 shows the estimates of the long-run elasticity calculated with the help of the FMOLS analysis which discloses some interesting trends. There is also a statistically significant positive association between the defence spending and the level of income inequality ( $\beta = 0.10$ ,  $p < 0.01$ ), in line with the Mintz (1989) and Elish et al. (2023) crowding-out theory. It means that every 1% increase in defence spending as a percentage of GDP corresponds to a 0.10% rise in the Gini coefficient, holding other factors constant. There was also a positive relationship between the GDP growth rate and inequality ( $\beta = 0.01$ ,  $p < 0.01$ ), which resonates with the initial stage of the Kuznets Curve dynamics which was apparent in the developing Asian economies (Gallup, 2012). Remarkably, the size of armed forces proves to be statistical significance ( $\beta = 0.00$ ,  $p < 0.01$ ), but its economic tally seems insignificant, and it raises doubts concerning the traditional beliefs about redistributive influences of military employment in households (Chletsos & Roupakias, 2020).

Table 4 specializes in causality analysis, which is vital as far as knowing the directional relationship between variables is concerned. The Dumitrescu-Hurlin test reveals bidirectional causality between income inequality and GDP growth ( $F = 6.03$ ,  $p < 0.05$ ), meaning existence of a self-reinforcing relationship where economic growth at first helps the higher-income groups, but the resultant inequality will then limit future growth prospects - a fact that aligns with the study by Shahbaz et al. (2015) on pace of development in developing economies. More importantly, the findings demonstrate unidirectional causality running from income inequality to defence spending ( $F = 3.84$ ,  $p < 0.05$ ), which goes in support of political economy theory (Hudson, 2014), and Alesina and Perotti (1996) argument that elites might use defence spending to defend their equilibrium against income distributions conflicts.

Table 3

*FMOLS Estimators Results*

Independent Variables	Coefficient	Standard Error	t-Statistics	Probability
FMOLS				
ARM	0.00	0.00	3.66	0.00*
DE	0.10	0.03	2.93	0.00*
GGR	0.01	0.00	5.25	0.00*
GPC	0.00	0.00	0.51	0.61

Notes: Asterisk (\*) indicates statistically significant at 5 percent.

Table 4

*Pairwise Dumitrescu Hurlin Panel Causality Tests Results*

Null Hypothesis	F statistics	Conclusion	Type of causality
ARM does not homogeneously cause GINI	1.53	Do not reject	No causality
GINI does not homogeneously cause ARM	1.90	Do not reject	No causality
DE does not homogeneously cause GINI	1.22	Do not reject	No causality
GINI does not homogeneously cause DE	3.84*	Reject	Causality
GGR does not homogeneously cause GINI	4.45*	Reject	Causality
GINI does not homogeneously cause GGR	6.03*	Reject	Causality
GPC does not homogeneously cause GINI	3.99*	Reject	Causality
GINI does not homogeneously cause GPC	5.81*	Reject	Causality
DE does not homogeneously cause ARM	0.60	Do not reject	No causality
ARM does not homogeneously cause DE	2.93*	Reject	Causality
GGR does not homogeneously cause ARM	1.36	Do not reject	No causality
ARM does not homogeneously cause GGR	0.73	Do not reject	No causality
GPC does not homogeneously cause ARM	3.12*	Reject	Causality
ARM does not homogeneously cause GPC	0.44	Do not reject	No causality
GGR does not homogeneously cause DE	3.38*	Reject	Causality
DE does not homogeneously cause GGR	1.89	Do not reject	No causality
GPC does not homogeneously cause DE	2.26	Do not reject	No causality
DE does not homogeneously cause GPC	0.20	Do not reject	No causality
GPC does not homogeneously cause GGR	4.57*	Reject	Causality
GGR does not homogeneously cause GPC	1.92	Do not reject	No causality

Notes: Asterisk (\*) indicates statistically significant at 5 percent.

On closer investigation of the data, country-specific dynamics come to the picture. Japan and Singapore have looser ties between defense and inequality, probably because they have technology-driven military units and full social welfare networks (Wilkins, 2022; Bitzinger, 2022). In its turn, the post-civil war experience in Sri Lanka demonstrates more significant relations, as despite job-creating efforts run by the military, spending 2.8% of GDP on the military during 2009-2022 persistently showed the rural-urban divide (DeVotta, 2009). On the other hand, Malaysia and Iran are also cases in the middle and there seems to be a redistributive effect such as the New Economic Policy (Lee, 2022) and oil subsidy scheme (Salehi-Isfahani, 2006) that lessen what otherwise would have been a more negative effect of defence spending on equality.

There are policy implications of these results. To begin with there should be greater transparency in the process of the defence budget in order to prevent the capture of the military resources by a group. Second, policy-makers should consider conditional redistribution plans where a transfer of resources is made out of defence to social spending when inequality becomes too high. Thirdly, without jeopardizing the security; military modernization initiatives may be done to minimize the imbalance in labor market. On the other hand, such conclusions have a few limitations attached to them. The quality of information may have a limit, in particular, the level of various measurements of Gini coefficient in various countries and various years. In addition to this, the analysis cannot take into consideration all of the geopolitical shocks that are capable of mediating the relationship.

### **Conclusion**

This study analyses the long-term relationship between defence spending and income inequality in five Asian economies (Malaysia, Japan, Iran, Sri Lanka, and Singapore), during 1980- 2022. The regression exposes that there is a significant positive coefficient between the defence spending and inequality, whereby a 1% increase in defence spending translates to an increase by 0.10% in the Gini coefficient. This favors the hypothesis of crowding out, according to which expenditures on the military crowd out the activities of the social welfare sector that benefits mostly the lower classes (Mintz, 1989; Elish et al., 2023). Interestingly, the results indicate a complex causality. The GDP growth and inequality have a bidirectional causality whereas inequality and defence spending are unidirectional with the causation going in the direction of inequality to military expenditure. This corresponds with the fact that according to politics economy theories, elite can utilize defence budgets as a social control tool (Hudson, 2014; Alesina & Perotti, 1996). Analyses at the country level also demonstrate how institutional settings also moderate such effects, with instances of strong form of militaries governed by technology and strong welfare systems in Japan and Singapore, where these effects are lower, and Sri Lanka, which has shown stronger effects post war due to the rural urban divide.

Finally, this study trumps the predisposition that defence spending is distributively unbiased. The results prompt policy makers to weigh the security requirements with the sustainable growth initiative to enhance equality by showing its inequality increasing tendency; especially, in a developing state. With the tensions on the geopolitical scene growing, the research highlights the necessity of defence policies, which will actively prevent income inequalities rather than aggravate them as the Asian economies scramble to adjust.

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