

Military expenditure, income inequality and economic growth interlinkages: Evidence from Pakistan

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Abstract: *A large literature considers military spending a determining factor for economic growth. Little effort has been made to find this link to inequality. This study breaks the ice by exploring the link between military spending, inequality and economic growth by applying the Generalized Method of Moments (GMM) technique during the period from 1972 to 2016. Using Harrod's technologically augmented Solow growth model, the study finds a positive link between military spending and growth. Inequality is found to be negatively associated with growth. The study also lists some policy implications.*

Keywords: Military spending, Inequality, Growth, Pakistan, GMM.

INTRODUCTION

In his seminal study, Benoit (1973, 1978) showed surprising and thought-provoking results regarding the link between military spending and growth. According to Benoit, military spending improves economic growth in developing countries. These provocative findings have motivated economists to investigate the economic influences of military spending. However, Deger and Sen (1983) strongly criticized the methodology of this study, and most studies found results contrary to previous ones (Dunne, 1996); although, depending on the level of wealth or poverty, the direction and importance of the outcome of military spending on economic growth will likely differ considerably from country to country and from the existence of an armaments industry, etc. (See Frederiksen & Looney, 1983; Brauer 1991). Many studies have been conducted to address the issue, but no consensus has been found among economists. The debate continues on the relationship between the army and growth

The Keynesian school of thought believes that military spending stimulates economic growth because it is part of fiscal policy and the government can use its discretion to stabilize the economy. There are some schools of thought such as neoclassical, institutional, etc., which believe that military spending hinders economic growth. I am of the opinion that military spending can exclude private investment. Military spending can hinder economic growth due to lower infrastructure spending by the government. There is also the possibility that military spending will be financed through domestic and foreign loans, which also has negative effects on the economy.

Therefore, there is diversity in economists' opinions on the economic outcomes of military spending. The positive effects act through the channel of security, aggregate demand, investments and work, while the negative effects show the crowding out effect, the opportunity cost, the increase in taxes, the inefficiency in the allocation of resources and the increase in the political power of [Obreja Brasoveanu, 2010]. Inequality has long been the focus of researchers to determine its impact on growth. Kaldor (1960) and Kalecki (1971) were the first to discuss the relationship between inequality and growth. By establishing nonlinear saving and investment behaviors, they proposed that inequality could positively influence growth. A variety of channels also explain the negative association between inequality and growth, as inequality across median and non-median voter patterns, differential savings rates, socio-political instability, fertility and education, factor participation, and reforms argue that inequality seriously affects economic growth

From 1972 to 2016, Pakistan spent on average nearly Rs. 226672.2 million, which represents 5.2% of GDP in military affairs and ranks 23rd in military spending in the world (SIPRI, 2016). Regarding the Gini coefficient, Pakistan recorded an average value of 0.30 (Pakistan Economic Survey, various issues).

For Pakistan, both military spending and inequality remain hot topics in terms of their impact on growth, but no serious efforts have been made to find the empirical relationship between them. The contribution of this study is to explore the association between them using Solow augmented growth model mainly in Pakistan. Second, this work focuses on explaining the nexus between military growth and growth incorporating income inequality using Harrod's neutral technological progress.

The rest of the chapter proceeds as follows: Section II describes the channels of influence for military spending, inequality, and growth. Section III reviews empirical studies on military spending and economic growth along with inequality and growth. Section IV explains the model specifications, data and methodology. Section V shows the results and discussions, while conclusions and policy implications are presented in Section VI.

MILITARY SPENDING, INEQUALITY AND GROWTH: CHANNELS OF INFLUENCE

In this section, the study describes the various channels through which military spending and inequality influence economic growth.

Spin-off Effects

Secondary effects concern the effects of military spending on physical and social infrastructure. These effects positively influence economic growth and can be divided into direct effects and indirect effects. The direct indirect effects of military spending on growth explain the additional creation of aggregate demand, i.e. military spending increases aggregate demand which ultimately influences growth through increased investment. The indirect effect generates growth through the modernization effect, i.e. research and development carried out in the defense sector can be transferred to the civil sector and improve social infrastructure, especially in developing countries. Likewise, investments in military human capital (training and skills) distribute their benefits to the civilian sector.

Reallocation of Resources

The resource reallocation channel suggests the negative connotation between defense spending and growth. Given the stock of savings, an increase in military spending crowds out private investment and worsens growth. Likewise, the increase in arms imports negatively affects the balance of payments and growth. Furthermore, the negative correlation between military spending and growth is due to the diversion of resources from the export sector to the military sector in the presence of resource constraints. The inefficient bureaucratic system and the excessive tax burden resulting from high military spending are slowing down growth

Creation of New Resources

Finally, the creation of new resource channels suggests the positive influence of defense spending on growth. High military spending promotes investment and growth opportunities through increased security, law and order.

CHANNELS OF INEQUALITY AND GROWTH

Inequality promotes or worsens growth depending on the channels through which it operates. Several models in the literature explain these channels.

Median and Non-Median Voter Models

Median voter models suggest that there is a trade-off between the benefits and costs to the voter due to redistribution. More disadvantaged people face higher costs of redistributive transfers in the form of taxes, which result in a lower level of capital accumulation and growth. Non-median voter models explain that inequality is harmful to growth because it leads to the concentration of resources in the hands of a few politically influential people. Financial corruption in this process diverts it from productive resources to non-productive resources and hinders growth.

Differential Savings Rates

This model is based on the premise that inequality is positive for growth due to the savings differential, since the MPS of capitalists is greater than that of workers. However, the modern interpretation assumes greater savings by workers when human capital is incorporated.

Sociopolitical Instability

This channel assumes that sociopolitical divisions generate uncertainty for investors and hinder growth

Fertility and Human Capital

Perotti (1994) underlined the role of fertility and human capital in determining growth. There is a negative association between fertility and inequality. It works through the mechanism, as the income of the poor increases through redistribution, it will lead to high human capital formation and economic growth by reducing fertility, i.e. increasing the opportunity cost of having more children.

Factor Shares

Pineda and Rodríguez (1999) found a negative association between capital participation and growth. Capitalist societies have a low level of investment in education and healthcare, which ultimately hinders growth. Therefore, inequality due to a high capital share is detrimental to growth, while if the human capital channel is ignored, the link between capital share and growth becomes positive through investment and physical capital formation.

Reforms

Inequality generates polarized societies that make fundamental economic reforms unsustainable. Therefore, inequality slows economic growth in the long run by hampering economic reforms.

REVIEW OF EMPIRICAL STUDIES

There has been a large flow of empirical writings to estimate the connection between military spending, inequality and growth. We divide this section into two parts: one concerns the empirical studies on the military growth relationship while the other concerns the growth-inequality relationship.

STUDIES ON MILITARY SPENDING AND GROWTH

There is extensive literature using a variety of models and techniques to uncover the relationship between the military and growth, e.g. Emile Benoit's study, ad hoc models, demand-side models, supply-side models, supply and demand side models, causality analysis and the Barrò Model. However, very few attempts have been made to explore this relationship using the augmented Solow

model. The researchers found the association between defense spending and growth with and without income inequality. The following studies used the augmented Solow model to explore the military growth nexus without considering income inequality. Caballero et al. (1996) analyzed the effects of military spending on economic growth by applying the Solow augmented growth model for 79 countries during the period 1971–1985. The study found a significant inverse link between defense load and growth. Additionally, military spending has shifted investment levels. Murdoch and Sandler (2002b) adopted the Solow augmented growth model to study the effects of civil wars on the short- and long-run growth of home and neighboring countries of four groups of countries. The study estimated the results through the panel data procedure using data from the period 1961-1995. In both periods, the effects of the civil war on economic growth were negative in all regions. Yakovlev (2007) studied the effects of military spending and net arms exports on economic growth using the Solow augmented growth model for twenty-eight countries over the period 1965–2000. The study's GMM and panel estimation techniques with fixed and random effects were used. The results of the empirical study indicated that military spending and net arms exports had negative effects on growth.

Two studies simultaneously examined the relationship between military spending, inequality, and growth, one of which applied the Solow augmented growth model. Aksogan and Elveren (2012) analyzed the impact of health and education spending, along with defense spending, on income inequality in Turkey over the period 1970-2008. The study found that growth and social transfers showed better effects on income inequality, while defense spending generates greater inequality. The study used an indirect channel to explore the link between defense spending and growth. In a recent study, Tongur and Elveren (2014) applied the Solow augmented growth model to explore the relationship between military spending, inequality, and growth for the period 1963–2008. Based on Turkey's structural model, the study found that income inequality is positively associated with growth, but military spending does not show a significant relationship with growth.

To date, it is clear that studies using the Solow augmented growth model have shown a negative association between military spending and growth, but studies using Feder, Deger, and Benoit-type models have found a defense-growth relationship, mostly positive.

. STUDIES ON INEQUALITY AND GROWTH

Forbes (1997), using a panel data study, found a positive association between inequality and growth. Li and Zou (1998) validated the findings of Forbes (1997). Barro and Martin (1995) explored a nonlinear relationship between inequality and growth, that is, for high levels of income, inequality promotes growth, but for low levels of income it slows growth. In another study, Barro (1999) showed the positive relationship between inequality and growth. Alesina and Drazen (1991) and Fernández and Rodrik (1993) present the link between inequality and growth through reforms. Alesina and Rodrik (1994) and Persson and Tabellini (1994) demonstrated the inverse relationship between inequality and growth by validating median voter models. Benabou proposed the models of non-median voters that justify the negative association between inequality and growth (1996) and Rodríguez (1999b). Perotti (1994), Alesina and Perotti (1993) and Alesina et al. (1992) provided negative empirical evidence between inequality and growth.

Castello-Climent (2010) proposed the inverse relationship between inequality and growth for middle-income countries. Kanbur (2000) demonstrated that inequality reduces economic growth due to uncertainty resulting from socio-political instability. Nissanke and Thorbecke (2010) observed that antisocial activities such as corruption, hoarding, and growing threats to property rights due to political and social polarization increase inequality which ultimately reduces economic growth

The studies discussed above on inequality and growth show varied results which suggest that the relationship needs to be explored using comprehensive data and modern econometric techniques.

MODEL SPECIFICATION, DATA AND METHODOLOGY

MODEL

Based on the theoretical foundations of the Solow augmented growth model presented by Manikiw, Romer, and Weil (1992), this study extended the model by incorporating inequality to find the link between military spending, inequality, and economic growth. None of the above studies applied Solow growth model enriched with military spending and inequality constraints for Pakistan. The study added a new dimension of inequality to the model previously developed by Dunne et al. (2005) based on the Solow augmented growth model to find the link between military spending and economic growth.

The model specification begins with the neoclassical production function that characterizes labor augmentation technology as

$$Y(t) = A(t)L(t)^\alpha K(t)^{1-\alpha} \quad (0 < \alpha < 1) \quad (1)$$

where Y(t) is aggregate income, K(t) is the capital stock, L(t) is labor and A(t) is the efficiency parameter representing technological progress. A(t)L(t) or AL refers to actual labor growing at a rate of (n+g). α is the share of capital in income, while (1-α) is the effective share of labor in income.

DATA AND METHODOLOGY

The data used for this study ranging from 1972 to 2016 was obtained from two sources. Data on GDP, gross capital formation and military spending are taken from World Development Indicators, while data on labor force, Gini coefficient and population are taken from Pakistan Economic Survey (different numbers). The study uses the Generalized Method of Moments (GMM) methodology to estimate equation (10) in order to resolve the endogeneity problem evident in the model.

RESULTS AND DISCUSSIONS

Table 1 presents the results of Durbin Wu Hausman (DWH) endogeneity test.

TABLE 1

| Variable | Chi-Sq. Statistic | d.f | Prob. |
|--------------------------|-------------------|-----|--------|
| COV χ^2 , $(1, 10)$ | 0.3970 | 2 | 0.7689 |

The results of the Durbin Wu Hausman (DWH) test indicate that we cannot reject the null hypothesis that OLS estimators are consistent and efficient compared to instrumental ones variables

Table 2 presents the results of estimating equation (10), showing the influence of defense spending and income inequality on economic growth under the technology-neutral, augmented Solow growth model. of Harrod. The variables of interest for the study are Inequality and military spending, while other mediating variables are used to interpret this relationship.

From the table it is clear that the coefficient $Y(t-1)$, i.e. the lag of one period of the logarithm of GDP per capita, is positive and highly significant. This means that the impact of the previous GDP per capita has a positive influence on the current level of GDP. It is based on the multiplier-accelerator interaction theory, which postulates that the increase in GDP in one period continues its effects in the next period based on the interaction between the multiplier and accelerator up to a certain time. But this result contrasts with previous findings of (Dunne and Nikolaidou, 2011; Tongur and Elveren 2014).

TABLE 2

GMM based Results of Military Spending and Inequality

| Explanatory Variables | Dependent Variable: ln(Y) | | | |
|-----------------------|---------------------------|--------------------|-------------|----------|
| | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 2.042410 | 1.272971 | 1.581015 | 0.1108 |
| ln Y(t-1) | 0.850866*** | 0.073267 | 12.81193 | 0.0000 |
| ln s | 0.073155 | 0.155636 | 0.438714 | 0.5531 |
| ln(n+g+δ) | -0.373160* | 0.254010 | -1.830746 | 0.0637 |
| ln ms | 0.873147* | 0.478591 | 1.778119 | 0.0718 |
| ln ms(t-1) | 0.668174* | 0.385330 | 1.677426 | 0.1007 |
| Ineq | -0.481125 | 0.250670 | -1.911855 | 0.0641 |
| R-squared | 0.993815 | Mean dependent var | | 9.434403 |
| Adjusted R-squared | 0.883002 | S.D. dependent var | | 1.320289 |
| S.E. of regression | 0.102372 | Sum squared resid | | 0.228859 |
| Durbin-Watson stat | 1.805710 | J-statistic | | 0.028679 |

The ratio between gross fixed investment and GDP, indicated as lns, has a positive sign, although it is insignificant and can therefore be ignored. The coefficient $(n+g+\delta)$ which represents the increase in the growth rate of the workforce appears with a negative sign at the significant level of 10%. The result of this coefficient is in line with the results of Dunne and Nikolaidou, 2011; Tongur and Elveren 2014. The negative correlation explains that physical capital per worker decreases due to the increase in population which hinders growth (Mankiw et al., 1992).

The military spending coefficient, is the main variable of interest for this study. It also represents the military load of a Village. The coefficient is positive and significant, which means that military spending has a positive impact on the growth of a country like Pakistan. There is a strong theoretical rationale for such findings in the defense economics literature. There are two types of indirect effects of military spending on growth (Deger, 1986a): one is direct and the other is indirect. Direct effects are generated through the effects of military spending on physical and social infrastructure and ultimately accelerate growth. In the case of Pakistan, the army has so many resources to serve in almost all sectors parallel to the civilian one. For example, CMH, Army Welfare Fund, Askari Bank, Fouji Foundation .

The indirect path of splitting operates through the modernization effect. The military sectors heavily engaged in research and development through investments in human capital. It also provides technical support to the civil sector. These effects of modernization are operationalized through educational institutions working in the military sector, for example the National University of Science and Technology (NUST), military colleges, army public schools and federal colleges, etc.

Deger (1995) also argued for the positive influence of defense projects on economic growth through the creation of new resources that thrive on the basis of security. This means that increased defense spending will result in peace and security, which can invite domestic and foreign investment, resulting in the creation and growth of new resources.

The socio-political and religious services provided by the military sector to the civil sector in Pakistan represent a further contribution to improving growth, as they should be in the case of elections, Muharram, land reclamation operations, censuses, natural disasters, rehabilitation of internally displaced persons and monitoring of various departments (WAPDA, Railways)

The positive result of military spending and growth in this study is in line with the findings of other researchers, namely Benoit, 1973; Aries, 1986; Atesoglu and Mueller, 1990; Ward et al., 1991; Biswas, 1993; Macnair et al., 1995; Alexander, 1995; Murdoch et al., 1997; Ramos, 2004; Sachin and Cetinkaya, 2010; Sheikh, 2014 and Sheikh and Chaudhry, 2016.

It should not be wrongly assumed that military spending should focus exclusively on improving growth in developing countries, but it is mostly so in Pakistan, where the military dominated the economic process and acquired so many skills and resources that over time led to economic growth. The other important variable in the study is inequality. It appears in the model with a negative sign, suggesting that inequality is holding back Pakistan's economic growth due to the reasons given in the models of non-median voters, socio-political instability, factor participation, and reform arguments. The result of this coefficient is in line with the results of previous studies.

CONCLUSIONS AND POLICY IMPLICATIONS

The study is an attempt to explore the relationship between military spending, income inequality and economic growth. The novelty of this study is that it incorporates inequality into the constraints of Harrod's technology-neutral Solow augmented growth model, mainly applied in Pakistan. Second, this study develops the framework of inequality and growth in the presence of defense spending and its economic outcomes. Therefore, the defense-inequality-growth triangle was first estimated in Pakistan and rarely in defense economics internationally.

The results of this study focus on two variables: military spending and inequality. The result for military expenditures is in agreement with the hypothesis of the study. The results are consistent with the findings of previous studies. Inequality is considered significant and negative. The Solow augmented growth model for defense spending supports the hypothesis that defense spending improves economic growth through technological benefits, positive externalities, and infrastructure facilities for Pakistan. Therefore, the findings of the study suggest that Pakistan should continue to spend more in the defense sector to achieve complementary effects on growth. Pakistan has a notable defense industrial base, for example, Heavy Industries Taxila (HIT), Pakistan Ordnance Factories (POF), Pakistan Aeronautical Complex (PAC) Kamra, Pakistan Navy Dockyard (PND), Karachi Shipyard and Engineering Works (KSEW). Pakistan's industrial base is substantial, growing and inclined to technologically advanced manufacturing. It has indirect effects on growth through the provision of an infrastructure base, research and development initiatives and the implementation of sophisticated technologies in manufacturing sectors. The sector also provides healthcare, education, transportation, communication and other social sector related services in Pakistan which lead to economic growth. For the reasons mentioned above, governments are justified in spending more in the defense sector. The findings of this study also supported the new resource creation hypothesis, suggesting that defense spending through the inflationary process improves economic growth, especially in resource-constrained economies such as Pakistan.

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