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The nexus between defense expenditure and economic growth: New global evidence

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ABSTRACT

This paper applies a two-step Generalized Method of Moments (GMM) to re-examine the causality between defense burden (MB) and real GDP (RY) for 137 countries. The findings indicate that a short-run causality running from MB to RY is found in lower-middle- and high-income countries and that from RY to MB is found in low-income countries, while bidirectional short-run causality is found in Asia, Europe, Latin America & the Caribbean and the Middle East & North Africa. No causality is found in upper-middle-income, European & Central Asian and Sub-Saharan African countries. Thus, our results do not support that one size fits all. This paper contributes important implications to the countries for making their defense policy.

1. Introduction

Ever since the seminal contribution of Benoit (1973, 1978), causal relationships between defense expenditure and economic growth have been extensively discussed in the literature.[1] Earlier studies about the relationships between defense expenditure and economic growth are "unfortunately blurry" due to different results for different countries in the same region, different time periods within the same country, and different methodologies in different regions (see Table 1). Moreover, the few research efforts that are on the issue of the defense–growth relationship use a dynamic panel data model within a global data framework, but the process of economic development may be dynamic, with current realizations of economic growth influenced by past ones. Although the key role of defense on economic growth is already a stylized fact as verified by many empirical studies, how the conditions of economic development and regions (geographic locations) impact on defense expenditure and its implication on the defense–growth nexus has not been adequately addressed in the literature.

This paper contributes to the literature by employing the dynamic panel Generalized Method of Moments (GMM) method to overcome econometrics limitations, i.e. the problems of small sample and endogeneity, and to address the problem of an interrelationship between defense expenditure and economic growth.[2] The general estimators are designed for situations with few time periods and many countries, with defense variables that are not strictly exogenous, with fixed effects, and with heteroskedasticity and autocorrelation within countries. We further use different regional or income panels to overcome the lumping problem and assess whether the defense–growth relationship is supported depending on countries classified by region and income. It is expected that the empirical results will lead to different policy implications and strategies for different sub-panels.

Due to a lack of data, most studies use cross-sectional (i.e. Deger, 1986; Galvin, 2003; and so on) or time-series (i.e. Dakurah et al., 2001; Karagianni and Pempetzoglu, 2009; Karagol, 2006; Klein, 2004; Lai et al., 2005; Safdari et al., 2011; and so on) models to investigate the relationship between defense expenditure and economic growth. One explanation for the failure to reach a consensus is that methodological limitations have plagued much of the literature (see Table 1), with a

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[1] Using data from 44 less-developed countries for the 1950–1965 period, Benoit (1973, 1978) found that defense expenditure has a positive impact on economic growth, a relationship that is referred to as the *Benoit Hypothesis*.

[2] In Wooldridge's (2001) opinion, a GMM method is necessary for more sophisticated applications, i.e. a dynamic panel data model with unobserved effects.

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Table 1
Empirical studies on the causal relationship between defense expenditure and economic growth.

Authors	*Period*	*Countries*	*Empirical methods*	*Causal relationships*
Benoit (1973, 1978)	1950–1965	44 Less-developed countries	Means of correlation analysis	DEFEXP→INCOME
Chang et al. (2011)	1992–2006	90 Countries	GMM	The relationship cannot be generalized
Chowdhury (1991)	1961–1987	55 Developing countries	Granger causality test	The relationship cannot be generalized
Dakurah et al. (2001)	1975–1995	48 Developing countries	Granger causality test	The relationship cannot be generalized
Deger (1986)	1965–1973	50 Less-developed countries	Three-stage least squares	DEFEXP↔INCOME
Gadea et al. (2004)	1960–1999	15 NATO countries	Cointegration	DEFEXP←INCOME
Galvin (2003)	1999	64 Developing countries	Ordinary least squares, two-stage least squares and three-stage least squares	DEFEXP→INCOME
Gerace (2002)	1951–1997	U.S.	Spectral method	No relationship
Joerding (1986)	1962–1977	57 Less-developed countries	Granger causality test	DEFEXP←INCOME
Karagianni and Pempetzoglu (2009)	1949–2004	Turkey	Linear and non-linear Granger causality tests	Linear: DEFEXP ←INCOME Non-linear: DEFEXP →INCOME
Karagol (2006)	1960–2002	Turkey	Impulse response function, variance decomposition and cointegration	DEFEXP→INCOME
Klein (2004)	1970–1996	Peru	Deger-type Simultaneous equation model	DEFEXP→INCOME
Kollias et al. (2004a)	1964–1999	Cyprus	Granger causality test	DEFEXP↔INCOME
Kollias et al. (2004b)	1961–2000	European Union	Vector error correction model	The relationship cannot be generalized
Kollias et al. (2007)	1961–2000	European Union	FE, dynamic FE and panel cointegration	DEFEXP↔INCOME
Kollias and Paleologou (2013)	1956–2004	U.S.	Linear and non-linear Granger causality test	Linear results: DEFEXP→INCOME (in the short run) DEFEXP↔INCOME (in the long run) Non-linear results: DEFEXP←INCOME
Kusi (1994)	1971–1989	77 Developing countries	Granger causality test	The relationship cannot be generalized
Lai et al. (2005)	1953–2000	Taiwan mainland China	Multivariate threshold vector autoregression model	DEFEXP↔INCOME DEFEXP→INCOME
Lee and Chen (2007a)	1988–2003	27 OECD countries and 62 non-OECD countries	Panel cointegration and panel causality test	DEFEXP↔INCOME
Lee and Chen (2007b)	1960–2002	Taiwan	Threshold autoregression	The relationship cannot be generalized
Safdari et al. (2011)	1988–2006	Iran, Malaysia, Saudi Arabia and South Korea	ARDL and Granger causality test of Toda and Yamamoto (1995)	
Yildirim et al. (2005)	1989–1999	Middle Eastern countries and Turkey	GMM	DEFEXP→INCOME
Yakovlev (2007)	1965–2000	28 Countries	FE, RE and GMM	DEFEXP→INCOME

Notes: DEFEXP→INCOME means a causal relationship from defense expenditure to real income. DEFEXP←INCOME depicts a causal relationship from real income to defense expenditure. DEFEXP↔INCOME represents bidirectional causality between defense expenditure and real income. FE stands for the fixed effects model. RE refers to the random effects model. GMM denotes the Generalized Method of Moments. ARDL denotes the autoregressive distributed lag approach.

problem being that the power of estimation is low with short data spans of 20 to 40 years that are commonly employed in single country studies (i.e. Chowdhury, 1991; dakurah et al., 2001; Karagol, 2006; Klein, 2004; Kollias et al., 2004a; Safdari et al., 2011; and so on). Even though recent studies use panel data techniques to control for country-specific effects, the traditional 'static' panel data model may give rise to endogeneity among the explanatory variables and may not take the processes of dynamic adjustment into account (i.e. Kollias et al., 2007; Lee and Chen, 2007a). Bond (2002) indicated that dynamic models are of interest in a wide range of economic applications including empirical modes of economic growth, allowing that dynamics in the underlying process may be crucial for recovering a consistent estimator of other parameters. Wooldridge (2001) also noted that a GMM estimator would be more efficient than the fixed-effect estimator in the existence of heteroskedasticity or serial correlation. Besides, given that defense may have a causal impact on growth, the use of a simultaneous framework, which treats both defense and growth as endogenous variables seems more appropriate. This paper uses the concept of causality in the predictive rather than in the deterministic sense.

There is a tendency for the literature to neglect the possibility of bi-directional causality between economic growth and defense expenditure. However, using panel data also produces another problem in which different countries are treated as an entity, not as a separate unit (Lee and Hsieh, 2013; Lee et al., 2013). Therefore, we cannot identify the differences in the relationship between economic growth and defense expenditure among countries. This study classifies the panel data into different sub-panels based on different income levels and locations. By controlling for country heterogeneity using the panel data approach, we hope this study will provide not only a clear picture of the relationship between defense spending and economic growth, but also offer a more accurate inference.

This study contributes to the existing literature in the following ways. First, while previous studies have focused mostly on developing countries, this study initially analyzes the data on a global level. Second, we empirically re-examine the causal relationship between defense expenditure and economic growth by applying a dynamic panel vector framework, which is completed using the most up-to-date defense expenditure data for 137 countries during the 1988–2005 period. Third,