

## Lecture 4: The Demand for Military Spending

- Have seen that military spending can change markedly over time. An important question is why. Can see from UK and US long run strategic role, but now why so high?
- This lecture will consider the potential determinants of military spending and some of the findings of a interesting empirical work that ranges across economic and political science
- A major issue we have already dealt with is problems of measuring military budgets and comparing across countries –see SIPRI appendices to Yearbook chapters.
- Clear links to the literature on determinants of conflict which we consider in the next lecture.

### Security and military spending

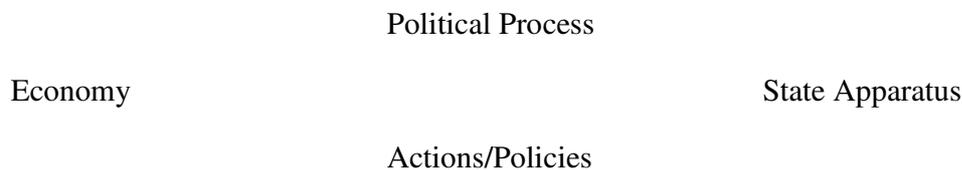
- Adam Smith considered the role of the sovereign/state to maintain security by stopping robbing pillaging and looting and provide defence of the realm. Robbing vs taxing?
- Maintaining security forces costs money and for Smith the military was unproductive, so trade off
- So military spending is an input to production of security.
- In principle state/sovereign should simply determine millex by spending up to the amount where the marginal increase in benefit from security is equal to the opportunity cost
- But not as simple as this
  - Can't measure security
  - Defence is a public good
  - Threats difficult to forecast or prepare against
  - National security may not correspond to individual security –usually an elite/ruling class who may start war for own interest

- Government not aggregation of preferences –autonomy –competition among groups -MIC
- In globalised world not defence of realm but safety of vested interests and issues of international public goods
- Increasing military spending may provoke response –conflict or arms race
- If no threats status and prestige; vested interests; insurance; argue other roles military can play eg rescue
- There are interservice battles over equipment to increase their shares and this can lead to increase overall and to strange compromises. The change in the share of expenditure towards the airforce, while whole weapon systems, such as cavalry have been replaced. Military response to change not great -cavalry still in use in US post WW2.
- Technological developments can increase uncertainties about the future and so increase spending above what it needs to be
- Technology can end up being the end product -not the weapon itself. This can lead to a ‘baroque arsenal’ (quote MK) with high tech, high spec expensive weaponry that doesn’t work in practice and is not efficient

### **State Expenditures**

- Really military expenditure is just a part of total government expenditure -it has specific characteristics but in many cases is simply seen as part of the ‘public sector’ or government. There are different views of the state:
  - N-C: the government is considered to respond to market failure a neoclassical paternalistic state dealing with the excesses and imperfections of the market
  - Keynesian state with government control and involvement in economic development through fiscal and monetary policy.
- It is useful to distinguish between positive theories -why the state does what it does and normative -what the state should do.
  - The state exists to provide public goods -those which a cannot be provided by the market because of non-exclusivity of which security is an obvious example, and because of the importance of externalities, which again are not dealt with by the market.

- This suggests a minimal state is necessary for a market economy, which protects agents against violence and theft, enforces contracts and taxes only to fund this activity.
  - Such a state does not have to be democratic or even reflect the preferences of the individuals in society. Social contract from Hobbes and Locke onwards have provided criteria to many normative judgements on the nature of society,
  - To relate this to the neoclassical model requires some form of social choice analysis, with the individuals in society having preference aggregated to the level of society (cardinal or ordinal) or some form of voting rules which allow majorities to determine outcomes.
  - This approach can be used to analyse a number of phenomena in the modern state, bureaucratic behaviour, pressure groups, government monopolies etc. But this is done in an ad hoc manner and for our purposes is inadequate.
  - There is no real concept of the state as a complex entity, it is a black box except for some ad hoc formulations.
- To go further it is useful to distinguish between the state and the state apparatus



- The state sets up a bureaucracy to collect information on the economy, but will be affected by the state apparatus/political process. This will affect how data are collected, interpreted, acted upon. The apparatus is amenable to change, through political pressure and action. Pressure groups can become incorporated into the apparatus -corporatism. (Aronovitch and Smith, ).
- Different theories of the state can then be seen as different ways of describing the processes and interrelations. The conventional theory sees feedback through the political system -voting theory and 'institutionalist's approach would focus on the party political processes and the bureaucratic.
- Marxist analyses take three forms: reductionist: expression of nature of capitalism in general, just reflects underlying class monopoly; functionalist -automatic response to the needs of capitalism; institutionalist-set of institutions reflecting nature of class struggle.

Conflict occurs within the state and no determinate outcome. Does provide useful insights -more complex.

### **What determines Military Spending?**

- Clearly there are both economic and strategic factors that could be important. Political scientists distinguish normative and positive approach (Russett, 1970, Nordhaus et al 2009)
- Normative: Military spending as national public good with transnational spillovers responding to threats and ongoing conflict. Nations provide citizens with security from external threat by spending on military, limited by size of national economy. Nations security environment determined primarily by likelihood of conflict and cost of any ongoing conflict
- Positive: includes various elements –power of MIC, bureaucratic inertia, arms races, domestic politics and the normative elements
- Nordhaus et al combine these and ask what relative importance of normative and positive are. Argue first with economists characterisations of optimisation problem –demand function to maximise external security from a threat subject to budget constraint, expenditure of allies and spillovers from private goods such as internal security

## Modelling the Determinants of Military Spending

- Approaches to modelling:
  - Those based on the arms race models of Richardson (1960), which are best suited to situations in which countries are in conflict and have often failed to perform well empirically (Dunne, 1996; Smith, 1989).
  - Those studies focusing on a range of economic, political and strategic determinants of military spending, with the most satisfactory empirical analyses tending to take a relatively comprehensive approach.
  - More recently these two strands of research have been brought together with arms race dynamics introduced into demand models, giving a more complex structural model than an action-reaction framework and also considering economic, political and military factors.
  - There are also 'ad hoc' cross country and case studies that still make a valuable contribution.
- Sandler and Hartley (1995) review a variety of applied studies and their general specification for the demand equation is

$ME = F(\text{income, spillin, threat, economic variables, political variables, dummies})$

- income is usually GDP
- spillin is lagged MILEX of allies
- Threat is lagged MILEX of threat
- Economic variables -eg size of budget deficit
- Political variables are political party/affiliation
- Dummies are other environmental factors such as wars summarised as dummy variables.

- An alternative approach treat the government as a rational actor facing some threat, following Smith (1980).
- Social welfare function (SWF) where welfare is a function of the welfare gained from a sense of security (S), from non-security expenditures (C), and exogenous internal political influences (ZP).

$$W = W ( S, C, ZP)$$

- This is seen as a household production model where Security  $S$  is seen as being an output from the inputs of military spending and other security variables, such as the military spending of allies.

$$S = S(M, ZS)$$

- There is then a budget constraint:

$$Y = P_M \cdot M + P_C \cdot C$$

- From this model a demand function can be derived where military spending is a function of output ( $Y$ ), or just civil output, the price of military  $P_M$ , the price of civil  $P_C$ , the political and security factors.

$$M = F(Y, P_M, P_C, ZP, ZS)$$

- There are empirical issues:
  - specific data on military prices is not available
  - burdens rather than level used
  - share of military spending in GDP (the military burden) is expressed as a function of GDP,
  - of various other economic and strategic variables, and of political variables such as the type of regime.
  - Population is also included to pick up possible public good effects.
- Can use Almost Ideal demand system, Stone Geary, or ad hoc
- Smith (1990) estimates the an error correction form after spec tests for UK

$$\Delta SM_t = \beta_0 + \beta_1 \Delta SA_t + \beta_2 (SM_t - SM_{t-1}) + \beta_3 KD_t + \beta_4 RD_t + \beta_5 N_t$$

$SM$  is the share of UK military expenditure in output (GDP),

$SA$  is share of US military spending in output,

$SR$  is the share of Soviet military spending in output (GNP, from ACDA),

$KD$  is a dummy for the Korean War,

$RD$  is a Defence Review dummy variables and

$N$  is a dummy variable for the NATO 3% real growth in military spending commitment made in the mid 1970s.

- Dunne, Pashardes and Smith (1984), provide a model which is more complex, allowing the interaction of milex with other forms of government expenditure and considering incrementalism, allowing for the persistence of milex due to bureaucratic inertia.
- Results with Smith's specification and other studies, suggested that milex in the UK is little influenced by political factors. This is certainly not the case for the US, where the

political business cycles influenced by changes in President and government are well recognised and such effects are very important in the determination of military expenditure.

### Arms Race Models and Strategic Effects

- There are other studies which focus more on the external factors, retaining the formal approach, but focusing on modelling arms races e.g. Murdoch and Sandler.
- The basic Richardson (1960) 'arms race' model supposes two countries whose military expenditure/level of arms/military capability,  $m_1$  and  $m_2$ , are related at time  $t$  by the equations:

$$\frac{dm_1(t)}{dt} = a_1 + b_1 m_2(t) - c_1 m_1(t)$$

$$\frac{dm_2(t)}{dt} = a_2 + b_2 m_1(t) - c_2 m_2(t)$$

- Where  $a_i$  are exogenous 'grievance' terms,  $b_i$  are 'reaction' terms, whereby each country responds to the military capability of the other, and  $c_i$  are 'fatigue' terms, usually representing some internal limitations on a country's military spending/capability. Alternatively, a discrete formulation can be made using difference equation,

$$\Delta m_{1t} = a_1 + b_1 m_{2t} - c_1 m_{1,t-1}$$

$$\Delta m_{2t} = a_2 + b_2 m_{1t} - c_2 m_{2,t-1}$$

- This basic model has been developed theoretically and empirically in a variety of ways
- Intrilligator Brito Cold War -using weapons
- search for clear empirical evidence of 'arms races' has, however, met with rather limited success, Dunne (1996), eg not finding for US-USSR
- Dunne and Smith find evidence of arms race for India-Pakistan but not for Greece-Turkey
- A number of authors, including Dunne and Perlo-Freeman (2003a and 2003b) and Collier and Hoeffler (2004), have sought to generalise the concept of an arms race,
  - Are number issues involved in this. A country  $i$  feels threatened by an alliance of  $j$  and  $k$ ; the equations for these 3 (out of  $N$ ) observations take the form:

$$m_i = \alpha + \beta^e (m_j + m_k) + \gamma' x_i + \varepsilon_i$$

$$m_j = \alpha + \beta^e m_i + \beta^a m_k + \gamma' x_j + \varepsilon_j$$

$$m_k = \alpha + \beta^e m_i + \beta^a m_j + \gamma' x_k + \varepsilon_k$$

$\beta^e$  measures the arms race effect from an enemy and

$\beta^a$  the spillover effect from an ally.

- Given data on N countries and knowledge of threats and alliances, this model could be estimated by say OLS.
- Obvious practical problems;
  - how to determine the strategic effects,
  - the pattern of threats and alliances,
  - how to aggregate if adding allies expenditure is not appropriate,
  - what time period to average over, and
  - which military measure to use –weapons vs spending
- Panel data models  $m_{it} = \alpha_i + \beta_i' z_{it} + \varepsilon_{it}$  can be estimated and the homogeneity or independence assumptions tested (Dunne and Smith, 2007). With panel data one can employ a larger sample and allow for heterogeneity in the responses of different countries. One central issue is how deal with heterogeneity

### Strategic Effects

- An early attempt to deal with strategic effects was the concept of a “Security Web” concept developed by Rosh (1988). This defines neighbours and other countries (such as regional powers) that can affect a nation’s security as being part of a country’s Security Web.
- Rosh calculates the degree of militarisation of a nation’s Security Web by averaging the military burdens of those countries in the web, finding it to have a significant positive effect on a country’s military burden.
- More generally spillover effects have been attracting increasing attention, e.g Murdoch and Sandler (2002, 2004).
- Dunne and Perlo-Freeman (2003a) estimated cross-section demand functions for developing countries using average data for Cold War (1981-88) and post Cold War (1990-97) periods.

- log of the share of military expenditure regressed on
  - log population (negative);
  - log of the sum of its 'Potential Enemies' military expenditure (positive);
  - log of the sum of the military expenditures of countries in its Security Web (including potential enemies) (positive);
  - a democracy measure (negative);
  - civil war; external war (both positive) and
  - region dummies.
  
- There was little evidence of a change in the underlying cross-section relationship with the end of the Cold War.
  
- Dunne and Perlo-Freeman (2003b) estimate a very similar model explaining the log of the share of military expenditure with the same explanatory variables, but rather than averaging the data they use it as an unbalanced panel of annual data for 98 developing countries 1981-1997. In contrast to the cross-section results there is evidence of structural change, between Cold War and post Cold War periods in the dynamic panel model.
  
- Collier and Hoeffler (2004) use a slightly different approach, taking a pooled static panel of five-year averages and explaining the share of military expenditure by
  - measures of international war, civil war, external threat, international war,
  - democratic government,
  - neighbour's military expenditure,
  - a post-Cold War shift after 1995,
  - log population,
  - log GDP per capita,
  - aid to GDP and
  - a dummy for Israel.
  
- They find the effect of neighbour's military expenditure quite large, meaning that increases in military expenditure are escalated among neighbours, making them a regional public bad.
  
- They also investigate the endogeneity of a number of variables and find that once instrumented, military expenditure does not deter rebellions.
  
- They find that the level of spending of neighbouring governments is an important determinant of a country's military spending (in addition to aid), and was emulation rather than threat suggesting that the deterrence of international war was not an important rationale for military spending, suggesting that military expenditure is a regional public bad.
  
- Other recent papers include:

- Batchelor et al (2002) provide a case study of South Africa, with detailed discussion of the political and strategic factors. Abu-Qarn et al (2010) take a similar approach for Egypt. Other papers in DPE.
- Nikolaidou (2008) estimating demand equations for the 12 largest EU countries separately, suggesting that panel methods might not have been appropriate.
- In a case study of Greece, Kollias and Paleologou follow the usual modelling path, but put particular emphasis on developing variables to reflect domestic political changes.
- Nordhaus et al (2009) introduce the probability of conflict onset into a demand equation
- Dunne et al in progress –panels

## **Determinants of Military Spending**

- Certainly cant understand the determination of military spending in purely economic terms but economic factors are important
- Strategic factors can be important but little evidence of arms race type interaction – hostility vs capability
- Interesting developments in this area with the integration of economic and strategic factors.
- Potential for analysis of large panel data sets
- Still potential for considerable ‘political economy’ work –fusion of political science/economics lits
- Important policy issues involved –affect way international community might deal with potential flash points
  - Arms races exist, though not in usual action reaction form
  - Economic factors can be important but not independently
  - Domestic as well as international forces important
  - Differences across groups countries
- Interesting developments –miles and natural resources as discussed
- Now move on to see what determines conflict and what role economics plays...