Military Spending and Contemporary Capitalism

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Abstract

In the first issue of CJE Ron Smith's *Military expenditure and capitalism* was a seminal contribution to the analysis of military spending and its role within capitalism. It considered the underconsumptionist explanation of the role of military expenditure in capitalism, which sees it as playing a positive role, and found it to be wanting. A more complex Marxist perspective was argued to provide a better understanding of the manner in which military spending influenced capitalism. This debate was again taken up in the journal by Smith and Dunne in response to Pivetti's effective demand arguments for the positive role of military spending in the US. Despite these contributions much of the empirical literature has been underpinned by a neoclassical perspective. This paper revisits the debate within the modern context, with the end of the Cold War, the changing geopolitical environment, the growth of less traditional conflicts and threats and the changing technology of conflict. It reviews how the analyses of the different schools of thought of the role of military spending in capitalism fit these changes and then undertake an empirical analysis to see how well the theories explain the concrete realities of the modern capitalist system, focusing upon the major OECD economies. This shows the value of heterodox understandings of the role of military spending in capitalism

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Preliminary draft, comments welcome. Please do not quote.

1. Introduction

In the first issue of CJE Ron Smith's *Military expenditure and capitalism* was a seminal contribution to the analysis of military spending and its role within capitalism. It considered the underconsumptionist explanation of the role of military expenditure in capitalism, which sees it as playing a positive role, and found it to be wanting. A more complex Marxist perspective was argued to provide a better understanding of the manner in which military spending influenced capitalism. This debate was again taken up in the journal by Smith and Dunne (in response to Pivetti's effective demand arguments for the positive role of military spending in the US, but despite these contributions much of the empirical literature has been underpinned by a neoclassical perspective.

This paper revisits the debate within the modern context, with the end of the Cold War, the changing geopolitical environment, the growth of less traditional conflicts and threats and the changing technology of conflict. The next section provides some general context, on how economics influences international relations research, but seems to have little feedback on economics. Section 3 then reviews how the different schools of thought have developed their analyses of the role of military spending in the development of capitalism, though in many cases it is to see it as having a marginal part in the story, or to be related through the development of hegemony in the international system.

Section 4 then takes the major capitalism economies covered in Smith (1977), considers his empirical findings and how well they carry forward to the present day. In particular it considers whether the resurgence of military Keynesianism is warranted. The discussion is broadened in section 5, to consider the nature of the changes in the military sector with the end of the Cold War and find them to provide more support for the Smith (1977) analysis. Section 6 then reports the results of econometric analysis that confront the Keynesian arguments with empirical data in a systematic manner and finds them wanting. This leaves the Smith (1977) critique still valid and brings back the focus to non Keynesian theoretical explanations. Finally section 7 presents some conclusions.

2. Military expenditure the economy and international security

While there is little contemporary debate in economics over issues of conflict war and peace, the debate that take place in international relations are predicated on economic theories. Modern international relations theories have developed from mercantilist, liberal and realist perspectives.

Prior to capitalism, the dominant mercantilist perspective considered the nation state as needing to produce wealth in the form of gold and this required running trade surpluses –encouraging exports and discouraging imports in a world in which trade volumes were considered fixed. This was one of the first instances of significant government intervention in the economy and encouraged wars in Europe and imperialism as the powers fought over available markets. Clearly creating wealth

would require military strength, which in turn would require economic strength. In such a system economic openness only comes with a hegemon to provide the collective goods of security and stability, but that state will only do so if it is in its own best interest. A realist perspective interprets all actions of states as rational and done in their own interest, in contrast to an idealist perspective that would see states aiming for ideals, such as those underpinning the UN. In recent years the two have combined into a neo mercantilist perspective and is linked with a realist perspective on international relations, which see countries and states motivated primarily by the desire for military and economic power or security rather than ideals or ethics. War is considered an irreducible human trait in earlier works but curable in more modern ones. In general, conflict will be inevitable unless there is some dominant hegemonic force –Pax Brittanica, or more recently US hegemony (Coulomb and Dunne, 2008).

In contrast the liberal perspective that developed from the work of Adam Smith see capitalism as the best way to create wealth and maintain individual freedoms. Laissez faire capitalism and the global division of labour allow all to benefit from trade, it is no longer a zero sum game. States intervene because of market failure and the public good nature of defence means they have to provide it, but it is seen as costly to the economy. Globalisation promotes peace and free trade with competition both internationally and domestically. War is dangerous and likely to be very costly. More recently, a liberal realist or rationalist perspective developed form this, which argued that there is a society of states at an international level, despite the condition of anarchy, in the sense of the lack of a ruler or world state. Governance is provided by the key institutions that regulate international relations, treaties, diplomacy and the mutual recognition of sovereignty. This was followed by more recent developments of the idea of democratic peace (following from Kant's perpetual peace), which implies that democracies do not fight each other. More recently the theory of democratic peace has had globalisation added to it, suggesting at first a role for multi layered governance structures to deal with weak states with anti capitalist and anti liberal attitudes which were reinforcing their backwardness in a globalising world. But more recently this has been replaced by the US hegemony pursuing democracy within states and protecting democracy from external aggression. This also reflects recent Democratic peace: that you have to make everyone a democracy even by force, only then will there be peace (Coulomb and Dunne, 2008).

This new orthodoxy, which sees war as a results of pre or anti capitalist sentiments and groups; sees the solution to conflict as a global neo-liberal system; accepts that military action might be needed in the shorter run to create the right conditions (dealing with rogue states and terrorists); that sees the need to maintain the basis to produce the means of destruction through high military spending; that accepts the hegemonic role of the US; is certainly not what was expected at the end of the Cold War and represents a limited view of the world that is coming into question with the continuing problems in Iraq and Afghanistan. It was not demilitarisation that followed the cold war but remilitarisation with closer integration of the civil and the military, through homeland security and the privatisation of defence functions (Lovering, 2004).

It is also not without its conceptual problems. The liberal perspective can be argued to oversimplify the nature of capitalist development –focusing on particular problems it may be fine, but for the big picture it is lacking. There are also alternatives, both

idealist (as opposed to rationalist) and Marxist, the latter drawing out the importance of economic processes and emphasising the inherent tendencies within capitalism to conflict and imperialism.

3. Military Spending and Capitalism

When Smith (1977) was published the Cold War gripped the international security environment and heavily influenced the way in which military spending was perceived. Those linked to vested interests in the military economy were peddling its importance to the economy and a number of Keynesians supported an underconsumption interpretation of the positive role of military spending. Smith (1977) provided a critical review of these issues and confronted the underconsumptionists with empirical analysis.

With the end of the Cold War the international security environment changed fundamentally. The removal of the superpower conflict saw an initial wave of hope and cuts in military spending, but it quickly became clear that the world was still a dangerous place and war and conflict remained endemic in many parts of the world. Conflicts had changed in general they were intra rather than interstate and there was a resurgence of interest in the role of economic forces in conflict in civil wars. In fact the discipline of economics has always included the study of conflict and war. At first the theories were global, focusing upon the role of inter state war in economic development and then became more focussed and partial analyses of conflicts. This partly reflected the changing nature of international relations over time, as modern nations were formed in an environment of international conflict and economics reflected this, but also a change in the nature of the dominant paradigm. A move from political economy to neoclassical economics.

At its core the orthodox approach remains the same, assuming a unitary state that recognises a national interest and sees threat that requires military precautions and action to preserve the peace. This is seen as a consensus, through democratic, pluralistic, social choice channels, which represent a national administration. It completely ignores the internal role of the military sand the connected vested interests. The state acquires capability through troops and weapons procurement and has to allocate resources. These resources and have an opportunity cost and they should aim to get the optimum force structure at the minimum cost.

The high Cold war arms expenditures are then seen as the result of technology, with expensive R&D required for new generations of weapons, within an arms race models, within an action-reaction framework. Long lead times and high fixed costs lead to increasing military spending. This draws attention away from the operation of the vested interest around the military and the potential for distortion. It is well known that the CIA massively overestimated the capability of the USSR during the Cold War. Brings the decision down to one of rational behaviour in the best interests of society, with the costs of deterrence being necessary for the safety of the country. It also doesn't allow for the fact that the state may actually see the people as the threat.

A criticism of the orthodox approach is that is ahistoric and applicable to a, but this is often taken as an advantage. So looking at the post cold war world does not require a

change in the theoretical structure. Much of the literature on the economic effects of military spending considered how military spending affects the growth of economies, in single country studies and moving from cross section to panel analysis. There was certainly little evidence of military spending playing an important positive role in economic growth and many argued it was likely to have a negative effect. The lack of economic problems with the large declines in milex at the end of the cold war, tended to provide support for this argument.

A positive role for military spending can be fashioned out of a basic Keynesian perspective would see military spending as simply one component of government spending, with effective demand/multiplier effects. In this way military spending can be good for an economy, getting it out of recession and helping plan expansions in effective demand. This can be on the basis of an IS-LM updated to account for changes in monetary theory and recently used by Atesoglu (2004), Pieroni et al (2008) and Smith and Tuttle. This type of study tends to have output determined by military spending, civil spending and interest rates and to find a positive impact of military spending for the US, though the second paper is more nuanced and the last study actually finds a negative effect. In addition, Keynesian models that introduce an aggregate production function have tended to find negative effects of military spending (Dunne and Uye, 2009) and using large structural models has also tended to show the existence of a 'peace dividend' as the benefit of reducing military spending and reallocating it has been termed (Gleditsch et al, 1996). It is also generally accepted, however, that war would have a negative impact upon the economy (Dunne, 1990).

After the experience of the Cold War and the research one might expect that Military Keynesianism had died, but even post 2008 distinguished economists such as Feldman, were arguing for military Keynesian solutions to the economic and financial crisis (Dunne, 2013).

Another strain of more radical Keynesianism combined an effective demand macro perspective with a form of institutional analysis to provide a more complex understanding of the processes at work and the role of military power and conflict[1]. The institutionalist perspective is predicated on existence of MIC (Eisenhower), where internal pressures for increases in military spending and forces are independent of threat. They create inefficiencies in the economy and so can have negative economic effects, particularly as the nature of defence production changed during the cold war and became very different from civil). This can also have other externality effects through influences on the civil sector and crowding out (Dunne and Skons, 2011). This approach clearly argues for the damaging effects of military spending on the economy.

The military sector create inefficiencies in the economy, particularly as the nature of defence production changed during the cold war and became very different from civil. This can also have other externality effects through influences on the civil sector and crowding out (Melman, 1970; Dunne, 1995). Melman (1974) underlines the harmful effects of militarism on the American economy such as the loss of competitiveness, the development of the bureaucracy, the fall in productive investment and limited

spillover effects from the military to the civil sector. Similarly, Dumas (1986) presents the military production as an economically non-contributory activity, which channels valuable productive resources and their outputs

A related perspective was developed from Marxist theory, with the most lasting contribution being by Rosa Luxemburg who introduced a theory of underconsumption, where military expenditure provides a way to invest the surplus without increasing production capacities. (Howard and King,). Initially, Marx in fact had little to say on militarism and it was Engels who provided most of the specialist writing even when jointly penned. His main statement is in Anti-Duhring and was influenced by Clausewitz, with war the continuation of politics, though he argued there were no benefits to war only the prospect of financial ruin, Wars were won by technology, but this led to ruinous arms races, such as the Dreadnoughts (Engels, 1987). Following Marx, Kautsky considered the need for capitalism to expand its markets by colonial expansion but suggested that this plays a contradictory role, as it has costs. Boosting consumer demand benefits capitalists but they will resist if it is funded by a tax from profits. Lenin developed his analysis of imperialism from Kautsky, essentially providing a pseudo mercantilist view that war is the continuation of economic competition by other means.

Luxemburg offered an analysis based on the expanded reproduction schema, suggesting that there could be positive effects depending how military spending was financed. Taxes on workers change composition, taxes on profits reduce overall profit, deficit finance will provide demand stimulus if below full employment. There would also be social and ideological benefits and military spending provides an external market. She stated that the military sector made it possible to release a surplus that is generally higher than that which would have been obtained in other sectors. But at the same time, the fixed capital becomes increasingly significant relative to the variable capital which is, in the Marxist theory, one of the factors of the fall of the rate of profit in a capitalist economy. It is thus necessary to distinguish the short-term effects of militarism, which are beneficial, and the long-term effects, which are negative, since they accentuate the internal contradictions of the capitalist mode of production. Bukharin developed an opposing view, arguing that military expenditure cuts into surplus value and so hinders reproduction and so rather than helping realise surplus value it destroys the production of value (Dunne & Coulomb, 2008).

Luxemburg's contribution has given rise to controversy: for some economists, it is a theory of underconsumption, with military expenditure a way to invest the surplus without increasing production capacities. For others the theory shows the important role of military expenditure as a stimulant of capital accumulation, by its encouraging technological progress and destroying the internal obstacles to capitalist expansion. The debate continued after the Second World War, with some Marxist economists defending the idea of a positive impact of military expenditure on the capitalist system, presenting militarism as a factor in the stabilization of capitalism. Kidron (1969) focusing on the threat of overproduction, rather than underconsumption, saw military spending as diverting capital from accumulation so creating a 'permanent arms economy'. Thus, overproduction and unemployment were contained in the 1950s and 1960s thanks to a high level of military expenditure, which prevented over-investment and which generated technological spillovers to the civil sector, while favouring exports. While military expenditure slowed down economic growth, by

inducing a high level of profit tax, it also slowed down the growth of the organic composition of capital in civil activities, by diverting resources which could have been used for the productive investment. Thus, the permanent arms economy represents a powerful means by which to thwart the fall of the profit rate.

Even if one rejects the specifics of Marxist analyses, it is still possible to see Marx's method as providing valuable contributions to an understanding of the economics of international security: to see the processes as historically specific, contingent rather than deterministic, and as contradictory/dialectical processes that reflect the balance of power between groups within society. This is reflected in a number of developments, with technology playing an important role in the development and demise of boom and crisis (Smith, 1977; Dunne and Coulomb, 2008).

The Marxist underconsumption theory of crisis was taken up by Baran and Sweezy (1966) in a manner that emphasised the monopoly nature of the post war system. This approach saw military spending as important in preventing realisation crises, through absorption of surplus without raising wages or capital. Other government expenditure could not do this. Using the 'surplus' approach to Marxist analysis, which identifies value with observed quantities, so for example profit in price terms is seen as the money representation of surplus value (Baran and Sweezy, 1966; Coloumb and Dunne, 2008). Baran and Sweezy were more circumspect than later proponents of the effective demand/underconsumption Pivetti (1992) and Cypher (1987), who suggest that military spending conscious instrument of economic policy and military spending has a stimulating effect on economy, Smith & Dunne (1994) provide a critique of Pivetti.

When the other routes by which Marxist crisis theory was used to understand the development of contemporary capitalism are considered, it seem surprising that there should be any adherence to an underconsumption perspective that seems somewhat static and a historic. Some more orthodox Marxist scholars, accepted the long-wave analysis, but saw the post-war period as creating a 'permanent arms' economy with US hegemony and the Cold War stand-off supporting international capitalism. Kidron (1970) seeing military spending as depriving capitalism of resources that would otherwise be used productively and so slowing the growth of the the organic composition, in other words the capital-to-labour ratio in value terms, and retarding the fall in the value rate of profit. In contrast, Mandel (1987) argued the high organic composition of capital in military production did affect the rest of the economy and accelerated the decline in the (value) rate of profit. The reasons for the wave of post-war prosperity then have to be sought in the countervailing tendencies that Marx identified[2]. This means that there is a dynamic for change inherent in the theoretical framework.

This historical dynamic is apparent in a number of development that consider a role for military spending but not a dominat one. In France, the Regulation School developed Marx's theory of crisis from its focus on the changing forces and relations of production to consideration of the superstructure – i.e. state, culture and consumption. Together these combine to define a mode of 'regulation' of a particular regime of accumulation that allowed movement out of a crisis and renewed accumulation. Aglietta (1976) argued that the boom after the Second World War was based not only on mass production

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[2] See Howard and King (1992)

'Fordism', extensive production methods, but also on mass consumption and the technologies engendered by them. The mode of regulation coordinated production and consumption and thus dealt with the contradictions between the forces of production and the social relations. The post-war boom was a combination of 'Fordism' methods of production and consumption (i.e. mass production and consumption) and the technologies engendered by them, from competition to monopoly regulation and with changes in the nature of governance. In a dialectical process similar to that of Marx, the development of a particular regime of accumulation is not harmonious and contains the seed of its own destruction. The end of the post-war boom led to 'post-Fordism', a shift to more intensive methods of production (Boyer and Saillard, 2002). Military spending plays no important role in this, other than maintaining US hegemony. Similarly, in the USA, the social structures of accumulation (SSA) school provided a similar analysis, but more of a structural model of crisis, with more emphasis on institutions allowing prosperity. Bowles et al. (1984) saw an accord between capital and labour, with an industrial structure and technology that allowed prosperity in the USA, although one that was country- and historically specific. The rise and demise of SSA led to long waves and they used the framework to explain the development and breakdown of the US economic boom. Critics of this approach see it as 'essentialist' (Norton, 1988) and others argued the need to focus on national capitals and be more cautious in distinguishing concrete and abstract analysis (Fine & Harris, 1985). An alternative route taken by Glyn et al. (1990) was to move beyond the focus on national capital and consider the end of the 'Golden Age' in the international economy – focusing in detail on specific aspects.

In contrast to those who see the existence of 'technology systems', the national systems theorists consider that specific factors shape the innovation process within states. Freeman and Louca (2001) argue that, unlike Schumpeter's analysis, there is no bunching or clustering of innovations, but basic innovations are interrelated, with new technology systems developing within countries that reflect their interlinkages, science, politics, institutions, cultures and patterns of consumption. The focus of this approach is the technological drivers of economic development and moving on from the general theory of the long waves to argue that national factors play a crucial role, as do institutional characteristics of education, public support for innovation, defence technology schemes, history, culture, language and institutional interaction. Thus, technological change needs to be researched in the light of the social relationships within which innovations are developed and used. There are strong forces at work rather than isolated events shaped by inventors and entrepreneurs and dynamic companies. There is a complex web of market and non-market interactions that are relevant, with tangible and intangible assets and public institutions as well as businesses (Archibugi & Michie, 1997; Freeman and Louca, 2001).

For other researchers, increasing international interdependence has meant a reduction in the relevance of states and increasing globalization. Analysing the globalization of technology has meant considering how globalization affects – and is affected by – the production, distribution and transfer of technology. The international exploitation of national capabilities, collaboration, and generation of innovations across companies are clearly becoming increasingly important with the growth of transport and communication, but there are a range of views of the extent of social and economic globalization. This is evident in the various definitions of globalization, from the vague to the specific, and in the debate over the true extent of globalization. Globalization in its most general form is the global integration of the economic, social, political,

environmental, cultural and religious spheres. Held et al. (1999) provide a comprehensive analysis of globalization, defining the hyper-globalists, those who see a new epoch of human history; the sceptics, who see things as much the same as before; and the transformationalists, who see globalization as the central driving force behind the social, political and economic changes that are reshaping societies and the world order. In contrast, Hirst and Thompson (1996) present a sceptical position. They see rapid internationalisation (a term they prefer to globalisation) as not new, arguing that the arrival of the telegraph had a more profound effect than the internet and that the world was actually more internationalised before the First World War than it is now. They consider current developments to be neither inexorable nor inevitable. The last phase of rapid internationalisation ended with the First World War and economic depression, with trade falling to a third of its previous level. They also point out that genuinely transnational corporations remain rare and that capital mobility has not led to a shift of capital to the developing countries; it has remained concentrated in the advanced countries. The world economy is far from global, with trade, investment and financial flows concentrated in Europe, Japan and North America, and they expect this to continue. Markets are not beyond regulation and the major economic powers together have the capacity to exert powerful governance pressures over financial markets and other economic tendencies to maintain their hegemony.

So this rich range of theoretical perspectives, recognises the changing taking place with the end of the Cold War, see some role for military spending, but not a particularly important one, unless linked to international relations and hegemony. It is really only the effective demand/underconsumptionist theory that sees military spending as fundamental and important to the development of the advanced capitalist economies. Smith (1977) seemed to have provided a strong case against this, as did Smith and Dunne (1994) and a range of work on the economic effects of military spending, recently surveyed in Dunne and Tian (2012). But the recent contribution by Cypher (2015) shows that selective quotes can fuel the maintenance of old fallacies.

4. Empirical Analysis

Looking at the evolution of military expenditure provide a striking picture, but one that seems easily explicable by strategic considerations with Certainly, the effect of major wars means that military expenditures have shown much larger variations than any other category of government finance. Taking the international superpower, the US as an example, Figure 1 shows its share of National Defence Expenditures in GDP was less than two per cent of GDP during the inter-war period; then rose with the war, peaking at around 50% of GDP in 1943 and 1944 and falling sharply with the end of World War II, to around seven per cent, before rising again to almost 15 per cent in 1953, with the Korean War.   Subsequently the share trended downwards, jumping upwards in the late 1960s with the Vietnam War, peaking at 10 per cent in 1967, before continuing its downward trend till 1979, falling to 5.7 per cent. With the Soviet invasion of Afghanistan, the election of President Reagan and worsening relations with the Soviet Union; the share again rose, peaking in 1986 at 7.8 per cent. As the Cold War thawed and then ended, the share fell; reaching a low of 3.8 per cent in 2000. The Global War on Terror, after 2001, increased the share to just over 5 per cent in 2008. By US post-war historical standards, this is still quite low (Dunne and Smith, 2011). As figure 2 shows the military burden for many of the advanced

economies has fallen over time, though with similar strategic factors influencing the path.

This sort of movement of military spending and the easy manner by which strategic factors seem to provide a reasonable explanation of the pattern of military burden, might seem to preclude any economic rationale, but this would be mistaken. It is clear that economic factors also have a role to play and the underconsumptionist/effective demand adherents would argue that the high unemployment of the inter-war period, interpreted as an inability of capitalism to generate enough effective demand, consumption or investment, to maintain full employment. Many forecast that World War II would be followed by a slump similar to that following World War I.

As discussed above, some economists, such as Baran and Sweezy (1966), argued that military expenditure was the source of the extra effective demand that stopped capitalism sinking into depression; since the US and UK devoted a much higher share of output to the military than their previous peacetime norms. They suggested that military expenditure was used to offset the tendency to stagnation and unemployment and adjusted to stabilise the economy and thus was a blessing for capitalism, rather than a burden. The original argument was nuanced and relatively specific to post war US economy, but has been stated in a much more strident and generalised way by effective demand adherents, such as Pivetti and Cypher.

Empirically, there are a variety of problems with this argument. It is not clear that the Marxist or Keynesian theories outlined above actually predicts such under-consumption tendencies. In Marxist crisis theory there are always endogenous changes as the forces and relational of production change and the countervailing forces can be dominant for various periods. We would not expect an underconsumption crisis to continue indefinitely. Indeed, the period from the end of World War II until the crises of the 1970s was one of low unemployment that, in retrospect, was labelled a golden age of capitalism (Glyn, 2006).

Smith (1977) considered the empirical implications of the underconsumptionist perspective as implying a number of stylised facts. First, at a concrete level, as capitalism gets richer the surplus increases beyond that necessary for C and I and there is a problem in absorbing the surplus, meaning effective demand has to be increased. There is an incentive to use milex to offset this tendency to stagnation, as it is wasteful. This should imply that the military burden would be increasing over time, or at least until the next crisis. It should also imply that in cross section there would be evidence of more prosperous countries having larger military burdens to deal with such problems, although milex may be higher for individual countries, such as the US because of its hegemonic role. Finally it implies that milex is being used by governments to stabilise economies rather than just to create demand to maintain full employment

It was quite clear that none of these held for the data Smith (1977). Taking data for the group of 15 advanced economies for the period 1960-70 and regressing the share of military spending in GDP, referred to as military burden, on real GDP and on per capita GDP confirmed that military burden had a positive relation with GDP, but not with GDP per capita, which is the expected results for the surplus absorption argument. Over the longer period of 1960-2014, neither are significant, but looking at

10 year subperiods (1960-69, 1979-9 etc and then 2010-14) over the whole period does show variation, with both significant for one subperiod, per capita income significant for 2 and log GDP for 3.

Considering the implication that nations with high military spending should have higher level of utilisation, than those with low, suggesting they will have lower unemployment rates. While this gave a significant positive correlation of 0.79, the opposite to what is implied Chester (1978) demonstrated there was no significant relationship, and this is not inconsistent with the correlation 0.44 for the whole period, 1960-2014. A similar argument is that milex is used to stabilise the system, dampening fluctuations in the economy, implying that there should be a negative correlation between the variation in growth rates and military burden across countries. Smith found the correlation to have the correct sign (-0.26), but to be insignificant. It is considerable smaller and less significant for the whole period (-0.02). Smith also found the investment share to be significantly negatively associated with the military burden (-0.76) and this remains the case (0.61) for the updated data.

So the cross section evidence seemed to cast doubt on an underconsumptionist argument and continues to do so. This evidence can however be criticised as countries may be very different and historical case studies are needed to understand the specificities , and/or the linkages in the international system are not being dealt with. The obvious country to consider as a case study is the US, the best example of military spending playing a role in offsetting tendencies to stagnation (Cypher , 1974). It is worth repeating these arguments as they still have influence, as Cypher (2015). It is certainly true that milex can be used to increase demand and with underutilised resources it will lead to increased output and reduced unemployment, but that does not mean that the state is utilising it in this way that would require evidence that it was responding to problems using military spending and there was no evidence for this (Smith and Dunne take US milex and unemployment and show that the changes in each are what you would expect if they were random). The other concern is that it is not military spending per se that led to full employment, but war. WWI, the Korean War and even the Vietnam War all saw low unemployment, but it is difficult to see the reason for these as economic. Indeed one might expect capitalist to want high unemployment to better regulate the labour force. Also other forms of government spending would seem to better than military spending for stimulating the economy, as the peace dividend literature showed (Gleditsch et al, 1996). So while milex main have played important role in creating demand this does not mean that maintaining demand was the reason for the military spending. Other capitalist states did fine with lower milex.

So if there is no good argument for the positive demand role of military spending in the economy the question of what economic role it plays and how important it is and whether it is a negative or positive one. Smith (1977) argues that while allocating resources to the military can reduce unemployment and underutilised capacity, it be at the expense of consumption, investment, civil government spending or the balance of payments, if it leads to increased imports. In addition to demand changes there can be supply constraints as procurement is from industries that create investment and exports. Given that nature of these industries there can be supply bottlenecks, something that certainly happens when rapid mobilisation takes place. Extra resources can be made available in future, but depends on whether the military has a positive or

negative effect upon economic growth. Can increase growth through demand confidence and spinoff, or reduce growth by reducing investment in civil and exports.

This suggests a range of variable that might be affected by milex, and considers how might be related to milex using cross country average again. Most interesting is relation to investment, so estimates regression for the investment share as a function of the military share and the average growth rate, finding a clear significant negative effect[3]. Moving to pooled data for NATO and added in GDP per capita and unemployment to pick up stage of development, leads to the finding that the coefficient on M was not significantly different from -1, meaning the evidence of trade off between investment and milex in cross section was not inconsistent with time series evidence.

Smith (1977), suggests a theoretical mechanism, that for a given potential output political conflict centres on social wage composed of private consumption and public welfare spending. Unless there is a lot support, workers will resist cuts in the social wage to pay for military. Given the balance of class forces, the share of the sum of private and civil government, consumption is a relatively constant share of potential output. The remainder is then allocated to investment and military spending, given the Balance of Payments situation and the rate of utilisation. Higher milex will then lead to lower investment, lower productivity, BoP problems, which are offset by running economy at a lower level utilisation. Given a BoP constraint, high milex gives low invest, low growth, high unemployment. Short run patterns complicated by number of factors. Exogenous reasons to increase milex, such as conflict will increase utilisation, but adverse effect on inflation and BP. Eventually milex will be reduced, or utilisation reduced by interventions to force down private and civil public consumption.

Smith (1977) moves from the narrow economic determinism of underconsumption to argue that, strategic requirement of CMP to create political end economic superstructure to defend the system. Not surprisingly this is seen through the Cold War lens, of protection from communism, the need for hegemonic power and need internal security. While the threats are different and there seems to be much less concern for utilisation and unemployment, the mechanism still seems reasonable as is evident in the next section

5. Post Cold War Capitalism

When the Cold War ended, in the UK and US cut their military expenditures substantially. In fact the cuts can be seen from the mid-1980s with the 'thawing' of the Cold War. If there had been an important role for military spending in the economy, this would have been a period of economic crisis. Instead rather than sinking into unemployment both grew rapidly; benefiting from the 'peace dividend'. The cuts in military expenditure reduced government deficits, which allowed lower interest rates boosting investment in the technology boom of the 1990s.

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[3] The results were weaker when Japan was excluded but general conclusions still held. Japan was excluded because unlike the other countries its post war peace trety required it to keep military spending at no more than 1% of GDP.

The strategic explanations, rooted in war and the communist threat, do seem a better explanation of military expenditures than economic justifications. As we have seen it is relatively straightforward to tell a strategic story to explain the share of military expenditure in the US and very difficult to tell an economic story. Although World War II, the Korean Wars and the peak of the Vietnam wars were periods of relatively full employment in the US, the strong downward trend in the share of military expenditure is not marked by any corresponding upward trend in unemployment. The communist threat may have been exaggerated but it was certainly perceived as real. (Smith and Dunne, 1994).

Nevertheless Pivetti (1992) attacked the general acceptance that military spending had a negative effect on economic growth, arguing it had increasingly become axiomatic. In fact it was the focus of continuing debate, with the empirical work suggesting no effect on economic growth, or if any effect a negative one. Certainly there was little respected evidence of a positive effect. Pivetti (1992) reasserted the underconsumption effective demand argument for the post Cold War world, arguing that in the US military spending was crucial in explaining low unemployment, but Smith and Dunne (1994) showed that there was no evidence of any regularity in the movements of unemployment and military burden in the US from 1948-88, overall or in a range of sub periods. The year on year changes observed are of the same frequency that would be expected by chance. Much of the empirical work suggested no evidence that milex and unemployment were related other than unemployment is low during wars. (Dunne and Smith, 1990).

Pivetti is reasserting a narrative that capitalist countries have a relatively weak MPC and so over time have a problem with effective demand and as savings and investment decisions are independent the excess savings is not absorbed by investment, meaning a tendency to stagnation. Military spending is privileged to fill the gap as it does not does not expand productive potential, nor displace private investment and so improves utilisation rates and stimulates investment. It is also continuously renewable and provides as technological boost through spin-off. Governments use military spending to deal with effective demand problems[4].

Coming at the end of the Cold War this seemed a strange reiteration. As Smith and Dunne (1994) point out the US had a rather low marginal propensity to save and by then it was becoming clear that the nature of production in the Cold War had limited any spin offs to the civil sector. In addition, Dunne and Tan (2012) surveyed the literature and found that while there was no consensus in earlier periods, increasingly studies that included post-Cold War data were becoming increasing more likely to find a negative impact of military spending on growth. Thus, it does seem even more difficult to accept a simple Keynesian or underconsumption explanation, but recently Cypher, who was one of the targets of Smith (1977) critique has reasserted the effective demand line.

With the disappearance of the Soviet threat large cuts in military expenditure occurred during the 1990s, but not without opposition, using economic and strategic arguments. New threats did emerge, or were created, and there were major innovations in military technology, which help explain the changes in the structure of the arms industry, the

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[4] Pivetti (1992) did not state this, but it is an important component of the argument.

structure of the armed forces and the costs and benefits and thus the probabilities of different types of war. Weapons are very R&D intensive: small performance advantages over the enemy can translate into victory, but getting that last 5% of performance is very expensive. This produces a race to improve technology and the real cost of weapons has grown at between 6 and 10% per annum between generations. Because the weapons are so expensive the gaps between generations get longer and as a result much military equipment is very old[5]. In addition, the Cold War continued to have influence on the nature of weapons systems and platforms and force structures, though declining as time passed.

Certainly the defence industry and trade changed. The old economy military technology was very centralising; rapid cost growth between generations of weapons means that almost nobody, not even the US, can afford it. Most military equipment was obsolete in commercial terms before it entered service, because it takes on average seven years to develop and deliver it, eg Eurofighter/Typhoon is based on early 1980s designs. In contrast, new-economy industries tend to have high fixed costs but low marginal production costs, tend to have network effects, the more people who use the product the more effective it is. Innovation tends to be a series of winner-take-all races. At any moment in time a single firm, which produced the killer application, tends to dominate the market; but when innovation is rapid their dominance is precarious[6]. Most weapons production does not show these characteristics. Although they do have high development costs, they are also so costly to produce that they are limited to small batches with long gaps between generations. A further consequence is that innovation is slow. The defence industry is fragmented and the market leaders are the same old firms who have been producing weapons for decades.

Cost was central to the RMA and it is there are clear issues of affordability, especially as governments continue to support legacy weapons systems (Mathews and Treddenick, 2000). Government's attempts to make defence more affordable include acquisition reform, use of commercial-off-the-shelf, COTS, technology and improved logistics. The increase in sophistication and cost of the most advanced military equipment, means it is impossible even for relatively rich countries to maintain a comprehensive defence industry the nature of confrontations and conflict has changed. It is unlikely that two sets of allies will face each other with similar weapons and tactics, as in the two world wars. It is more likely that there were be an asymmetry between antagonists and this has changed the nature of the conflict[7].

Within the post Cold War environment, the end of proxy wars and superpower involvement had not reduced the number conflicts, though it had reduced their intensity and it had changed them. Civil or intra state wars were the most common

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[5] e.g. the B52, still being extensively used, is a 1950s bomber with newer avionics and weapons.
[6] Netscape fell to Microsoft and Yahoo fell to Google. Bresnahan and Greenstein (1999) discuss some of these issues
[7] The military distinguish three levels of analysis: the strategic, the conduct of the war as a whole; the operational, the conduct of a campaign; and the tactical, the conduct of a particular engagement with the enemy, e.g. a battle. Since the meaning of strategy is different between the military and game theorists, who use it to refer to state contingent moves, we will always refer explicitly to military strategy, rather than strategy, when we refer to the planning of a war as a whole.

and the nature of war had clearly changed. Kaldor (1999) considered the new wars to be very different and only understandable within the context of political economic and military globalisation. There was a blurred distinction between war and organised crime and while local the wars tended to have a transnational connection. There were no real military battles as in the past but skirmishes and in general civilians were targeted by militia. New war economies were seemingly based upon plunder and black marketeering and sometimes supported by aid and were sustained through continued violence. This was not helped by the tendency of the 'international community' to work with the protagonists to broker peace deals rather than the civil society that existed outside of the conflict (Kaldor,2006).

When the developments of the post Cold War period are considered it is quite clear that the world has been changing and the simple military Keynesian arguments are no longer applicable. Orthodox approaches, using simple growth models have provided interesting analyses that fail to reflect the dynamics of the processes at work, but can be interpretered as searching for empirical regularities, that can be interpreted within a more satisfying heterodox theoretical perspective.

6. Econometric Analyses

Valuable contributions have been made to the debate by the military spending economic growth literature that focuses specifically upon the econometric analysis. Smith (1977) showed the added value of having self-consistent empirical analysis of available data and over the years the techniques available have improved. Three recent approaches have allowed empirical analyses that are not constrained to operate with orthodox economic theory. Firstly, Granger causality methods allowed the complexity of any underlying theoretical arguments to be ignored, by simply considering bivariate relations between military spending and growth. At their simplest these studies were testing if growth could be explained by its own lagged values just as well as it could by its own lagged values plus the present lagged values of military spending i.e. if the coefficients on the military spending terms were jointly significantly different from zero. If so it was considered that there was 'Granger causality' from military spending to growth. A similar test could be conducted with military spending as the dependent variable. In confronting the military Keynesian arguments the methods have value if investigating if military spending plays a role in predicting the value of income.

Suppose that we are interested in the relationship between a measure of military expenditure, e.g. the logarithm of real military expenditure, m_t, on which we have data $t = 1, 2, ..., T$, and an economic variable y_t, say the logarithm of output, but could be unemployment or investment. A variable, say m_t is said to be Granger causal, GC, for another variable y_t, if knowing past m_t, in addition to other available past information including past y_t, helps to explain current y_t; or equivalently current m_t helps to predict future y_t.

GC measures incremental predictability, relative to an information set, not causality in the usual sense: weather forecasts are GC for the weather, but few regard them as causing the weather and likewise the dawn chorus does not cause the dawn.

A general framework is provided by vector autoregression (VAR) methods. Consider

$$Y_t = a_o d_t + \sum_{i=1}^{k} A_i Y_{t-i} + u_t \quad \text{or} \quad A(L)Y_t = a_o d_t + u_t \qquad (1A)$$

Where Y_t is an $n \times 1$ vector of endogenous variables; d_t is a vector of deterministic elements; u_t a vector of errors with expected value zero and covariance matrix $E(u_t u_t') = \Sigma$; and $A(L) = I - A_1 L - ... - A_k L^k$ is a polynomial in the lag operator. For illustration assume $n = 2, k = 2$, and that log output and log military expenditure, y_t, m_t, are represented as a second order VAR with trend

$$y_t = a^1{}_{10} + a^2{}_{10}t + a^1{}_{11}y_{t-1} + a^1{}_{12}m_{t-1} + a^2{}_{11}y_{t-2} + a^2{}_{12}m_{t-2} + u_{1t}$$

$$m_t = a_{20} + a^2{}_{20}t + a^1{}_{21}y_{t-1} + a^1{}_{22}m_{t-1} + a^2{}_{21}y_{t-2} + a^2{}_{22}m_{t-2} + u_{2t}$$

$$(1B)$$

Note that we can reparameterise this system to use log military burden, $sm_t = m_t - y_t$ in the second equation. The elements of the variance covariance matrix Σ are $E(u^2{}_{1t}) = \sigma_1{}^2; E(u^2{}_{2t}) = \sigma_2{}^2; E(u_{1t}u_{2t}) = \sigma_{12}$ and the null hypotheses are: that m_t is GNC for y_t, $H^0{}_{21} : a^1{}_{21} = a^2{}_{21} = 0$ and that y_t that is GNC for m_t $H^0{}_{12} : a^1{}_{12} = a^2{}_{12} = 0$. The hypotheses can be tested with standard F statistics on each equation, though these are only valid asymptotically because of the lagged dependent variables in the equations and if the variables are stationary, I(0) (Smith and Fuertes, 2010). The tests can be sensitive to the inclusion of trends and other deterministic elements, such as seasonal dummies, and the choice of lag length. Adding extra lags reduces the probability of misspecification but also reduces the power of the test, the probability that one will reject the false null of GNC when there is in fact GC.

Dunne and Smith (2010) estimated a second order bivariate VAR with trend, was estimated on US data for two samples: 1950-2009 excluding World War II and 1932-2009 including it, assuming trend stationarity and using two lags and a trend. For 1932-2009 GNC of *m* with respect to *y* would be rejected at the 5% level, and of *y* with respect to *m* at the 10% level. So for both samples using the 10% level one would conclude that there is GC in both directions; using the 1% level in neither direction; at the 5% level the answer would differ between samples. These results were not robust across the sample, specification, measurement, and significance level and there is no clear pattern in how these factors change the p values. There was also no consistent pattern across countries.

Tables A1 and 2 updates and extends the analysis to consider 15 countries 1960-2014, with a subsample 1960-89 to give some idea of results dominated by the Cold War. Using GDP per capita and military burden and reporting with and without a trend, shows GNC to only be rejected for the US for full period, but when a trend is included this results disappears. Given the previous discussion of the US, this is a striking result, no consistent evidence of a role for military burden in determining GDP per capita in the US and vice versa, with similar results for the UK. A result that fails to support the military Keynesian argument. Looking at the unemployment rate for the US fails to reject GNC for the whole period, though this is not true for the Cold War period. There is also no discernible pattern across countries in both Tables, which can again be considered as evidence against any consistent pattern that the military Keynesian and underconsumption theories would imply.

An important developments of this form of analysis saw attempts to to deal with possible long run relations within the data, through cointegration analysis, which itself was superseded by the use of the vector autoregression (VAR) framework model following Dunne and Vougas (1999). More formally this analysis uses the result that if a set of variables are integrated of order one, I(1), that is they are stationary, I(0), after being differenced once (as seems common for economic variables) and there exist linear combinations of them which are themselves, stationary then they are said to cointegrate. If there is cointegration, there must be Granger causality in at least one direction ie some feedback which stops the I(1) variables diverging. In dealing with I(1) data, it is convenient to rewrite the VAR in vector error correction model, VECM, form

$$\Delta Y_t = a_o d_t + \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + u_t \qquad (1)$$

And for the bivariate case –output y and military burden m- case

$$\Delta y_t = a^1{}_{10} + a^2{}_{10}t + \pi_{11}y_{t-1} + \pi_{12}m_{t-1} + \gamma_{11}\Delta y_{t-1} + \gamma_{12}\Delta m_{t-1} + u_{1t}$$
$$\Delta m_t = a_{20} + a^2{}_{20}t + \pi_{21}y_{t-1} + \pi_{22}m_{t-1} + \gamma_{21}\Delta y_{t-1} + \gamma_{22}\Delta m_{t-1} + u_{2t} \qquad (2)$$

Dunne and Smith (2010) use this approach on US data for 1950-2009 and got the following cointegrating relation normalised on y, the log of GDP, with m military burden and t a trend[89]:

$$y_t = \quad -0.431 \quad m_t \quad +0.038 \quad t \quad +z_t$$
$$\quad\quad (0.093) \quad\quad\quad (0.002)$$

The short run error correction equations, where z is the error correction term were:

$$\Delta y_t = \quad -0.107 \quad z_{t-1} \quad + 0.110 \quad \Delta y_{t-1} \quad -0.015 \quad \Delta m_{t-1} \quad +v_{1t}$$
$$\quad\quad (0.030) \quad\quad\quad (0.125) \quad\quad\quad (0.029)$$
$$SER = 0.022, R^2 = 0.193$$
$$\Delta m_t = \quad -0.486 \quad z_{t-1} \quad +1.339 \quad \Delta y_{t-1} \quad +0.322 \quad \Delta m_{t-1} \quad +v_{2t}$$
$$\quad\quad (0.106) \quad\quad\quad (0.440) \quad\quad\quad (0.101)$$
$$SER = 0.078, R^2 = 0.438$$

so both the adjustment coefficients have the expected sign and are significant; both the lagged changes in GDP and military expenditure have significant effects on military expenditure, but neither of the lagged changes have significant effects on GDP.

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[8] Estimated using the Johansen method in Microfit 5.0, which given the lag length of the VAR determines the number of cointegrating vectors, provides estimates of this long run relation and provides estimates of the individual error correction equations. Tests for Granger causality can then be made. Both the Johansen trace and eigenvalue tests at the 5% level suggest one cointegrating relation

To determine how Granger causality relates to economic causality requires an identified structural model, and different, observationally equivalent, just identifying assumptions may give very different causal pictures. This suggests it would be better to focus on the development and estimation of structural models rather than less theoretical statistical approaches. Doing just that, Dunne (2013), specifies and estimates a Keynesian models that might be considered closer in spirit to the effective demand type arguments, including the aggregate production function eg Dunne and Nikolaidou (2005). Output is a function of military burden, as well as taking non-military spending and investment as shares of GDP. Clearly, the implications of an increase in military burden are that military spending increases more than output, meaning that the military sector becomes relatively more important, reflecting changes in priorities and policy that suggest the role of vested interest such as a MIC[10].

Given $log(M_t/Y_t) = (log (M_t) - log(Y_t) = (m_t - y_t)$ and that the other shares can be written in this way, gives long run estimates:

$$y_t = -0.125(m_t - y_t) + 0.271(c_t - y_t) + 0.048(i_t - y_t) - 0.029 u_t + 0.030t$$
$$(0.05) \qquad (0.05) \qquad (0.09) \qquad (0.03) \qquad (0.001)$$

With short run estimates:

$$\Delta y_t = 1.106 - 0.049 \Delta y_{t-1} - 0.068 \Delta(m_{t-1} - y_{t-1}) - 0.018 \Delta(c_{t-1} - y_{t-1}) + 0.153 \Delta(i_{t-1} - y_{t-1})$$
$$(6.1) \quad (0.3) \qquad (2.3) \qquad (0.6) \qquad (2.7)$$

$$- 0.091 u_{t-1} - 0.099 z_{t-1}$$
$$(5.2) \qquad (5.9)$$

R-Squared = 0.55
S.E. of Regression= 0 .017

Which give the negative effect of military burden on output consistently found by such studies. Again further evidence against the positive role military spending is hypothesised to play in the military Keynesian perspective. Table A3 presents some results for 15 countries 1960 – 2014 for the bivariate and extended model and show a range of results. There is certainly no consistent results coming out that would support an underconsumptionist or effective demand story.

7. Conclusions

A survey article by Dunne and Tan (2014) makes it clear that there is little empirical evidence for positive effects of military spending in the literature, that it is more likely

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[10] Dunne (2013) also considers a Keynesian model based on an IS-LM type framework, which has been used in the relatively recent literature. But this not considered here as the focus is on the effective demand Keynesian arguments.

to have negative effects, and that studies that include the post Cold War data seem to be providing stronger evidence of negative effects. There still remains a stubborn assertion that military spending plays a positive role in the economy, both from those arguing against cuts, often reflecting vested interests, and those taking an effective demand Keynesian or underconsumption argument. These contributions, such as Cypher (2015) seem to be oblivious of the literature that already exists on the subject.

Publishing Smith's (1977) critique, the CJE played a major role in the genesis of the debate over the economic effects of military spending and seemed to discredit the military Keynesian underconsumption perspective. This was of course during the Cold War and things have changed markedly since then and protagonists of the seemingly discredited theory are still continuing to be active. This paper has reviewed the analysis in Smith (1977) to see if it remains valid and have found that it does. Aside from the simple Keynesian perspective a number of more complex theoretical perspectives emerged, from Keynesian and Marxist schools of thought, with no clear theoretical consensus of the impact of militarism and military spending on growth, but considerable debate using a range of empirical analyses. The most convincing is Marxist approach and the application of variants of crisis theory to the development of modern capitalism.

Considering the pattern of military spending in the US economy, a strategic narrative seems rather more compelling than an economic one, suggesting military spending responded to strategic changes rather than played an important economic role and casting some doubt on the military Keynesian premise. The findings and arguments in Smith (1977) seem to follow through and there is no support for a underconsumption or effective demand perspective. This is even clearer in the econometric analysis presented for the longer time series and for a number of the advanced economies.

Overall, this paper reviewed the empirical results that continue to bring into question the simple Military Keynesian and underconsumption arguments that suggest military spending should be used to stimulate the economy. It suggests the more complex theoretical perspectives do have value, particularly Marxist perspectives where the contradictory role of military spending is considered and the historical specificities analysed.
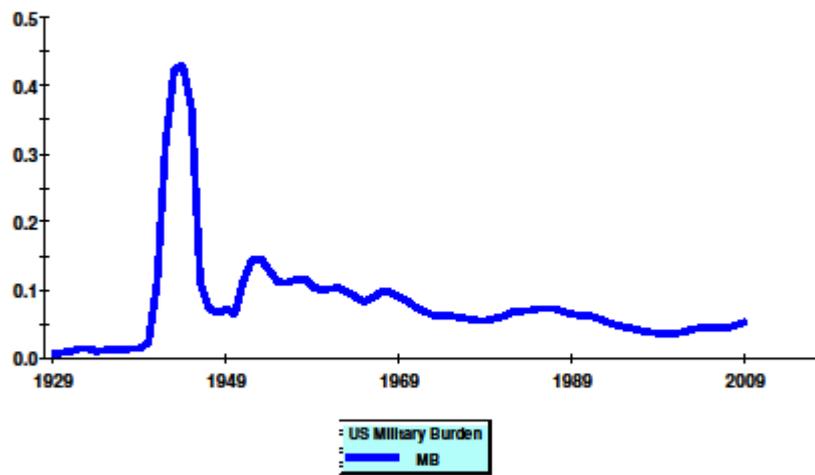
US Military Burden
MB

20

Table A1

Granger Non Causality Tests: GDP per capita

| | | With trend | | | With trend | | | | | | | | | |
| | | Whole sample | | | 1960-89 | | | Whole sample | | | 1960-89 | | |
		exc y	exc m	N	exc y	exc m	N	exc y	exc m	N	exc y	exc m	N
1	Australia	**0.027**	**0.000**	53	**0.003**	**0.000**	27	**0.000**	**0.029**	53	**0.003**	**0.004**	27
2	Austria	**0.036**	0.929	53	0.071	0.501	27	**0.000**	0.949	53	0.092	0.740	27
3	Belgium	**0.027**	0.142	53	**0.000**	0.054	27	0.054	0.368	53	0.918	0.099	27
4	Canada	**0.000**	**0.005**	53	0.113	0.328	27	0.657	**0.034**	53	0.160	0.333	27
5	Denmark	0.684	**0.001**	53	**0.000**	**0.004**	27	**0.000**	**0.010**	53	**0.000**	**0.000**	27
6	France	0.063	0.663	53	0.381	**0.008**	27	0.938	0.659	53	0.681	0.128	27
7	Germany	**0.001**	0.115	53	**0.006**	0.682	17	**0.000**	0.820	53	**0.000**	0.995	17
8	Italy	0.239	**0.001**	43	**0.000**	**0.049**	27	**0.001**	**0.001**	43	**0.009**	**0.019**	27
9	Japan	0.083	**0.011**	53	**0.019**	0.395	27	**0.000**	**0.015**	53	**0.000**	0.129	27
10	Netherlands	0.070	0.259	53	0.217	0.435	27	0.603	0.112	53	0.109	0.557	27
11	Norway	**0.046**	**0.005**	53	0.419	0.669	27	**0.001**	**0.000**	53	**0.005**	0.496	27
12	Sweden	0.914	0.846	53	0.971	0.909	27	**0.006**	0.061	53	**0.000**	0.077	27
13	Switzerland	0.356	0.968	33	**0.001**	0.506	7	0.117	**0.020**	33	**0.000**	0.211	7
14	United Kingdom	**0.033**	0.820	53	0.941	0.128	27	0.194	0.693	53	0.105	0.459	27
15	United States	0.853	0.076	53	0.456	0.247	27	0.122	**0.035**	53	0.316	0.393	27
	Significant	7	6		7	4		8	8		8	3	

Table A2

Granger Non Causality Tests: Unemployment

| | | With trend | | | With trend | | | | | | | | | |
| | | Whole sample | | | 1960-89 | | | Whole sample | | | 1960-89 | | |
		exc u	exc m	N	exc u	exc m	N	exc u	exc m	N	exc u	exc m	N
1	Australia	0.189	0.335	53	0.792	**0.000**	27	**0.008**	0.403	53	**0.046**	0.150	27
2	Austria	0.991	0.069	53	0.113	0.642	27	**0.001**	0.320	53	0.817	0.068	27
3	Belgium	0.973	0.191	53	0.926	0.141	27	**0.016**	0.891	53	0.498	**0.013**	27
4	Canada	0.288	**0.008**	53	0.379	**0.006**	27	0.928	**0.034**	53	0.063	**0.000**	27
5	Denmark	**0.007**	0.060	53	**0.010**	**0.015**	27	0.074	0.060	53	0.113	**0.000**	27
6	France	0.417	**0.014**	53	0.551	0.647	27	0.508	0.398	53	0.939	**0.000**	27
7	Germany	0.797	0.785	53	0.176	0.585	27	**0.016**	0.507	53	**0.022**	**0.009**	27
8	Italy	0.204	0.118	53	0.100	0.067	27	**0.047**	**0.008**	53	**0.020**	0.093	27
9	Japan	0.370	0.068	53	0.907	0.051	27	**0.000**	**0.008**	53	**0.000**	**0.007**	27
10	Netherlands	0.830	**0.003**	44	0.906	0.965	18	**0.010**	0.123	44	0.459	0.813	18
11	Norway	0.700	**0.001**	53	0.444	**0.001**	27	**0.007**	0.416	53	0.964	**0.000**	27
12	Sweden	**0.028**	0.368	53	**0.003**	0.421	27	**0.001**	**0.003**	53	**0.013**	**0.020**	27
13	Switzerland	0.947	**0.005**	47	0.955	**0.000**	21	**0.002**	0.062	47	**0.005**	**0.000**	21
14	United Kingdom	0.265	0.052	53	0.724	0.284	27	**0.011**	0.953	53	0.137	**0.020**	27
15	United States	0.651	0.742	53	0.757	**0.026**	27	0.324	0.332	53	0.730	**0.001**	27
	Significant	2	5		2	6		11	4		6	11	

VECM results														
	Australia	Austria	Belgium	Canada	Denmark	France	Germany	Italy	Japan	Netherlan	Norway	Sweden	Switzerlar	United Kir	United Sta
ECM	0.041	0.006	-0.066	0.004	0.000	0.000	-0.147	0.012	-0.058	0.002	-0.081	-0.028	-0.147	-0.004	-0.011
z	3.6	0.6	-2.8	0.9	0.9	-0.6	-3.3	4.3	-4.1	0.2	4.5	-3.9	-1.9	-1.1	-1.4
lm	2.160	0.056	0.536	2.620	7.442	16.065	0.296	9.412	-2.929	1.000	-0.005	0.066	0.212	-2.910	0.079
z	8.3	0.2	10.1	3.5	1.4	2.4	6.5	5	-2.9	7.8	0	0.18	3.6	-5.1	0.3
lc	-0.587	-3.524	1.438	-15.720	57.187	95.177	0.067	-6.544	1.997	0.001	-1.717	3.860	-0.296	-9.840	-1.548
z	-1.42	-3.7	4.5	-5.8	4.6	5.2	0.2	-2.3	2.6	0	-7.4	3.1	-1.8	-5.9	-1.3
lk	-1.978	3.136	-0.398	4.370	-2.102	21.032	0.828	-1.446	1.064	-3.788	0.472	4.510	0.360	7.661	7.004
z	-3.4	3	-1.7	1.8	-0.2	1.2	4.5	-0.6	1.4	-5.6	2.7	3.7	1.6	4.8	6.1
cons	-3.577	-10.160	-13.775	22.232	-190.017	-378.920	-13.304	7.166	-19.724	0.212	-7.532	-37.449	-11.357	-1.203	-28.405
ECM: Error correction term for Dly equation														
ly is 1														
	Australia	Austria	Belgium	Canada	Denmark	France	Germany	Italy	Japan	Netherlan	Norway	Sweden	Switzerlar	United Kir	United Sta
ECM	0.146	-0.036	-0.043	-0.069	-0.035	-0.041	-0.037	0.011	-0.051	-0.076	-0.007	-0.046	-0.226	-0.037	-0.015
z	1.3	3.3	-3.9	-3.2	-3.4	-3.9	-0.9	4.5	0	-3.8	-3.5	-1.7	-2.4	-1.62	-0.9
lm	1.938	0.724	0.231	0.561	-0.096	0.286	0.507	10.041	-0.808	0.544	-3.02	0.574	0.287	0.718	0.987
z	8.6	2.9	1.68	5.4	-0.34	1.4	7.7	5.5	-0.9	5.9	-2.8	7	9.8	4	5.1
cons	-11.5	-10.431	-10.476	-10.786	-10.596	-10.911	-10.53	-16.004	-10.598	-10.896	-8.108	-10.71	-10.839	-11.224	-11.744

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