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**THE DEFENCE ECONOMICS OF TOTAL WAR 1870-1918: A LITERATURE REVIEW  
ARTICLE**

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**ABSTRACT:** *The intellectual aspiration of the paper serves two purposes. The first one is to demonstrate that the defence economics methodology has been partially implemented as an analytical tool in the case of Total War and especially in the analysis of the First World War (1914-1918). This can be regarded as the auxiliary purpose of the paper. The second purpose, which can be regarded as the core one, demonstrates that the analysis of the First World War as one of the main case studies of Total War has seven major categories of studies which address, directly or indirectly, economic issues related to total war. These categories are: 1) Political & Social History, 2) Military History, 3) Military Logistics, 4) Economic History, 5) Business History, 6) Integrated Studies, and 7) Comparative studies of the two world wars. We point out that the above research field, although extensive, does not fully analyse all aspects of total war, nor every aspect of the First World War per se. Either, due to limited information or due to complete absence of information certain questions related to the role of the military industrial complex, the economic efficiency of the two belligerent military alliances (Entente versus Central Powers), intelligence and its nexus to economic and industrial mobilization may never be fully highlighted.*

**KEYWORDS:** Economic History, Total War

**JEL Classification:** N44, H56

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**INTRODUCTION:**

In the history of warfare, the period from 1860-1945, is regarded as the period of total war. The concept of “total war” is debatable among historians, political scientists and economists; however the American Civil War (1861-1865) and the Franco-Prussian War (1870-1871) are the first two conflicts which are regarded as total wars by social scientists or at least as the prelude to this type of warfare. It is surprising, that other conflicts, such as, the Russian-Ottoman War (1877), the Russian-Japanese War (1904) the Balkan Wars (1912-1913), the Greek-Turkish War (1919-1922), are not regarded as total wars, or they have not attracted the attention of various scholars. However, there is general agreement that the First World War (1914-1918), as well as the Second (1939-1945), are the epitome of total warfare. In this article we focus our attention to the 1870-1918 period. This intellectual dichotomy is necessary since there is an immense amount of work on the two world wars. A second article will focus in the 1919-1945 period.

The structure of this article is as follows: In the first introductory section we will simply refer to the various current intellectual aspects of defence economics. In the second section we will

present the various kinds of the literature of total war for the 1870-1918 periods. In this section we present the main work which is published (mainly) in English, as well as other languages. This is taking place due to the huge amount of available literature on the issue, and to the limitations of space in a journal article. A third and final section will tight the literature of total war with the current intellectual aspects of defence economics, refer to the limitations of the current research, and identify some gaps which exist in the current literature about the early period of warfare. Recommendations for further research will also be presented.

## **DEFENCE ECONOMICS: CURRENT INTELLECTUAL ASPECTS.**

Modern defence economics cover the various issues. For reasons of simplicity we can group them in two major categories: The “core” and the “auxiliary” issues.<sup>1</sup> The “core” issues are as follows:

**1. Economic theories of alliances.** In this field researchers use microeconomic tools (such as utility curves, Nash equilibrium, game theory etc.) as well as econometric tools in order to determine a leader-follower behaviour inside the alliance and a burden sharing commitment, an optimal alliance viz. a viz. a certain threat etc.

**2. Demand and level of military expenditure, and the relationship between defence spending and economic growth.** Here most studies demonstrate that there is an inverse relationship between economic growth and defence spending. Furthermore, the studies point out that the level of military spending is related to threat perception, economic/financial resources of the country, defence spending of the opponent, past defence spending of both countries, current armament status of the two rivals, future projection of military power for both countries, economic financial resources of the opponent, bureaucracy etc.

**3. Arms races.** These are related to the above mentioned factors. Arms races models go back to the ideas of Richardson (1960) and Intrilligator (1975).<sup>2</sup>

**4. Defence procurement, defence industries, industrial conversion from military to civil uses, arms control / disarmament.** In theory every country who is engaged in defence procurement or purchases has the following four policy options: 1) Engagement in a national project exclusively. This solution allows the country to have a free hand in the type of the equipment which will be produced, the quality of the product and the number of produced units. The absence of participants secures the access of the single producer to confidential designing and technology. However, this policy is associated with high R&D expenditure and high risk. 2) Collaboration with one or more countries. This is especially important for the case of defence industry since it allows the reduction of high R&D costs, and also minimises the risk of wasting financial resources in similar activities across countries of the same alliance. 3) Licensing, co-production, or subcontracting. Here production cost can be reduced since certain elements of the defence equipment are produced in another country and thus a cost-focus strategy is achieved. 4) The final option refers to the case that one country will simply buy it from the international market. This transaction (arms trade) will have two potential dimensions. The first refers to “off the shelf trade”, that is equipment purchased without any offsets for the buyer. The second option refers to arms trade with offsets for the buyer. Nowadays most nations which are third tyre defence producers follow the “trade with offsets” strategy but the extent of these offsets is not always clear and is not always publicly available information. When the authorities of a state

decide on the type of policy that they will follow then the next step will be the determination of the benefits that will occur from the production, joint production, or simply purchase of a specific type of defence equipment. These potential benefits are of two main types: 1) Military and Strategic Benefits, 2) Economic/ Social Benefits. In the first category the acquisition of one specific defence article and its introduction to the local armed forces will have implications for the fighting power of the local forces. The military benefits may include broader co-operation in the defence sector. The opportunity cost of defence activity, the conversion of certain activities or even whole industries from military to civilian uses, the peace dividend which is the outcome from such changes has been analysed extensively in the literature.

**5. Arms trade.** This takes into consideration primary versus auxiliary suppliers. Countries with a big defence industrial capacity are the primary suppliers, versus those with infant or developing defence industries which are regarded as secondary or even tertiary suppliers.

**6. Military manpower.** The issue of military manpower is associated with huge expenses related to the training of the force, logistical support of the armies etc. Historically the military manpower was coming from the “pool” of the reserve units, whereas nowadays more and more armies become professional and conscription is minimized, if not totally abolished. Additional issues, which can be regarded as “auxiliary” refer to non-conventional conflicts, such as terrorism and guerilla warfare. These types of conflict existed in the past as well, however they were not the dominant type of conflict in which the armed forces of great powers had to be involved and face.<sup>3</sup> If, the current literature of defence economics, provides clear intellectual dichotomies among the various issues, the literature on the economics of total war for the 1870-1918 period is not so well formally structured. This is understandable since various social scientists have addressed the relevant issues from different perspectives, not just economists. To illustrate, historians, political scientists and economic and business historians, as well as economists, have addressed, the economic developments of the 1870-1918 era, with astonishing detail.

## **DEFENCE ECONOMICS AND TOTAL WAR (1860-1918): INTELLECTUAL DIMENSIONS OF ANALYSIS.**

In order to analyse the literature related to total war an essential intellectual dichotomy has to be made. In the international literature we can identify seven major categories of studies which address, directly or indirectly, economic issues related to total war.<sup>4</sup> Furthermore, due to the immense literature comments are made selectively on books / articles, book chapters we can not discuss in detail all the works, thus we simply make reference to them.

### **1<sup>st</sup> Literature dimension: Political/Social History.**

The first type of studies refers to books, which explain political tensions and divisions among the various states in the 1870-1918 period (**political/social history**). These studies demonstrate, how political tensions and disputes created the precondition for conflicts, but also affected the economies by diverting huge amounts of sums to arms and naval races. The studies address conflicting geopolitical interests, nationalistic ideologies, social tensions, international trade and conflicting economic interests etc. These studies demonstrate also that conflicting economic and trade interests between the various countries created the seeds of global conflict.

In this stream of thought the rise of nationalism in the great powers during the 1870-1914 period, the internal social conflicts and the rise of the socialist parties which challenged the dominant social elites and structure, the relative decline of Germany and Austria-Hungary viz. a viz. Russia, France and Britain, the geopolitical clash in the Eastern Mediterranean, South-Eastern Europe, Middle East, are factors which triggered the First World War. Historians, political scientists and sociologists are the main writers behind this approach.

It is impossible to list all the books, book chapters, not to mention the articles, which are related with the above intellectual stream of thought. Thus the following references are indicative and they do not represent an exhaustive list, by no means. For the 1870-1914 period we mention the following books/ articles from various intellectual contributors. From the **perspective of political scientists** one has to mention the following: 1) Dale C. Copeland: "The Origins of Major War", Cornell University Press, 2001, especially chapters 3 and 4, (pp.: 56-78 and 79-117), 2) S. R. Williamson Jr. : "The Origins of World War I", in the volume: R. I. Rotberg & Th. K. Rabb (eds.): "The Origin and Prevention of Major Wars", Cambridge University Press, 2002, pp. 225-248, 3) Stephen Van Evera: "The Cult of the Offensive and the Origins of the First World War", in the volume: Michael Brown (et.al) (eds.): "Offense, Defense, and War", The MIT Press, 2004, pp. 69-118, 4) Scott D. Sagan: "1914 Revisited. Allies, Offence, and Instability", in the volume: Michael Brown (et.al) (eds.): "Offense, Defense, and War", The MIT Press, 2004, pp. 158-182, 5) M. Sheehan: "Balance of Power. History and theory", Routledge, 1996, especially chapter 6, pp: 121-144, 6) Joanne Gowa: "Allies, Adversaries, and International Trade", Princeton University Press, 1994, 7) Edward D. Manshfield: "Power, Trade & War", Princeton University Press, 1994, 8) Michael P. Gerace: "Military Power, Conflict and Trade", Frank Cass, 2004. From the **perspective of the historian** one has to mention the following: 1) A.L. Kennedy: "Old Diplomacy and New 1876-1922 From Salisbury to Lloyd George", London, John Murray, 1922, 2) W.W. Gottlieb: "Studies in Secret Diplomacy during the First World War", London, George Allen & Unwin Ltd. 1957, 3) L. Albertini: "The Origins of the War of 1914", (three volumes London, 1952-1957), 4) Fritz Fischer: "Griff nach der Weltmacht: die Kriegszielpolitik des kaiserlichen Deutschland 1914/18", Dusseldorf, 1961. (The work is translated into English under the title: *Germany's Aims in the First World War, New York, 1967*), 5) Imanuel Geiss: "German Foreign Policy 1871-1914", London, 1976, 6) P. Kennedy: "The Rise of the Anglo-German Antagonism, 1860-1914", London, 1980, 7) D. Stevenson: "The First World War and International Politics", Oxford 1988, 8) Niall Ferguson: "Germany and the Origins of the First World War: New Perspectives", published in the *Historical Journal*, Vol. 35, No.3, Sept. 1992, pp: 725-752. From the **perspective of the sociologist** one has to mention the following: 1) Gerd Krumeich: "Armaments and Politics in France on the eve of the First World War", Berg 1984, 2) Herwig Holger H.: "The German Naval Officer Corps: A Social and Political History, 1890-1918", Oxford 1973, 3) Gooch John: "Army, State and Society in Italy 1870-1915", New York, St. Martin's Press 1989. (Although the above writers are not sociologists we group this work in this field, since, it has a dominant sociological dimension).

It goes without saying that the above stream of thought only indirectly is linked to the defence economics of the 1870-1914 period. The main contribution of these studies is the demonstration of the influence which geopolitical rivalries have on economic decisions, allocation of resources across different sectors of the society etc. The above rationale has an economic dimension but

there is only a limited amount of econometric treatment of data. This can be found in the writings of Mansfield (1994), Gowa (1994) and Gerace (2004) exclusively.

## **2<sup>nd</sup> Literature dimension: Military History.**

The second type of studies refers to the analysis of military developments in the 1870-1918 period (**military history**). These studies demonstrate in immense detail the creation of huge armies, as well as navies, in the 1870-1914 period, the limited efforts for disarmament in the same period.

Before analyzing the literature in this field we have to point out the broad contribution of two scholars. Geoffrey Brennan & Gordon Tullock: "An Economic Theory of Military Tactics", in *Journal of Economic Behavior and Organisation* No.3, (1982), pp: 225-242, introduces game theory in the military structure. According to the authors in any army the individual soldier has a personal interest which is in conflict with that of the whole army establishment. Thus the individual low ranking soldier faces a prisoner's dilemma. In order for the army (as an institution) to avoid such behavior it has to monitor closely the behavior of the individual soldier, a task associated with "monitoring costs" according to the authors. (Transaction costs if we follow the terminology of Oliver Williamson). The above assertion is a starting point of introducing game theory to formal military structures, however for the case of the First World War the contribution of military historians to defence economics has a different character.

The arms race of the 1870-1914 period was characterized by the introduction of universal conscription, the introduction of new weapons in the infantry (new rifles and machine-guns), new types of artillery as well as the naval race between the great powers, mainly between Britain and Germany after 1890. During this period the appearance of the airplane and air power in its most elementary form was also an important trait.

The arms race of the 1890-1914 period was mainly emphasizing static warfare with the development of artillery, infantry and the machine-gun. At sea, there was a greater emphasis in mines and submarines, although the construction of heavy battleships, cruisers as well as destroyers was still the eminent characteristic. It goes without saying that during the periods of warfare, the detailed analysis of the clash of arms at land, sea and air is the primary task of these studies. Military historians, political scientists and a limited number of economic historians are the main writers behind this approach.

The First World War saw a huge evolution in armaments both in terms of quality as well as quantity. New defence articles like the tank, the submarine, the land and naval mine, the aircraft carrier, the flamethrower were created and new types of heavy artillery were introduced.

The literature has the following economic characteristics. First of all it demonstrates that the pre-war arms race was economically unbalanced. More funding was diverted to naval armaments than those of land warfare, whereas the defence spending allocated to the air-force was very marginal. The second important characteristic is that the defence sending of the Triple Alliance (Central Powers and Italy) was smaller in terms of size compared to the combined spending of

Entente Powers (Britain, France, Russia) and that Germany and her allies were not able, in the long run, to sustain an arms race with Entente.

Finally the literature on military history implies that land, sea and air campaigns of the First World War were not designed exclusively to bring a military outcome. There was always a direct economic aim linked to the military outcome. This is most obvious in the sea battles of the First World War. The blockade of Central Powers aimed to destroy the economic and trade links that these had with the rest of the world. In response Germany launched three times unrestricted submarine warfare aiming the transport shipping of the allied as well as neutral countries. In the air the air warfare which at the beginning had limited observation purposes very soon became a bombing campaign aiming ports, railway facilities, factories, and even civilians from both sides. Finally land warfare aimed not only to the destruction of human capital of the opponent but to the conquering and economic exploitation of enemy's territories.

In this stream the following references are very useful, however they do not represent an exhaustive list by no means. However all the following contain essential information about military budgets, procurement costs, in some cases, consumption of ammunition, logistical support, etc. For the 1870-1914 period, the work of David G. Herrmann: "The Arming of Europe and the Making of the First World War", 1996 is an important study on the land arms race between the Great Powers. For the naval arms race see the work of Robert K. Massie: "Dreadnought. Britain, Germany and the coming of the Great War", London 1992. See also: L. Sondhaus: "Naval Warfare 1815-1914", Routledge 2001. The evolution of the German Army is well documented in the volumes: Eric Dorn Brose: "The Kaiser's Army", Oxford 2001, and Robert T. Foley: "German Strategy and the Path to Verdun", Cambridge 2005. For the British Army see: Shelford Bidwell & Dominick Graham: "Fire-Power. The British Army Weapons & Theories of War 1904-1945", 2004 and Field Marshal Lord Carver: "Britain's Army in the 20<sup>th</sup> Century", 1998. For the French Army see: Robert A. Doughty: "Pyrrhic Victory. French Strategy and Operations in the Great War", 2005 and Gerd Krumeich: "Armaments and Politics in France on the Eve of the First World War", 1984. A more recent development is associated with the excellent initiative by Mark Osborne Humphries & John Maker to translate and publish in English major parts of the German official history of the First World War. So far one volume has been published entitled: "Germany's Western Front 1915", by Wilfried Laurier University Press, 2010. The volume contains essential information on the military, operational and economic developments of the year. It is an excellent work and has to be continued in the future by the publication of additional volumes.

For the Austro-Hungarian Army see: Gunther E. Rothenberg: "The Habsburg Army in the First World War: 1914-1918", in the volume: R. Kann & B. K. Kiraly & P. S. Fichtner (eds.): "The Habsburg Empire in World War I", 1977, pp:73-86. [For the other opponents see the references in other sections].

Some general histories of the war have tremendous importance for an economist since they are not just a description of the military operations, but they contain information on economics, logistics, etc. The following are very important. The work of David Stevenson: "1914-1918 The History of the First World War", 2004, is very well written and contains essential information on

logistics as well as economics. The book of John Mosier: "The Myth of the Great War. A New Military History of World War I", 2001, provides very important insight on the logistics and tactics of the two opponents. Also the work of Ian Cawood & David McKinnon-Bell: "The First World War", 2001, contains also important information on shell consumption and other issues. The book of John Keegan: "The First World War", 1999, although it has a relative small section on economics provides throughout the text a lot of information on logistics. The work of Spencer C. Tucker: "The Great War 1914-18", 1998. provides important information on the consumption of artillery shells. The work of Holger Herwig: "The First World War. Germany and Austria-Hungary 1914-1918", 1997 is also a very important contribution with immense data regarding the logistics of the German and Austro-Hungarian armies. The classical work of John Terraine: "The Great War", 1965 is a useful guide but certainly outdated. Finally important information on logistics is provided in the book of Martin Gilbert: "The Routledge Atlas of the First World War", 2002.

Turning to specific books on military equipment the work of John Walter is essential. Both of his books "Central Powers' Small Arms of World War One", 1999 and "Allied Small Arms of World War One", 2000, provide essential information on various issues such as types, volume of production and cost (in limited cases). On artillery the work of Herbert Jäger: "German Artillery of World War One", Crowood 2001, provides immense information on the artillery logistics. Also the work of Ian V. Hogg: "Allied Artillery of World War One", Crowood, 2004, is also very informative and useful.

Turning to specific histories of battles (or fronts) which provide data on shell, bullet consumption and other material the following references are essential. The following list is again indicative and certainly not complete. The work of Norman Stone: "The Eastern Front", 1998, provides very good information about the consumption of shells, bullets, artillery pieces rifles, food, prices etc on the Eastern front. Turning to the Western Front the work of Malcolm Brown: "Verdun" 2000, is very well written. The battle of the Somme is well presented in the writings of 1) Martin Gilbert: "Somme. The Heroism and Horror of War", 2006, 2) Gary Sheffield: "The Somme", 2003, 3) Chris McCarthy: "The Somme. The Day-by-day Account", 2002 (reprint). The battle of Messines Ridge is described in detail in the volume: Ian Passingham: "Pillars of Fire", 2004. The 1918 campaigns are described in the work of 1) Martin Kitchen: "The German Offensives of 1918", 2001 and 2) J.H. Johnson: "1918 The Unexpected Victory", 2000.

Some additional general work with essential information is the work of Stephen Bull: "Trench Warfare", 2003 and Herbert Sulzbach: "With the German Guns", 2003. Turning to naval warfare the following references are useful: 1) Paul G. Halpern: "A Naval History of World War I", 1994, 2) Geoffrey Bennet: "Naval Battles of the First World War", 2005.

Turning to air power we can mention the following: 1) Kenneth Munson: "Bombers 1914-1919" and 2) Kenneth Munson: "Fighters 1914-1919" 3) John Buckley: "Air Power in the Age of Total War", 1999. Finally for chemical warfare see: Kim Coleman: "A History of Chemical Warfare", Palgrave, 2005.

In order to sum up we point out that the main contribution of this stream of literature to the economics of total war is related to the huge consumption (demand) for military funding of the various armies and the allocation of resources across countries in the different arms [army (infantry, artillery, cavalry, etc)-navy-air-force].

### **3<sup>rd</sup> Literature dimension: Military Logistics.**

The third type of studies, directly related to the previous one, refers to the logistical support of the armies. (**military logistics**). Here plenty of evidence is exposed on the technical (technological) developments of the various defence articles, as well as logistical support in terms of food requirements, ammunition, maintenance, etc. In these studies it is demonstrated that the complexity of logistical support systems is raising immensely during the 1860-1918 period, across the armed forces of the Great Powers. Here again, historians and economists are the main writers.

The logistical support of the armies during the era of total war has attracted adequate attention. The most well known book on the subject is that of Martin Van Creveld: "Supplying War. Logistics from Wallenstein to Patton", Cambridge second edition, 2004, especially pp.: 109-230. However the most complete book on logistics is that of John A. Lynn (ed.): "Feeding Mars. Logistics from the Middle Ages to the Present", 1993. The book has two essential essays: Jon Tetsuro Sumida: "Forging the Trident: British Naval Industrial Logistics, 1914-1918", pp: 217-249 and that of G. Satterfield: "Bibliography of Logistics from Ancient Greeks to the 1980s", pp.: 289-308. Additional work with immense detail on logistics of the 1860-1945 period can be found in the official publication of the US Air-Force, entitled "The Logistics of War a historical perspective", Air Force Logistics Management Agency, 2000. Two more essential surveys are those of Julian Thomson: "Lifeblood of War. Logistics in Armed Conflict", Brassey's 1991 and C. R. Shrader: "US Military Logistics, 1607-1991. A Research Guide", New York, 1992.

A very special part of the literature on logistics refers to railways. Here for the role of railways in the First World War we point out the following selective works: 1) Colonel A. M. Henniker: "Transportation on the Western Front 1914-1918", originally published in 1937, however republished in 1992, 2) J.A.B. Hamilton: "Britain's Railways in World War I", London 1967, 3) David Gould: "The South-Eastern & Chatam Railway in the 1914-18 War", 1981, 4) John Westwood: "Railways at War", 1980, 5) Alan Earnshaw: "Britain's Railway's at War 1914-1918", 1990. For the German railways of World War I one has to address the official German History "Reichsarchiv: Der Weltkrieg 1914 bis 1918. Die Militarischen Operationen zu Lande. Das Deutsche Feldeisenbahnwesen". For the Austro-Hungarian Railways see: J. Robert Wegs: "Transportation: The Achilles Heel of the Habsburg War Effort", in the volume: R. A. Kann (et.al) (eds.): "The Habsburg Empire in World War I", 1977, pp.: 121-134. Finally one can mention the following: Allan Mitchell: "The Great Train Race: Railways and the Franco-German Rivalry Before 1914", in the volume: "Francia 19./20. Jahrhundert", Band 19/3, Forschungen zur Westeuropaischen Geschichte, 1993, pp.: 47-55. A publication on British railways and their services exclusively to the Royal Air Force can be found in the volume: W.J. Corser (2003): "Wings on Rails. Industrial Railways in the Logistic Support of Britain's Air Defence Forces 1914-1994". Finally an old but overall book about railways see: Christofer I. Savage: "An



Economic History of Transport”, London, 1959. The book is focused on terrestrial and railway network of Britain, with limited reference to that of other countries.

Another important dimension of the logistical support is the oil issue. The role of oil in both world wars is well documented. For a general discussion see: Daniel Yergin: “The Prize. The epic quest for oil money & power”, Free Press 1992. The book provides an overview of the development of the global oil industry and immense detail on the development of specific oil companies such as BP, Royal-Dutch /Shell, Standard Oil etc. Also the book by A Shampson: “The Seven Sisters. The Great Oil Companies & the World they Shaped”, 1975, provides essential information on the development of the early oil industry. These books however are rather general and they provide a very broad picture of the role of oil in the First World War. More specific information can be found in the following publications: For a very good account on oil consumption of the Royal Navy during the war years see: D.K. Brown: “The Grand Fleet”, London 1999. Also for a very detailed account on German oil consumption during the war years see: Rainer Karlsch & Raymond G. Stokes: “FAKTOR ÖL: Die Mineralölwirtschaft in Deutschland 1859-1974”, C.H. Beck Verlag, 2003. See also the very rear book of Herbert Volck: “Öl und Mohammed”, Breslau, 1937. This is an important book on the oil of the Caucasus and the attempted exploitation by the German army. For the French consumption and use of oil see the official French History of the First World War (Les Armées Francaises Dans La Grande Guerre).

A new book on the Logistics of the First World War is expected to be published around 2008-2009 by Professor David Stevenson.

This stream of thought is associated with defence economics because it demonstrates the huge demand which was generated in the front for ammunition, food, spare parts, fuel, medical equipment etc. The supply of these huge amounts of goods is associated with the other two streams of thought which analyse the economic-industrial mobilization during the war years.

#### **4<sup>th</sup> Literature dimension: Economic History**

The fourth type of studies focuses on the development and evolution of the various economies (**economic history**). These studies tend to explain the (second) industrial revolution, the development of new capital intensive economies in the Great Powers, technological change, international trade, investment flows, immigration etc. Here a limited number of studies refers to defence trade as well as defence expenditure. These dimensions explain also the phenomenon of total war. Economic historians are the most dominant writers, however other social scientists also address these issues.

Here we can identify to sub-categories of literature. Literature, which is directly related, to the economics of total war. This work is associated with defence spending, defence trade, arms races, arms production. The second sub-category is general economic history which is indirectly related to total war. Due to the immense literature comments shall be made on the first sub-category of works, whereas we shall simply refer to the second one.

**Economic History Literature directly related to total war (1914-1918).**

The most complete history about the economic aspects of the Great War has been published in the 1920s and 1930s, under the auspices, of the “Carnegie Endowment for International Peace”. The series has almost 145 titles (but more volumes since some issues are analysed in two volume sets). The series entitled: “Economic and Social History of the World War” and covers the economies of US, UK, France, Russia, Japan, Belgium, Italy, Greece, Germany, Austria-Hungary, Bulgaria and Turkey. Furthermore, there are volumes for Czechoslovakia, Denmark, Poland and Romania. Many different editorial houses were involved in the project across the different countries. Some of the volumes are published in English while others are published in French, Italian, and German languages.

The volumes for Britain cover the issue of agriculture and food supplies, the cotton industry, coal mining industry, munitions, shipping, effects on local / regional economies like the industries of Clyde Valley and rural Scotland, social and financial aspects. The volumes for France cover the evolution of the French industry, railways, transportation, agriculture and food supply, financial aspects, role of women. The volumes on Belgium refer to the economics of occupation, the role of the Belgium army, economic cost of occupied territories. The Italian volumes refer to legislation changes, social changes of rural Italy and economic mobilization. The volumes on Russia refer to agriculture, the role of Russian army, cooperative movement and social change, public finance, industrial transformation, the role of schools and universities, financial cost of the war. The volumes for Japan refer to the evolution of the economy, industrial and social transformation during the 1914-1918 period, and the effects on industry and commerce. The volumes for the other countries (Greece, Romania, Poland, Holland) cover the economic developments and the occupation cost / exploitation (in the case of Poland and Romania).

For the Central Powers the picture is identical. The volumes for Germany cover agriculture, textiles, railways, state finances, criminality, social change, industrial and military mobilization, post war cost. The volumes on Austria-Hungary cover industrial evolution, financial and fiscal policy, criminality, social change, post war costs. The volume on Bulgaria focuses on the effects of the war on the economy and the volume on Turkey analyses the economic evolution in the Ottoman Empire during the war.

The other major works which provide an overall picture of the economics of the First World War are the following: S. Broadberry & Mark Harrison (eds.): “The Economics of World War I”, Cambridge 2005. This is an essential volume with contributions for the following countries: Germany, Austria-Hungary, Ottoman Empire, France, UK, Russia, Italy and the US. The case of the neutral economy of Holland is also described. The book, is very informative on the economic evolution of the period, however detailed data about war production are limited to the cases of Austria-Hungary, and the UK. Furthermore aggregate data on war production are presented in the chapters for Russia, US and Italy. There are no data on war production in the chapters for France and Germany. This is surprising since the editors provide aggregate data on war production in the introduction. Furthermore, one of the editors (Prof. Harrison) has provided overall data on war production for both opposite alliances (Central Powers versus Entente) in a paper that he had presented in October 2004 in Paris in a conference organized by the French Ministry of Defence, entitled “Why the Rich Won: Economic Mobilization and Economic

Development in Two World Wars". However, in spite of the above limitation, the book is certainly a very good effort and deserves every credit. An earlier book which attempted to provide an overall economic analysis of the First World War was the book of Gerd Hardach: "The First World War 1914-1918", which is part of the Penguin History of the World Economy in the Twentieth Century, published in 1977 (although originally published in German). The book addresses in detail issues related to agriculture, finance, labour movement, the economic consequences of the allied blockade and of the German unrestricted submarine warfare, and only partially the issue of armaments policy. Furthermore, a book which provides a comparative examination of the war financing in both UK and France is the work of Martin Horn: "Britain, France and the Financing of the First World War", 2002.

On the case of Russia two very important volumes are published: Peter Gatrell's: "Russia's First World War", 2005. The book provides an excellent picture of the Russian war economy, the challenges of mobilization, the social conflicts associated with mobilization efforts and also a very detailed picture of the war industry as well as agriculture. The second volume again by Peter Gatrell is entitled: "Government, industry and rearmament in Russia, 1900-1914", Cambridge 1994. The book is very well written with extreme detail on the Russian defence industry, the huge re-armament efforts which occurred after the Russian defeat with Japan in the war of 1904, military spending, and the relations between civil institutions with the military industrial complex. Also the reader should consult the book chapter again of P. Gatrell: "Big Business and the state in Russia, 1915-1918", in the volume: J.M. Cooper & M. Perrie & E.A. Rees (eds.): "Soviet History 1917-1953: Essays in Honour of R.W. Davies", London, 1995, pp: 1-21.

An excellent volume on the economics of Total War and Eastern Europe (excluding Russia) is the work of B. K. Kiraly (et al) (eds.): "War and Society in East Central Europe", Vol. XIX, Columbia University Press, 1985. The volume covers essential economic aspects on the provinces/districts of the Austro-Hungarian Empire, Serbia, Romania and there is even a chapter on the Bulgarian economy during the first world war. The consequences of the war on the region are discussed in a different volume of the series (Vol. VI), although the economic dimension is only partially addressed especially in the article of I.T. Berend & G. Ranki: "The Economic Problems of the Danube Region After the Breakup of the Austro-Hungarian Monarchy", pp: 89-104, in volume VI. Another article in that volume directly related to economics is the Paul Jonas: "The Economic Consequences of Trianon", pp.: 529-544. Finally, a case study which demonstrates the relationship of political and economic objectives is the article of Anne Orde: "France and Hungary in 1920: Revisionism and Railways", pp: 183-200, again in Vol. VI of the series.

For the case of France one has to refer to two studies: John F. Godfrey: "Capitalism at War. Industrial Policy and Bureaucracy in France 1914-1918", Berg 1987 and the work of Patrick Fridenson (ed.): "The French Home Front 1914-1918", again from Berg 1992.

The first book is very informative on the chemical industry, as well as other specific cases (Schneider and Roanne). The second volume provides a general essay on the evolution of industrial mobilization on specific industries like aviation and provides also social aspects like the status of female munitions workers. Furthermore we have to mention the book chapter of :

Gerd Hardach: “Französische Rustungspolitik 1914-1918”, in the volume H. Winkler (ed.): “Organisierter Kapitalismus”, 1974, pp: 101-116. An important contribution on the French defence industry during the war but with no data on defence production. However aggregate data on the French defence production during 1914-1918 can be found in the volume of A.D. Harvey: “Collision of Empires”, 1994, page 276, and also the reader should consult the multi-volume official French History of the First World War (Les Armées Françaises Dans La Grande Guerre), published in the 1930-1937 period.

Turning to the British case an excellent volume with immense information is the David Bilton’s work entitled: “The Home Front in the Great War. Aspects of the conflict 1914-1918”, 2003. Another important contribution is the article of J.M. Hobson entitled: “The Military-Extraction Gap and the Wary Titan: The Fiscal Sociology of British Defence Policy 1870-1913”, in the Journal of European Economic History, Vol. 22, No.3, 1993, pp: 461-506. This is a very important article with huge amount of data on defence spending across the Great Powers and points out that the UK was not a primary / essential spending force in the 187-1914 period on armaments. Two more book chapters have to be mentioned. The first one is the Clive Trebilcock: “War and the failure of industrial mobilisation: 1899 and 1914” in the volume: J.M. Winter (ed.): “War and Economic Development. Essays in the memory of David Joslin”, Cambridge, 1975, pp: 139-164. This is an important article which demonstrates the failure of British economic mobilisation in the early stages of the First World War. This is associated with previous failures in colonial wars. The second book chapter is the D.C. Coleman: “War Demand and industrial supply: the “Dope Scandal”, 1915-1919”, in the same volume pp: 205-227. The article demonstrates a scandal during the industrial mobilization of Britain in the First World War. Even if the scandal was not associated with moral decision making (a claim which partially contradicts specific evidence) it is certainly associated with incompetence in the chemical industry and inability to raise production in spite of huge investments.

For the case of Germany there are plenty of books in both English and German. In English the pioneering work is that of Gerald Feldman: “Army, Industry and Labor in Germany 1914-1918”, 1992 (second edition). Although there is limited economic information in its strict sense, there is an ample discussion on the relationship of civil-military institutions, social classes and their conflicting clash, and on the catastrophic intervention of the High Command on economic issues which simply absorbed all the resources for the military and thus left the civil economy to collapse. The interesting outcome of this policy is that it left the Army to claim that the defeat was the outcome of internal forces and not from military mistakes in the field. Another pioneering work is that of Belinda J. Davis: “Home Fires Burning. Food, Politics, and Everyday Life in World War I Berlin”, 2000. The book highlights exclusively the role of domestic agriculture as well as the effects of allied blockade on German economy and society. Due to space limitations we refer only to one journal article by Niall Ferguson entitled: “Public Finance and National Security: The Domestic Origins of the First World War Revisited”, in Past and Present, No.142, Febr. 1994, pp: 141-168. A very important article which demonstrates that due to the collapsing fiscal status of German budget, the country was unable to finance in the long run an arms race with the Entente powers and thus the July 1914 crisis gave a huge chance to start a pre-emptive war.

The economic exploitation of occupied Belgium and Luxembourg is discussed in the volume: Peter Liberman: “Does Conquest Pay”, Princeton University Press 1996, pp. 69-86. Furthermore, one has to mention the work of William Lowell Putnam: “The Kaiser’s Merchant Ships of World War I”, 2001. This is another important work which provides information on the activities of individual merchant ships! We also have to mention the book chapter by I.D. Salavrakos: “German Economic Industrial Mobilisation in World War I (1914-1918)”, in the volume Nicholas C. J. Pappas (ed.): “Antiquity and Modernity. A Celebration of European History and Heritage in the Olympic Year 2004”, Athens Institute for Education and Research (ATINER), 2004, pp: 165-178. The chapter is very well written with emphasis in the production of military equipment and hardware in Germany and the other belligerent countries. Table 1 presents the most complete picture of German military production in a yearly basis from 1914-1918. Also Table 4 presents also a comparative picture of military production across belligerent countries. Both tables are certainly not complete, however they represent a very good starting point for the proper determination of military production hardware in the various countries.

The literature in German is extensive and worth mentioning. The three volume work of the former East German Academy of Sciences entitled “Wirtschaft & Staat in Deutschland” is important. The first volume covers the 1871-1919 period, the second volume covers the Weimar Republic and the third volume covers the period of the Third Reich. Surprisingly the volumes have different authors, and there is no editor. The first volume, published in 1978, and written by Dieter Baudis & Helga Nussbaum provides immense information on the economics of the second Reich and also aggregate data of monthly maximum defence production (see page 309). Another important work is that of Regina Roth: “Staat und Wirtschaft im Ersten Weltkrieg”, 1997. This is a very good work, which covers all aspects of economic mobilization in Germany with the exception of defence production. From a Marxist perspective the German economic mobilization is discussed in the work of Alfred Schröter: “Krieg, Staat, Monopol 1914-1918”, Akademie Verlag (East) Berlin, 1965. Also the work of Michael Geyer: “Deutsche Rüstungspolitik 1860-1980”, 1984, provides a general, descriptive framework of the evolution of the defence industry. Of course the outstanding 14 volume publication –before the Second World War- of the Reichsarchiv “Der Weltkrieg 1914-1918” is a very important source. Of course the difficulty with this work just like all pre-world war two works in German is the use of the “old” type German language which makes it difficult for the reader to use.<sup>5</sup>

For the Austro-Hungarian monarchy there are two volumes which provide immense insight. These are: 1) The doctoral dissertation of Mag. Helmut Meelich entitled: “Die Kriegswirtschaft Österreich-Ungarn 1914-1918. Wirtschaftsorganisation und Versorgungspolitik im Ersten Weltkrieg”, Vienna University, 1976 and 2) the postgraduate dissertation of G. Oberer entitled: “Die Organisation der Kriegswirtschaft Österreich-Ungarns 1914-1918”, Vienna University 1996. Both dissertations cover with detail the economic mobilisation of the Austro-Hungarian Monarchy. There are two more book chapters worth mentioning both published in the same book rather recently. The book is a publication of Charles University of Prague and it is edited by the well known economic historians Alice Teichova & Alois Mosser & Jaroslav Patek etitled: “Der Markt im Mitteleuropa der Zwischenkriegszeit”, 1997. In that book there are two important articles. The first one is by Z. Jindra entitled: “Die Bemuhungen um eine Wirtschaftliche Annäherung zwischen Österreich/Hungarn und Deutschland im Ersten Kriegsjahr 1914-1915”,

pp.: 327-340. The article discusses the economic co-operation and its problems between the two Central Powers in the first war year. The second article by György Köver entitled: “Centripetal and centrifugal Economic Forces in the Austro-Hungarian Monarchy”, pp.: 341-346.

The Greek economic mobilization is analysed in extreme detail in the book of George Leontaritis: “Greece in the First World War: From Neutrality to Intervention 1917-1918”, Boulder 1990, Columbia University Press, East European Monographs, 284. Especially chapters 5 and 6 are very well written and provide immense insight in military preparations and economic mobilisation.

For the case of the Ottoman Empire three books provide essential information. The first one is the E.J. Erickson: “Ordered to Die. A History of the Ottoman Army in the First World War”, 2001. The book covers all aspects of the military mobilisation and partially addresses issues of economic mobilisation as well. The second one, entitled “A Century of Turkish Defence”, Ankara 1994, is a publication of Altay Group of companies in Turkey. In spite of its non-academic character it provides limited but essential information on the Ottoman military / industrial mobilization for the 1900-1918 period.

For the role of agriculture the classic study of Anver Offer entitled: “The First World War: An Agrarian Interpretation”, Oxford 1989, is a very well written and researched study which mainly provides an insight in the role of agriculture in Britain and Germany (and up to a point in other countries).

The issues relating to defence trade are addressed in the following volumes: D.J. Stoker & J.A. Grant (eds): “Girding for Battle. The Arms Trade in a Global Perspective, 1815-1940”, Praeger 2003. In this volume the essay of Jonathan Grant entitled: “The Arms Trade in Eastern Europe 1870-1914”, pp: 25-41, provides immense insight on the role of the various arms dealers and producers in the region. The essay of W.F. Sater & H.H. Herwig entitled: “The Art of the Deal”, pp: 53-96 is also a very well written and demonstrates the penetration of German defence companies in the markets of Latin American states. Also the work of Keith Krause: “Arms and the State: Patterns of Military Production and Trade”, Cambridge 1992, especially chapter 3, pp.: 54-80 is an important overview of global arms trade for the entire 1850-1945 period. Finally the work of A. Sampson: “The Arms Bazaar”, 1977, provides in chapters 2-4 information about the arms trade of the 1870-1918 period.

#### **4b. Economic History Literature indirectly related to total war (1914-1918).**

Important work on economic history which is indirectly related to the economics of total war is the following: For the British economy the two volume work of Sydney Pollard: 1) “Britain’s Prime and Britain’s Decline. The British Economy 1870-1914”, 1990 and the second volume entitled: “The Development of the British Economy 1914-1990”, 1992, provides essential information on industrial development, indirectly related to total war, 2) S. Broadberry & N.F.R. Crafts (eds.): “Britain in the International Economy”, Cambridge, 1992. For the French economy see: R. F. Kuisel: “Capitalism & the State in Modern France”, Cambridge 1983, and for a comparison between France and Germany in the early industrial period see: J.H. Clapham: “Economic Development of France & Germany 1815-1914”, Cambridge 1966, for the German

economy see the following: 1) W. O. Henderson: "The Rise of German Industrial Power", 1975, 2) W.O. Henderson: "Studies in German Colonial History", 1976 (this is a small book with limited but excellent information on the economics of the colonies of the German Second Reich). Also of importance for the role of various factors (social, political economic) in German defeat is the work of 3) R. Chickering: "Imperial Germany and the Great War, 1914-1918", 1998, 4) Gerald D. Feldman: "The Great Disorder. Politics, Economics and Society in the German inflation, 1914-1924", Oxford 1997. A more recent publication is the Volker R. Berghahn book: "Imperial Germany 1871-1914. Economy, Society, Culture and Politics", 2005. For the broader relations between businesses and politics see the work of Lamar Cecil: "Albert Ballin: Business and Politics in Imperial Germany 1888-1918", 1967 and for a more recent work see Niall Ferguson: "Paper and Iron: Hamburg Business and German Politics, 1897-1927", Cambridge 1995.

For the Austro-Hungarian economy, see: D.F. Good: "The Economic Rise of the Habsburg Empire 1750-1914", University of California, 1984. For the case of Italy see: Vera Zamagni: "The Economic History of Italy 1860-1990", Oxford 1993. The chapters on the economics of the First and the Second World War (chapters 7 and 9) are very informative. For Eastern and south-eastern Europe see: I.T. Berend & G.Ranki: "Economic Development in East-Central Europe in the 19<sup>th</sup> & 20<sup>th</sup> Centuries", Columbia University Press 1974 and I.T. Berend & G. Ranki: "The European Periphery & Industrialization 1780-1914", Cambridge 1986. For the US economy see the following: 1) Jonathan Hughes & Louis P. Cain: "American Economic History", 1998, 2) P. Renshaw: "America in the Era of the Two World Wars 1910-1945", 1996. For the Japanese economy see: G.C. Allen: "A Short Economic History of Modern Japan", 1972. The economics of the Ottoman Empire, North Africa, Middle East both as markets as well as sources of raw materials, minerals etc are also important for the understanding of the economic of total war and also for the economic causes of the two world wars. Here the following work is essential: 1) John R. Lampe & Marvin R. Jackson: "Balkan Economic History 1550-1950", 1982, John R. Lampe: "The Bulgarian Economy in the Twentieth Century", 1986. For the Ottoman Empire see the two volumes set entitled "An Economic and Social History of the Ottoman Empire" (surprisingly the authors of the two volumes are different). Two more important studies are the volumes of S. Pamuk: "The Ottoman Empire and European capitalism, 1820-1913. Trade, investment and production", Cambridge 1987 and S. Pamuk & J. G. Williamson (eds.): "The Mediterranean Response to Globalization before 1950", Routledge, 2000. A more detailed study is the volume G. G. Gilbar (ed.): "Ottoman Palestine 1800-1914: Studies in Economic and Social History", 1988. For the broader relations between Ottoman Empire and the other Central Powers see: Frank G. Weber: "Eagles on the Crescent. Germany, Austria, and the Diplomacy of the Turkish Alliance, 1914-1918", 1970. An important volume, with adequate information about the economic, political and strategic bonds between the three countries. For the economics of the Middle East see: Elie Kedourie & Sylvia G. Haim (eds.): "Essays on the Economic History of the Middle East", Frank Cass, 1988 and also: Charles Issawi: "An Economic History of the Middle East and North Africa", 1982. See also Akinjide Osuntokun: "Nigeria in the First World War", 1979, with important economic data in various footnotes.

However general volumes on economic history are indirectly related to total war. Here one has to refer to the three volume set of B.R. Mitchell: "International Historical Statistics 1750-2000"

(one for Europe, one for the American Continent and one for Africa, Asia and Oceania). The statistics on iron/pig-iron and steel industry as well as the data about agricultural production, oil production and other minerals are useful for every researcher on total war and on the geopolitical competition between the Great Powers.

Two more books provide essential information on technological change and its relation to finance, as well as political (and partially military) objectives. The work of Daniel R. Headrick: "The Tools of Empire. Technology and European Imperialism in the Nineteenth Century", Oxford 1981 and also from the same author "The Tentacles of Progress. Technology Transfer in the Age of Imperialism, 1850-1940", Oxford 1988, are very important.

### **5<sup>th</sup> Literature dimension: Business History**

The fifth type of studies refers to books which are related to the evolution of various business activities in the major economies both at national and multinational level (**business history**). In this type of literature the reader will find plenty information regarding the entrepreneurial activities of specific firms both at national as well as multinational level. A limited number of studies in business history refer to specific defence industries. The interaction between pure economic decisions, politics, managerial revolution, social conflicts, personal interests (opportunism according to transaction cost theory), are documented by various scholars. These studies are indirectly related to total war since up to a point demonstrate the conflicting economic / business interests which created conflicts between the Great Powers. Economic and business historians are exclusively the scientists behind this type of work.

In this section we can refer to publications which analyse specific defence industries and also publications which analyse other businesses which provide additional information on the developments of the period in microeconomic level.

General work on the evolution of the armaments industry is the following: 1) H.C. Engelbrecht & F.C. Hanighen: "Merchants of Death. A Study of the International Armaments Industry", New York 1934. This is a very good book with good information on the development of various defence industries before and during the First World War as well as in the 1920s. The book covers the evolution of the US industry firms like Colt, Winchester, Remington, as well as the chemical Du Pont. The activities of European manufacturers like the German Krupp, the French Schneider, the British Vickers are also discussed before and during the First World War. 2) The book of Philip Noel-Baker: "The Private Manufacture of Armaments", (first edition 1936, second edition by the same author 1972), is also very significant. Again the book aims in analyzing the evolution of global defence industry in the 1880-1930 period. However here a big part of the book is associated to the link between corruption and defence trade, across states, the close co-operation between the military / industrial complex and the various political parties and individual politicians (again across countries), the influence on the press, and the role of armament manufacturers in fueling the arms race before the First World War. Aspects of arms trade between countries with opposing political interests but which still provided business opportunities for the companies are also discussed. Finally selective data on the role of defence industries during the First World War are presented. 3) Another study on the development of defence industries is the book by Richard Lewinsohn: "The Profits of War", New York 1937.



The book demonstrates the relationship between financiers (banking institutions), armament manufacturers, and generals before and during the First World War. It has to be noted that all the above books were written after the First World War in an era when there was widespread criticism on arm manufacturers, thus they are all very critical. Three more books in similar line are the following: 1) George A. Drew: "Enemies of Peace: An Expose of Armaments Manufacturers", Toronto, 1933, 2) Eugene Stanley: "Foreign Investment and War", University of Chicago Press, 1935, 3) Seymour Waldman: "Death and Profits", New York 1932. Two more books (but very rare) are those of Bauer Lothar: "Die Rustungsindustrie der Welt", Wirtschaftskurve, 1932 vol.11, No.2 and 3 which analyse Schneider and Vickers respectively.

After the Second World War one has to mention the following publications: 1) William Manchester: "The Arms of Krupp" (first edition 1968 and second edition 2003), 2) Clive Trebilcock: "The Vickers Brothers. Armaments and Enterprise 1854-1914", London 1977. The global shipbuilding industry is very well analysed in the volume of Robert J. Winklareth: "Naval Shipbuilders of the World. From the Age of Sail to the Present Day", London 2000. Furthermore, German books which provide a description of the main defence industries are the following: 1) Thomas Rother: "Die Krupps", Campus Verlag, 2001, 2) Lothar Gall: "Krupp im 20. Jahrhundert", Siedler Verlag, 2002, 3) Thomas Rother: "Die Thyssens", Campus Verlag, 2003. For small arms see the following: 1) Robert W.D. Ball: "Mauser Military Rifles of the World", Krause, 2003, 2) John Walter: "The Luger Story", Greenhill 2001 and finally the study which provides the most complete history of all small arms manufacturers is the volume by John Walter: "The Greenhill Dictionary of Guns and Gun makers", Greenhill 2001. The work on the aircraft industry is immense. To illustrate, we refer to the following: 1) Paul Leaman: "Fokker Aircraft of World War One", 2001, which demonstrates the development of the most successful German industry of the First World War.

Also one has to mention the unpublished information which has been presented in the European University Institute in 1991 in Florence, Italy in the workshop entitled: "The Armament Industry and European Economic Development". In that forum the following papers are of immense value: 1) Michael Epkenhans: "The German Armament Industry and Economic Development, 1870-1914", (No.15), 2) Claude Beaud: "Les Schneider "marchands de canons"" (No.16), 3) Luciano Segreto: "Armament Industry and Italian Economic Development (1880's-1939)", (No. 18), 4) V. Prucha: "Development of the Skoda Works and its Role in Czechoslovak Industry up to the year 1938".

In this field the work related to the evolution of chemical, steel, oil industries as well as banking are also important since they had immense role during the First World War. Again the list provided is by no means complete.

In the chemical industry the work of W.J. Reader: "Imperial Chemical Industries A History" (Vol. I: The Forerunners 1870-1926), Oxford 1970, provides essential information about the company and the development of the industry in Britain. For the development of the chemical industry in Germany see the work of Werner Abelshauser et. al: "German Industry and Global Enterprise BASF: The History of a Company", Cambridge 2004 is also a very important work. For the evolution of the chemical industry in the US see: Graham D. Taylor & Patricia E.

Sudnik: “DuPont and the International Chemical Industry”, 1984. See also: Haber L. F.: “The Chemical Industry 1900-1930. International Growth and Technological Change 1900-1930”, Oxford, 1971.

In the steel industry the following references are also important: 1) Robert C. Allen: “International Competition in Iron and Steel, 1850-1913”, *Journal of Economic History* Vol. 39, (Dec. 1979), pp: 911-937, 2) David S. Landes: “The Unbounded Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present” Cambridge 1970, 3) Donald N. McClockey: “Economic Maturity and Industrial Decline: British Iron and Steel 1870-1913”, Cambridge 1973, 4) Stephen B. Webb: “Tariffs, Cartels, Technology and Growth in the German Steel Industry, 1879-1914”, in *Journal of Economic History*, Vol. 40, June 1980, pp: 309-329.

For the oil industry the following work is essential: 1) Geoffrey Jones: “The State and the Emergence of the British Oil Industry”, 1981, 2) T.A. B. Corley: “A History of the Burma Oil Company 1866-1924”, Vol. I, 1983, 3) R. W. Ferrier: “The History of the British Petroleum Company”, Vol. I, (The Developing Years 1901-1932), Cambridge 1982, 4) Ralph W. Hidy & Muriel E. Hidy: “Pioneering in Big Business 1882-1911. History of Standard Oil Company”, 1955.

In banking and finance the following references are essential: 1) Ron Chernow: “The Warburgs”, 1993, 2) Ron Chernow: “The House of Morgan”, London 2003, 3) Youssef Cassis (ed.): “Finance and Financiers in European History 1880-1960”, Cambridge 2002, 4) Alice Teichova (et.al): “Banking, Trade and Industry. Europe, America and Asia from the thirteenth to the twentieth century”, 1997, 5) Lothar Gall (et.al): “The Deutsche Bank 1870-1995”, 1995, 6) Eduard März: “Austrian Banking & Financial Policy. Creditanstalt at a turning point 1913-1923”, 1984, is an excellent book on the Austro-Hungarian economic mobilization during the war and the role of the banking houses. Finally the work of Karl Erich Born: “International Banking in the 19<sup>th</sup> and 20<sup>th</sup> Centuries”, 1983 is a very good book with important information on the financing of the war as well as of big projects on railway and shipping before the war. (Actually the work of März and partially that of Born can be included in the references which have direct intellectual nexus with the concept of total war).

### **6<sup>th</sup> Literature dimension: Integrated Studies**

The sixth and final approach is the one which some scholars follow when they attempt to integrate all the above elements in their work. (**integrated studies**) These studies may also encompass a comparative methodology, i.e. comparing one or more Great Powers, in a specific time period or comparing the behaviour of one or more Great Powers across time. Historians, political scientists and economic historians are those which follow this trend.

In this category one can refer the following books: 1) D. Stevenson: “Armaments and the coming of war”, 2000. This is a very good book which demonstrates how the interaction of (geo)political, economic, military and social factors created the global or European environment of conflict, 2) Niall Ferguson: “The War of the World”, Allen Lane 2006. The work provides an overall assessment of conflicts in the 20<sup>th</sup> century. The aim is to explain the basic contradiction

of the era, which is epitomized in the conflict between economic progress on the one side versus violence and war on the other. 3) Niall Ferguson: "The Pity of War", Penguin Books 1999. This is also a very important book which highlights various aspects of the conflict. Economic, financial social and political aspects are well explored and developed. 4) A.D. Harvey: "Collision of Empires. Britain in three World Wars 1793-1945", Phoenix, 1992. This is truly monumental. The author analyses extensively the conflicts between Britain and France in the 1793-1815 period as well as the two world wars. Different aspects (political, economic, social, industrial, military) are well written across countries and years. A comparative analysis (taking Britain as the central player) of the various countries is presented, 5) P. Kennedy: "The Rise and fall of Great Powers. Economic Change and Military Conflict from 1500 to 2000", Fontana Press, 1988. This is a well known book which attempts to analyse the interaction of economic and military power in a dynamic way, across countries and centuries. Additional work is that of Hew Strachan: "The First World War, Volume I: To Arms", Oxford 2001. This work is the first part of a broader study. The study covers ideologies, military strategies, geopolitical plans and grand strategies, financial and industrial mobilization. Also the work of Gerd Fesser entitled: "Die Kaiserzeit. Deutschland 1871-1918" 2000, provides an important overview of the German Reich.

Three more works are needed to be mentioned. The work of Randal Gray & Christopher Argyle: "Chronicle of the First World War", (in two volumes), published in 1990 and 1991 respectively contain essential economic information and information on logistics as well. The work of John Ellis & Michael Cox: "The World War I Databook", 1993, contains essential information on strengths, casualties, defence production and hardware. The nexus between finance and political and military power across states and eras is also addressed in the work of Niall Ferguson: "The Cash Nexus. Money and Power in the Modern World 1700-2000", 2002. Finally, one has to mention an excellent book by David Stevenson: "With our Backs to the Wall Victory and Defeat in 1918", London 2011, which provides an excellent analysis of the last year of the war and covers various aspects like military developments and organisation, economic, industrial, and financial mobilization, morale and leadership across belligerents etc.

### **7<sup>th</sup> Literature dimension: Comparative Studies of both World Wars and/or Literature on the Second World War which also refers to the First.**

Here we have books which although deal with issues of the second world war they have essential information for the First one as well. Some of these titles are the following:

The work of R. Overy: "War and Economy in the Third Reich", 1995 has essential information on the production of military equipment for Germany in 1918. Also the recently published work of Adam Tooze entitled: "The Wages of Destruction. The Making and breaking of the Nazi Economy", 2006 has also important information on the economics of the First World War. The work of Edward B. Westmann: "Flak. German Anti-aircraft Defences 1914-19145", 2001, also has important information. The volume of I.C.B. Dear & M.R.D. Foot (eds.): "The Oxford Companion to World War II", 2001, has also important information on various aspects of the First World War. The monumental work of the German Research Institute for Military History entitled: "Germany and the Second World War", contains also very important information on German mobilization during the First World War. The memoirs of Albert Speer entitled "Inside the Third Reich" also has important information. The work of Jonathan R. Adelman: "Prelude to

the Cold War. The Tsarist, Soviet and US Armies in the Two World Wars”, 1988 is also very important. See also: Peter Gatrell & Mark Harrison: “The Russian and Soviet economies in two world wars: a comparative view”, in the Economic History Review, Vol. XXVI, 3 (1993), pp.: 425-452.

#### **4. Defence Economics versus literature on total war (1870-1918): Concluding Remarks.**

We have presented the intellectual issues which are related to the study of defence economics and we have continued by identifying seven different types of literature associated with the study of total war during the second industrial revolution, and the early twentieth century. It goes without saying that the lists provided are not extensive or complete. But it is obvious that the literature of total war overlaps in many aspects with the literature of defence economics. In order to understand the similarities and the differences, and also identify the gaps in the literature we construct a table of similarities and we also comment on the differences. These are as follows:

**TABLE 1: DEFENCE ECONOMICS-TOTAL WAR 1870-1918 LITERATURE: SIMILARITIES**

<b>Defence Economics</b>	<b>Total War</b>	<b>Similarities</b>
Economic Theory of Alliances	Political Social History Integrated Studies	<b>Yes</b>
Level of Military Expenditure	Military History Integrated Studies	
Relationship between defence spending and economic growth	Political Social History Integrated Studies Economic History not directly related to total war	<b>Yes</b>
Arms races	Military History Economic History related to total war	<b>Yes</b>
Defence procurement	Military Logistics Business History Comparative Studies	<b>Yes</b>
Defence Industries	Economic History related to total war Military Logistics Business History Comparative Studies	<b>Yes</b>
Arms Trade	Economic History related to total war Business History Comparative Studies	<b>Yes</b>
Military Manpower	Economic History related to total war Military History Military Logistics	<b>Yes</b>

Table 1 demonstrates which types of the literature of total war overlaps with which part / stream of thought of the current defence economics approach. It is obvious that elements of the defence economics research agenda can be found in different categories of the economics of total war.

However there are methodological differences between the two research agendas. The main difference is that defence economics use econometric methodology as well as game theory, utility theory and microeconomics in order to support their results. These methodologies are extensively used across the different areas of defence economics. (Economic theory of alliances, demand for military expenditure and arms races, military expenditure and economic growth, procurement, arms trade).

On the other hand the use of econometric methodology in the literature of total war is very limited. Only a small number of studies apply this instrument in defence spending of the 1870-1914 period and also on the broader issue of the relationship between trade and conflict.

Finally one has to point out that the study of the economics of total war of the 1870-1918 period is certainly not fully explored. What is well covered and extensively discussed and analysed is the macroeconomic evolution. Data on inflation, unemployment, strikes, government spending, taxes, debt, agricultural and industrial production, trade are well analysed and evaluated, however a lot is still needed to be done.

To illustrate, we still do not have the complete picture of military hardware production of all belligerent countries during the war period (The data for artillery shells, guns, aeroplanes, aeroplane engines, machine guns, rifles and other small arms, ships) across all countries are well known however we still do not have complete data on them and we do not have them in a monthly basis. Furthermore the data on small arms ammunition (bullets) as well as grenades are incomplete.

Another problem is that of prices for military hardware which is again very difficult to calculate. Thus, production costs for every item across the war period and across the belligerent countries, is very difficult to obtain. In spite of these difficulties further research is needed in the field. The following research questions are indicative as to what can still be done:

-How capital versus labour intensive was the economic mobilization of the Great Powers before and during the First World War? Here the crucial question is not of percentage allocation of defence budget resources between armaments (capital) and expenditure on human capital (labour) but rather the speed and the emphasis across countries taking into consideration the failure of the “speed war” of 1914 and the evolution of static trench warfare versus the military doctrines of the time and the belief-illusion of a short war

-Procurement costs: Difficult to establish but at least a partial view is needed;

-Was there an outsourcing effect from defence trade in the 1870-1914 period and if there was how this affected the war?

-What was the role of dual purpose industries in the domestic economies of each country and was there an outsourcing effect as well before the war?

-To what extent personal opportunistic goals affected decision making in the defence industry during the war across countries?

- Was there a real civil-defence industrial complex and did the generals had at their disposal the quantities of defence articles required?
- Was the economic role of colonies marginal or not?
- Was there an optimal allocation of resources in defence procurement across belligerent countries?
- To what extent innovation in the defence industry was optimal during the war across countries?
- To what extent the (late) British industrial mobilization was a failure? Is it possible that it was part of a well calculated decision to mobilize the resources of the Empire and the country in later stage when the resources of France, Russia and Germany would have been exhausted?
- If Russia and Italy, were a liability for the Western alliance and Austria-Hungary, Bulgaria and Turkey were a liability for Germany to what extent this affected the mobilization of France, UK and Germany?
- Who intelligence influenced the economic / industrial mobilization of the 1914-1918 period?
- What are the similarities and differences in business practices and defence trade for conventional weapons manufacturers during the 1870-1914 period and nowadays? Is there a globalisation in the defence industry similar to that of the 1870-1914 period in other sectors of the economy?

A final remark is needed the list of references provided is not complete (especially the business history section). We also neglected some volumes published during the 1930s on defence trade simply because they repeat the information which the books that we already include in our list have. However, we hope that we achieved the goal to provide the reader with the most useful references on the issue which constitute an intellectual starting point in the field. The bibliography which the above work uses is immense and needs further attention, for anyone interested in the above research agenda. We have not included, due to limitations of space, any journal articles. However we believe that the current article provides a guide for anyone interested in the study of total war. Critical comments, from social scientists across disciplines, are more than welcomed...

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**DISCLAIMER:** The current work reflects private views and does not reflect the views of the European Parliament.

<sup>1</sup> Here we follow the methodology/classification of Todd Sandler & Keith Hartley: “The Economics of Defence”, Cambridge University Press, 1995.

<sup>2</sup> See: 1) Richardson Lewis F.: “Arms and Insecurity: A Mathematical Study of the Causes and Origins of War”, Pittsburgh, Homewood, 1960, 2) Intriligator Michael D.: “Strategic Considerations in the Richardson Model of Arms Races”, Journal of Political Economy, Vol. 83 issue 2, pp: 339-353, 1975.

<sup>3</sup> At this point an essential remark has to occur. From the period of the Cold War, due to the existence of nuclear weapons as well as other weapons of mass destruction, the possibility of full scale warfare between the great powers is considered very marginal. However the Cold War as well as the post Cold War period have created either terrorism and guerilla warfare low intensity conflicts or (at worse) regional conflicts in which the armed forces of Great Powers had to intervene either for humanitarian purposes or peace keeping/enforcing operations. It was only in a limited amount of cases were the armed forces of Great Powers had to intervene for fighting (such as Vietnam, Falklands, Iraq etc.)

<sup>4</sup> The various theoretical debates, as well as aspects, related to total war are summarized in the excellent five volume series which has been published recently by the German Historical Institute in association with Cambridge University Press. Three of these volumes refer to the 1870-1918 period and are as follows: 1) Stig Förster & Jörg Nagler (eds.) (1997): “On the Road to Total War. The American Civil War and the German Wars of Unification 1861-1871”, 2) Manfred F. Boemeke & Roger Chickering & Stig Förster (eds.) (1999): “Anticipating Total War. The German and American Experiences 1871-1914”, 3) Roger Chickering & Stig Förster (eds.) (2000): “Great War, Total War. Combat and Mobilization on the Western Front”. For a short but well focused article on the definition of total war see: R. Chikering: “Total War. The Use and Abuse of a Concept”, in the second volume of the above series pp.: 13-28.

<sup>5</sup> It will be an immense contribution to the academic world if the German Institutue for Military History translates this huge 14-volume work in **modern** German or English so that it will be easier accessible to researchers. Partially this work is expected to be published by Wilfried Laurier University Press by Mark Osborne Humphries & John Maker.