Applying Business and Economic Models to the Analysis of Warfare

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1. Introduction

The intellectual aspiration of the research project is to analyze the nexus between economic forces and the military apparatus (of various belligerents) during the era of war. The nexus between the economy and the military during the era of peace is well analyzed by the economics of defense. The economics of defense analyze issues related to arms trade, conversion, military alliances, arms races.[1] In this analysis the "gun versus butter" dilemma is essential because it demonstrates how many resources are used for military purposes viz. a viz. other needs of the society.

However, when real war erupts, the situation changes dramatically and thus the economy has to mobilize and assist the military apparatus of any society. Then we have to speak about the economics of warfare rather than the economics of defense. The structure of this intellectual exercise is as follows: In the first section we refer to the basic traits of conventional warfare. In the second section we introduce the economic models which can be applied to analyze the issue at the level of strategy. The third section provides the models which can be used for the analysis of the topic at the tactical level. Conclusions follow.

2. Traits of conventional warfare.

When war erupts there are three traits which are unique. The first is duration. No pre-war plan can accurately assess the time duration of the conflict. To illustrate, in August 1914 when WWI erupted the conventional belief was that the boys will be back home for Christmas. However they were back for Christmas of 1918 and not of 1914. When Germany invaded Poland (September 1939) a blitzkrieg style war followed and this was repeated in the cases of Scandinavia, Western Europe and the Balkans. However when Germany attacked USSR and the US entered the war in December 1941 the conflict became global and lasted until September 1945. When NATO attacked Yugoslavia in 1999 no-one predicted a 78 days air-campaign. Thus most conflicts last longer than anticipated.

The second trait of modern warfare is that it is total. Total war makes the civilian population a legitimate target.[2] Although the Geneva Convention prohibits the mass murder of civilians and war prisoners the former have been targeted many times. To illustrate during WWI the allied naval blockade was responsible for the death of at least 600,000 civilians in Germany whereas the air bombing of towns in the Spanish Civil War and during WWII was responsible for many deaths and for the destruction of thousands works of art. The notion of targeting civilians goes back to Clauzewitz who points out that if a war effort does not have overwhelming popular support then any tactical victories at the front will be nullified. Thus if the "home front" collapses any tactical advantage may perish. [This is partially the explanation of the German defeat in November 1918, which created the "stab in the back" assertion in the interwar period].

The third trait of conventional warfare is associated with the type of victory that we wish to achieve. Here we use the terminology of Martell (2007) who points out that there are three types of victory: a) the tactical victory, which is achieved at the battlefield, b) the political-military victory which is achieved in limited warfare and c) the grand strategy / total victory which is associated with the unconditional surrender of the enemy and imposition of regime change.[3]

The fourth trait of war is associated with the type of war and with the strategy that belligerents endorses. There are many types of war. We can identify: 1."Offensive wars", 2) "Defensive wars", 3) "Wars with or without allies", 4) "Wars of intervention in the internal affairs of another state", 5) "Pre-emptive wars",

[1] See: T. Sandler & K. Hartley: "The Economics of Defense", Cambridge, 1995.
[2] See: R. Chickering: "Total War. The Use and abuse of a concept", in the volume: M. Boemeke (et.al) (eds.): "Anticipating Total War. The German and American experiences 1871-1914", Cambridge, 1999, pp: 13-28.
[3] See: W.C. Martell: "Victory in War Foundations of modern military policy", Cambridge 2007, pp: 83-103.

6) "Wars of opinion or ideological wars", 7) "National Wars", 8) "Civil wars", 9) "Guerilla or partisan wars", 10) "Total wars", 11) "Wars of religion", 12) "Wars of annihilation", "Wars of Imperialism or nationalism", 13) "Hegemonic wars", 14) "Peoples wars".[4] The tactical aspects of warfare are associated with the various types. We differentiate between "land warfare", "naval warfare", "air-warfare", "nuclear and Weapons of Mass Destruction (WMD) warfare", "cyber warfare", "communication-intelligence warfare", "economic warfare".[5]

3. Economic Models which can be applied to analyze conflict.

There are two main models which can be used to the analysis of economics and warfare. The former is the Diamond Model, whereas the latter is the New Institutional Economics (NIEs), Square of Power Model. The Diamond is originally a model which aims to examine the competitiveness of any economy in the international economic system; however this model can capture very well the nexus between the real economy and the military apparatus of any nation during warfare. The second model; that of the Square of Power, captures the nexus between the financial sphere of the economy and the military apparatus of any nation during the era of warfare.

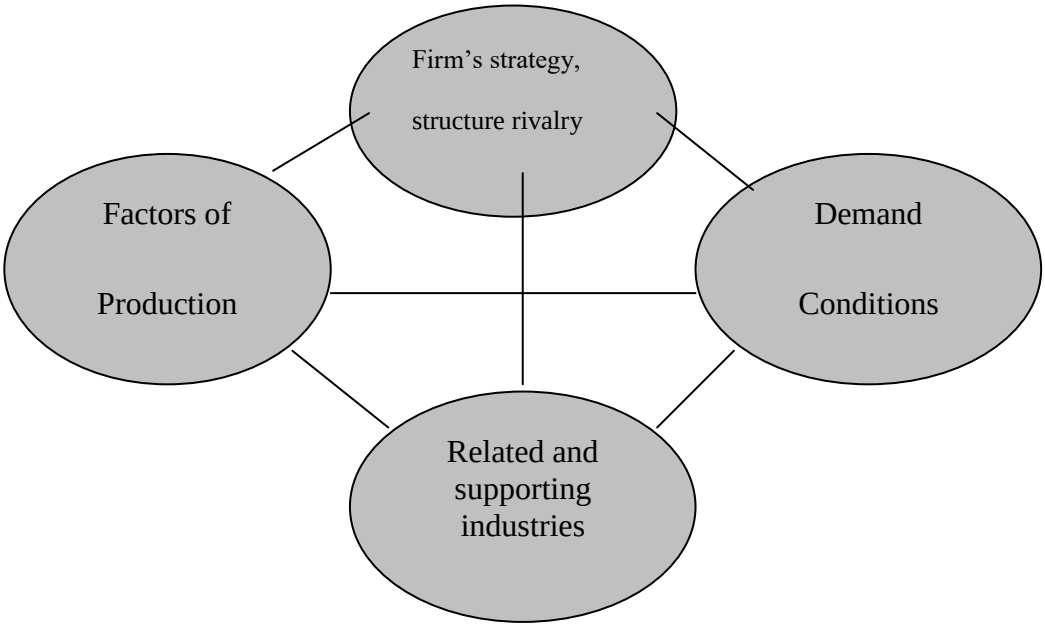
3a. The Diamond Model.

The model is demonstrated in Figure 1.

[4] The analysis of warfare is immense see: 1) J.S. Levy: "War in the Modern Great Power System, 1495-1975", University Press of Kentucky, 1983, 2) R. Rotberg & Th. K. Rabb (eds.): "The Origin and Prevention of Major Wars", Cambridge University Press, 1998, 3) Dale C. Copeland: "The Origins of Major War", Cornell University Press, 2000, 4) M.E Brown & O. R. Cote Jr. & S.M. Lynn-Jones & S. E. Miller (eds.): "Theories of War and Peace", MIT Press, London, 2001, 5) B. Heuser: "The Evolution of Strategy Thinking War from Antiquity to the Present", Cambridge University Press, 2010. For the evolution of "total war" the most brutal type of conventional warfare see: 6) Manfred F. Boemeke & Roger Chickering & Stig Förster (eds.) (1999): "Anticipating Total War. The German and American Experiences 1871-1914", 7) Roger Chickering & Stig Förster (eds.) (2000): "Great War, Total War. Combat and Mobilization on the Western Front", 8) R. Chickering & Stig Förster (eds.) (2003): "The Shadows of Total War Europe, East Asia and the United States 1919-1939", 9) Roger Chickering & Stig Förster & Bernd Greiner (eds.) (2005): "A World at Total War Global Conflict and the Politics of Destruction 1937-1945" all volumes published by Cambridge University Press and the German Historical Institute. For the theoretical definition of total war see: R. Chikering: "Total War. The Use and Abuse of a Concept", in the volume: Manfred F. Boemeke & Roger Chickering & Stig Förster (eds.) (1999): "Anticipating Total War. The German and American Experiences 1871-1914", pages 13-28. For an excellent analysis of the various war types see: B. Heuser: "The Evolution of Strategy Thinking War from Antiquity to the Present", Cambridge University Press, 2010.

[5] See: J. F. Dunnigan: "How to Make War", William Morrow and Company, New York, 1993. Tactical issues and aspects of warfare are also analysed in the following: 1) Rob Johnson & M. Whitby & J. France: "How to Win on the Battlefield", Thames & Hudson, London, 2010, with excellent analysis on land warfare tactics. For the logistical support see: 2) M. Van Creveld: "Supplying War Logistics from Wallenstein to Patton", Cambridge University Press, 2004, 3) J. Thompson: "Lifeblood of War Logistics in armed conflict", Brassey's 1998, 4) J. A. Lynn (ed.): "Feeding Mars Logistics in Western Warfare from the Middle Ages to the Present", Westview Press, 1993. For naval logistics see the outdated but still useful: 5) G.C. Dyer: "Naval Logistics", US Naval Institute, 1960. For air-force logistics see: 6) W. J. Boyne: "Beyond the Wild Blue A History of the United States Air Force 1947-2007", St. Martins Press, 2007. For an overall assessment of warfare evolution see: C. Archer & J. R. Ferris & H. Herwig & T. H. E. Travers: "Cassel's World History of Warfare", Cassell, London, 2003. In the Greek bibliography see: 1) D. Dimoulis & Chr. Giannouli: "The Dialectics of War", Athens, Kritiki Publications, 1995, 2) Panayotis Kondilis: "Theory of War", Themelio editions, Athens, 1997. The economic warfare is analysed according to various case studies. See for example: 1) J.M. Winter (ed): "War and Economic Development", Cambridge University Press, 1975, 2) St. Broadberry & M. Harrison (eds.): "The Economics of World War I", Cambridge University Press, 2005, 3) M. Harrison (ed.): "The Economics of World War II", Cambridge University Press, 1998, 4) J. Brauer & H. Van Tuyll: "Castles, Battles & Bombs How Economics Explains Military History", University of Chicago Press, 2008. The reader has to treat the above list as indicative and certainly incomplete.

Figure 1. The Diamond Model.



Source: M. Porter: "The Competitive Advantage of Nations", 1990, page 72.

An analysis follows:

Production factors: Every economy has a certain level of Capital, Labour, Technology, space with certain natural resources. These factors will change when war erupts. We expect that capital will be reduced due to enemy bombardment; labour will also change since men will become soldiers (traditionally men were replaced by women in factories, transportation, agricultural facilities etc). Women entered the labour market *en mass* during WWI and the phenomenon was repeated during WWII. Turning to technology the machine tools inside the various industries before the war have to be ideally modern in order to ensure maximum productivity. Turning to space and natural resources the war will either end in conquering space and land from the enemy; or vice versa. In the first case if the conquering territories are not "scorched earth" they can be useful to the war effort; if however they are fully or partially perished their use is limited. In the second case the opposite occurs.

Demand Conditions: The economy during the war will have to meet the enormous demand for consumer products and military hardware for the front at the same time. If the economy is maximizing the production of military hardware (guns, ammunitions, etc) and marginalizes the production of consumer goods this will result in shortages in the home front and this will trigger public dissatisfaction which will result in the Clauzewitz assertion that the public dissatisfaction will sooner or later force the leaders to seek for a diplomatic solution to the conflict in spite of what is occurring at the tactical level. A typical example of the "Demand Trap" is the case of the German economy in the two world wars. In WWI the German economy produced more defense articles than any other belligerent economy.[6] This maximum war production marginalized the needs of the home front which eventually collapsed under the minimum supply of consumer goods. In the case of WWII the opposite occurred. Hitler who had the experience of the previous war had maximize the supply of the home front with consumer goods. When the German economy mobilized in 1944 and increased the supply of defence articles *en mass* it was too late to much the quantitative superiority of the combined allied production. Furthermore the Germans made the mistake of not concentrating in specific high quality weapons like the Me-262 fighter jet and apply mass production techniques. Thus the result was complete defeat in May 1945.[7]

[6] See: 1) I.D. Salavrakos: "Economy and Total War" Volume I The case of the First World War, Krtitiki publications, Scientific Library Series, Athens, 2007, pp: 273-340 and 2) I.D. Salavrakos: "The Defence Industry as an Explanatory Factor of the German Defeat during World War I: Lessons for Future Conflicts", *International Journal of History and Philosophical Research,* Vol.2, No.1, pp: 1-34.

[7] See: I.D. Salavrakos (2009): "World War II-German Economy: triumph, tragedy and irrationality (1939-1945)", Iolkos publishers, Athens, Greece, (in Greek).

Related and Supporting Industries (and services): During war the so-called related and supporting industries have a crucial role to play. Obviously we do not refer to defense industry or to other crucial industries like steel, oil, petrochemicals, coal [historically] etc. it goes without saying that the more developed these are the better the chances to prevail in the war. We are talking here about other industries (or services) like the fire-brigade. In war thousands of fires will erupt due to enemy bombardment. The case of Hamburg in 1943 is unique when the fire-brigade force had to face 360,000 fires simultaneously!! The better equipped the fire-brigade from the era of peace the less damage will occur in the era of war. Another example is the case of the telecommunication industries. When WWI erupted the Germans enjoyed very powerful electrical generators of up to 5,000 volts which allowed them to send signals up to 5,000 nautical miles. When war erupted the German Pacific fleet was notified immediately, mobilized and started to sink British merchant navy ships immediately, however the British had to notify the Pacific fleet with pigeons thus the Germans gained a three day advantage.[8] The transportation network is an additional advantage. Again a typical example comes from WWI when the railway network of Germany used only for the Western front 11,000 trains with 250,000 wagons. Between 2-18th August 1914 2,150 trains with 44 wagons each passed every ten minutes the seven bridges of the Rhine river transporting 640,000 men, 200,000 horses and 300,000 tons of ammunition.[9] Another example again from German is the network of Prussia during the Seven Years War which allowed the Prussian army to cover the 150 miles distance between Dresden and Erfurt in September 1757 in 13 days. Two months later the distance of 225 miles between Leipsich and Parvitz was covered in 14 days. In September 1758 the distance between Kürstrin- Dresden (140 miles) was covered in 7 days.[10]

Finally the NHS (National Health System) is an additional asset. During the era of war any society will have thousands of wounded civilians and soldiers. Furthermore we can anticipate spread of diseases either through enemy activity (via chemical warfare attacks) or simply because living and medical conditions will deteriorate. The ability of the Health System to cope with multiple cases of wounded humans and the ability of the pharmaceutical industries to maximise production of medical equipment as well as drugs is key for victory. Again a WWI example illustrates the point. In Germany the highly developed medical treatment and practices before and during the war made the average wound mortality for the whole 1914-1918 period to just 8%.[11]

Finally agriculture is an additional related and supporting industry. The Napoleonic assertion that "an army marches on its stomach" is well known; however agricultural supplies are needed for the home front as well. To illustrate General Ludendorff in his memoirs points out that Germany needed to import 1,800,000 tons of final food products or seeds annually. These imports were denied by the allied blockade and caused immense strain to the home front. He points out with regret that "we have failed to pay any attention to agriculture in our pre-war planning".[12]

Firm's strategy, structure, rivalry: The final aspect of the Diamond is the role of the private sector and of entrepreneurship. It is well known that during the era of peace firms aim to maximize profits either via cost reduction strategies or via qualitative superiority, marketing etc. The question is what is the role of the enterprise during war? Is it still business as usual or there is a social responsibility for the enterprise and the entrepreneur? A typical example comes from the Russian defence industry in WWI. When the war erupted the Russian army had a huge deficit in small fire arms and ammunition. The Russian state industries like Putilov did not have the ability to produce *en mass* thus the Czar asked the private enterprises to increase their production of fire-arms. However many private entrepreneurs took the state funds but instead of investing them to production lines they bought the local agricultural production and sold it back to the black market. A typical example is the case of the Revdinskoye industries in the Urals.[13]

[8] See: Hew Strachan: "The First World War", Vol. I To Arms, Oxford 2001, pp: 450-452 and 468-469.
[9] See: E.D. Brose: "The Kaiser's Army", Oxford, 2001, page 186.
[10] See: Martin Van Creveld: "Supplying War Logistics from Wallenstein to Patton", Cambridge University Press, 2004, pp. 28-29.
[11] See: H. Herwig: "The First World War Germany and Austria-Hungary 1914-1918", Arnold, 1997, London, pp: 296-301. See also: H. Jager: "German Artillery of World War One", Crowood Press, 2001, pp: 212-214.
[12] See: E. Ludendorff: "Total War", Greek edition, Athens, 1938, page 56.
[13] See: N. Stone: "The Eastern Front 1914-1917", Penguin, London, 1998, page 197.

In the Second World War US oil firms and high-technology industries have supplied the Axis powers even after the entry of US in the conflict with oil and technology via neutral states of Spain, Portugal, Switzerland and via Latin America.[14] So what the private entrepreneur will do is essential, for victory or defeat in war.

However it is not just the real economy which contributes to victory or defeat in war but it is also the financial sphere of the economy. A war-any war – which in the majority of cases last longer from what is anticipated by pre-war planners has to be financed and there are three ways to finance war: a) via taxes, b) via loans (domestic or international), c) via increased money supply. In order to capture these we need to address the second model that of Square of Power.

3b. The Square of Power model and NIE (New Institutional Economics)

The Square of Power model is demonstrated in Figure 2.

Figure 2: The Square of Power Model

Source: Niall Ferguson: "The Cash Nexus Money and Power in the Modern World 1700-2000", Penguin, 2002, page 16.

Bureaucracy-Tax Authorities: Any war can theoretically be financed exclusively by taxation. However, if this is the case, then heavy taxation will create social unrest and eventually, the government will be forced to seek a diplomatic solution. The second issue associated with taxation is the efficiency of the tax authorities per se. If taxes are not collected fully during the era of peace they shall be collected during war times? Two examples in order to illustrate this point. During WWI the British authorities practically nullified the inheritance tax, which was reduced from 13.8% of total tax revenues in 1914 to 3.4% of tax revenues in 1918.[15] The rationale behind this was simple. The human cost of the war was high and if the society was to remain disciplined a fiscal measure was needed to guarantee satisfaction. People across social classes inherited from their dead relatives and they had a pschychological cost to pay. This should not become pecuniary as well. However it goes without saying that other taxes like the income tax increased immensely during the war. The second example comes from Germany during WWII. The allied air campaign destroys not only the houses of the civilian population but also the state archives and records thus the state does not have information about the wealth of the individuals so on what basis it an formulate a tax policy? However tax revenues increased during the period 1939-1943 due to the fact that ordinary Germans did whatever it was possible to assist the war effort.[16]

National Debt/ Money Markets: The second way to finance a war is via internal or external loans. If the option of internal loans is exercised this requires adequate level of savings from the era of peace. If the citizens do not save during peace or they are in debt how can they finance a war? If this is the case then interal financing is impossible and the government has to offer any bonds to international markets and investors. In this case the optimum strategy is that the loans have a long-time duration with low interest rates.

[14] See for example: 1) C. Leitz: "Economic Relations between Nazi Germany and Franco's Spain 1936-1945", Clarendon Press, 1996, 2) J. Pool: "Hitler and his secret partners", Pocket books 1997, 3) E. Black: "IBM and the Holocaust", Little Brown, 2001.

[15] See: Hew Strachan: "The First World War", Vol. I To Arms, Oxford 2001, page 864.

[16] See: 1) K. Hardach: "The Political Economy of Germany in the Twentieth Century", University of California, 1980, pp: 85-86 and 2) A. Speer: "Inside the Third Reich", Phoenix, 2002, page 352.

The opposite option (i.e, short-time duration and high interest) is not desirable. However the international investors will buy the bonds in time of uncertainty only if the state entered the war with low public debt. The cases of Great Britain, Russia and Germany during WWI illustrate the above points.[17]

Money Supply-Central Banks: The third way to finance a war is historically the excess print of money by the central bank (i.e. excess money supply). However especially under gold standard the excess money supply triggered hyperinflation thus triggered social unrest. The examples are ample. To illustrate in the US Civil War the Confederate attempted to finance the war via the "cotton-bonds". These were bonds which the South issued to the international investors promising to repay them with cotton exports. However these exports never occurred due to the naval blockade which the North imposed on the South. When this occurred the only way for the South to finance the war effort was via taxation and excess money supply which both triggered social dissatisfaction. These developments with two major tactical defeats in Gettysburg and Vicksburg forced eventually the Confederates to surrender.[18]

Institutions and Parliament: The fourth invisible force which will determine victory or defeat in war is associated with institutions. There are two dimensions here. The first is the quality of civil-military relations. WHO DECIDES IN WAR? The answer to this question by the German General Staff has been that the commander in chief at the tactical theatre of operations has the freedom to take all the necessary decisions in order to achieve victory. To illustrate, the command for the German retreat in the West after the battle of the Marne was given to the army by Lieutenant Colonel Richard Hentsch who "had sweeping powers to make whatever adjustments seemed appropriate…On September 9th …he concurred …to withdraw to the Aisne".[19] Thus 1,5 million soldiers withdraw after the order of a Colonel. Opposite to this rationale is the well known phrase that: "War is a too serious matter to entrust it to military men", by Clemenceau. The institutional conflict is obvious.

However there is a second dimension about institutions and how they affect war. The role of the Parliament is also crucial. In a parliamentary democracy various political parties will win elections and rule for a certain period of time. Obviously all political parties have voters (supporters) which belong to certain social classes; and social classes have conflicting interests. The main task of the Parliament is to legislate and the crucial question according to the NIE paradigm is if the parliamentary majority will legislate in order to support exclusively the interests of its own voters or if the legislation will try to compromise conflicting social interests. In the first case, when the interests only of the voters of the specific party which won the election are satisfied, class struggle will increase since the interests of other social classes are marginalised. In this case social instability (violence, strikes, demonstrations etc.) will certainly decrease the growth rate of the economy and will also have a harmful effect on the morale of the population in case of war.

However if the opposite occurs (i.e. a social compromise via the legislation) then all social classes will be satisfied. This will create a stable social environment which will promote economic growth and the morale for sacrifices will be high in case of war. A typical example of social compromise from economic history is provided by the case of the Second German Reich (1871-1918). German capitalism was based on a social compromise. The landowners (Junkers) needed the termination of cheap Russian wheat imports, in order to achieve high prices for agricultural products. The industrialists opposed the idea, since higher prices for food would mean higher salaries for industrial workers. The syndicates objected to the idea as well. However eventually the state decided to terminate Russian cheap imports; however in exchange of higher food prices the landowners accepted the development of a big German navy (a move associated with huge demand for iron and steel, thus high profits for the heavy industry). In exchange of the higher food prices, the labour movement was compensated with the creation of a welfare state (free health and education for the working class). Under this social compromise model Germany flourished. Thus when war erupted all social classes supported the war effort.[20]

[17] See: N. Ferguson: "The Pity of War", Penguin, 1998, pp: 126-131.

[18] See: 1) Niall Ferguson: "The Ascent of Money A Financial History of the World", Allen Lane, 2008, pp. 92-97, 2) Bruce Catton: "American Civil War", Vol. 3, Phoenix Press, 2001, pp. 70-80.

[19] See: S.C. Tucker: "The Great War 1914-1918", UCL Press, 1998, pages 31-32.

[20] For the rise of German capitalism see: 1) A.D. Chandler Jr.: "Scale and Scope The Dynamics of Industrial Capitalism", Harvard University Press, 1990, pages: 399-400, 425, 2) R. Chickering: "Imperial Germany and the Great War 1914-1918" Cambridge, 1998, page 2, 3) P. Watson: "The German Genious", Simon & Schuster 2010, pages 340-397 (with the nexus

The above two models analyse the nexus between economics and warfare at the strategic level. The above analysis demonstrates that in conventional wars which have a long time duration the side with the limited resources is in most cases doomed to fail. According to one study during the period 1800-1849 in the 88.2% of armed conflicts the "strong side" prevailed on the "weak". During the 1850-1899 period in the 79.5% of conflicts the "strong" prevailed over the "weak". During the period 1900-1949, in the case of 65% of conflicts the strong prevailed. The situation is reversed during the period 1950-1999, when the weak prevail on the 51.2% of conflicts. For the whole period 1800-2003 in the 71.5% of conflicts the "strong" prevail over the weak.[21] The only chance that the "weak" have to prevail in war is to mobilize the maximum of their limited resources (manpower, economic, financial, industrial etc) sooner than the stronger side; thus create a window of opportunity for specific time which will allow them to achieve a decisive blow to the stronger enemy. The other optional strategy is to achieve the attrition of the stronger opponent via guerrilla warfare.

4. Business models which can be applied at the tactical level.

The nexus between economics and tactical warfare has been very limited in the international bibliography. To illustrate at the tactical level the only study which applies "game theory" to military tactical operational level is that of Brennan & Tullock (1982). The authors point out that during battles each soldier aims to maximise his personal utility and advantage and not the advantage of the whole army or unit. Thus a system of control is needed in order to avoid such behaviour.[22] Another attempt to apply economic principles to military tactics is the study of Brauer & Van Tuyll (2008). The authors analyse selected military operations and practices from the medieval era until the era of the Cold War. They demonstrate that various military leaders across history were making decisions having taken various economic principles into consideration. They point out that various military leaders made decisions considering six economic principles: 1) opportunity cost, 2) expected marginal cost versus marginal benefit, 3) substitution effect, 4) diminishing marginal returns, 5) asymmetrical information and hidden characteristics, 6) hidden actions and incentive alliance.[23] Mathematical models have also been applied to tactical warfare analysis. The most famous application is the ORSBM model (=Oak Ridge Spreadsheet Battle Model).[24]

However in the current intellectual exercise we attempt to analyse tactical battle developments with the application of Feasibility Study model.[25] The Feasibility Study model includes elements of the SWOT model (which stands for Strengths, Weaknesses Opportunities, Threats) and of the PEST model (which stands for Political, Economic, Social, Technological). The Feasibility Study model has the following characteristics:

A. Introduction-Historical background, description of product or service

1. Brief Description of proposed entrepreneurial venture
2. Brief History of the Industry
3. Information about the economy and its trends
4. Current status of the product or service
5. Intended or Suggested production process of the product or service

between sciences and economics), 4) J. Fear: "German Capitalism", in the volume: Th. K. McCraw (ed.): "Creating Modern Capitalism", Harvard University Press, 1997, pages: 135-184 and especially pages 141-152. See also: 5) K.D. Barkin: "The Controversy of German industrialization, 1890-1902", University of Chicago Press, 1970. Finally see: S. Halperin: "War and Social Change in modern Europe", Cambridge 2004, pages 148-149 where there is an excellent analysis of the class struggle inside Germany and the ramifications that this struggle had on Germany's economic relations.

[21] See: Ivan Arreguín-Toft: "How the Weak Win Wars. A Theory of Assymetric Conflict", Cambridge University Press 2005. For the 1800-1849 period 34 conflicts are examines, for the 1850-1899 period, 78 conflicts are examined, for the 1900-1949 period 43 conflicts are examines, and the same number of conflicts is examined for the 1950-1999 period. In total for the 1800-2003 period 200 conflicts are examined.

[22] See: G. Brennan & G, Tullock: "An Economic Theory of military tactics", Journal of Economic Behavior and Organization No.3, 1982, pp: 225-242.

[23] See: J. Brauer & H. van Tuyl: "Castles, Battles and Bombs. How Economics Explains Military History", University of Chicago Press, 2008.

[24] See: 1) T. N. Dupuy: "A Genius for War. The German Army and General staff 1807-1945", Prentice Hall, 1977, 2) T. N. Dupuy: "Numbers Predictions and War. Using History to Evaluate Combat Factors and Predict the outcome of Battles", Boss-Merrill Company, 1979, 3) T. N. Dupuy: "Understanding Defeat. How to recover from loss in battle and gain victory in war", Paragon, 1990.

[25] See: Stephen P. Robins & Mary Coulter: "Management", Prentice Hall, 2002, page 250.

6. Complete list of goods or services to be provided
7. Strengths and Weaknesses of the business
8. Ease of entry into the industry, including competitors analysis and entry barriers

B. Accounting considerations

1. Proforma Balance Sheet
2. Proforma profit and loss statement
3. Project cash flow analysis

C. Management Considerations

1. Personal expertise –strengths and weaknesses
2. Proposed organizational design
3. Potential staffing requirements
4. Inventory management methods
5. Production and operations management issues
6. Equipment needs

D. Marketing Considerations

1. Detailed product description
2. Identification of the target market (who, were, how, many)
3. Description of the market place where the product will be distributed (location, traffic, size, distribution channels etc.).
4. Price determination (competition, price lists etc)
5. Promotion plans (role of personal selling, advertising, sales promotion etc)

E. Financial Considerations

1. Start up costs
2. Working capital requirements
3. Equity requirements
4. Loans-amounts, types, conditions,
5. Breakeven point analysis
6. Collateral
7. Credit references
8. Equipment-buildings financing-cost and methods

F. Legal Considerations:

1. Proposed Business Structure (type, conditions, terms, liability and responsibility, insurance needs, buyout, succession issues)
2. Contracts, licences, other legal documents

G. Tax Considerations:

1. Direct taxes (property, income)
2. Indirect taxes (VAT)
3. Local taxes and insurance contributions

H. Appendixes:

1. Charts / diagrams, graphs
2. Layouts
3. Resumes

This final dimension is not applied in our case, thus we omit it.

The Feasibility Study model can analyse tactical warfare as follows:

A. Introduction-Historical background, description of product or service

1. Brief Description of proposed entrepreneurial venture

In the case of tactical warfare this is associated with the military planning which occurs during the pre-war era. This planning takes into consideration the home country reserves, and identifies the practical (immediate and long-term) objectives which the military apparatus needs to achieve during the era of conflict. In this phase we take also into consideration the weapon systems of the potential adversaries.

2. Brief History of the Industry
Here we provide a historical assessment of the fighting strength and ability of both adversaries. We consider issues like training, morale, leadership, organization, tactics, formations, war potential, etc.

3. Information about the economy and its trends
We provide an analysis based on the previous models for all adversaries. Therefore we consider the industrial strength of the states (defence industry, microelectronics, oil and gas industry, chemical industry, food and beverages industry, pharmaceutical industry, telecommunications industry). Our economic assessment includes the transportation network (railways, terrestrial network, port facilities, airports, rivers). We also take into consideration monetary factors like the exchange rates of currencies, foreign exchange reserves, gold reserves, inflation, money supply. We also analyse the health system, the level of public services (policing, fire-brigade, etc).

4. Current status of the product or service
Here we assess the fighting capacity of the armed forces. How many artillery pieces tanks, ships, airplanes can be deployed, what is the rate of fire of the weapon systems, what is the destructive power of the weapon systems, their technological level, their calibre and so on.

5. Intended or Suggested production process of the product or service
Which modifications can be made to the weapon systems at what financial cost and what is the time duration? How quickly the fighting strength of the current weapon systems can be increased? (In other words how quickly we can modify existing weapons in order to increase the fighting power i.e. number of bullets or shells fired per minute), the calibre of the weapons the endurance of the systems in certain climates etc.

6. Complete list of goods or services to be provided
Here we suggest which defence articles are needed for future combat. A Cost/ Benefit analysis is undertaken in most of the times in order to define the optimum product.

7. Strengths and Weaknesses of the business
Here we analyse the Strengths and Weaknesses of the military apparatus (land, sea and air forces) of the opponents. This of course may include not only conventional forces but nuclear forces as well.

8. Ease of entry into the industry, including competitors analysis and entry barriers
This is a crucial element. In case of war we have to know in advance how many industries which produce civil goods can start immediate military production. In other words we have to know how many industries have a dual character or purpose i.e. can serve the military and the civil needs of the economy. We have to know the barriers of entry and exit from one activity to the other, the time which is required, the amount of resources both (financial and raw materials) which are needed in order to shift activities etc.

B. Accounting considerations

1. Proforma Balance Sheet
The modern armed forces can generate profit during the era of peace via certain economic activities. To illustrate exports of defence articles or import substitution activities can be made. These profits can be used to finance future acquisition projects and R&D.

2. Pro-forma profit and loss statement
The armed forces provide tacit and in-tacit advantages. The tacit advantages during the era of peace are associated with medical services, transportation, dual purpose R&D process, deliveries of humanitarian aid in case of earthquakes, fires and other disasters. However the biggest in-tacit advantage of the armed forces is that they provide security. If security (i.e. deterrence strategy) collapses any economic activity which generates profit will collapse as well. Again a Cost/Benefit analysis will determine the profit / loss ratio.

3. Project cash flow analysis
Armed forces need a certain amount of cash flows every year in order to remain operational. The pecuniary amounts will pay for salaries of the personnel, buildings and fortresses, spare parts, lubricants, and other logistics, ammunition, food and medical supplies.

C. Management Considerations

1. Personal expertise –strengths and weaknesses

Here we analyse issues related to the training of the armed forces. How many hours the pilots fly their airplanes? How many times ships, tanks, artillery conduct manoeuvres? For which missions do they practice and how many times? The missions are associated with a variety of activities and roles including attack, defence, reconnaissance, search and rescue operations etc.

2. Proposed organizational design

How the strength is organised? Are large formations (like armies and divisions) the standard type of organisation or we endorse models with many small fighting units (regiments-battalions-platoons)? What type of internal hierarchies we use and have we minimised transaction costs? The same considerations occur for the navy. Do we have large fleets or not. How the air-forces are organised?

3. Potential staffing requirements

We consider current and future demographic elements and dynamics in order to define the optimum current and future man-power and women power of the armed forces. We must also distribute this power to different roles (combat versus non-combat, support).

4. Inventory management methods

In business traditional managerial methods are associated with U-form and M-form enterprises, or with business practices which aim to maximise profits, market shares, investment returns. Traditional management aims to minimize internal conflicts inside the enterprise, between shareholders and managers or between white and blue collar workers. Partially these ideas are applied to the armed forces. To illustrate, there are always internal struggles and conflicts between the branches (army-navy-air force) associated with resource allocation and priorities. There are also issues associated with financing of different projects. This is especially true in the case of the army where artillery, tanks, infantry, mechanised units, special-forces, anti-aircraft units etc struggle for funds and other logistics.

5. Production and operations management issues

If the military apparatus wishes to be efficient during the era of war this has to achieve the following aims: a) Maximize opponent's losses at minimum time of operations, b) minimize friendly losses during the era of conflict. If these are to be achieved the production of military equipment needs to be maximized and its optimum use has to be made. Thus production and operations management techniques are involved. The production process is maximized by the 24 hour work of the defence industry. Usually, during the era of war, the labour force is expected to work in three shifts of eight hours each, under any circumstances. If this occurs then labour productivity is maximized and the military does not suffer from any major logistical support supply delay. However in order to inflict the maximum losses to the enemy (and simultaneously minimize its friendly losses) the military has to have if not numerical superiority complete fire-power superiority over the enemy. Complete fire-power superiority is achieved only if the rate of fire of the various defence articles (light arms, machine guns, artillery, tanks, air-force etc) is higher per minute compare to the fire power of the opponent. Training of personnel is also essential, since it is the most crucial factor in the exchange of fire with the enemy. Thus the fire has to be accurate against enemy positions and avoid any error which will result in friendly losses from friendly fire.

6. Equipment needs

The equipment which the armed forces use needs to follow the following criteria:

1) The weapons supplied must be cheap to produce (*en mass*) and their logistical needs must be cost effective (thus ammunition, spare parts, lubricants, oil consumption etc) must also be cheap to produce and maintain,

2) The weapons supplied must have bigger or at least equal fire power from those of the potential opponent. Thus if the enemy has machine guns with a rate of fire of 1,000 rounds per minute then we must have similar or better equipment,

3) The weapons supplied must be used in different climate and weather conditions equally well. To illustrate during the Desert War of 1990-1991 certain defence articles were overheated or jammed due to the weather conditions. The same occurred when in December 1941 the Germans were in the gates of Moscow but with -40 C temperatures their artillery, planes and tanks were frozen. This was not the case of the Red Army equipment which allowed the Soviets to undertake their major offensive. They must also be used in different war theatres (urban warfare, open field warfare etc.)

4) The equipment must be easily transported from one location to another with various means of transport.
5) The weapons systems must have better range, calibre, from those of the enemy and they must carry more destructive ammunition from those of the enemy

D. Marketing Considerations

Modern armies are not just for war. During the era of peace the military apparatus and more particularly the military industrial complex can be a very good source of revenue from exports of military equipment to other nations. Thus defence industries must produce arms (airplanes, frigates, helicopters etc) tailored to the specific needs of the client. Thus the price of the product will vary from one case to another since every state has its own prerequisites over the use of the product, its traits, equipment, logistical support etc. Furthermore the original price (or fly-away price) differs from one contract to another by the different amount of defence articles produced. Thus it is different if a country places an order for 40 aircraft of a certain type and another country places an order for 100 aircraft of the same type. Even if these planes are equipped with the same navigation and targeting systems, communications, they have the same type of engines, they use the same type of ammunition etc the price will be different since the amount of the order is different.

Another issue associated is the way that the procurement will be made. In the case of US produced and supplied weapons there are mainly to major ways of procurement. The first is the government to government deal when one state places the order to the US administration (government) and the administration passes the order to the defence contractor industry. The second case is the direct supply from the defence contractor. In this case the state places the order directly to the industry without any US government intervention. Historically if the first root was used the transaction was financed partially via FMS (=Foreign Military Sales) a specific programme of the US administration; whereas if the second root was followed the transaction was financed by the national resources of the state which placed the order. Different countries involve different procedures; however the major arm manufactures follow government to government transactions.

In order to gain a defence contract most countries-manufactures nowadays provide various types of offsets. These involve technology transfer, investments in selected industries, absorption of selective exports. However there may be in-tacit offsets such us political support of the state in selective diplomatic disputes, training of military personnel, exchange of information etc.

It goes without saying that in case of war all defence exports and imports are under review. The supply of local armed forces is the biggest priority compared to any foreign contract signed before the war. Historically many exports of defence articles have been cancelled or at best delivered in a much later date. In extreme cases major defence producers impose arms embargo in states which are at war. This however many times is violated either by the defence industries or by arm dealers. Thus arms trade during the era of war becomes a complex game with immense political, financial, intelligence and moral dimensions and ramifications.[26]

E. Financial Considerations

The financial dimension of both arms procurement (R&D costs of new weapon systems, logistical support, training of personnel, creation of new bases and installations, spare parts etc) has to be accurate from the beginning of establishing a new defence project. Many defence projects across countries have been initially under valued and as the programme evolved the acquisition cost and in some cases the overall cost increased significantly. If this happens in certain extreme cases the programme was completely cancelled or, at best, it was modified with the scale down of the initial order and the purchase of less defence articles. In case of war however any defence contracts and articles which are under delivery are under review. Thus some of them may be cancelled because the priorities alter or they may be delivered earlier from the expected delivery date.

The financing of defence procurement during war is an additional dimension. Historically, as already pointed out, wars are financed by four sources: 1) taxation, 2) increased money supply, 3) internal borrowing and 4) external borrowing.

[26] For a historical analysis of arms trade see: 1) Robert E. Harkavy: "The Arms Trade and International System", Ballinger Publishing, Cambridge Mass, 1975, 2) A. Sampson: "The Arms Bazaar", Coronet books, 1978, 3) K. Krause: "Arms and the State: Patterns of military production and trade", Cambridge University Press, 1992. Another very important contribution is the volume Stephen Martin: "The Economics of Offsets Defence Procurement and Countertrade", Harwood Academic Publishers, 1996.

The defence industry is mainly financed by state revenues. An additional dimension is associated with the profits of the industry. Will defence contractors supply weapons at higher prices or at lower prices? Is there a social responsibility dimension for the defence industry during the war or not? To illustrate during World War I (1914-1918) the German defence industry enjoyed an immense surge in profits. The profits of Krupp Industries increased from 31.6 million Marks before the war to 33.9 million in 1914-1915, 86.5 million for 1915-1916 and 79.7 million for 1916-1917. The pprofits of DWMF (Deutsche Waffen und Munitions Fabriken) increased respectively from 5.5 million to 8.2 million, 11.5 million and 12.7 million.[27] Many case studies tell the same story across various historical conflicts.

F. Legal Considerations:

The legal considerations during the era of war are associated with the issue of war crimes and the potential violations of the Geneva Convention and its amendments. The laws of war prohibit the mass extinction (genocide) of women and children and also they emphasize the just and human treatment of war prisoners. However across time human conflict has been associated with immense atrocities. The genocides only of the 20th century are well known and documented and there is no reason to repeat them here.[28] It goes without saying that although the enemy's home front is a legal target from the point of view of the theory of war, this cannot become the major theatre of operations. The primary objective of war is to target and destroy enemy's war machine. The effort to undermine the moral of the enemy by destroying the home front proved across history not only futile militarily but also morally unacceptable.

5. Concluding Remarks

The intellectual aspiration of the current paper was to apply business and economic theoretical tools to conventional military theory. We can summarize the argument as follows: The military apparatus is a complex institution. This institution is unique since it encompasses the following elements: 1) hierarchies from top to bottom, 2) manpower of different social classes and educational background, 3) logistics, 4) geographical limitations associated with tactical theatre of operations, 5) advanced technological defence articles, 6) policy objectives which may change, 7) multiple scenarios of operations, 8) different doctrines, 9) dependence on critical industries and infrastructure, 10) ideals of fighting, 11) morale of the personnel and leadership skills.

This complex organization with tacit and in-tacit economic traits can become an essential application (case study) of economic and business models.

The armed forces are not an enterprise with constant goals and objectives like profit or market share maximisation. Their leaders so not earn bonuses like the general managers of the firms. Internal conflicts occur but are not similar to the manager versus shareholder conflicts; or between white versus blue collar workers. The policy objectives constantly change as the operations in the theatre of war evolve. Conflicts about resources allocation occur between the different branches (army navy air-force) as well as about priorities occur but these cannot alter the objective of winning the battles and eventually the war.

In a globalised world were in spite of the integration of economic forces immense geopolitical instability is present from the Middle East to Eastern Europe, Asia-Pacific and Africa and with the presence of the constant threat of international terrorism the analysis of armed forces with the application of economic and business principles is an essential intellectual exercise.

We have demonstrated the differences as well as the similarities of military apparatus with other institutions. We stress that we are not "war-mongers", thus we study warfare because we want to avoid it.

However the argument of the paper is as follows: Victory or defeat in the battlefield or at war is associated with immense economic factors: The armed forces in order to prevail in war must be well supplied, financed, lead and morally motivated. For the first item (supply) the developed related and supporting industries is an important element (transportation networks, agricultural production, defence industries, oil industry, pharmaceutical industry, health services, telecommunications, dual purpose industries etc).

[27] See: Gerd Hardach: "Der Erste Weltkrieg 1914-1918", Deutscher Taschenbuch Verlag, 1973, page 117.

[28] See for example: N. Ferguson: "The War of the World. History's Age of Hatred", Penguin, Allen Lane, 2006 for the atrocities of the twentieth century.

The financing of the armed forces and of the war campaigns is associated with low pre-war debt as well as with the existence of fiscal pre-war surpluses. The leadership is associated with human resources and with pre-war training. The moral motivation is associated with the prevailing social pre-war beliefs.

Wars occur not only by planning but also by accidents. In today's complex world low intensity conflicts are considered more likely compared to full scale mobilized wars. We must also bear in mind that wars may have economic causes, a dimension which shall be analyzed in a future paper, however it is obvious that the nexus between economics, business and warfare is strong. The point which the current paper seems to demonstrate.

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(**) This article is dedicated to the memory of Professor G. Ranki and to the memory of Trevor Dupuy, both with immense intellectual contribution to the field of defence studies.