

A Reassessment of the British and Allied Economic and Military Mobilization in the Revolutionary and Napoleonic Wars (1792-1815)

By Ioannis-Dionysios Salavrakos

The Wars of the French Revolution and the Napoleonic Era lasted from 1792 to 1815. During this period, seven Anti-French Coalitions were formed; France managed to get the better of the first five of them. The First Coalition was formed between Austria and Prussia (26 June 1792) and was reinforced by the entry of Britain (January 1793) and Spain (March 1793). Minor participants were Tuscany, Naples, Holland and Russia. In February 1795, Tuscany left and was followed by Prussia (April); Holland (May), Spain (August). In 1796, two other Italian States (Piedmont and Sardinia) bowed out. In October 1797, Austria was forced to abandon the alliance: the First Coalition collapsed. The Second Coalition, between Great Britain, Austria, Russia, Naples and the Ottoman Empire (22 June 1799), was terminated on March 25, 1802. A Third Coalition, which comprised Great Britain, Austria, Russia, Sweden, and some small German principalities (April 1805), collapsed by December the same year. The Fourth Coalition, between Great Britain, Austria and Russia, came in October 1806 but was soon aborted (February 1807). The Fifth Coalition, established between Britain, Austria, Spain and Portugal (April 9th, 1809) suffered the same fate when, on October 14, 1809, Vienna surrendered to the French – although the Iberian Peninsula front remained active.

Thus until 1810 France had faced five coalitions with immense success. The tide began to turn with the French campaign against Russia (June 1812), which precipitated the Sixth Coalition, formed by Russia and Britain, and soon joined by Spain, Portugal, Austria, Prussia, Sweden and other small German States. It proved successful in the spring of 1814 and forced Napoleon to abdicate. In February 1815, Napoleon managed to escape from exile and returned to France. The Seventh Coalition, between Great Britain, Prussia, Russia, was formed on March 25th, 1815. In June Napoleon was defeated at Waterloo.

The intellectual aspiration of the present article is to explain the repeated failures of the first five and decisive success of the last two anti-French coalitions by analyzing the economic, not least industrial, and military mobilizations of the participating States. For that purpose, it will successively review the British, Prussian, Russian and Austrian cases, as well as that of minor allies, based on (predominantly British) historiographical sources. A final section provides an overall comparative assessment of the French and anti-French coalitions. Conclusions as to which factors proved most decisive will follow.

Britain: Military, Industrial and Economic Mobilization (1792-1815)

The country was not prepared for a long war. However, as hostilities continued, it managed over the years to mobilize critical demographic, economic, financial and industrial resources which, combined with a system of alliances, finally brought victory.

The British War Effort: Army, Navy and Logistics

In 1792, the British Army had 135 regiments. Between 1793 and 1801, its strength was increased threefold. In 1803, the infantry counted 126,677 men ; by 1806, nearly 329,000.¹ However, due to annual recruitment deficits (of 11,000 on average after 1810), in January 1811 the force was down to 305,870,² and in January 1814, the regular army comprised 233,837 men and the militia another 70,000.³ British cavalry officially increased from 190,000 in 1795 to 260,000 in 1801, but the actual number was slightly lower.⁴

The role of the Royal Navy was pivotal. During the Revolutionary and Napoleonic Wars, it enjoyed complete superiority over the French Navy in terms of numbers of ships and naval guns. In 1793, the British navy had 115 ships of the line as against 76 on the French side. In the short run, this changed in favour of France when in 1795 the occupation of Holland added 59 ships of the line from the Dutch fleet, and in 1797 another 76 ships from the Spanish fleet, to the French Navy. However, by 1800 the British had 93 ships of the line, 12 ships with 50 guns, 141 frigates, and another 256 ships of all other types (20 were rented). In 1814, the total was 91 ships of the line, 7 ships with 50 guns, 124 frigates, 248 smaller vessels. British losses between 1793 and 1815 were 32 ships of the line (5 from enemy action, 27 by exposure to various hazards) as well as 473 ships of all types due to various causes (but only 152 from enemy action).⁵ By 1815, the Royal Navy had 214 cruisers and 800 smaller ships.⁶ The number of commercial vessels increased from 14,310 in 1789 to 24,860 in 1815. The losses of British commercial shipping from French action were limited. Between 1793 and 1800, a total of 3,466 British commercial ships were captured by the French.⁷ Another source points out that during 1793-1815 the average annual losses of commercial shipping were just 2% of the fleet's strength; however, in the open seas the losses were up to 5%-6% annually due to both weather conditions and French action.⁸

Naval construction increased substantially over the period: *“warship building in the (...) years of the Napoleonic War was virtually double that of the previous four major wars*

¹ McNab (ed.), 2009, pp.106-107.

² Partridge & Oliver, 1999, p.2.

³ Knight, 2013, pp.438 and 441.

⁴ McNab (ed.), 2009, *op.cit.*, p.160.

⁵ Glover, 2003, p.181.

⁶ James, 2001, pp.155 and 179. Also : Harvey, 1994, p.125.

⁷ Glover, 2003, *op.cit.*, p. 197.

⁸ Rodger, 2004, p.559.

of the eighteenth century. Between 1803 and 1815, 518 new warships measuring 323,136 tons, were built; 84 per cent of these were built by contract (72 per cent by tonnage). Private shipyards built 436 warships (228,176 tons), while the Royal Dockyards built only 82 warships (94,960 tons). A further 52 [ships] (15,510 tons) were built in Bermuda, Halifax, Bombay and Penang”.⁹

Table 1: British versus French Navy

Year	Britain (ships of the line) (*)	France (Ships of the line)	Britain (Cruisers)	France (Cruisers)
1790	145 (**)	73	131	64
1795	123	56	160	65
1800	127	44	158	43
1805	136	41	160	35
1810	152	46	183	31
1815	126	52	151	31

Source: Rodger, 2004, *op.cit.*, p.608. (*)=Ships of the Line fought in line because their guns were static. There were many types of such ships. Some had many guns (100 and more). Then there were those with 84-98 guns. The third category was that with 64-80 guns. The fourth category was that with light vessels defined as frigates with 50-60 guns.¹⁰ (**)=Including 15 ships with 50 guns each, after that year these were considered cruisers.

Table 2: Strength of British Commercial Fleet

Year	Number of ships	Tonnage in tons	Number of sailors
1789	14,310 (9,558)	1,395,172 (1,078,374)	108,962 (80,299)
1792	16,079 (10,663)	1,540,145 (1,186,610)	118,286 (87,589)
1802	20,568 (13,446)	2,128,055 (1,642,224)	154,530 (113,670)
1815	24,860 (17,346)	2,681,276 (2,139,301)	177,309 (135,006)

Source: Harvey, 1994, *op.cit.*, p.62. The numbers in brackets refer exclusively to English trade. The numbers outside brackets refer to the combined strength of Britain, Ireland and the colonies.

The supply requirements of the British Army and Navy were colossal. Every Army horse needed 9 kg of fodder per day, thus 112 horses needed one ton of fodder. Every battery of 6 field guns required 6 horses per gun and another 6 transport carriages. In addition, 18 ammunition wagons were needed and each needed 4 horses. Furthermore, 4 more carriages with 2 horses each were required for the transport of other supplies (water, medical equipment, etc.). Finally, 18 horses were needed for the officers. In total, 134 horses were needed for the transportation of 1,206 kg of fodder whereas total needs for food were around 2 tons.¹¹ The fighting conditions which the British Army had to endure were negative, but gradually improvements occurred. To illustrate, in the battle of Talavera (summer 1809), the British soldiers involved fought unpaid for two months and

⁹ Knight, 2013, p.363. According to this source, between 1739 and 1802 there were 386 months of war during which 694 warships were built in British merchant and State yards combined (same page).

¹⁰ Zouridis, 2007, pp.4-15. According to Harvey, 1994, p.121, between 1793 and 1815, the French captured 8 frigates and 2 ships of the line (one with 80 guns, another with 50-54 guns). In accidents, Britain lost 4 ships of the line with 98 guns and more, 1 ship with 80 guns, 17 ships with 74 guns, 6 ships with 64 guns, 5 ships with 50-54 guns and 58 frigates. In addition, the French captured 3 ships of the line with 74 guns, 1 ship with 50-54 guns and 9 frigates. However, these 13 vessels were re-captured by the British during the hostilities. Finally the British captured the following French ships: 9 ships of the line with 98 guns or more, 19 ships with 80 guns, 87 ships with 74 guns, 24 ships with 64 guns, 9 ships with 50-54 guns and 229 frigates.

¹¹ Glover, 2003, *op.cit.*, p.12.

with a shortage of 20,000 pairs of boots.¹² By the end of 1811, the British Army in Spain had more than 600 Portuguese-made carriages with a transport capacity of 800 pounds of supplies each. There were around 12,000 donkeys for additional transports.¹³ In the artillery, the consumption of shells was high. In the battle for the capture of the Spanish fortifications of Ciudad Rodrigo in January 1812, the British artillery consumed 2,754 24-pound shells in two and a half days. Since every donkey could only carry 9 shells, the above consumption called for the use of nearly 360 donkeys. In another case (fortifications of Badajoz, April 1812), British artillery consumed 2,523 barrels of gunpowder, each weighing 90 pounds, and needed some 1,200 donkeys to carry them. In addition 18,832 24-pound and 13,029 18-pound shells were used (carried by 3,590 donkeys). The howitzers consumed additional shells, thus bringing the total of ammunition fired to 400 tons.¹⁴

In the Navy alone, over a period of six months, the Channel Fleet (a 36,000-man force) consumed 2,925 tons of biscuits, 1,671 tons of beef, 835 tons of pork, 626 tons of pies, 313 tons of barley, 156 tons of butter, 313 tons of cheese, 6,912,000 gallons of beer. In the battle of Trafalgar (1805), it had a total firepower of 2,148 cannon, and in 1807 the naval bombardment of Copenhagen required more than 40,000 rockets and three times as much gunpowder as in the battle of Waterloo,¹⁵ where British artillery used 10,400 shells.¹⁶

The cost of fortifications was huge. In the south of England and in some colonies, they absorbed £9 million, to which military barracks added another £7 million. The cost of Dartmoor prison which opened in 1809 and had a capacity of 5,000 prisoners was £74,000. The purchase of 6,800 slaves from the West Indies during the 1798-1807 period cost £484,000, and the donations and gifts to the soldiers from the conquest of one French colony alone in Africa was £200,000. British financial flows towards allied States in the 1812-1813 period alone was £26 million, excluding military hardware donations.¹⁷

Military rank at that time could be bought. The rich aristocrats could practically buy high-ranking positions in the armed forces, whereas poor and middle-class men were either low-ranking officers or privates. To illustrate, the rank of colonel (brigadier by today's standards) cost £3,500 in the infantry. The cost of the same rank in the Royal Guards was £6,700, and £4,982 in the cavalry. The cost of the rank of major was £2,600 in the infantry, £6,300 in the Royal Guards, and £3,882 in the cavalry. The rank of captain cost £1,500 in the infantry, £3,500 in the Royal Guards, and £2,782 in the cavalry. Another paradox was associated with the training burden of the regular army as well as that of the militia (i.e. the non-professional soldiers of the time). The cost of one regular army infantry soldier was £7, 12 shillings, 6 pence, whereas the average cost of an equivalent

¹² Robertson, 2000, p.90.

¹³ *Ibid.*, pp.181-182.

¹⁴ *Ibid.*, p.29. Also: Haythornthwaite, 1996, p.113.

¹⁵ Rodger, 2004, *op.cit.*, p.484 ; Haythornthwaite, 1996, *op.cit.*, p.113.

¹⁶ 31,200 shells rained down on Copenhagen. For the British artillery in Waterloo, see Adkin, 2015, p.267. For data on the Royal Navy : Knight, 2013, *op.cit.*, p.372, and Harvey, 1994, *op.cit.*, p101.

¹⁷ Harvey, 1994, p.46 ; James, 2001, *op.cit.*, pp.154 and 159.

militia soldier was £25. In addition, training costs differed from one region to another. In the region of Anglesey, the cost was £12 in 1803, whereas in 1804 it could fetch £50 in Aberdeen and in Sussex, £60 in Middlesex, and even £100 in other places.¹⁸ The cost of constructing a 74-gun ship of the line in 1780 was £50,000, when the construction cost of the largest factory in England was just £5,000.¹⁹

British Industrial Mobilization: Defence Production

British industrial production increased immensely during the war years. To illustrate, cast-iron output increased from 170,000 metric tons in 1799, to 240,000 in 1804 and 400,000 in 1814.²⁰ In 1803-1816, Britain produced 2,673,366 rifles and pistols and imported another 293,000. However, other sources mention the figure of 3,143,366, probably because they also include muskets and carbines. Aggregate Ordnance figures for the whole 1793-1815 period are on the order of 2,834,485. The production of gunpowder from State factories in 1809 was 36,623 barrels, whereas private enterprises produced another 24,433 barrels. A major part of the British production was exported to allied States (Portugal, Spain, Sweden, Austria). To illustrate, between 1796 and 1801, Portugal received from Britain 31,500 infantry muskets, 11,300 cavalry rifles, 3,300 pistols, 14,300 swords, 10,000 barrels of powder, 500 tons of explosives, and 25 artillery guns. During the 1808-1811 period, British aid to Portugal included 114,116 muskets, 600 small-calibre rifles, 2,120 rifles, and 6 guns. Spain received from Britain 222,141 muskets, 2,600 small-calibre rifles and 342 guns, and ammunition worth more than £2 million. Sweden in 1808 alone received from Britain 35,000 muskets. In 1813, British aid to Austria allowed the country to equip a force of 50,000 infantry and 10,000 cavalry. By the end of 1812, Sweden and Russia had received 120,000 muskets. In 1813, Britain exported 100,000 muskets to Prussia, complete with powder accoutrements and flints, and Russia received a similar delivery. Sweden received 40,000 muskets, along with uniforms. In the summer of 1813, a single Swedish order was for 2,000 barrels of gunpowder, 5,000,000 cartridges, 20,000 muskets, pistol flints, and carbines. By the autumn of 1813, the allied forces in the Iberian Peninsula received 201,000 muskets, 41,391 swords and 23,500,000 cartridges.

The importance of the above can be realized from the fact that in that early part of the industrial era, it took an average of some 3,000-10,000 rounds of ammunition to kill one enemy soldier. British rifles had a firing rate of 3 rounds per minute, and the best results of firing tests occurred during 1802 (3 rounds in 49 seconds and 5 rounds in 90 seconds). The Woolwich factories were the largest in the world, with four furnaces which could melt 16 tons of metal. Cannon, rifles, rockets, mines and shrapnel shells were mass-produced in these arms factories: in 1809 alone, they were able to produce 385 artillery guns. Shrapnel, after its initial production in 1804, represented 15% of total artillery shell

¹⁸ Haythornthwaite, 1996, p.175 ; Partridge & Oliver, 1999, pp.13 and 25.

¹⁹ Findlay & O'Rourke, 2007, p.256.

²⁰ Mitchell, 2003, p.457.

output and 50% of howitzer shells. Naval crane production reached the astonishing level of 160,000 units per year. The Brunel shoe manufacturers produced 400 pairs of boots a day. However, the mobilization of State factories was rather limited. To illustrate: in 1806, of a total annual production of 305,000 tons of iron, State industries accounted for only 56,000 tons (or 18.3%).²¹

Financing the War: Government and Defence Spending, Taxes, Money Supply

War finance was – unsurprisingly – of paramount importance. During the war, Britain spent £1,657,854,518, of which £440,298,079 came from loans. From 1793 to 1815, Britain also gave £65 million in aid to allied States. The country enjoyed higher tax revenues from wealthy citizens than France, which in 1810 could only count on 25,000 taxpayers with an annual income above £200; as against 69,060 British taxpayers with similar income (1801). In the same period, only one French aristocrat had an income above £5,000, whereas in Britain there were 1,020 high income taxpayers. In 1793-1815, total tax revenues in Britain were £1,217,000,000. The expenditures occasioned by the battle of Waterloo were £21,338,831, 10 shillings, 8 pence.²² Britain covered 73% of its war spending

²¹ Harvey, 1994, pp.46 and 54-56 ; Van Creveld, 2004, p.57 ; Nosworthy, 1997, p.204 ; Partridge & Oliver, 1999, p.7 ; Haythornthwaite, 1996, pp.86, 110. The technological level of the British industry relative to that of France is difficult to assess. According to one view, Britain was superior in the production of light arms, explosives and ships. A second view points out that France had built better ships and light arms, since the quality of the firing mechanism of British rifles was considered poor. See : Harvey, 1994, p.53 ; Knight, 2013, p.375. The same source mentions that in April-December 1803 the army received 40,000 muskets, in 1804 the deliveries increased to 167,000. In 1805, they amounted to 181,000 muskets, carbines and rifles, and by 1809 the number rose to 270,000. The supply of cartridges was huge. The Plymouth factories alone manufactured 70 million rounds between 1806 and 1814 (of which 52,953,970 were produced in 1807-1814). In the last years of the war, the average annual consumption of gunpowder was 80,000 barrels of 90 pounds each (Knight, 2013, pp.372-373).

²² Cf. Harvey, 1994, pp.31-39 and pp.46, 62. According to a different source, the total cost of the wars during the 1793-1815 period was £830 million. Of that amount, £59 million were given to Britain's allies. Annual public expenditure increased from £18 million to £100 million and total public debt from £240 million in 1793 to £900 million in 1815, reaching almost 200% of GNP : see Ferguson, 1998, p.90. However, the evolution of British aid to its allies during the Napoleonic Wars is a very debatable issue in terms of its volume and (especially) goals. According to J. Holland Rose (1914, p.81), "*in 1804 [British Prime Minister] Pitt named £5,000,000 as the maximum sum that Britain could possibly spare in subsidies to her allies. In 1814 Castlereagh named precisely the same sum, though Prussia had now joined*". In 1807, Britain had two options in establishing an alliance with Denmark: "*...the British government should subsidize Denmark at the rate of 100,000 Dutch florins for 1,000 foot soldiers and 120,000 Dutch florins for 1,000 horse soldiers (...) and a British fleet of 15 ships of the line and 6 frigates was to be offered for her defence. As an alternative plan a project of a secret treaty was to be offered for – (a) the handing over of the Danish fleet (...) till the peace; (b) a subsidy of £100,000 for the service of the Danish fleet; (c) relaxation of the blockade then imposed on Danish ports and rivers; (d) assistance to Denmark in case [of attack]*". In this case again, pecuniary benefits are associated with foreign policy goals but the real goal of Britain was the capture of the Danish fleet, a clause which the Danish government could not accept, thus eventually forcing it to ally itself with Napoleon (Holland Rose, 1914, p.139 for the quote and pp.140-143 for the collapse of the effort). The question thus remains : if Britain really wanted to provide subsidies for Denmark, why did insist on controlling the Danish fleet which after all was rather small compared to the Royal Navy ? In another case, in 1813 the British provided £7,000,000 to the Prussians and the Russians in order to fight Napoleon. Another £1,000,000 was given to Sweden in order to form a 30,000-strong force and fight the French on the Continent. In total, for 1813 British military aid to its allies was £11,294,416 and an additional sum of £11,355,412 came from war loans. Thus total British aid for 1813 to its allies was £22,649,828. See Leggiere, 2003, pp.39-84, especially pp.63 and 75. If the above figures are correct, then the Rose (1914) data already referred to for 1814 must be treated with caution.

via tax revenues (as against only 27% through loans and increased money supply). To illustrate, in 1798 the income tax was introduced, which by 1815 had generated some £142 million. Public debt by 1815 was £834 million.²³ The money supply increased from £9,531,330 cash in 1797 to more than £27 million cash in August 1815, and the average annual inflation rate was 3.3%.²⁴ According to another source, total war cost was £1,000 million and combined army and navy expenditure was £830 million.²⁵

Army mobilization was less efficient than that of France. During the period extending from 1st January 1793 to 31st December 1815, the British Army recruited 747,670 men on a volunteer basis (an annual average of 32,507 men), whereas the French Army in the 1799-1814 period inducted 2,015,000 men (an annual average of 125,969).²⁶ Although France mobilized more men, the British eventually won in Spain. According to Harvey (1994), the British domination can be explained by technological superiority. In Spain, the British extensively used wood and leather and had higher-standard ammunition. In addition, the British army enjoyed logistical support that was far superior to that of the French. British soldiers' pay was double the European average (though in 1813 it only represented 8% of the expenditure in Spain, as against 56% for supplies²⁷ and 9% was land transportation costs). Between April 1808 and December 1811, the food supplies of the British Army in Spain and Portugal cost £20,181,250, 18 shillings, 10 pence; the money spent on ammunition amounted to £281,117, 4 shillings, 5 pence. In 1812, the daily food needs of the British Army in the Iberian Peninsula amounted to 200,000 pounds.²⁸ In contrast, the French side during the January 1810-June 1811 period spent 53 million francs in Spain.²⁹ However, many corruption and embezzlement cases emerged.³⁰ The evolution

²³ See : James, 2001, p.153.

²⁴ The volume of money supply differs according to source. Wellington himself stated in 1830 that money supply was £30 million in banknotes (printed by the Bank of England), £23 million in notes printed by other banks, £4 million in gold, and £11 million in silver. However, much of these refer to monetary developments after 1815. See : Harvey, 1994, pp.37-38.

²⁵ James, 2001, p.153.

²⁶ Harvey, 1994, p.146.

²⁷ The supplies for every British infantry soldier were 3 pairs of socks (8 pence a pair), 3 shirts (5 shillings and 6 pence each), 1 brush for cleaning clothes every two years (2 shillings), one additional pair of shoes (6 shillings), additional soles for shoes (6 shillings), 1 night-sack every 6 years (6 shillings), one pipe cleaner (4 shillings 4 pence). The weekly cost of cleaning clothes was 4 pence, whereas the average for haircuts was 2.5 pence. In the Scottish regiments every kilt cost 5 shillings 6 pence. All the above expenses were deducted in part from the soldiers' pay, whereas the expenditure associated with weapons cleaning (2 shillings 9 pence on average) was covered by the Treasury.

²⁸ Harvey, 1994, p.54 and pp.146-148.

²⁹ See : Asprey, 2002, pp.231 and 238.

³⁰ To illustrate, one captain of the 1st West Indies Regiment embezzled some £111 (and was sentenced in July 1813 as a result). In 1796, General Valentine Jones embezzled some £10,000 in the Dominican Island colony. The same officer in another case bought food from his father's company in Belfast, although he could have bought the same food from other companies at lower prices. He also bought 300 wineskins at a price of £59, 18 shillings per skin, and he resold them to the Army Supply Service for £90 each. The Commander of Barbados Islands, Fretwell Phillips, bought 100 flavour-skins but sent to London a receipt for the (hypothetical) purchase of 250. See : Haythornthwaite, 1996, pp.84-85 and 120-121.

of Naval Budget during the 1789-1815 period demonstrates that in most years the real expenditures were higher than those allocated by Parliament (Table 3).

Table 3 : British Naval Finance (in £s)

Year	Budget approved by Parliament	Total Naval debt	Real Naval expenditure
1789	2,328,570	2,370,439	2,482,358
1790	2,433,637	1,818,020	1,881,218
1791	4,008,405	2,301,280	4,491,665
1792	4,985,482	2,745,991	5,430,193
1793	3,971,915	5,444,366	6,670,290
1794	7,432,783	7,108,074	9,096,491
1795	7,806,169 *	10,788,985	11,487,080
1796	11,779,349	4,158,744	5,149,108
1797	24,629,202 **	6,458,490	26,928,948
1798	13,449,389	5,556,034	12,546,933
1799	13,654,013	5,992,288	14,090,267
1800	13,619,080	8,705,886	16,332,678
1801	15,857,037	9,073,071	16,224,222
1802	13,833,574	3,103,648	7,864,151
1803	10,211,378	4,037,308	11,145,038
1804	12,350,606	3,933,099	12,246,397
1805	15,035,630	5,911,588	17,014,119
1806	15,864,341	5,520,208	15,472,961
1807	17,400,377	4,993,549	16,873,718
1808	18,317,548	4,625,324	17,949,323
1809	19,578,467	5,916,401	20,869,544
1810	19,829,434	5,591,823	19,504,856
1811	20,935,894	4,890,774	20,234,845
1812	20,442,149	6,057,913	21,609,288
1813	21,212,012	8,562,291	23,716,390
1814	19,312,071	6,361,076	17,110,856
1815	19,032,700	3,694,821	16,366,445

Source: Rodger, 2004, pp.644-645. (*)=Including war credits of £184,615 allocated by the Irish Parliament, (**)=Including Naval Debt of £11,595,529 financed by bond issues. Part of this debt was of the previous fiscal year (1796).

Expenditures for land and sea transport increased as well. Total expenditure for bridge construction increased from £41,000 in 1793, to £46,000 in 1800 and £130,000 in 1813. The Pontcysyllte Aqueduct and Canal constructed during 1795-1805 cost £47,018, 6 shillings, 7 pence. The construction of the East India Docks requested digging of 625,000 cubic yards of soil, whereas the construction of the West India Docks requested 24,000,000 bricks.³¹ Thus, the industrial mobilization of the period had total war characteristics similar to those of the 1914-1918 and 1939-1945 periods. In 1816, a Parliamentary Commission found that in the Scottish looms only 17.8% of the labour force were adult men and 38.2% were adult women. The remaining 44% were children (of whom 4.1% were below the age of 10).³²

The role of banking was also significant. In many cases, banks directly financed major military formations of Britain or its allies. To illustrate, the Banking House of Rothschild played a major role in financing Britain's allies during the 1813-1815 period,

³¹ Harvey, 1994, pp.35 and 45.

³² *Ibid.*, p.48.

by giving out loans to Russia, Prussia and Austria. Furthermore, from January 11, 1814 onwards, the Rothschild House officially financed Wellington's campaign with the sum of £600,000 (actually the bank provided higher sums).³³ The British State was also financed by the Barings Bank. In this case, the bank bought war bonds worth £770 million during the 1793-1815 period. Total British debt increased from £229,614,446 in February 1793, to £497,043,488 in February 1802 and to £816,311,939 in February 1816.³⁴ In just five war bond issues (1793, 1797, 1807, 1808, 1811), the British Treasury absorbed loans of £14.3 million in 1793 and 69.8 in 1815. Over the 1797-1810 period, war bonds totalling £400 million were issued. Of those, £70 million were bought by the Bank of England. Major bond purchases were made by private banks: Goldsmid Brothers, Sir Francis Baring, Walter Boyd & Paul Benfield, and John Julius Angerstein.³⁵ In 1805, the French budget was just 684 million francs (£27,636,363), while the British was £76.4 million. In 1813, while French expenditure reached 1,150 million francs (£46,464,646), Britain's rose to £109,078,113.³⁶

Prussia's Military, Industrial and Economic Mobilization (1792-1815)

Prussia had suffered immensely in previous wars (mainly the Seven Years War). As a result, when the Napoleonic Wars erupted, its domestic resources were insufficient to finance a long war. Nor did the country have adequate raw materials or agricultural products to sustain it.

The Prussian War Effort: Army and Logistics

The Prussian Army until 1806 had a strength of 200,000 men and no fewer than 7,095 guns of all calibres and types (static guns, field guns, mountain guns, etc.).³⁷ In spite of this strength, Prussia experienced its greatest defeats in 1806. At Jena, the French side captured from the Prussians more than 600 artillery guns, 4,700 horses, 48 ammunition carriages, food and beverages worth millions of francs, ammunition, uniforms, saddles and other equipment. In the town of Leipzig alone, the French confiscated British goods valued at 60 million francs. The confiscated British cloth was adequate to replace the uniforms for all the French army, and this is exactly what happened.³⁸ In the town of Magdeburg in November 1806, the French captured 20 generals, 800 officers, 22,000 soldiers, 800 artillery pieces, 1 million pounds of powder, and a bridge equipage.³⁹ In addition, after the battle of Jena, Prussia, Saxony and other German States were forced to pay France the sum of 470,467,387 francs. The German States provided also immense quantities of goods and materials. Thus, they gave to the French 280,000 uniforms, 250,000 pairs of boots and huge numbers of horses. Thus, total German supply aid to France (pecuniary and non-

³³ Ferguson, 1998, pp.91-102.

³⁴ Ziegler, 1988, p.58 ; Harvey, 1994, p.67.

³⁵ Harvey, 1994, pp.71-72.

³⁶ Harvey, 1994, p.63.

³⁷ Dawson, Dawson & Summerfield, 2007, p.48 ; McNab (ed.), 2009, p.254.

³⁸ Asprey, 2002, p.37 ; Chandler, 2003, pp.223-234.

³⁹ Parsons, 1914, p.127.

pecuniary) was 739 million francs.⁴⁰ After 1806, Prussia was in a very poor military state. By the end of May 1807, the French seized the city of Danzig and captured 800 artillery guns, thousands of small arms, and huge quantities of wheat which could provide rations for a two-year period for the whole of the army. Some 500,000 bottles of wine, 200,000 pints of rum, and another 200,000 pints of brandy were sent to the army depots in the town of Elbing, supplying every soldier with one extra bottle of wine for his private consumption. In June 1807, the port of Königsberg fell to the French, yielding 200 Russian ships with food supplies on board which could cover the needs of the French army for a minimum of four months.⁴¹ At that time, Prussia's plight seemed hopeless. One source vividly describes the evolution of the whole period:

Between 1795 and 1805, Prussia pursued an official policy of neutrality [and] engineered agreements (...) Prussia received 7,440 square miles with a population of some 900,000 in Westphalia and Thuringia as compensation for the 1,674 square miles and 125,000 subjects that had been lost to the French expansion along the left bank of the Rhine...[However,] the Franco-Prussian Treaty of Tilsit [1807] diminished Prussia to a third-rate power. Prussia's pre-war population of 9,752,731 inhabitants shrank to 4,938,000 and the State's 5,570 square miles were reduced to 2,877. In addition to being stripped of new Prussian Poland (...) all territory west of the Elbe [was lost]. Danzig became a free city under French authority, and French troops occupied the three great fortresses of the Oder river (...) until the Prussians paid an indemnity of 140 million francs. Berlin also had to cover the costs of provisioning the imperial garrisons that would be spread throughout Prussia and maintaining the imperial highways that would be built (for) an estimated total cost of 216 million francs...Four months after the Spanish insurrection of 2 May 1808, Napoleon forced another treaty [which]...limited the Prussian army to 42,000 men...[Another 1812 treaty] opened Prussia's borders to imperial troops en route to the Russian frontier (...).⁴²

The exhausted and humiliated Prussia was in no position to rebound militarily until Napoleon's defeat in Russia. Thus, by 1813 its strength was just 33,000 infantry, 12,000 cavalry, 6,000 gunners with 1,659 guns of all types.⁴³ On June 14, 1813, a treaty was signed between Britain and Prussia. Under its provisions, Prussia was to receive a territory

⁴⁰ Harvey, 1994, pp.62-63 ; Ferguson, 1998, p.103 ; Glover, 2003, p.96 ; Weider & Gueguen, 2004, pp.79-82. According to Kennedy, 1988 (p.172), after the battle of Jena, Prussia paid to France the sum of 311 million francs, which was equal to half the tax revenues in the French budget. Of the total German financial contribution (470.4 million francs), 159.4 million were extracted from Saxony and other allied States to France (Duchy of Berg, Duchy of Essen-Darmstadt, Kingdom of Bavaria). According to other sources, Prussia paid 120 million francs just to secure French withdrawal of their occupation forces from its territory. See : Gideon, 2005, pp.4-9, especially p.8. See also : Wehler, 1996, p.435, who points out that France extracted from Prussia the sum of 474 million thaler during the October 1806-October 1808 period. During the October 1808-October 1813 period, France extracted another 115 million thaler from Prussia (that is 585 million francs) in order to finance some of the costs of the *Grande Armée* in the 1812 campaign against Russia.

⁴¹ Asprey, 2002, pp.61, 67, 73.

⁴² Leggiere, 2003, pp.39-84, especially pages 41-44.

⁴³ Dawson, Dawson & Summerfield, 2007, p.48 ; McNab (ed.), 2009, p.254. The number of 1,659 guns refers to 1812 (it is lower than that of 1806 but slightly higher than that of 1808 which was 1,318 pieces).

equivalent to that which it possessed in 1806, and financial assistance of £5,000,000 for its rearmament. Thanks to British assistance in 1815, the Prussian Army could deploy 89,000 men and 92 guns at Waterloo.⁴⁴

Prussian Industrial and Agricultural Mobilization

Coal production in the Ruhr valley increased from 177,000 tons in 1790, to 231,000 in 1800, 369,000 in 1810 and 513,000 in 1815. The number of workers increased from 1,360 in 1790, to 1,550 in 1800, to 3,120 in 1810 and to 3,440 in 1815. The number of mines increased from 154 in 1790, to 158 in 1800, to 177 in 1810, but was reduced to 173 in 1815. Part of the coal production was used by the French side as it set up the “Confederation of the Rhine”.⁴⁵

During the war, significant technological developments occurred. For instance, the Prussian rifle was the fastest in the allied camp with a velocity of 5 rounds per minute.⁴⁶ In another development, a German entrepreneur and steel producer managed to bypass Napoleon’s Continental Blockade System and transfer British goods like coffee, sugar, soap with a cost of £1,500 to Prussia, Holland and other German States. The name of that entrepreneur was Friedrich Krupp. On August 3, 1809, he travelled from Essen to Bremen with a passport signed by Napoleon himself. From his war profits, two years later (20 September 1811), Krupp was able to establish the first steel mill on German soil. At that time, steel production was an exclusive British business since in 1740 British steel producer Benjamin Huntsman had secured an exclusive copyright agreement for 100 years. British steel was important for Continental Europe and Napoleon offered £1,000 to any European inventor who could replicate the product. When Krupp established the Gusstahl-fabrik, he aimed “*to produce English steel and all other products which derive from it*” as quickly as possible. However, short term developments were negative : between 1811 and 1814, the Krupp enterprise suffered losses of £5,000 and was forced to terminate its activities in the autumn of 1814. At that time, the firm’s only military product was the bayonet which armed the French Army at the end of 1812. Then the company operated in Essen for the Prussians (until the autumn of 1814) and re-opened one year later (autumn 1815), but was forced to close down again in July 1816, only to re-open in 1817.⁴⁷ That year was the company’s milestone: the birth of Europe’s biggest war industry took place then. The technological innovations associated with rifles, guns and other products would change the German and European political, military and economic history.

The prices of agricultural products increased considerably and for a long period of time across all German States including Prussia. Although prices were reduced during the 1809-1815 period, they but remained high (Table 4).

⁴⁴ See: Browning, 1907, p.31 ; Harvey, 1994, pp.62-63; Ferguson, 1998, pp.96-102 ; Chandler, 1999, pp.481, 484.

⁴⁵ Batty, 2001, p.36 ; Wehler, 2005, pp.74, 72.

⁴⁶ For a comparative assessment of British and Prussian rifles : Haythornthwaite, 1996, p.86.

⁴⁷ Batty, 2001, pp.33-48 ; Manchester, 2003, pp.34.

Table 4 : Prices of agricultural products (1913=100)

Year	Rye	Wheat	Barley	Oats	Annual Average
1792	56	66	51	53	57.9
1793	59	68	53	57	60.5
1794	64	71	59	60	64.8
1795	88	106	73	76	89.1
1796	65	91	60	64	70.8
1797	54	81	58	60	62.8
1798	64	90	68	73	72.7
1799	91	102	82	90	92.8
1800	100	118	87	89	102.0
1801	100	125	77	78	100.0
1802	105	122	96	84	105.7
1803	110	127	94	81	108.7
1804	100	122	90	78	101.8
1805	137	167	109	108	137.6
1806	137	145	122	130	136.5
1807	110	116	92	105	108.6
1808	109	116	87	124	110.1
1809	89	92	94	87	90.4
1810	56	76	84	68	66.5
1811	51	74	58	56	58.5
1812	89	116	84	90	95.6
1813	83	108	60	69	84.8
1814	76	89	57	67	75.6
1815	82	96	65	68	81.7

Source : Wehler, 1996, p.491.

Table 4 demonstrates that on average the prices of agricultural products increased across all German States, from 57.9 in 1792 to 137.6 in 1805, and despite the later downward trend in 1809-1815 prices (81.7) were still higher than 1792 levels. Food shortages were the outcome of bad weather conditions, French lootings, labour shortages, reduced trade, and shift of resources to war mobilization.

Meat production across German States was also reduced, from 490,000 tons in 1800-1804, to just 240,000 tons in 1810. Milk production went down slightly from 5,243,000 to 5,040,000 during the same period, and livestock numbers were reduced from 10,200,000 head in 1800-1804 to 6,700,000 in 1810. Wool production decreased from 15,200 to 10,000 tons during the same period.⁴⁸

Prussian War Finance: Government and Defence Spending, Taxes, Money Supply

Public finances were problematic. Prussia initially was forced to borrow 5,000,000 gulden in 1793 from the markets of Amsterdam and another 5,000,000 the next year. In 1795, the Prussian government got financial aid of £1,200,000 from Britain, and from domestic loans the country was able to gather another 1,227,450 thaler (or £188,838). However, these amounts could not cover the war needs. Under the circumstances, the Prussian government had to issue additional bonds of 8,000,000-10,000,000 gulden, which

⁴⁸ Wehler, 2005, p.47.

it attempted to sell to the banking houses of Frankfurt, but only 1,387,000 gulden were subscribed. By December 1804, the Prussian public debt was 24,780,220 thaler (or £3,800,000). On February 4, 1806, new bonds were issued for £1,400,000 (or 9,093,210 thaler). After the Prussian defeat in October 1806 at the battle of Jena, however, these bonds depreciated heavily on the Berlin financial market. Thus the value of a 100-thaler bond decreased to a meagre 27 thaler in July 1808, increased again to 74.5 thaler by December that year, only to go down again in June 1809 to 31.5 thaler. In December 1809, the Prussian government issued new bonds for 2,000,000 thaler: by February 1810, the value of the 100-thaler bond was down to 86.75 thaler ; it picked up to 90 in March 1812, but plummeted to only 24 thaler by June 1813. Total Prussian debt increased from 54,419,149 thaler at the end of 1806 to 131,765,336 by the end of 1812.⁴⁹ In 1806, Prussian war expenditure was 15.3 million thaler (£2,353,846). In 1813-1814, it amounted to £7,123,867, a sum which was just one thirteenth of British war spending. In January 1813, France claimed from Prussia a war debt of 48 million francs but by that time, Prussia had supplied provisions to the French Army valued at 94 million, thus Prussia demanded money from France and refused to recognize any French claims. Here Rothschild played also an important role.

According to another source, annual war expenditures were closer to 25-28 million thaler; before the war, the total public debt was 75.5 million, of which only 22 million were actually repaid. State reserves were 13 million thaler and the credit rating of Prussia and other German city-States and principalities was good. Total spending for the 1806-1813 period was 144.4 million but in the following 1813-1815 period another 61.6 million were spent; bringing total spending to 206 million thaler. After the end of the war (during the period 1815-1820) another 81 million were needed as relief aid, social benefits for widows, orphans, wounded soldiers, etc.; thus, the total war expenditure reached 287 million thaler. Of those, 164 million came from State revenues of all types (115.5 million from donations, 25 from privatization of State forests and church property, and only 23.5 from taxes). The remaining 122 million were covered by public borrowing which in 1810 reached 100 million thaler, 132 in 1813 and at least 218 in 1820. Many taxes were introduced from 1810 onwards but the results were minimal. On October 27, 1810, a consumption tax was imposed across towns and villages. In March 1811, income tax was introduced in all peripheries (a specific tax was imposed earlier in some of them). However, both taxes failed. The consumption tax introduced on 20 everyday life products caused immense social unrest. Income tax was also a failure since both the aristocrats and the higher public servants were opposed to it. As a result, the actual revenues from income taxation for fiscal year 1811-1812 were 1.3 million only when the expectation of the Ministry of Finance had been 4.7 million. A slightly more successful tax levy (introduced on November 2, 1810) was that on private professionals, which produced a net result of 700,000 thaler where 900,000 had been expected. Yet another unsuccessful tax (introduced on November 10, 1810) was the stamp duty. Because most taxes failed to generate

⁴⁹ Harvey, 1994, p.68. The thaler, or taler, was the Prussian currency ; the gulden was the Austrian currency.

revenues, on September 7, 1811, consumption tax was abolished in small villages and remained only in the big towns. Also, a new council tax was imposed across the State. The expected annual revenues from these tax adjustments were set at 5.5 million thaler ; however, the real revenues they generated did not exceed 2 million over the entire 1811-1816 period.⁵⁰ It was obvious that taxation failed to finance the war effort. Turning to levies on imports was critical for the war effort. Prussian foreign trade initially followed a downward trend due to the war. It picked up later, but soon resumed its downward slope : the number of ships which reached Prussian ports in the Baltic went down from 698 in 1790 to 615 in 1793, increased to 2,022 in 1796, 2,049 in 1801, 2,388 in 1802, but declined to 2,012 by 1804.⁵¹

The Prussia of 1815 is described vividly as follows:

Prussia lost a big part of Poland (...) but received Saxony [and now] extended across all northern Germany (...) ; the country enjoyed geographical unity and also population homogeneity. Before Jena, 1/3 of Prussia's residents were Slavs, but in 1815, 6/7 of its citizens were Germans (...). Its population remained almost equal to that of 1806 ; however, it was 5 million more than the original population of 1790: a hefty $\frac{3}{4}$ increase. The territory increased from 190,000 square km in 1790 to 280,000. In spite of these immense gains, Prussia believed that it has been deceived.⁵²

Despite the immense economic costs which the country suffered during the Napoleonic Wars, the final victory provided the general economic basis on which the future German unification, under the auspices of Prussia, would rest and lead to the increase in German military, political, and economic power in 1870-1914. It is not an exaggeration to say that the rise of German power was a long, three-step process which started with the victory in the Seven Years War (1756-1763), continued with the Revolutionary and Napoleonic Wars (1792-1815), and ended with the Wars of German Unification (1866-1871).

Russia: Military and Economic Mobilization, 1792-1815

The Russian War Effort : Army, Logistics and Industrial Mobilisation

In 1805, the total Russian strength deployed against the French was 70,000 men; but in 1812 it was 411,000 men, despite the Russian defeats in Austerlitz in 1805 and in Eylau in 1807.⁵³ According to another source, at the beginning of 1812 the Russian Army had a strength of 420,000 men and 1,552 guns; however, by June it increased to 480,000 men, equipped with 1,600 guns.⁵⁴ The great campaign of Napoleon against Russia started

⁵⁰ Wehler, 1996, pp.434-436.

⁵¹ Harvey, 1994, p.59.

⁵² See: Ernest Labrousse, 1959, pp.247-424, especially p.396.

⁵³ Glover, 2003, p.90; Haratsis, 2005, p.22 (in Greek). According to one source, during the 1812-1814 period, Russian manpower mobilization resulted in the drafting of almost one million men. Of those, more than two-thirds were enlisted in the regular army. See : Lieven, 2009, p.217.

⁵⁴ Burton, 1914, pp.14-15.

on June 24, 1812, and during that year the Russian Army had immense difficulties since the financial support from the Finance Ministry was very poor: total expenditure of the Russian field armies did not exceed 19 million roubles. Most of this sum was associated with the wages of the troops and very little was spent on food and fodder. Soldiers were paid three times a year (first day of January, May, and September). Peacetime rates were 9 roubles 50 kopecks a year for an infantry private, and 14 roubles for a grenadier. In wartime, a bonus was received. In addition to his own provisions, each soldier would receive 72 kopecks for meat and 24 kopecks for salt per year, deducted from their annual pay. The daily ration was almost one kg of grain and 750 grams of biscuits, bread and salt were also included. In June 1812, Russian reserves in food and fodder supplies could sustain an army of just 200,000 men and their horses for only six months. Inadequate financial capital and supplies forced the Russian government to ask for donations in order to meet the huge war demands. The province of Saratov, a small isolated region in the Volga basin contributed 2,000 oxen and 1,000 carts for the transportation of the army. In addition 1,000 head of cattle were requested for food. In addition, 270 workers would have to be hired for six months as auxiliary troops (their pay was 30 roubles per month : a total of 48,600 roubles). The contribution of Saratov alone was thus 400,000 roubles. The initial contribution to the war effort of Moscow's merchants in July 1812 was 2,500,000 roubles. For the June-December 1812 period, total civilian donations (of all types) to the Russian army are estimated at 100 million roubles.⁵⁵ However, the cost of logistical support for a regiment differed from one Russian region to another. For example, in the regions of Riazan, Voronezh and Tambov, the cost of feeding, clothing and equipping a regiment was 188,000 roubles and another 28,000 were needed for transport wagons. However, the cost for one regiment in the region of Kostroma, was estimated at 290,000 roubles.⁵⁶ While the problems of the regular army were partially solved, those of the militia were not. According to Lieven (2009, pp.233-234 and 347):

A critical problem for the militia in 1812 was lack of firearms. By the end of July 1812 (...), almost 350,000 of the 371,000 muskets held in store in the eighteen months before the war had been distributed. Current production (...) depended (...) on the State and private manufacturers in Tula. Between May and December 1812, Tula produced 127,000 muskets, at the average of just under 16,000 a month. After the fall of Moscow (...), many artisans fled from Tula (...), which seriously affected production (...). Subsequently, much effort had to be directed into manufacturing pistols for the cavalry (...). For a time, the main source of Russian muskets was the 101,000 imported from Britain and the many thousands captured from the French. (...). Kutuzov put top priority on arming the new recruits destined for the field army. The militia came at the back of the queue for firearms (...). In November 1812, [Russia could] supply only 776 muskets for each 1,000 strong reserve battalion he was forming (...).

⁵⁵ Lieven, 2009, pp.221, 225 and 227 ; McNab (ed.), 2009, p.228.

⁵⁶ Lieven, 2009, p.228. Each regiment required 2,900 meters of cloth and 4,500 pairs of boots. For payment and provisions, see McNab (ed.), 2009, pp.228-229.

In that period, with requests growing as time passed, the Army's logistical support problem was also immense. Thus, in a letter dated June 12, 1813, the Russian Army leadership requested 3,000,000 kg of flour, 400,000 kg of oats, 250,000 litres of vodka, 330,000 kg of meat, 1,000 cattle head and huge quantities of fodder.⁵⁷ The artillery force in 1808 consisted of 139 batteries with 1,550 guns, but by 1812 the figure was 161 batteries (44 heavy, 58 light and 22 horse-driven) with 1,699 guns.⁵⁸ Complete data on Russian industrial mobilization do not exist; however, during the 1790-1814 period, total pig iron production was 3,536,000 metric tons.⁵⁹

Russian War Finance: Government and Defence Spending, Taxes, Money Supply

Russian government spending increased from 79,303,355 roubles in 1802, to 108,528,755 roubles in 1806 ; it reached the level of 279,246,791 in 1809 and 287,541,557 in 1812, the year of Napoleon's invasion of Russia. In the same period, tax revenues increased from 77,163,555 roubles in 1802, to 95,252,501 in 1806, to 148,134,116 in 1809 and to 258,386,087 by 1812. Increased public spending was associated with the war effort. Russian bonds were bought by the Rothschild House. The commission from Russian bonds was 4%, equal to that of the British.⁶⁰ With support from that British bank, the Russian government managed to finance the war effort. Money supply in Russia (in paper roubles) increased throughout the war, and the exchange rate between gold and paper roubles also changed, leading to inflation (Table 5):

Year	Monetary Circulation of Paper Roubles	Rouble/ Gold Exchange Rate
1797	163,574,840	126:100
1800	212,689,335	153:100
1803	247,624,665	125:100
1806	319,239,960	137:100
1809	533,201,300	224:100
1810	577,000,000	300:100
1817	836,000,000	Not available

Source: Harvey, 1994, p.71.

Table 5 : Monetary Circulation of Paper Roubles

Money supply increase was the main strategy to finance the war effort. The fiscal avenue of higher taxes was simply not possible. As one source points out : *“Even before Napoleon's invasion, budget deficits could only be covered by printing of paper money and fears of financial collapse were common. As a result of the war (...), nearly 25 per cent of anticipated revenue had failed to arrive in 1812”*.⁶¹ In the first quarter of 1813, things worsened: only 54 percent of expected revenues had come in by late April.⁶² In that month, Russia's deficit was running at 200 million roubles and the only sources of income were

⁵⁷ *Ibid.*, p. 337.

⁵⁸ McNab (ed.), 2009, p.245.

⁵⁹ Mitchell, 2003, p.457.

⁶⁰ Harvey, 1994, p.64 ; Ferguson, 1998, pp.96-102.

⁶¹ Lieven, 2009, p.335.

⁶² *Ibid.*, p.335.

2,500,000 million in paper roubles from the Finance Ministry's deposits in Germany, 4.8 million in silver and 4 million in paper roubles which the British were sending. However, the total of these British funds were not received until July 1813. In Russian eyes, British financial aid was unsatisfactory, and they forcefully drove the point home by pointing out that in 1811 British financing of the war in Spain absorbed £11 million whereas the Spanish Front was peripheral compared to the Russian Front, and thus British aid was inadequate. In April 1813, the Russian fiscal situation was so critical that policy-makers fully expected the banking system to collapse completely if war operations were prolonged for another year or more.⁶³

The Austrian Case

The Austrian War Effort: Army and Logistics

While Austria was regarded as a major power in continental Europe, in reality its military and economic might was questionable. As one source points out :

The Austrian Army at the very beginning of the 19th century was in a state of confusion, still reeling from the debacles of the First and Second Coalitions. In these wars, the Armies of the French Revolution and the Consulate continually outperformed their Habsburg counterparts. The problems (...) were broad : logistically, tactically, strategically and politically, the armies suffered handicaps compared to the rapidly modernizing French (...). Conditions improved greatly (...) in 1806 [after a] reform programme began to take effect.⁶⁴

The first great defeat occurred in the battle of Ulm (14-20 October 1805), where Napoleon captured 60,000 Austrians, 120 artillery guns complete with 300 carriages and ammunition, as well as 3,000 horses. The capture of Austrian fortifications followed (30 October) in Braunau, where Napoleon confiscated 40,000 portions of bread, 1,000 sacks of flour, 300,000 pounds of ammunition and explosives, 6 artillery guns and huge quantities of clothes and uniforms.⁶⁵

The greatest defeat occurred at the battle of Austerlitz (2 December 1805), where Napoleon destroyed the joint Austrian-Russian forces and captured 180 artillery guns, 400 ammunition carriages, almost 20,000 prisoners and killed or wounded 16,000 Austrians and Russians. In that battle, the French artillery used 50,000 rounds.⁶⁶ After the battle of Austerlitz (1805), France extracted 75 million francs from Austria (of which 27 million covered the operating/ subsistence costs of French occupation army, the rest – 48 million – being directly paid to the French Treasury). According to one source, the Austrian payments were made in cash, which helped relieve “*the very severe monetary crisis which had, in the autumn of 1805, caused widespread failures and disasters in France*”,⁶⁷ and triggered inflationary pressures.

⁶³ Lieven, 2009, pp.335 and 337.

⁶⁴ McNab (ed.), 2009, pp.168-173.

⁶⁵ Smith, 1998, p.205 ; Asprey, 2002, pp.523, 526, 534-535.

⁶⁶ Smith, 1998, p.217 ; Chandler, 2003, pp.31-36. For artillery consumption, see Adkin, 2015, p.290.

⁶⁷ See : Parsons, 1914, p.20.

Around 1809, Austrian military strength was at its peak. At that time, the infantry had 46 German and 15 Hungarian line regiments, each of 3 battalions made up of 6 companies. Together, the German regiments had a total strength of 180,504 men and the Hungarian regiments of 64,260 men. Thus, total infantry strength in 1809 was around 245,000. Cavalry strength in March 1809 was 44,490 with 42,791 horses. Finally, artillery strength was considerable. In 1790, it consisted of 948 guns (798 field guns, 86 howitzers and 64 horse artillery pieces). In 1805, it reached 1,257 field guns and 184 horse guns. After the 1808 reforms, light 3-pounders were left in the depots and the field force was down to 742 guns in 108 batteries.⁶⁸ The infantry's logistical support assets which in 1792 amounted to 14 "Proviand" wagons,⁶⁹ 6 ammunition wagons, and 1 field wagon per regiment and 54 horses per company, were reduced in 1809 to 11 wagons (10 four-horse wagons, 1 field wagon) and 534 tents per regiment and 26 horses per company. That same year, there was bread for three days, biscuits for one day.⁷⁰ On average each gun had an allocation of 130-180 shells.⁷¹ It was obvious that the limited logistical support at the disposal of the Army reduced its fighting capacity. The outcome was military catastrophe once again. In April 1809, the Austrians suffered another defeat. In five days (21-25 April), the French Army captured 100 artillery guns, 600 howitzers with their ammunition, 3,000 wagons with supplies and huge resources in cash.⁷² This was followed by the battle of Wagram (5-6 July 1809), where French artillery used 96,000 rounds of ammunition and helped score yet another major French victory.⁷³ This time Austrian losses included 124 officers (including 4 generals) and 5,507 soldiers killed, 629 officers (including 13 generals) and 17,490 soldiers wounded, while the French captured 18,000 Austrian prisoners and 9 guns.⁷⁴ While, due to food supply shortages, the French Army could not annihilate the Austrians completely, after the battle of Wagram France extracted from Austria another 226-250 million francs.⁷⁵

Austria's participation in that Fifth Coalition against Napoleon only occurred after British promises to the Austrian Emperor of financial aid, and of military action in Italy and Holland in order to tie down French troops. Yet, "*other than £250,000 in silver bars the money did not materialise. The Austrian Treasury remained empty as heaps of worthless paper money flooded the country. The intended landing in Italy remained a non-event, the fault of...General Stuart whose 15,000 troops remained idle in Sicily. The northern expedition also backfired*".⁷⁶

⁶⁸ McNab (ed.), 2009, pp.173, 200 and 205.

⁶⁹ Each Proviand wagon carried 200 pairs of shoes, 75 pairs of gaiters, 200 trousers, 200 pairs of underpants, 800 shirts.

⁷⁰ McNab (ed.), 2009, pp.190-191.

⁷¹ Dawson, Dawson & Summerfield, 2007, p.253.

⁷² Asprey, 2002, p.153.

⁷³ Adkin, 2015, p.290.

⁷⁴ Smith, 1998, p.322.

⁷⁵ Of which 100 million were for war reparations, 76 for occupation costs (running at 4 million a month), 50 from the sale of surplus food, ammunition and equipment ; the remainder was paid directly to the French Treasury. However, in this case, the money was never paid in full : Asprey, 2002, p.177.

⁷⁶ *Ibid.*, pp.171-172.

Austrian War Finance: Government and Defence Spending, Taxes, Money Supply

Austria's economic mobilization was also important and, just as in the Russian case, relied heavily on money supply increases. To illustrate, in September 1806 money circulation was just 440,549,000 paper gulden ; in July 1810, it was increased to 1,011,801,000 paper gulden. In February 1811, the exchange rate between a paper and a silver gulden was 12:1. At that point, the Austrian government decided to impose new rates, which accelerated the currency's depreciation.⁷⁷ The war proved financially catastrophic.

The Cases of Spain, Portugal and Other Minor Allied States

Until 1802, the Spanish government financed the war mainly via loans by issuing bonds valued at 1,490,000,000 Real (around £14.9 million), with a 4% interest rate, but was also forced to ask extensive financial aid from Britain.⁷⁸ When the Peninsular War started in 1808, the Spanish Army had 7,000 officers, 130,000 soldiers (including 30,000 militia).⁷⁹ Its cavalry was 15,000-strong but could only count on 9,000 horses, and its artillery had 40 batteries with a meagre average of 6 guns each.⁸⁰ Britain sent 40,000 firearms in 1811, and another 100,000 (including 95,000 muskets and 3,000 cavalry carbines, plus 13,000 cavalry sabres) between April 1812 and March 1813. In 1812, Britain additionally sent also 100,000 army uniforms, 50,000 in 1813 and an equal number in 1814.

The Portuguese army was a small force of only 30,000 men, with limited supplies. To illustrate, in December 1808, the 21,094 Portuguese fusiliers could count on 19,113 weapons and only 6,912 uniforms. In that same month, its cavalry had 3,641 men but only 2,617 horses and 629 uniforms. British assistance was again crucial. According to one source, “[b]etween 1796 and 1801 [British] shipments totalled some 32,500 muskets, 17,000 carbines (including 8,000 sergeants), 6,300 pistols, and 16,500 swords (...), 20 brass 12-pdr field guns with ammunition (...). However, it was from 1808 that (...) British (...) aid became extraordinary ; money; arms of all sorts, clothing and equipment of all types were sent (....) In November 1808, Britain agreed to provide not only the money to pay 10,000 men, but also all arms, clothing and equipment for that number. This was doubled to 20,000 men in 1809 and increased yet again to 30,000 by January 1810 – in addition to providing the £130,000 necessary to increase the pay of Portuguese officers... [Aid to Portugal increased] from £600,000 to £2,000,000 [Thus in February 1809 the Parliament questioned the wisdom of this policy]”.⁸¹ After 1812, Britain decided to support a force of 30,000 men and the Portuguese government committed itself to pay for the rest of the army.

⁷⁷ Thus, a newly-printed gulden was declared worth 1.05 1799 gulden, 2.06 1807 gulden, 2.22 1809 gulden, and 5 1811 gulden.

⁷⁸ Harvey, 1994, pp.69-71.

⁷⁹ McNab (ed.), 2009, pp.294 and 300.

⁸⁰ Partridge & Oliver, 1999, pp.290 and 308.

⁸¹ McNab (ed.), 2009, p.346.

The Swedish Army was at its peak a force of 27 infantry (including 10 special *Jager* and 3 Imperial Guard) regiments, 8 cavalry regiments and 4 artillery regiments. It was facing “*chronically limited supplies of everything from uniforms to weapons [thus]...would never amount to a mighty force*”.⁸² Most Swedish regiments had 2 battalions each of 4 companies (although the *Jager* and the Guards battalions had 6 companies) and each company had 100 men.⁸³ Together, the 14 infantry regiments had a strength of 11,200 men, to which the 10 *Jager* battalions added 12,000 and the Guard battalions 3,600. Thus, the strength of the Swedish Army did not exceed 26,800 men. The number of artillery guns varied between 96 and 144 pieces in the four foot regiments and 30 6-pounder guns and 10 howitzers in the one horse regiment.⁸⁴ However, Sweden was a major naval power and could control the Baltic and the North Sea. In 1790, the Swedish Navy had 110 ships with 1,000 guns and 10,000 men – three times as many as the Russian Navy. Over the 1792-1815 period, the losses incurred from all causes by Sweden at sea amounted to 380 ships.⁸⁵ Its merchant marine, which boasted 1,500 ships in 1800, was down to 1,051 in 1809.⁸⁶

The Hanoverian Army in 1794 included 18,000 infantry and 6,500 cavalry.⁸⁷ Until 1798, this force was rather stable and comprised 14 regiments with 4 3-pounder guns per regiment, thus a total of 56 guns. In 1803, it was disbanded and until 1813 remained an exiled army. In 1813, the country was invaded by Prussian and Russian forces and in 1814-1815 there were 40 infantry regiments (most with only one battalion). Every battalion had between 4 (1814) and 6 companies (1815) each of 120-160 men.⁸⁸ Thus, its total infantry strength rose from an estimated 19,200 in 1814 to an estimated maximum of 38,400 men in 1815. That same year, its cavalry included 3 cavalry regiments, each of 4 squadrons of 4 troops of 150 men each, bringing the total to 7,200 men; its artillery consisted of 2 artillery regiments equipped with 12 9-pounder guns.⁸⁹ The Hanoverian contribution to the allied side at Waterloo comprised 22,788 infantry, 1,682 cavalry, 465 artillery and 12 guns.⁹⁰

The Dutch-Belgian army of 1815 which assisted Wellington at Waterloo had a total strength of 24,174 infantry, 3,405 cavalry, 1,635 artillery with 56 guns. Among smaller anti-French allied forces were the Brunswick Army,⁹¹ the King’s German Legion (3,301

⁸² McNab (ed.), 2009, pp.305-306, 346, 353, 374-365 and 383.

⁸³ Partridge & Oliver, 1999, p.407.

⁸⁴ *Ibid.*, p.408.

⁸⁵ Anderson, 1910, p.274 and pp.369-373.

⁸⁶ Muller, 2006, pp.30-47.

⁸⁷ McNab (ed.), 2009, p.383.

⁸⁸ Partridge & Oliver, 1999, pp.113-114.

⁸⁹ Partridge & Oliver, 1999, pp.115-116.

⁹⁰ Chandler, 1980, p.63.

⁹¹ In 1806, it had two infantry regiments, i.e. a total strength of 2,280 men. In 1809, the Brunswick Army had 1,230 infantry men, 2 howitzers and 2 guns. At the beginning of 1814, it was down to 793 men, while another 276 more were in Spain. In April 1814, its strength was down to 679 men, 8 (6-pounder) and 8 (9-pounder) guns. At Waterloo, the Brunswick Army was 5,376 infantry, 922 cavalry, 510 artillery (16 guns). Chandler, 1980, page 63.

infantry, 2,560 cavalry, and 526 artillery men with 18 guns) and the Nassau formations (2,880 infantry men).⁹²

Overall Assessment of the Anti-French Coalitions

To sum up, the Napoleonic Wars created two immense systems of alliances, respectively led by France on one side, Britain and Russia on the other, with a host of smaller States attached to them over time. An attempt to assess the power of the two opposing alliances is made in the following tables (Tables 6 and 7, below).

Table 6 : Anti-French Coalitions

State	Period	Military contribution	Naval contribution*	Industrial Power (1913=100)	Financial Power
Britain	1793-1815	748,000	10,550	9	£1,657,854,518
Russia	1792-1815	1,500,000	–	n/a	2,889,330,100 + roubles
Prussia	1803-1815	300,000	–	n/a	206,000,000 thaler
Austria	1792-1815	400,000-450,000	–	n/a	571,252,000+ gulden
Spain	1801-1814	200,000	1,202	n/a	£15,000,000+
Portugal	1807-1814	60,000	300	n/a	
Sweden	1804-1813	28,000	1,224	n/a	
Ottoman Empire	1799-1815	20,000-30,000 in Egypt	n/a	n/a	
Duchy of Brunswick	1803-1815	8,000-10,000		n/a	
Hanover	1792-1815	8,000	–	n/a	
Holland/ Belgium	1815	30,000	1,871	n/a	
Total		3,302,000-3,364,000	15,665+		

Sources : (1) Partridge & Oliver, 1999 ; (2) Mitchell, 2003, p.421 for Britain’s industrial index.

(*)=The numbers for Spain, Portugal, Sweden, Holland, refer to the year 1786-1787 and are only for commercial ships. The British data refer to construction of warships throughout the period. In addition, many Swedish ships were captured by the British during the war. The data were obtained from Muller, 2006, pp.30-47, especially p.46. See also aggregate data in Table 2.

The industrial index of France was stronger than Britain’s. To illustrate, coal production increased from 250,000 tons in 1794 to 800,000 in 1814. The production of iron increased from 60,000 tons to 112,000 tons and salt-mine production increased from 40,000 tons to 150,000 tons over the same period.⁹³ In this time frame, France’s arms industry went through a steep and immense transformation.

⁹² *Ibid.*, p.63.

⁹³ See : Weider & Gueguen, 2004, p.81.

Table 7: French Coalitions

State	Period	Military contribution	Naval contribution*	Industrial Power (1913=100)	Financial Power
France	1793-1815	2,015,000	5,268	19.2	9,600,000 Fr. (est.**)
Grand Duchy of Baden	1805-1815	8,620			
Grand Duchy of Berg	1806-1813	29,970			
Grand Duchy of Warsaw	1807-1813	164,578			
Duchy of Hesse-Darmstadt	1805-1815	18,632			
Kingdom of Bavaria	1803-1815	11,000			
Kingdom of Denmark	1804-1813	62,974	3,601		
Kingdom of Holland	1804-1810		1,871		
Kingdom of Two Sicilies	1804-1814	63,859	1,047		
Kingdom of Naples	1804-1815	150,300			
Kingdom of Saxony	1806-1815	66,987			
Kingdom of Westphalia	1807-1813	64,621			
Kingdom of Württemberg	1805-1815	12,000			
Smaller German States	1806-1815	5,000+			
USA	1812-1815	25,000+			
Total		2,698,541	11,787		

Sources : (1) Partridge & Oliver, 1999 ; (2) Mitchell, 2003, p.421 for industrial index of France. (*)=The numbers for France, Denmark, Holland, Italy, refer to the year 1786-1787 and are only for commercial ships. The data for Denmark include Norway as well. The data for the Kingdom of Holland are included in both Tables 6 and 7 since part of the Dutch fleet was allied to Britain. The data were obtained from Muller, 2006, pp.30-47, especially p.46. The role of the US was not important in the European war theatres. The 1812 war between Britain and the US was a peripheral conflict and the US mobilization refers to front line soldiers and auxiliary troops as well : see Arnold, 2012. (**)=estimate of total French defence spending for 1800-1815.

In 1792, France had a reserve stock of 158,233 rifles, and its annual production was amounted to 42,000 items.⁹⁴ It was obvious that the country’s arms industry had to respond to the Army’s huge needs by becoming more productive. In 1800, it was comparable to that of other major European nations. The main factories were located in Paris, Charleville, Saint-Étienne, and Clermont-Ferrand, among others. During the 1792-1795 period, artillery production doubled from 1,300 to 2,600 guns. In addition, rifle production increased from 100,000 in 1789 to 245,500 in 1791. During the 1803-1814 period, the French industry produced 2,659,397 rifles and the army was able to capture another 700,000 on various battlefields. Other sources point out that between 1805 and 1815 period, French factories produced 3,900,000 small arms (pistols, rifles, muskets). However, while the French arms industry was more developed than its British counterpart in 1803, by 1811 its advantage had vanished. The French ammunition industry did not lag behind. During the Napoleonic Wars, every artillery gun had on average a supply of 147-300 shells and every soldier received an initial allocation of 60-80 bullets. Every formation of 8,000 men had a reserve supply of 97,000 rounds of ammunition. Maximum production was reached

⁹⁴ Glover, 2003, p.22.

during the Russian campaign in 1812. In July that year, the Imperial Guard and the so called “Polish” divisions of the Guard had at their disposal a total supply of 1,224,000 rounds.⁹⁵ The average supply of shells per artillery gun was 670-1,100 – figures which according to van Creveld (2004) “do not compare all that badly with those of an industrialized and highly militaristic Germany one hundred years later”.⁹⁶

On the other hand, the country’s shipping industry was weak, and the artillery guns of the French ships were of lower quality (notably in terms of firing rate) than those of the Royal Navy.⁹⁷ France’s naval losses were truly gigantic. In 1789, it had an aggregate number of 5,268 ships (of which 3,270 were above 100-ton mark) and the total tonnage of both commercial and naval ships was 729,340 tons. Over the 1793-1815 period, the French Navy lost 377 warships, sunk or captured by the Royal Navy.⁹⁸ The French commercial fleet also suffered badly: the number of sailing ships was reduced from 1,500 in 1801 to 179 by 1812. In addition, during 1793-1814 another 1,031 (formerly private) ships were confiscated, along with their 9,400 artillery guns and 69,147 sailors.⁹⁹ By 1815, France had only 80 naval ships left. These combined losses of the French Navy, commercial fleet and private ships decisively changed the balance of naval power and made the Royal Navy the true master of the seas.

The overall strength of the anti-French coalitions (3.3 million men) was over 20% higher than that of France and her allies (2.7 million men). At sea, the Anti-French coalitions enjoyed a decisive superiority of more than 4,000 vessels. In terms of financial power, total allied spending was also far more substantial. To illustrate, French public expenditure increased from 700 million francs in 1806, to 955 million in 1811, 1.3 billion in 1812 and to 1.15 billion by 1813.¹⁰⁰ Of the above sums, defence expenditure represented some 50% (462 million francs in 1807, 817 million in 1813). In addition, the French confiscated raw materials, financial wealth and a variety of resources across Europe. Prior

⁹⁵ See: (1) Harvey, 1994, p.54 ; (2) Smith, 2002, pp.101-103 ; (3) Archer, Ferris, Herwig & Travers (eds), 2003, p.392.

⁹⁶ See: Van Creveld, 2004, p.63. The total number of artillery guns was greater than the 806 (see below) which the above source mentions. This number refers to the guns and the shells which were in stock. The number of first line French guns and shells and the number of guns and shells in various fortifications have to be added. Thus their total number must have been higher.

⁹⁷ See: (1) Harvey, 1994, pp.52, 58-59, 119-127; (2) Glover, 2003, pp.173-243.

⁹⁸ This number breaks down into 9 ships with 98 or more artillery guns each, 19 ships with 80 guns each, 87 ships with 74 guns each, 24 ships with 64 guns each, 9 ships with 50-54 guns each, and 229 frigates. In order to put into perspective the economic cost associated with the capture of French ships, it must be borne in mind that one ship with 100 guns required 5,750 loads of wood (1 load=50 cubic feet of wood). The construction of one ship with 74 guns required almost 3,500 loads of wood, and a 50-gun ship 2,450 loads. See: Smith, 2005, p.228. From the above data, it is obvious that the French Navy lost between 10,826-10,862 artillery guns with the loss of these 148 ships. Turning to French frigates, most classes had 32 artillery guns per ship (though there were 8 frigates each with 40 guns, 3 frigates with 38 guns, and 1 frigate with 34 guns). As a result, the capture of 229 frigates cost the French Navy at least another 7,328 guns, thus placing total artillery losses at a minimum of 18,154 guns. [For a useful, detailed list of French frigates, see : https://en.wikipedia.org/wiki/List_of_French_sail_frigates, which provides].

⁹⁹ Harvey, 1994, p.124.

¹⁰⁰ Weider & Gueguen, 2004, pp.78-79.

to 1804, France extracted 229,127,901 Dutch guilders as war contribution (of which 74,065,814 were used by the French army in order to finance operating/current costs). After the battle of Austerlitz, France extracted 75 million francs from Austria ; after Jena, Prussia, Saxony and other German States were forced to pay to France huge sums and to provide immense quantities of goods and materials.¹⁰¹ Yet, France's budget could hardly compare with Britain's, of which it represented a fraction: 36% in 1805, 42% in 1813.¹⁰² In spite of the exploitation of occupied countries, the French debt increased from 47 million francs in 1809 to 220 million in 1813.¹⁰³ By 1814, the fiscal situation had become extremely problematic. On January 25 that year, a Cabinet meeting concluded that monthly State revenues amounted to only 367,000 francs, as opposed to the 10 million which would normally accrue in peacetime.¹⁰⁴ French defence spending could not possibly equal the combined spending of Britain, Prussia, Austria, and Russia. This undoubtedly was one of Napoleon's greatest sources of weakness.

Concluding Remarks

The Napoleonic wars demonstrated that despite the operational superiority an army can enjoy in prolonged conflicts, what matters most is the ability to finance the war effort. What is also crucial is the ability to keep supply lines open so that raw materials, food, medical equipment, etc., can flow uninterrupted and meet the needs of both the armies and the civilian populations. These strategic advantages were possessed by Britain. During the war years, the successive French coalitions managed to mobilize troop numbers which, while lower than the opposite coalitions', were not at a decisive disadvantage, and even enjoyed a higher production of defence equipment. However, the French could not finance their war effort and the production of food and other supplies was limited. These hard facts forced the French army to endorse looting policies across Europe, which caused immense social dissatisfaction and rebellions. As French economist Jean-Baptist Say aptly remarked after the fact, Napoleon's eventual defeat was the logical fate of a man who knew nothing of political economy.¹⁰⁵

¹⁰¹ Parsons, 1914, p.20.

¹⁰² See : (1) Harvey, 1994, pp.62-63 ; (2) Ferguson, 1998, p.103 ; (3) Glover, 2003, p.96 ; (4) Weider & Gueguen, 2004, pp.79-82.

¹⁰³ Smith, 2005, p.73. According to Harvey, 1994 (p.67), the French debt in 1804 was 45,180,624 francs (or £1,825,480) and by April 1814 it stood at 63,307,637 francs. On the Prussian debt, see : Browning, 1907, p.8.

¹⁰⁴ Houssaye, 1914, p.20.

¹⁰⁵ Liaropoulos, 2006, pp.363-384. On French tactical/ operational French dominance : Weider & Gueguen, 2004, p.82.

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