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## 2

# Power and Money

This chapter reviews the overlap between the economic and strategic spheres, introduces some economic concepts and illustrates how they can be used to illuminate military issues. Military and economic calculations involve inherent uncertainty so it discusses how to analyse uncertainty. Finally, it considers some examples of economic–security interactions.

Defence and peace economics studies a set of questions that arise in the intersection between the sphere of power and strategy (the art of a general, the specialist in violence) and the sphere of money and the economy (the processes of production, distribution and exchange and incentives that shape the allocation of scarce resources between competing ends in those activities). These questions concern how the forces of production interact with the forces of destruction. These forces are often seen as operating in separate spheres with their own rules and logic; but this is not the case, they interact. Economic development and the operation of markets require some mechanism to control violence, provide order and secure property rights. Most economic theory is part of peace economics: it takes for granted the ability of people to safely specialise, trade and hold property. In practice, the conventional economic forces of supply and demand are often shaped by violence and power. Military groups were probably the first formal social organisations and wars have played a major role in economic development. Success in war is influenced by economic factors, such as the wealth of nations and their ability to finance military activities.

Adam Smith in Book V chapter I of *The Wealth of Nations*, on the expense of defence, matched the development of different types of military preparations and employment of force to the different modes of economic development: hunting, pastoral, agricultural and

manufacturing. He saw the propensity to war increasing then decreasing with development. It was not until the development of manufacturing, and guns, that agricultural states could feel safe from their nomadic neighbours, like Scythians, Tartars and Mongols, who regularly overran them. Europe would be very different had the Mongols, who reached Vienna and the Adriatic in 1242, not turned back. The Mongols established the largest land empire in history. They conquered China and northern India, defeated Christian armies in Poland and Hungary in 1241 and destroyed Baghdad in 1258, ending the Caliphate, the central authority of Islam. Europe was spared because the Mongol general Sabotai took his army home on the death of Ogadai, son of Genghis Khan, and the Mongols never bothered to return. Timothy May (2007) describes the Mongol way of war.

Money is a very concrete category, power is not; it has many dimensions. One dimension is the ability to get others to do what you want. This requires understanding why people do things, the many things that might motivate them to action. People are motivated by: coercion, they are forced to do it; material gain, they are bribed to do it; beliefs, they think it is the right thing to do; enjoyment, they get pleasure from doing it; reputation, they gain approbation from others for doing it; solidarity, they support their group in doing it. Our emphasis will be on coercion and material gain, fear and greed, but the other motivations are often more important. The soft power that comes from the ability to persuade can be more effective than the hard power that comes from the ability to coerce. It is not coercion or material gain that usually drive religions and charities, or the open source movement that produces products like Linux and Wikipedia. Similarly the motivations that make military risk death are often wider than coercion and material gain, though both can play a role.

Generally power and money are fungible: one can be transformed into the other. The rate at which they can be transformed is not a constant, but will change over time with the cost of force. In some circumstances, people or nations acquire power in order to extract money from others. In other circumstances people make money in order to acquire power. Often acquiring power and money go together. The 'Robber Barons' who made their fortunes creating late-19th-century American industry took the associated violence for granted. As Richard B. Mellon said, 'You couldn't run a coal mine without machine guns' (Von Hoffman, 1992, p. 24). Paul Kennedy (1988) describes the rise and fall of the great powers in terms of how their growing wealth gave them power and their attempts to maintain that power undermined their wealth.

Cyclical theories of power are very old. Ibn Khaldun, the 14th-century North African Islamic scholar, described how hardy warrior became softened as they took advantage of the riches of the civilisations that they had conquered, leaving themselves vulnerable to the next wave of hardy warriors.

This intersection or overlap between power and money is a contested terrain fought over by different disciplines. This overlap occurs at the individual, the national and the global levels. At the global or systemic level, the international system of states and markets, there is constant dynamism as new economic and strategic competitors enter this overlap. Life in this overlap between economics and strategy is complicated by the 'separate tracking' of issues in the two spheres. Different people are involved in international economic negotiations and international security negotiations. Those who go to the World Trade Organisation (WTO), which regulates trade in civilian goods, do not go to the organisations that regulate the trade in military goods. While there is just one organisation, the WTO, to regulate trade in civilian goods, there are four to regulate trade in weapons: the Wassenaar Arrangement for trade in conventional weapons; the Australia Group for chemical and biological weapons; the Nuclear Suppliers Group for nuclear technology; and the Missile Technology Control Regime for longer range missiles. Both the WTO and the European Union (EU) explicitly exclude weapons from their rules on trade. There would be interesting implications of applying WTO and EU rules to weapons, but there seems no political will to do so.

Similarly, except at head of government level, the people who go to the United Nations (UN) and North Atlantic Treaty Organisation (NATO) are not the same as the people who go to meetings of the World Bank and International Monetary Fund (IMF). This separate tracking can be functional in that it insulates the spheres: countries can be in dispute in one sphere and cooperating in another. But there is a danger that it can be dysfunctional: actions in one sphere having unintended consequences in the other. This separate tracking can also cause hostility between the Ministry of Defence, the lead department in the strategic sphere, and the Ministry of Finance, the lead department in the economic sphere. The hostility can run deep. During the Cold War, in the event of a nuclear attack, the 210 top people in the UK were to be spirited away by the military to a hideout under Box Hill. The military, who compiled the list of those to be saved, did not include anybody from the Treasury (Hennessy, 2002).

A recent description on life in this overlap between economy and strategy is provided in *Global Financial Warriors* (Taylor, 2007).

John B. Taylor is an eminent US monetary economist, best known for the 'Taylor Rule' which specifies how central banks should set interest rates. He was US Treasury Under Secretary for International Affairs from 2001 to 2005. After 9/11, he was responsible for cutting off terrorist money, organising the financial aspects of the invasions of Afghanistan and Iraq and attempting to reform the World Bank and IMF. Beyond the *Financial Times* and *Wall Street Journal* his book got less attention than it deserves. This may be partly because the issues are technical and partly because, unlike most such memoirs, he does not have a bad word to say about anybody, even George W. Bush. Early in the book (p. xxiii), he says:

Financial Issues have always been a third pillar of foreign policy, along with political and military issues. Over two thousand years ago Thucydides wrote how 'The Athenians,' needing money for a siege, 'sent out twelve ships to collect money from their allies, with Lysicles and four others in command.' In the modern age of globalization the role of finance in foreign policy is even more important, and it is growing rapidly.

Taylor gives a nice example of how communications between economic and security specialists can fail. This arose during a National Security Council presentation he made to President Bush in the Situation Room in May 2003, shortly after the invasion of Iraq. The presentation was on Iraqi finance and a central issue was the movements of the Iraqi currency, the dinar. Exchange rates are usually quoted in units per dollar, the number of dinars required to buy a dollar. When a currency strengthens, fewer dinars are required to buy a dollar, so the rate goes down. Taylor comments (p. 228):

One of my briefing charts showed how the value of the dinar had declined sharply at the start of the war, but then recovered rapidly and had since stabilized. As is typical in charts of currencies, an *upward* movement in the number of dinars per dollar is a *depreciation*, which causes no end of confusion to people who do not study the currency markets every day (which included, of course, everyone in the Sit Room that day except me).

He got the charts changed for future presentations.

The interaction of economics and security means that decisions taken in one sphere can have unintended consequences in the other.

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Economics is largely the study of unintended consequences. Sometimes the unintended consequences are positive. We get most of what we need, not because of the concern of others with our welfare, but as an unintended consequence of the pursuit of their self interest: to make money out of us. This process is often described as an 'invisible hand' which directs the self interest of one to the benefit of others. The idea is usually attributed to Adam Smith, though he did not actually use the term in this context. Some companies explicitly say their goal is 'to do well by doing good', but even when they do not intend to do good they only do well, and make money, by meeting the needs of their customers; if not other stakeholders.

Sometimes the unintended consequences are negative; the economic consequences of political self interest in the 1919 Treaty of Versailles, after World War I, were disastrous. The victors' pursuit of their short-term self interest, over the reparations paid by Germany and its allies and the allocation of inter-allied debt, contributed to the German inflation of the 1920s, the depression of the 1930s and the causes of World War II. This disastrous outcome was predicted by the English economist John Maynard Keynes, in his 1919 book *The Economic Consequences of the Peace*. Keynes (pronounced Canes), who was known as Maynard, not John, was involved in the management of economic–security interactions throughout his life. He worked in the Treasury during World War I, rising to being responsible for the external finance, despite feeling 'that I work for a government I despise for ends I think criminal' (Skidelsky, 1983, p. 295). He was Treasury Representative at the peace negotiations before resigning in disgust to write his book. He was heavily involved in war planning during World War II; wrote *How to Pay for the War*; helped develop the national accounting information that allowed better war planning; and tried to negotiate loans from the US. He played a major role in the Bretton Woods Conference of 1944 which created the post-war international economic order. Throughout this he was very conscious of the interaction of economic and security policy.

The activities of Keynes are well documented because, unlike most economists, he was interesting enough to justify a three-volume biography (Skidelsky, 1983, 1992, 2000). He influenced policy on issues of war and peace; revolutionised economics, by shifting the emphasis from microeconomics to macroeconomics; and was heavily involved in the arts, setting up the UK Arts Council. During World War I, he organised the purchase of many impressionist paintings, both for the nation and himself, when the contents of Degas's studio came up for sale in Paris. Prices at the auction were depressed by the sound of German

guns in the distance. He was a member of the Bloomsbury group which included novelists like Virginia Woolf and painters like Duncan Grant, advising them on their finances. He also shocked them by abandoning his established homosexual ways in his early forties and happily marrying a Russian ballerina, Lydia Lopokova, of whom they disapproved. During World War I, he was torn between his conscientious objection to the war and his work, which his friends Bertrand Russell and Lytton Strachey described as the 'job of demonstrating how to kill Germans as cheaply as possible' (Skidelsky, 1983, p. 324).

### Producing security

At each level (individual, national and global) within this interaction of economics and strategy one can imagine an input–output process of linked elements, what in business schools would be called the value chain (Porter, 1985). The first link in the chain is the defence budget or military expenditures. Governments decide how much to allocate to their military budget, in the light of the economic and strategic environment: the threats they perceive and what they can afford. This budget buys forces: troops, weapons and the organisations to support them. Estimates of the size of forces can be found listed in the International Institute for Strategic Studies (IISS), publication *The Military Balance*, which gives the number of personnel, tanks, aircraft and the like. The forces provide capabilities – the ability to achieve military objectives – which influence the probability of winning in certain types of conflict. The military capabilities can then be used for attack, defence, deterrence or peacekeeping, which are intended to contribute to perceived security, confidence in the safety of society and its interests. This process is most obvious at the national level, but also operates at the individual and global levels and each of these four elements (budgets, forces, capability and security) is linked to the economic and strategic environments.

There are similarities between the commercial and military value chains. Commercial entrepreneurs must raise a budget to finance the purchase of labour and capital. They then use this labour and capital, with the available technology, to produce a product that will thrive against competing products in the marketplace. The military entrepreneur must also raise a budget to finance the acquisition of troops and weapons. They then use these armed forces, with the available technology, to produce military capability that will thrive against competing militaries in the strategic sphere. Many military organisations, like many large firms, are bureaucracies following standard procedures.

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But at times, just as some innovative economic entrepreneur, like Bill Gates of Microsoft, can develop strategies that transform the value chain and sweep through the market, some innovative military entrepreneur, like Napoleon, can develop strategies that transform the military value chain and sweep through their enemies. Of course, there is the danger that the innovative entrepreneur gets locked into strategies that were initially successful, not realising that the competitors, like Google or Wellington, had developed responses to these strategies.

Although useful analytically, each of these elements are difficult to define and measure. Measuring budgets raises difficult accounting issues and it can take a military expert to assess what forces are really available to a state. But budgets and forces are conceptually easier categories than capability or security, which can mean very different things to different people. There is massive variability and uncertainty in the links between each of these four elements, with the strength of each link subject to economic and strategic influences. The linkages operate within interacting societies. The interactions may be negative, increasing one countries security reduces that of the other; or positive, increasing trade benefits both.

Consider an example of the link between budgets and forces. In the mid-1970s the Central Intelligence Agency (CIA) doubled its estimates of the share of output that the USSR devoted to the military, from about 8 per cent to about 15 per cent. This was not because the CIA thought that they had underestimated the forces that the Soviets could field. Their estimates of the forces remained the same; they had counted them using what were then called national technical means of verification: satellites and spy planes. What changed was their estimate of the efficiency of the Soviet defence industry. They obtained information that suggested that those forces cost twice their previous estimate. Although the revision was widely interpreted as indicating that the Soviets were more threatening, in fact it indicated that they were less threatening, only half as efficient. At the time, many thought the CIA was exaggerating the Soviet military burden. Subsequent to the collapse of the Soviet Union, it was discovered that the share of their output that the Soviets were spending on the military was probably well over 20 per cent, much more than the CIA estimated. This high share of defence did considerable damage to the Soviet economy.

How much capability the forces provide depends on the military skills and intangibles that shape force deployment: leadership, training, strategy, tactics, logistics, morale and maintenance of the equipment. How military capabilities translate into security is a matter of grand strategy.

In particular, there may be more effective means of maintaining security than military means. In 1946 France had been invaded by Germany three times in the previous three quarters of a century. France could have constructed another Maginot Line to protect itself, as it did between the World Wars. Instead France tried to create such economic interdependence that war would be impossible. This was initially done through the Iron and Steel Community and subsequently through the Common Market and the EU. However, to be on the safe side, during the Cold War, France did keep some of its nuclear missiles targeted on Germany.

In principle, this input–output structure provides a way of determining the defence budget by thinking forward, deciding where you want to be, and reasoning back, deciding how to get there. In principle national powers should look at the threats to their security and what they can afford; calculate the military capabilities required to deter or defend against those threats; establish the forces necessary to provide those capabilities; and match the cost of those forces to the available budget. This is the basis for what is called the Program, Planning and Budgeting System (PPBS), developed in the US in the 1960s and widely used. The Program is designed to provide the capability to match the threat; the plans specify the forces required to do this; and the budget provides estimates of the cost of those forces. Budgeting is discussed in more detail in Chapter 4.

In practice, although the formal process reflects this command and control structure, actual defence budgeting is rarely done in this way. This sort of calculation is done on a small scale when deciding to acquire particular types of system. Then investment appraisal is combined with operational analysis of the effectiveness of alternative force structures to determine the costs and benefits of alternative solutions. In the UK this process is called combined operational effectiveness and investment appraisal (COEIA); David Kirkpatrick (1996) describes the process. But this sort of process cannot be applied to the whole budget. This is partly because the calculations are too difficult and partly because decisions are not made in this way. The calculations are difficult because of the uncertainties in all the links in the chain from budgets to security and the fallibility of any forecasting process. For instance, it can be difficult to judge the extent to which the threat can be countered by the use of military capability. In *The Utility of Force*, General Sir Rupert Smith (2005) examines the use of military force to achieve one's purpose. The book attracted a lot of attention and his scepticism about the current effectiveness of military power led to it being labelled by some as 'the futility of force'. Some threats can be deterred by military preparations,

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others cannot. He also points out an important difference in the use of our two central motivators, fear and greed, through the use of threats or bribes. Threats are expensive when they fail, bribes are expensive when they succeed (p. 384).

In addition to the difficulty of these calculations, actual defence budgeting cannot be done in this way because there is no single national decision maker, no unitary rational actor, to attempt these calculations. Any society is a mixture of different groups with various identities and possibly antagonistic interests. They compete within an arena established by a set of standard operating procedures that establish the rules of the game. These rules or institutions may be constitutional check and balances and the rule of law, if it exists, but they may also reflect the procedures of the military and civil bureaucracy. In bureaucracies it is often said that where you stand on an issue depends on where you sit: the organisation you belong to. These standard operating procedures are not immutable but it may take much effort, even for an autocrat, to change them. The state is not a monolithic institution and the identities of the groups competing for control may be defined by their class or relation to means of production; their religion; their ethnicity; or their beliefs about particular issues such as the environment. There may be an elite, or ruling, class, which shares common interests, but its members are not homogeneous and their personal interests or values may conflict with their class interests. To implement the policies that promote their interests the ruling class have to operate through institutions and even the most autocratic dictators can have difficulty implementing their wishes.

Decisions are the product of various groups – political, military, industrial and bureaucratic – with their own interests and often conflicting objectives operating in a fluid system of institutions. These institutions and groups provide the transmission mechanism by which perceptions of threats and affordability are turned into decisions. This transmission mechanism reflects industrial and political interests, pork-barrel politics as elected representatives try to get military facilities in their constituencies, inter-service rivalry and various bureaucratic forces. The exact form of this institutional transmission mechanism is society specific. Who matters in different countries can be quite different. For instance, unlike most legislatures, the US Congress has great power over the details of the military budget: determining whether a particular piece of equipment is produced or not or whether a particular military base is closed or not.

In most countries there is inter-service rivalry between the army, navy and air force. This rivalry is partly for roles and resources. For instance

in the 1950s, the US army, navy and air force, each fought to have their own nuclear weapons. Another example is a long dispute between the Italian air force and navy. A Mussolini law of 1926 gave the air force exclusive aviation rights, even though Italian military aviation had been pioneered by naval Lieutenant Mario Calderara. Despite defeats in World War II attributable to absence of aircraft carrier capability, the air force monopoly of fixed winged aircraft was maintained. In the 1950s naval pilots who flew two US-supplied Curtiss SC-2 Helldiver planes onto Italian soil were arrested and the planes mothballed. It was declared that 'everything that flies is Air Force property.' There was some co-operation between the services, such as in anti-submarine warfare, but over 30 years the two services devoted huge resources to lobbying on this issue. The navy acquired an aircraft carrier, despite being unable to put fixed-wing aircraft on it. Eventually in 1989 the navy was allowed aircraft, subject to a convoluted compromise retaining air force prerogatives. Monopolies, like the air force monopoly over aircraft, create excess profits, which need not be measured in money. Economists call these excess profits rents; and it is worth individuals or organisations, like the armed services, to invest in obtaining those rents. This 'rent-seeking' behaviour can absorb a lot of resources to no productive effect.

Thinking about the optimum solutions may be revealing in certain circumstances, particularly in revealing mistakes; but the limitations of optimisation and the importance of institutions must also be recognised. We will alternate between the two approaches, depending on which seems most useful for the purpose at hand.

At some points we will treat the state as an optimising rational actor and at others as an arena of conflict constrained by standard operating procedures.

### **Militarism**

Military and society are closely linked. Society provides the resources for the military and the military have to respond to social trends, for instance in attitudes to gays, women and discipline. Conversely society may also be influenced by the military. The term militarism is usually used to describe the adoption of military values and symbols by the wider society. The military influence might involve an emphasis on an external or internal threat, justifying military expenditures and large arms industry; bellicose foreign policies and repressive internal security measures; the widespread use of uniforms and military ceremonial and procedures; or government by the military. The range of these examples

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indicates that militarism is not a single phenomenon, but describes various ways the military can influence society. At one extreme the whole society may be dedicated to the production of soldiers, like classical Sparta; at the other extreme the soldiers may merely provide ceremonial for public holidays.

The military values of patriotism, discipline, self-sacrifice and respect for tradition can be made part of an ideology which is used for other purposes. The values can be used to promote social solidarity and cohesion, encouraging people to unite against a common enemy. Such unity may be designed to over-ride conflicts of class, gender or ethnicity and mobilise the nation to serve some higher objective. In the face of domestic discontent or industrial unrest governments may be tempted to indulge in foreign adventures to divert attention from domestic disputes. Liberals traditionally ascribed militarism to the aristocracy, socialists ascribed it to the capitalists; but it can permeate whole societies, particularly when linked to deep nationalist feelings. Michael Howard (1981) says:

At the dawn of the twentieth century Europe was a very bellicose, very militarist society, and the inflated spirit of patriotism and xenophobia which fuelled an alarmingly intensive arms race could not be laid at the old aristocracy. It was no less virulent among those 'industrious classes' which Saint-Simon and his successors had expected to propagate the spirit of peace.

Militarism may be dysfunctional, particularly when military styles are ineffective for more general economic and social purposes. The fact that different styles may be effective for different purposes is illustrated by the often unhappy relations between scientists and military during World War II, for instance in the Manhattan Project, constructing the atomic bomb. Soviet society was highly militarised at great cost to its economy. Military involvement in government may not only be damaging to the economy, but may make the military ineffective in combat as their goals are switched from military objectives to domestic politics. Military governments have a poor record of winning wars. Even in maintaining internal order, the military style may not be effective and most societies draw a strong distinction between military and police activities, with quite different modes of operation. Similarly, most military counter-insurgency strategies recognise that the military contribution is a small, though necessary, part of the package of measures required.

**Economic concepts**

Just as the military approach to running the economy may be ineffective, the economic approach to running the military may be ineffective. Edward N. Luttwak (1985) attacks the materialist bias in much military planning, which comes from the economic approach. In his chapter 'Why we need more fraud, waste and mismanagement in the Pentagon' (p. 139), he says

But when it comes to material power, the relationship between material inputs and desired outputs is not proportional; it is in fact very loose, because the making of military strength is dominated by the nonmaterial, quite intangible human factors, from the quality of national military strategy to the fighting morale of individual servicemen.

He also says (p. 133): 'The trouble is that the outputs that count in war are very particular and very different from the outputs that count in peacetime and when civilian notions of efficiency are applied, the difference is routinely overlooked.' Despite the fact that Luttwak's criticism of the mechanical application of material targets is correct, the economic approach can still be useful, if applied carefully, with due respect for the intangibles. This section reviews some economic concepts, which can be useful in a military context.

**Marginal analysis**

Economics emphasises marginal analysis: the effects of small changes, a little more or a little less. Adam Smith noted that water was essential to life but very cheap, while diamonds are inessential but expensive. What determines their relative prices is not their relative value, but the relative cost of obtaining the last unit. The marginal cost of obtaining another glass of water is normally rather small, that of obtaining another diamond rather large. Some may argue that defence is so important, like water, that we should spend whatever is required. But what matters is the margin. When the defence budget is optimised, the marginal security benefit (the extra security got by a little more military spending) is equal to its marginal opportunity cost (benefits lost by that military spending not going to alternative uses, such as lower taxes or more government spending on health or education). Opportunity costs, resources used for one purpose are not available for other purposes, and equalising marginal costs and marginal benefits are central to economics. Marginal

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costs are additional costs, so the marginal cost of the Iraq War after the invasion of 2003 is different from the total cost. Much of the troops and equipment used in the war would have existed anyway, even without Iraq. Thus the marginal cost is the extra expenditure that would not have been incurred had the war not been fought.

Whether one measures marginal or total costs is one of the reasons that there have been disputes about the costs of the Iraq War. Donald Rumsfeld, then US defense secretary, initially estimated the cost as \$50–60 billion; Bilmes and Stiglitz (2008) estimated it as \$3000 billion. In the UK at the time of the invasion the Blair government ‘prudently’ allowed for £1 billion to cover the costs, but by 2008 the UK had already spent about £9 billion. Differences in estimates also arise because of the time period over which the costs are measured (over a year, over the period since the invasion) and what is included in the costs. In addition to the direct costs in Iraq, one may or may not include such things as: replacement military equipment; extra interest on the national debt; the risk premium added to the oil price; the future costs of medical care for those wounded; and imputed values of human lives for those killed.

Marginal analysis cannot be used where the idea of a little more or a little less is not applicable, because there are sharp breaks. Economists refer to such breaks as indivisibilities or discontinuities. For instance, it rarely makes sense to speak of being a little more dead, or a little less dead; you are either dead or not. However, averaging can make marginal analysis useful even here. Considering a large number of people, one can analyse the small changes in the probability of death that result from particular expenditures to estimate their marginal benefits.

There is a useful piece of marginal analysis, originally due to Ricardo in the early 19th century. Imagine a city, set in a fertile basin surrounded by mountains. The land close to the city is the most productive and fertility falls as you move further out. The price of food will be equal to the cost of production on the least fertile fields farmed, the marginal land. The cost of production will include the food and subsistence for those who work the land and any necessary investment such as the seed for the crops. If the price of food was higher it would be worth extending the area farmed, workers could move to unused land. If the price was lower, the marginal farms would not cover their costs and go out of business.

This equality of the price of food and the cost of production on the marginal land is called an equilibrium condition. In economics, equilibrium is a situation where nobody has any incentive to change their behaviour. An example is lines at supermarket checkouts; in equilibrium

they are all about the same length. If they were not, people would move to the shorter lines, until lines were once more the same length. In equilibrium, people are indifferent about which line they join, since they are all about the same length. The equilibrium need not be efficient. A single line with people going to the next available checkout may be quicker, but there is no mechanism for people to move to that alternative arrangement without some form of organisation. Notice that the equilibrium does not determine the length of the lines, it just says that they are equal. Nor does it make sense to ask which of the lines determines their length, they just equalise. Similarly it does not make sense to ask whether price determines cost of production on the marginal land or vice versa, they just equalise by people moving. The time it takes to move to equilibrium, the speed of adjustment, varies. People move between supermarket lines quickly, they move between farms more slowly.

If the price of food is equal to the cost of production on the marginal land, price will be higher than the cost of production on the more fertile land. The owners of the more fertile land can extract the difference, the surplus over the cost of production, as rent. Since the right to extract the surplus is valuable, people will invest resources in trying to acquire this right, by force if necessary; though this aspect of the model rarely makes the economics text books. The rights may be acquired in various ways, including driving the peasants off their common land, or by imposing restrictions on the ability of the workers to move. While profitable for individuals, this rent-seeking behaviour may be unproductive for society as a whole. It is costly, absorbing resources, but does not add to the total amount produced, just redistributes it. While often unproductive, such conflicts over the ownership of land and control of other rents are common and often violent.

## **Rents**

Economists have extended the term rents from just land to any surplus of price over the cost of production. The term rent-seeking is used for attempts to control this surplus. Rents can be the product of state actions which restrict supply. By imposing tariffs that stop foreign competition, the state can raise the profitability of domestic industry. It then pays domestic firms to invest in advertising, lobbying or bribing politicians to get tariffs imposed. Even within a democracy, this may be effective, since the few firms who each benefit a lot are better able to organise than the large number of consumers who each lose a little. Tariffs are not always harmful; protection may allow the domestic industry to

attain the critical size for efficient production that allows it to compete effectively on the world market. Such protection was crucial in the early stages of industrialisation of the US, Germany and Japan. Economists know this as the 'infant industry' argument and while recognising its force, many are sceptical about the ability of the state to distinguish real infant industries from rent-seeking geriatrics.

The argument that rent-seeking conflicts over ownership are unproductive rests on the assumption that the form of ownership, the allocation of property rights, does not influence the total amount produced. The Coase (1960) Theorem shows that if there are no transactions costs, then unrestricted trade in property rights and resources can achieve an efficient allocation, regardless of the initial allocation of property rights. Whether the workers or the landlords owned the land, one would get the same outcome in terms of food produced and hours worked. It is a striking theoretical result, but it depends on a very strong assumption, no transaction costs that restrict free exchange; so its empirical relevance is questionable. Often economic transactions are governed more by the assumptions of Machiavelli, 'a prince never lacks legitimate reasons to break his promises' than the assumptions of Coase, where trade can be trusted. In practice, changes of ownership, such as after wars or land reforms, do have major effects on productivity. The enclosures in Britain drove the peasants off the common lands, but the enclosed land produced more. Cramer (2007, p. 281) argues that economic development is often an unintended consequence of violent conflict. War can influence the amount of wealth available for investment, change social and political organisation, and provoke technological and institutional innovation. It is important to emphasise that these are unintended consequences. The fact that development may follow a war is not a reason to conclude that the desire for development was a cause of war. Marx called this process, by which a ruling class can generate development by investing the surplus expropriated from peasants or workers, primitive accumulation.

### **Substitution**

The economic approach emphasises opportunity costs, what you give up by taking an action, and the need to compare expected marginal costs and benefits of an action. It also emphasises substitution; if the costs of one alternative rises decision makers will tend to substitute another alternative. When increased airport security raised the cost of hijacking aircraft, terrorists substituted other tactics, including bombing. The Irish Republican Army (IRA) was quite efficient at substituting targets

in the light of incentives, moving from military targets in Northern Ireland to targets on the mainland. The first mainland targets were civilian, such as pub bombings; then political, they killed Airey Neave, a leading Conservative MP, and got close to killing two prime-ministers, Mrs Thatcher in the Brighton hotel bombing and Mr Major when they mortared Downing Street, the Prime Minister's residence. Finally, they switched to high value financial targets like the Baltic Exchange and Canary Wharf. Nuclear and conventional weapons can be substitutes: the rising costs of conventional defence provide incentives to switch to cheaper nuclear substitutes. Brauer and van Tuyl (2008) discuss such substitution in the case of French nuclear forces. As income grows you may be able to afford more of both the substitute goods, more conventional and more nuclear weapons. Two goods are substitutes if raising the price of one causes you to increase your demand for the other. Two goods are complements if raising the price of one causes you to reduce your demand for the other. Guns and ammunition are complements: reduced demand for guns reduces demand for ammunition.

A particularly important form of substitution is between the present and the future. The extent to which you are willing to substitute short-term gains now for longer-term benefits in the future is central to much military and security analysis. This is described in terms of a discount rate. If you will give up \$100 now for \$110 in the future, this is a 10 per cent discount rate, the \$110 in the future is discounted to a present value of only \$100 now. The extent to which you discount the future partly depends on how uncertain it is. If you prefer a bird in the hand to two in the bush, you discount the two because of the uncertainty of catching them. We return to uncertainty.

### Returns to inputs

Often each extra unit gives a smaller return. When you are thirsty, the satisfaction from the first glass of water is very large, but the satisfaction from subsequent glasses declines; there are decreasing or diminishing returns. Suppose you are selecting targets for a nuclear attack, and are targeting the enemy's society, called a counter-value strike. You select the most valuable target first, such as their leadership, then sequentially less valuable targets for each subsequent missile. Thus there are decreasing returns to nuclear missiles in counter-value targeting. Given the vast numbers of nuclear warheads in the US arsenal, it was difficult to find enough meaningful targets for them in the Single Integrated Operation Plan (SIOP) that controlled nuclear deployment. Decreasing returns are not universal and there can be increasing returns, each extra

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unit generates a greater reward. The coexistence of both positive and negative returns to increasing inputs is reflected in English proverbs. With increasing returns, 'extra hands make light work'; with decreasing returns, 'too many cooks spoil the broth'. To return to nuclear war, suppose you aim not at the enemy's society, as in a counter-value strike, but at its nuclear missiles in a counter-force strike. The objectives are different. A counter-value strike tries to maximise mega-deaths in the enemy country, a counter-force strike tries to minimise mega-deaths in your own country. The first missiles you launch provide little benefit. You destroy a few enemy missiles, but there are still more than enough left for a retaliatory strike that will completely annihilate your society. As you fire more missiles, the benefit increases, because there are fewer enemy missiles left to inflict retaliatory damage on you. Once you have reached the point where you can destroy all the enemy missiles, decreasing returns set in again; there is nothing left for your missiles to destroy.

There are two related economic concepts which sometimes get confused: returns to scale (more output or more missiles fired) and returns to one of the inputs (more labour, holding output constant; or better accuracy, holding the number of missiles fired constant). The effectiveness of each missile depends on a number of inputs such as its payload (the number of warheads and the destructiveness of each) and accuracy (usually measured by circular error probable (CEP)). Returns to inputs and returns to scale can be different. There may be decreasing returns to scale, each extra missile fired does less damage; but increasing returns to an input, each improvement in accuracy causes more damage. Esoteric calculations of this sort were common during the Cold War.

Earlier it was noted that economic power and political power were fungible, one could be transformed into another, but that the marginal rate of transformation, how much extra power you get for an extra bit of spending, was not constant. This exchange rate between power and money will depend on all the links in our chain: what military forces money can buy; the capability those forces provide; and the effectiveness of military capability in achieving your goals. There are also likely to be diminishing returns; initially some political power can be bought quite cheaply, but the more power you obtain the more it threatens others and the more expensive it gets to buy off resistance. The UK in the 19th century and the US in the 20th century used their considerable economic power to gain political leverage which allowed them to organise the international system, but the more powerful they became the more resistance they provoked. In the 21st century, China and other countries

which acquired large international currency reserves, through running balance of payments surpluses, could use these reserves through Sovereign Wealth Funds to support political goals. For instance, China used its money to persuade other countries not to recognise Taiwan. Such use faces trade-offs: how much profit on foreign investments are you willing to sacrifice to meet your political objectives?

Brauer and van Tuyl (2008) argue that these economic concepts can illuminate many episodes of military history. They illustrate this with the role of opportunity costs in the choice between castles and standing armies in mediaeval Europe; the role of contracting issues in the private sector provision by the mercenary Condottieri in the renaissance; the role of marginal cost-benefit analysis in the decision by generals to offer battle in the 18th century; the role of asymmetric information during the American Civil War; the role of diminishing returns in strategic bombing during World War II; and the role of capital-labour substitution in the development of a French nuclear capability during the Cold War.

### **Public goods**

Military preparations are usually, but not always, the preserve of governments. In most countries, individuals do not provide for their own defence against their country being invaded. They do protect themselves against local threats, by fitting locks and hiring private security firms, but not national threats. Defence is usually publicly provided, but in economics, the term public good has a more specific meaning. A public good is one where nobody can be excluded from consuming it and there is non-rivalry in consumption: if one person consumes a public good the ability of others to consume the good is not reduced. Since private producers of a public good cannot exclude people from consuming it, they cannot charge for it, so have no incentive to provide it. If the government provides it, welfare is maximised if the sum of the marginal benefits (often called marginal rates of substitution between public and private goods) over all consumers equals the marginal cost of production (often called marginal rate of transformation). There is a practical difficulty in applying this condition, since it requires determining each consumer's marginal benefits. Even if the consumers knew what these benefits were, they may have no incentive to report them truthfully, since governments could tax them on those benefits. Sometimes surveys of stated preferences are used to determine benefits. For instance, people are asked how much they would be willing to pay, for instance in extra airport taxes, for protection of aircraft against shoulder-launched

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surface-to-air missiles. Such protection is not a pure public good; those who refuse to pay can be excluded.

Defence is usually given as the example of a public good, but this is not clear. One might distinguish between defence, protection when attacked, and deterrence, discouraging attack through strength. Pure deterrence may well be a public good, since the expenditure deters enemies from attacking, everyone benefits and nobody can be excluded from that benefit. Protection from attack may not be a public good. The Spitfires that were defending airfields during the Battle of Britain were not defending London, so there was rivalry in consumption. There is also the problem that many of the benefits of the defence budget may be private benefits that accrue to those that determine it. The military spending may be motivated as much by the benefit that the elite gets from protecting themselves from attack by the people as by protecting the people from attack by outsiders. In calculating marginal benefits, strategic responses must be taken into account. If the defence spending provokes an antagonist to match that spending, the extra spending may not provide any extra security; the marginal benefit of the military expenditure is zero.

When there are reasonably free markets, the marginal benefits and costs of goods and services can be usually be approximated by their prices. This is not necessarily the case when there are public goods or restrictions on the prices, either from monopolies or from government regulations. Markets may also fail to allocate efficiently when individual choices, and thus market prices, do not reflect all benefits and costs. In such cases there are said to be externalities: benefits or costs that are imposed on others. When someone is vaccinated there is a positive externality. Not only are they less likely to get the disease, a private benefit, but they are also less likely to infect others with the disease, a public benefit. When cost-minimising firms cause pollution, they impose a negative externality on others. Externalities, like public goods, are cases where markets fail to allocate efficiently. Cases of market failure may justify government intervention, such as subsidised vaccination or regulations on pollution. However, the danger of government failure may be as great as the danger of market failure; the outcome after government intervention may be worse than no intervention at all. In some cases government regulations are introduced to benefit particular groups; there are then incentives for rent-seeking groups to pressure or bribe governments to introduce regulations that benefit them.

Calculating the benefits of military preparations involves identifying the possible threats, their likelihood and how military preparations

would reduce them. Some might argue that the most likely security threats, such as global warming, pandemics and terrorism, are not amenable to a military solution. This would suggest a defence budget of zero, like Costa Rica or Iceland. Others might argue that while there are no obvious military threats, one never knows what may happen, so it is sensible to maintain a military as an insurance policy. Then it is a question of what is a sensible insurance premium: how much is enough? This question, which is considered in Chapter 4, involves a judgement fraught with uncertainty.

### Uncertainty

Given that society has decided to maintain a military as an insurance policy, the military have to decide what risks to prepare for. This requires identifying the threats that have the highest probability or impact in terms of their potential consequences. It is impossible to prepare against all risks, since preparations are expensive; so priorities are essential. But to establish priorities requires predicting risks and this is fraught with difficulties in both the economic and strategic spheres. Furthermore, if the preparations are effective and deter the threat, then the preparations seem unnecessary since no threat materialised. The threats that materialise tend to be the unexpected ones, against which no preparations were made.

As Carl von Clausewitz emphasised, chance plays a central role in war and the outcomes of conflict are unpredictable. If one side was completely confident that it was going to be massively defeated it probably would not fight. An exception is where the group wants to establish a reputation for fighting to the death against impossible odds, which might be useful in future conflicts, to the group if not the individuals who die. In practice one can never be completely confident about the outcome: what appears inevitable after the event, may look very uncertain before it. Given the centrality of chance in military affairs, we need to analyse uncertainty.

The large role of chance in war tempts us to ask unanswerable 'what if?' questions. To illustrate the role of such uncertainties, consider the small, well documented, war between the UK and Argentina over the Falkland/Malvinas islands in 1982. The islands, 300 miles off the Argentine coast were held by Britain, though their ownership had always been disputed. Argentina invaded the islands on 2 April 1982 and established a large garrison. The British despatched a task force to the South Atlantic, which landed at San Carlos on 21 May, recaptured the

islands and accepted the surrender of the Argentine forces on 14 June. From one perspective it can be presented as the inevitable victory by the professional armed forces of a major Western power, in a small colonial war against third world troops, led by a vainglorious and incompetent military Junta, trying to establish domestic political legitimacy by foreign adventures. From another perspective, it was a dangerous gamble by a bellicose British Prime Minister, Mrs Thatcher, which, against all the odds, paid off and where failure would have had major international repercussions.

Argentina is unusual in going from a developed economy in the 19th century to a developing one in the 20th century. In 1913 Argentina had a per capita income of \$3797, close to that of Britain, \$4921, when Britain was at the height of its power. In 1973, after a long period of relative decline Britain had a per-capita income of \$12025, Argentine only \$7962 (Maddison, 2007). Argentina had potentially effective armed forces that were well equipped, had operational experience in internal counter-insurgency and were trained for a possible war with Chile. The Argentine air force destroyed six British ships and damaged ten others. One of the ships destroyed was the Atlantic Conveyor carrying the Chinook helicopters on which the British plan of advance depended. The Parachute Regiment and the Marines were able to advance on foot. While it seemed anachronistic in an age of mechanised high-technology warfare to insist that Paras and Marines spent much of their training carrying heavy loads over boggy mountains in Wales, this paid off in the Falklands. Other units, like the Guards, who could not walk had to be shipped by sea suffering heavy losses from the Argentine air force at Bluff Cove.

To illustrate the role of chance, consider some things that, had they been a little different, might have changed the outcome. Had Argentina delayed the invasion by 9 months, as had originally been intended, Britain probably could not have sent a task force. Most of the ships and landing craft used in the task force would have been scrapped or withdrawn from service under the 1981 John Nott Defence Review. The delay would have also allowed Argentina to take delivery of more French Exocet missiles, which did such damage to British ships. The Reagan administration was split between supporting UK or Argentina, though eventually it backed Britain. Had it not, the UK would have lacked essential satellite intelligence and the AIM9L Sidewinder air-to-air missiles. These were rapidly purchased from the US and fitted to Harrier jets. Without Sidewinders, the Harriers could not have destroyed so many Argentine aircraft. Argentina sent poorly

trained conscripts to the Falklands, keeping its elite units on the borders with Chile, fearing that Chile would exploit the situation to attack. The elite troops would have made the British task more difficult. Had Argentina extended the airport at Port Stanley to take fast jets, the Argentine air force would not have had to fly 300 miles before engaging the British, giving them more flexibility and forcing the task force to change their deployment. British losses of shipping would have been much heavier had Argentina mined the approaches to San Carlos Water, where the British landed, or correctly fused their bombs dropped. Many of the bombs that hit British ships did not explode or went straight through the ship. Had the Argentine Navy not retreated into port after the sinking of the cruiser, *The General Belgrano*, or used their submarines more aggressively, they could have restricted the task force. Had the Argentine garrison held out for a few weeks longer, for instance by counter-attacking and disrupting the British advance rather than staying behind defensive lines around Port Stanley, the British ships, which were already suffering from the prolonged campaign, could not have stayed on station any longer and would have been withdrawn.

The British also made mistakes. The attack on Goose Green and Darwin was a diversion from the main thrust on Stanley, to establish an early win for morale and political purposes. Contrary to the British expectations, the settlements were heavily defended and the battle went on for almost 3 days, delaying the main advance. The casualties included the commanding officer of the Para battalion. Had the war gone badly for the British and there been a danger of their losing the whole task force, it is not clear how they would have responded. Many of the ships in the task force had been on exercises before being diverted to the South Atlantic and some were still carrying nuclear weapons which could not be offloaded before they went south. All these issues are contentious and there are good reasons for some of the Argentine decisions. Had they postponed the invasion, the Junta may have been swept from power much earlier, instead of being deposed after the defeat. Chile might have invaded, had the elite troops been moved to the Falklands. Basing fighters at Port Stanley was not just a matter of extending the runway but providing the considerable infrastructure required to equip and maintain fast jets. The logistics of the conflict played a central role on both sides. These examples are primarily intended to emphasise the uncertainties of war, the impossibility of forecasting, the imponderables involved in any calculation and how things might have turned out differently.

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Going back to the more general issues of uncertainty, humanity seems to have evolved with a set of decision-making rules, often called heuristics, which while effective in evolutionary terms, leave blind-spots about dealing with uncertainty and probabilities. Generally there tends to be some reluctance to believe in the importance of chance, instead people think that there must be some pattern or reason behind the outcomes. In areas where chance reigns supreme, such as sports, war or dangerous occupations, people tend to become superstitious, attributing importance to magical actions, or lucky pieces of clothing. This is despite the fact that it is said to be very unlucky to be superstitious.

When thinking about chance, it can be useful to distinguish three different types of uncertainty. With mild uncertainty, which economists often call risk, one can not only identify the possible outcomes or future states of the world, when tossed a coin may come up heads or tails, but also attach probabilities to them, heads has a probability of a half. This is typical of most gambling situations, such as horse races or casinos. With more fundamental uncertainty, which economists sometimes call Knightian uncertainty after Frank Knight, an American economist, one can identify the future possible outcomes, but not assign probabilities to them. When a coin is tossed, the possibilities are still either heads or tails, but you suspect that the coin is biased, so cannot attach a probability to heads. With a more extreme, but rather common, form of uncertainty one is not able to list all the possibilities let alone assign probabilities to them. Economists sometimes refer to this as unawareness and Nassim Nicholas Taleb (2007) calls it wild uncertainty. Military matters often involve such extreme uncertainties, what US Defense Secretary Donald Rumsfeld called 'unknown unknowns', things you don't even know you don't know about.

Probability is a late branch of mathematics. There does not seem to be any conception of probabilities as things that might be calculated before about 1650. During the 19th century probability was widely employed in science, but a proper axiomatic foundation for probability theory was only established in the early 1930s by the Russian mathematician Kolmogorov. Even now there is no agreement on what probabilities are. There are two broad interpretations, which go back to the origins of probability in the 17th century. On one view probabilities reflect relative frequencies, on the other they reflect degrees of belief.

The relative frequency approach measures probabilities as proportions. These are calculated from the number of occurrences of an event, such as the proportion of tossed coins that come up heads. So the probability of being killed when flying is calculated by counting the number

of people killed in air crashes and dividing that by the distance travelled by air passengers. For the US this is about 0.1 deaths per billion passenger kilometres travelled. One can do the same thing for travel by road and one gets about 2.6 deaths per billion passenger kilometres, 26 times higher. After 9/11 many Americans chose to drive rather than fly and in the subsequent year road deaths rose by about 1600. This was reported in *New Scientist*, 30 August 2008 and prompted correspondence about the interpretation of this choice. This may have been because 9/11 changed their estimates of the probabilities; people expected more attacks on aircraft. However, people do seem to fear flying more than driving, despite the probabilities suggesting flying is much safer. This may be because of salience, air crashes get more publicity than car crashes; because of circumstances, people feel they have more control when driving; or because of preferences, people would rather die on their own, as is usual in a car crash, rather than with lots of other people, as is usual in a plane crash. What matters in choices, such as between flying and driving, are expected values, which depend both on the probabilities of the various outcomes and the consequences of those outcomes.

For many uncertain events, such as nuclear war, there are too few historical observations to estimate the probabilities by relative frequencies. The estimates are then based on some degree of belief informed by potentially relevant causal factors. The *Bulletin of Atomic Scientists* has a clock on the front cover showing the number of minutes to midnight, midnight being nuclear war. This is based on an assessment of the danger by experts. To illustrate how such probabilities might be used, consider a simplified version of the Cold War question of nuclear disarmament. It was generally thought that there were three possible outcomes or future states of the world: cold, red or dead. Cold was the maintenance of the Cold War pattern of armed confrontation; red was Soviet dominance and dead was nuclear annihilation. A fourth outcome, that the Soviet Union would peacefully disappear, was rarely included as a possible future state of the world. One then tried to compare the probability of each outcome, with and without nuclear weapons. For instance, if the West did not have nuclear weapons the probability of being red might be thought higher and the probability of being dead lower. But calculating the probabilities does not provide an answer; one also has to value the three outcomes: the perceived cost or value attached to being cold, red or dead. It is not clear what units you would use to express those relative values, but the quality adjusted life years (QALYs), used in medical cost-benefit calculations, might be a

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possibility. The expected value of nuclear weapons to the West is then the sum over the values attached to each outcome (cold, red or dead) multiplied by the probability of that outcome, given that the West has nuclear weapons. This can then be compared to the expected value without nuclear weapons. There is clearly scope for differences of opinion about the inputs to this calculation.

There are markets for certain sorts of uncertainties, which establish a price for risk. This price might be an insurance premium which provides cover against certain events, such as your house burning down; it might be a futures or forward market, which allows you to buy or sell a commodity for delivery in the future at a fixed price, irrespective of what happens; it might be a spread, the difference between the percentage return you can earn on a risky asset and on a safe asset; or it might be the odds on a horse winning a race quoted by a bookmaker. These prices provide information on risks. If you wanted to know whether the risk of piracy off the Horn of Africa had changed, you could consult Somali specialists and naval officers or you could look at ship insurance rates. Markets do not always get prices right and it is widely believed that markets systematically under-priced risk, prior to the credit crunch of August 2007. Markets are also supposed to pass risk to those best able to absorb it: risk specialists such as investment bankers, insurance companies and bookmakers. The risk specialists can absorb risk because they diversify; because they are specialists in calculating probabilities; and because they may also be able to influence the risk: early fire insurance companies helped establish fire brigades. The diversification benefits arise because insurance companies can pool over many risks, relying on the fact that not every house will burn down at the same time. The benefits of pooling depend on the risks being independent. If the risks are correlated, lots of disasters happening together as is common in crises, this undermines the benefits of diversification.

While in theory risk should be passed to those best able to absorb it, there is a danger that the risk will be packaged by financial engineers to pass it to those who are least able to understand it. In the case of the credit crunch it appears that those who least understood the risks were not the usual victims, uniformed consumers, but the large investment banks and insurance companies. All five of the large US investment banks had disappeared by September 2008. Bear Stearns, Lehman Brothers and Merrill Lynch failed and were taken over; Morgan Stanley and Goldman Sachs retreated to the safety of being regulated retail banks. The largest US insurance company, AIG, also had to be bailed out.

Even with mild uncertainty, when probabilities can be attached to events, people seem bad at judging risks and calculating the probabilities. Gerd Gigerenzer (2002) gives a range of examples, mainly drawn from health and medicine, of how people, including physicians, routinely make mistakes about judging risks and probabilities. He suggests various ways to avoid such mistakes. With wild uncertainty it is still more difficult; not only can you not calculate probabilities you cannot even imagine the events that might occur. Taleb (2004, 2007) argues for the importance of the highly improbable, calling such events Black Swans, the title of his 2007 book. Before Europeans went to Australia, every swan they had seen was white; they could not imagine black swans. Taleb was fortunate in the timing of his book. *Black Swans* was published in April 2007 just before the credit crunch of summer 2007. This nicely illustrated the type of improbable events he had in mind, including the first run on an English bank since the Overend-Gurney crisis of 1866.

Consider a simple example, where the probabilities often seem to surprise people. This example is usually given in terms of screening for a disease, but consider screening for spies. Suppose you run an intelligence agency and discover, through your own spies in the opposition agency, that you have been infiltrated and that the opposition estimate that they have recruited 1 per cent of your employees as agents. Suppose that there were procedures, such as some sort of future lie detector, to screen your employees and these were 99 per cent accurate: only 1 per cent of foreign agents escape detection and only 1 per cent of loyal employees are falsely accused. You undertake the screening process and identify the suspects. What proportion of the suspects are actually foreign agents? A common guess is 99 per cent, but in fact only half of the suspects are likely to be agents. To see why that is the case, follow one of Gigerenzer's suggestions and work with numbers rather than percentages. Suppose the agency has 100,000 employees, the opposition has recruited 1 per cent of them: 1000 employees are agents. Of those 1000 agents screening will identify 99 per cent of them correctly, 990 suspects. However, of the 99,000 loyal employees, screening will also wrongly identify 1 per cent of them as suspects, another 990 people; the same as the number of actual agents identified. So of the 1980 identified suspects, only half, 990, are real spies.

Whether such screening is worthwhile depends on the benefits of identifying agents (the programme identifies all but 10 of them) relative to the costs to morale, and to the individuals concerned, of wrongly identifying loyal employees as agents. In reality, life is more

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complicated. You are unlikely to know the actual proportion of agents or the accuracy of the screening and real screening methods are far less effective than 99 per cent. This is even better than the rates claimed, but not widely accepted, for possible future methods like functional magnetic resonance imaging (fMRI) brain scans. In addition, making an intelligence agency paranoid about its employees is an effective way of incapacitating it. So the information obtained from the opposition about their recruitment may have been fed to you to cause disruption. Had there been no foreign agents, the information about infiltration was false, your screening would have wrongly identified 1000 suspects (1 per cent of 100,000) and you would have thought that you had identified all the imaginary spies.

While reality is more complicated, the example is merely to illustrate that, even in simple cases, guesses about probabilities can be wrong. Economists sometimes argue that people will not make systematic errors of this type; because if they did, industries would grow up to make money from these errors and that the victims would learn from this, thus eliminating systematic errors. Part of the argument seems right. Large industries, such as gambling and advertising, have grown up to make money exploiting people's systematic mistakes. But the conclusion that such mistakes will be eliminated seems optimistic.

A common problem is to distinguish random fluctuations from systematic trends or patterns in a set of observations. Taking terms from communications technology the random part is often called the noise, the systematic part the signal. As the signal to noise ratio in the observations rises (less interference on the telephone), it is easier to distinguish the signal or message. Deception often relies on increasing the noise, so that the enemy finds it difficult to determine the signal. Before D-Day in World War II, considerable effort was put into creating information (noise) that suggested to the Germans that attacks would be made on Norway and the Pas de Calais. This was to swamp the signal, any indications that the attack would be in Normandy. The noise here included dummy units, with plywood tanks, located close to the launch point for an invasion of the Pas de Calais. Information supplied through double agents and extensive radio traffic reinforced the impression that these were active units.

Even with purely random noise it can be difficult to separate the signal from the noise. Random fluctuations tend to cancel out over time allowing one to determine the underlying message by averaging. In training, there tends to be an average trend improvement in performance, with fluctuations around that average: people do a bit better

or worse but with a tendency to return to the average trend. A range of studies indicate that rewarding good performance leads to a faster trend improvement than punishing bad performance. However, experienced military trainers dismiss such theories as liberal sentimentality. They know that if they shout at recruits when they do badly, they do better next time; while when they praise them for doing well, they do worse next time. This is exactly the pattern one would expect with random fluctuations around a trend. A particularly good performance is likely to be luck, with a return to the average at the next attempt, similarly with the bad performance. Praise or blame does not stop that return to average but may have different effects on the trend improvement.

It is sometimes useful to distinguish what are called exogenous risks, determined outside of the system, from endogenous risks, which result from the operation of the system itself. Risks like the storms that caused D-Day to be postponed during World War II are exogenous; one can prepare for them, to provide protection against their consequences, but one cannot influence them. Risks like the storms that arise from man-made, climate change are endogenous; one can not only prepare against them but also influence the probability of them happening. In war many risks are endogenous, arising from actions by you that the enemy can exploit. Recognising uncertainty is crucial; certainties that do not correspond to reality, the things you think you know but are not so, can be very dangerous.

Big unexpected shocks, crises that come like storms out of a blue sky, are characteristic of both economics and the military. In economics they appear most often as financial crises, like the credit crunch starting in August 2007. Such economic crises can also have major political and strategic consequences. The book by Charles P. Kindleberger (2000) *Manias, Panics, and Crashes* provides a history of such crises and their economic effects. In their paper, 'This Time Is Different', Reinhart and Rogoff (2008) provide a panoramic view of eight centuries of financial crises. 'This Time Is Different' is what is usually said in the boom preceding financial crises. In international relations, crises like World War I, the Cuban Missile crisis and the collapse of the Soviet Union can also appear out of a blue sky.

### **Economic–security interactions**

For some of the time, the spheres of money and power operate separately in their own manner; but at other times, particularly in times of crisis, they interact strongly. Military crises or wars may disrupt trade,

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production and financial flows. Economic crises may undermine the legitimacy of governments, as in Germany between the Wars. Since World War II, the UK has had a series of major defence reviews: Sandys in 1957, Healey in 1966, Labour in mid-1970s, Nott in 1982, Options for Change in 1991 and the Strategic Defence Review of 1997. It was not strategic reconsideration that drove these reviews; they were each driven by economic crises that meant that the UK could no longer afford its old defence policy.

Development of the currently rich countries is rooted in war. Their states were often forged in internal war like the British and American civil wars and the French Revolution or in the many international wars. Development was kick-started by protectionist tariffs; industrialisation was linked to deforestation, pollution and exploitation of natural resources; there was expropriation of large parts of the population: peasant enclosures in the UK, elimination of native Americans in the US. The unpleasant characteristics of the development of the rich countries are often forgotten. Poor countries have a case in accusing the rich countries of adopting a 'do what we say rather than what we did' when the rich condemn their civil wars, protection, environmental degradation, massacres and expropriation. But such unpleasant policies are not always effective routes to development, as many failed states illustrate.

On the British industrial revolution, Clark, O'Rourke and Taylor (2008) comment that 'The magnitude, scale and transforming power of the Industrial Revolution lay in its unification of technological advance with the military power that generated easy British access to the markets of Europe, the Americas, the Near East and the Far East.' They argue that success in trade in the mercantilist world of the 18th century was not just a product of comparative advantage, but of comparative advantage married to the musket and the cannon, globalisation with gunboats. Much of the state's legal and fiscal capacity, the ability to enforce contracts and raise taxes, have their origins in war; where the state is seen as representing a common interest, fighting an external enemy.

These are macroeconomic issues, the economic performance of whole economies, but microeconomics, the interaction of supply and demand in markets for particular goods, can also illuminate security issues. The illicit trade in drugs and firearms is an important security issue and prices can be a sensitive indicator of the success of supply side measures by governments to eradicate the trade. The failure of the war on drugs in most countries is clearly signalled by the falling prices of illegal drugs. Although rarely emphasised by champions of free markets, the vitality and flexibility of trade in illegal products is evidence of the

power of markets. Economists tend to be biased against making products illegal, partly because all the profits from meeting illegal demand go to criminals, whose use of those profits tends to have adverse social effects.

A particularly interesting price for economic–security interactions is the price of money to governments: how much it costs them to borrow. This is measured by the yield lenders get paid on government bonds. Governments usually have to borrow during wars and war financing is discussed in more detail in Chapter 8. If government expenditure is greater than government revenue, the government runs a deficit which it must finance. One source of finance is the sale of government bonds. In return for the loan, the government promises to pay the bondholder an amount each year (the coupon) by way of interest. These bonds are then traded on financial markets and the yield or rate of interest (the amount the government pays each year divided by the price of the bond) reflects how much it costs the government to borrow. Wars tend to generate large deficits both because of the higher military expenditure and because they disrupt trade, reducing tax revenues. Large deficits increase the cost of borrowing, because the government must offer a higher yield to attract more savers willing to buy the bonds. Should the government lose the war, it is unlikely to be able to pay interest or repay what it borrowed; so the interest rate or yield has to be higher to compensate lenders for incurring this default risk. Financial markets are forward looking, so even the threat of war, with the danger of future deficits or default, will push up yields.

Niall Ferguson (2006) examines bond yields for the great powers (UK, France, Germany, Russia and Austria) between 1845 and 1914. Political risks and the threat of war are not the only things determining bond yields, fears of inflation and returns on alternative investments also matter; but he finds that, between 1845 and 1880, war or the threat of war pushed up the yields on the government bonds of the great powers. He looks for the big jumps in weekly data on yields and comments (p. 81): ‘Once again it is remarkable that the biggest short-run jumps in yields occurred on dates that mean more to the political historian than the economic historian.’

The evidence indicates that Victorian financial markets were a sensitive indicator of political tensions. The puzzle is that in the run-up to World War I, an event traditionally seen as heralded by repeated international crises, bond yields hardly moved. He says (p. 85):

Indeed, until the assassination of the Archduke Franz Ferdinand on 28 June 1914, events in the Balkans coincided with falls in

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both Russian and Austrian bond yields. These events may have been important to diplomats. They have certainly been important to historians. They do not seem to have been very important to investors.

Keynes also did not believe that there would be a war and made investments which bet against a war. Ferguson concludes (p. 102):

Yet even to the financially sophisticated, as far as can be judged by the financial press, the First World War came as a surprise. Like an earthquake on a densely populated fault line, its victims had long known that it was a possibility, and how dire its consequences would be; but its timing remained impossible to predict, and therefore beyond the realm of normal risk assessment.

The argument that World War I came as a bolt from the blue remains controversial. The military, on both sides, had been preparing detailed mobilisation plans for such a war and their rigid mobilisation timetables contributed to making war inevitable. However, the military always plan for possible wars, even when they do not expect them to happen; ideally the planning should deter war. During the Cold War, the US and Soviets had detailed plans for nuclear war, but it did not happen. Whatever the controversies, Ferguson's basic point remains valid. Detailed examination of financial markets can be illuminating about strategic assessments, providing an opinion poll of how people (or at least rich bond holders) perceived the future.

The integration of economy and strategy is central to post conflict reconstruction. During the World War II there had been intense discussions among the allies, and a major conference at Bretton Woods, to construct a blueprint for a new post-war order that would avoid the economic dislocation of the inter-war years. In the event there was a US security guarantee for Europe leading to NATO; a new set of international institutions (UN, World Bank, IMF and General Agreement on Tariffs and Trade (GATT)); the Bretton Woods monetary and exchange rate system; and US economic aid through the Marshall Plan. These all contributed to reconstruction and the creation of a new capitalist economic and security order particularly, but not only, in Western Europe and Japan. All the elements of this post-war settlement were controversial. There had been an alternative Morgenthau plan, which would have tried to de-industrialise Germany and turn it into a pastoral agrarian economy that could no longer threaten the world. This was rejected. It

was not only Keynes, who was deeply involved in these negotiations, who was well aware of the damage that the vindictive peace after World War I had done to international stability.

With the end of the Cold War, more opportunities for intervention in civil wars arose and considerable effort was put into conflict resolution and reconstruction. But post-conflict situations are fragile and civil wars often resume. To reduce the risk of conflict resuming, one needs both to provide security and to boost the economy. Higher income and higher growth reduce the risk of conflict restarting. These may be contradictory. Interventions that boost economic development may increase the risk of conflict and vice versa. For instance, an autocratic government may reduce the risk of civil war restarting; but an autocratic government that terrifies people into peace is unlikely to promote economic development. Higher military expenditure after the conflict seems to increase the risk of the conflict resuming, since it signals an intention that the government is likely to renege on any peace agreement reducing its credibility (Collier, Hoeffler and Soderbom 2008).

In reconstructing societies after civil wars, or invasions like Afghanistan and Iraq, there are usually three transitions involved: from war to peace, to a different political structure and to a new form of economic operation. To make these transitions requires demilitarisation, political transformation and economic incentives that stabilise the situation and stop conflict breaking out again. Along with demobilisation, disarmament and economic reconstruction, post-war adjustment may require transformation in the role of the armed forces: security sector reform. Outside intervention may help these transitions and we return to peacekeeping in Chapter 7. Managing these transitions can be difficult: much of the population may have access to weapons, the issues that caused the conflict may not have been resolved and some of the participants in the conflict may have only reluctantly agreed to a ceasefire.

A classic example of reconstruction is in the Confederate States after the US Civil War. Some would argue that this was not completed until a century later when the federal government again sent troops into the south to enforce desegregation. Reconstruction could have been even more difficult. This example and a range of other historical 'what ifs?' are given in Cowley (1999). In April 1865, at the end of the war, the Confederate General Robert E. Lee was surrounded by Grant at Appomattox Virginia. Lee's subordinate, General Porter Alexander, suggested that the army scatter with their weapons and continue a guerrilla war. Lee rejected this and surrendered his whole army, making the classic wild

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west a little less wild. Of course, many ex-soldiers, like Jesse James of Missouri, became outlaws using their military skills to rob trains and banks, but there was not organised guerrilla war. The tendency for people to carry pistols and rifles, a feature of all classic westerns, was largely a post-civil war phenomenon in the US. A major source of alternative employment for demobilised troops was the construction of the railroad across the US. Stephen E. Ambrose (2000) notes that the men who built the Union Pacific Railway were mainly young ex-soldiers from both the Union and Confederate armies. The construction of the railroads also relied on experience in finance, organisation and logistics acquired during the war. Working on the railroad, or moving to frontier farms in the West, provided a relatively attractive alternative to organised violence.

The issue of dealing with the widespread ownership of guns after a civil war also involves some economic calculations. Let us assume that, unlike the US case, the post-war government thinks that widespread possession of guns is a bad thing. To reduce the stock of guns, it has to make the value of surrendering them greater than the value of retaining them. The value of retaining them will be influenced by people's expectations about how useful the gun may be in the future, what economists call an option value. The value of surrendering the gun will be determined by the price of guns. The government can make the price negative: possession of guns is made illegal and anyone caught with one is punished. To the person holding the gun, this price is the probability of being detected with the gun times the punishment on being detected. So unless the government can make the probability of detection high, this policy may not be effective. Offsetting a low probability of detection with a very harsh punishment may not work if the very harsh punishment is not credible: people think it unlikely that the government would actually implement such a harsh punishment. The government can make the price zero, essentially ignoring the issue. It can offer a positive price, people who hand in guns get paid for them and the guns are destroyed. This can take a large number of guns out of circulation and have social benefits which are much greater than the cost of the guns to the government. But the price offered must not be too high. In particular it has to be less than the cost of acquiring new guns, for instance from the illegal international market. Otherwise there is an incentive to buy extra guns to hand in and collect the money. This is a profitable activity which provides a source of finance and does not reduce the stock of guns. There is also a quality issue. People have an incentive to sell the bad, old or unreliable guns to the government and retain the good ones. It may be that the option value of retaining the gun is greater than

the cost of acquiring new guns; so there is no market-clearing positive price that the government can offer. Calculating these values and costs is not easy.

Similar issues arise with policy towards the cultivation of illegal drugs such as coca, the base for cocaine, and poppies, the base for heroin. Alternative policies include: trying to eradicate the crops, for instance by spraying, which may drive the farmers to support the insurgents; trying to provide alternative crops which provide an equivalent income; buying the drug crops to stop them getting onto the illegal market, which may encourage the farmers to plant more; or reducing demand to lower price and the incentive to plant the crops.

The pace and nature of change in the spheres of economics and strategy is quite different. In economics change tends to be fast and continuous, in contrast to political change which tends to be slower and more discrete. Economic change is marked by volatility and financial crises. Financial crises and macroeconomic shocks are common. Over the past 150 years the probability of a macroeconomic disaster, a fall in GDP of over 10 per cent, is around 3.5 per cent a year, with an average size of 22 per cent and an average duration of about 3.5 years. Many of these are associated with wars or global recessions, such as the 29 per cent fall in US GDP between 1929 and 1933. The volatility of economic variables, like the price of oil, has political consequences, particularly on large oil exporters or importers. The price of oil can influence perceptions of the success of economic management and the political competence of a government. In 1998, when Russia under Boris Yeltsin defaulted on its debts and allowed the rouble to devalue, the price of oil was about \$12 a barrel. A decade later in summer 2008 when Prime Minister Putin and President Medvedev began their double act, the price of oil almost touched \$150 a barrel. Since 20 per cent of Russia's production and 60 per cent of its exports are accounted for by oil and gas, the price of oil has a large effect on Russian revenues. It is estimated that Russia requires the price of oil to be above \$70 a barrel to balance its budget; well above the oil price of late 2008.

Crises and commodity price fluctuations can have immediate short-term political effects, but the political effects of long-term economic trends can be much slower. One may recognise unsustainable economic trends, but it can be almost impossible to predict their political consequences. Such was the case with the Soviet Union, where the adverse trends were evident from the late 1970s in falling life expectancy and worsening economic performance. But the political adjustments were not predictable. Similarly the first decade of the 21st century was marked

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by what economists called 'global imbalances', unsustainable financial flows. The primary feature was the pattern by which the US lived beyond its economic means, running a large balance of payments deficit financed by foreigners, primarily China, at very low interest rates. The US was fortunate; the interest rates it paid on its borrowings was much less than the return it got on its assets abroad. The US moved very rapidly from being the world's largest net creditor, its assets overseas being much larger than its liabilities, the amount it owed to foreigners, to being the world's largest debtor. Countries cannot continually increase their debts without prospect of repayment and what cannot go on forever, will not go on forever. But the economic and political adjustments that will restore balance are largely unpredictable.

As Ferguson's quote above indicated, the strategic sphere is more like plate tectonics: tensions build up, often as a consequence of economic pressures, but nothing happens; the system is locked in stasis. Then there is an earthquake, a rapid and extreme adjustment which upsets the system. Often these geopolitical earthquakes are associated with major wars, but not always; the collapse of the Soviet Union did not cause a major war, though it left various conflicts. Like real earthquakes, geopolitical earthquakes are hard to forecast.