



Picking Winners:
How UK industrial policy ensured the success of
the aerospace and automobile industries

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Introduction

A cloud hangs over contemporary discussions of industrial policy. That the UK needs some sort of activist industrial strategy to 'rebalance' the economy along several dimensions is widely accepted. Yet there is also much trepidation because it is widely believed that industrial policy efforts of the past failed almost uniformly. The very term 'Industrial policy' is often associated with the waste and inefficiency of the post-war British settlement which saw its death knell during Margaret Thatcher's premiership. When George Osborne talked of a new industrial policy at the Conservative Party Conference, he was keen to use the term 'modern industrial policy', presumably to distinguish contemporary efforts with those of past failures. However, our historical memory is too stark and selective. The UK's industrial policy record contains real success stories. Mrs Thatcher's government in particular made effective use of industrial policy in certain sectors. The purpose of this paper is to draw attention to some of these successes. It focuses mainly on the aerospace sector with attention also being paid to the UK car industry.

It is divided into three parts. Section one lays out the theoretical case for industrial policy: why a country's comparative strength in a particular sector does not arise spontaneously but, more often than not, is facilitated by government intervention. These interventions have to be proactive, consisting of not just 'horizontal' policies that try to be sector-neutral, such as investments in basic infrastructure or general education, but also include 'vertical' interventions targeting particular sectors. Industrial policy is not a choice. Governments have to do it, whether they admit to it or not. The second section focuses on the UK Aerospace sector, the country's most successful manufacturing sector. The UK's comparative advantage in this sector has been built up through a wide variety of government efforts. This section documents how the government was an entrepreneurial actor in the post-war period, designing and investing in new planes; how subsidies and industrial co-ordination by Mrs Thatcher's government were integral to the establishment of Airbus in the UK; and how Rolls-Royce benefited from extensive state subsidies while under public ownership and protection from stock market short-termism through the institution of a golden share following privatisation.

The third section focuses on the British car industry and British Leyland. The 1965 creation of the firm as a 'national champion' in car manufacturing is rightly remembered as a mistake and a failure. Yet, insufficient attention is given to the crucial intervention of the Labour government in 1975 when it nationalised the struggling company. Had it been allowed to go bust, Britain would not have a viable car industry today. Subsequent state aid, especially by Mrs Thatcher's government, and the

impact of competition through the subsidised entry of Japanese companies laid the foundation for the car industry that we have today.

Section One: Why Industrial Policy?

The inevitability of industrial policy: why Governments must 'pick winners'

Why is one country more successful in producing and selling a particular good or service on the world market than another? Or, to put it in economic terms, how does a country gain a comparative advantage in a given sector? One answer is provided by laissez-faire economists such as Milton Friedman. Comparative advantage is revealed by the unhindered operation of the free market. The only tasks of government are the provision of the rule of law and a minimal range of public goods. Otherwise it should get out of the way. The free market will reveal which goods or services a country is most efficient at producing. However, the renowned development economist Dani Rodrik points out a difficulty with this argument. In his influential TV documentary, entitled *Free to Choose*, Milton Friedman held up a pencil to illustrate the power of markets. It took the coordination of many people from across the world to produce a pencil. Different people with different skills were needed to mine the graphite, cut the wood, assemble the components, transport the finished pencils, and so on. Friedman emphasised that all this complicated coordination occurred purely through the price mechanism without any central planning.

Yet, argues Rodrik, his vision missed out the crucial role of the state in creating the institutional prerequisites of markets. Milton Friedman would struggle to explain why China has come to dominate the pencil market. There are better sources of graphite in South Korea and Mexico, of wood in Indonesia and Brazil, and also better technology in Germany and the United States. The reason why China has a comparative advantage in pencil production is the initial investments in technology and labour by Chinese state-owned firms, government provision of cheap finance, tariff protection of domestic producers, lax forest management policies to keep wood cheap and generous export subsidies.¹ In other words, comparative advantage in a given sector is a mixture of innovative private entrepreneurship and public action. All markets are in some sense 'mixed'. If state action is the institutional prerequisite of well-functioning markets, then governments have no choice but to try and 'pick winners' in the economy. Many critics of the industrial policy refer to the seemingly spontaneous dynamism of the US economy as proof of the benefits of unfettered free markets. However, as we shall see in the next section, the US government has been very active in fashioning comparative advantages for American firms in a variety of sectors.

Active interventionism in the United States

The United States has a strong interventionist tradition dating back to the economic thought of founding father Alexander Hamilton. This has always sat uneasily with the laissez-faire tradition that has been more dominant in US political culture, especially in recent years. Nevertheless, the country has had a very interventionist, 'developmental' state throughout the twentieth century; but one which has also stayed largely hidden due to this tension.² In the three decades following the Second World War, interventionist efforts were hidden under the moniker of defence spending. Two-thirds of US R&D spending came from the government over this period. Vernon Ruttan has documented how these military research efforts were critical to the creation of commercially exploitable innovations in aerospace, information technology, computing and other high-tech industries.³

In the 1960s and 1970s a reorientation of US industrial policy began. The crucial public agency here was the Advanced Research Projects Agency (ARPA), which was created after the 1957 Soviet success with Sputnik and was designed to put America at the fore of the technology frontier. It proved very successful. The finance it provided to various computer science departments at major universities was responsible for many of the technologies that became incorporated into the personal computer. The internet itself began as an ARPA project in the late 1960s. What was most notable about the organisation was its model. It was staffed by expert technologists with significant funds and considerable autonomy as to their allocation; it was proactive in identifying technological objectives that needed to be met; its activities 'went well beyond research funding' while it was also prepared to pull the plug when funding did not produce results; and it funded networks of researchers encompassing university-based personnel, start-ups, established firms and consortia.⁴

ARPA was the inspiration for the plethora of new institutions and measures created in the 1980s, ranging from the Small Business Technology Transfer Program (SBTTR), to the collaborative initiatives between federal laboratories and private firms to commercialise research, to the Bayh-Dole Act of 1980 encouraging closer collaboration between universities and business. Block argues that these measures amount to the creation of a 'Developmental Network State', which continues to this day.⁵ By this he means that American industrial policy has been so decentralised as to be hidden from view. Research activity is not coordinated centrally through a handful of large-scale Federal programmes. Instead, it is dispersed across hundreds of organisations, some public, some public-private collaborations and others publicly-funded.

It is important to stress that the role of this research network extends far beyond 'basic research' to providing investment capital and technical expertise to private companies capable of commercialising scientific innovations.⁶ This decentralised and publicly-financed network of researchers has been critical to the development of the ground-breaking technologies used by many of America's leading firms. Google's search algorithm was funded by a grant from the US National Science Foundation. Apple received early stage funding from the Small Business Investment Company (SBIC) programme and its products have incorporated state-funded innovations in GPS, touch-screen and artificial intelligence technologies. Pharmaceutical giants such as GSK and Pfizer have benefited from the massive \$600 billion worth of funding that the US government has invested into the US National Institute of Health.⁷ These are not isolated examples. In 2008, Fred Block and Ian Keller analysed the top 100 innovative, commercial products introduced in the US over the previous 40 years as identified by US-based *R&D Magazine*. They found that fifty of these innovations were made by researchers working in US government laboratories, universities or other public agencies. Thirteen others came from new start-ups that had received considerable federal funding, and another 14 had received public subsidies of some form or another. In short, 89 out of the 100 products had depended on some form of public support.⁸ The American government has 'picked winners' on a *very wide scale*.

The industrial policy tools available to government

If public action or 'industrial policy' is an essential prerequisite to private sector dynamism, then it becomes important to understand the forms it can take. The purpose of this sub-section is to outline a typology of the sorts of interventions a government may undertake when conducting industrial policy. This typology will prove to be illuminating in the second and third sections of this report which analyse the impact of UK government interventions on the aerospace and automotive sectors. The most important role for the state may well be to engage in *Schumpeterian entrepreneurship*.⁹ This is a more precise form of entrepreneurship than the more common one of setting up any kind of business. Schumpeterian entrepreneurship involves radical innovation which leads to new products and business models. It may severely disrupt incumbents and destroy jobs in the short-run but it creates more wealth in the long-run. It leads to what Joseph Schumpeter called 'creative destruction'.

The introduction of disruptive, innovative new technologies, such as the railroads in the past or the internet today, is a prime example of Schumpeterian entrepreneurship. The role of the state is crucial here because these technologies require a very different sort of investor than profit-seeking,

private sector agents. Investment in such innovation is characterised by what the economist Frank Knight calls 'uncertainty', as distinguishable from 'risk'. The difference between the two terms is:

... that in the [case of risk] the distribution of the outcome in a group of instances is known... While in the case of uncertainty that is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique.¹⁰

While one can never be sure of the returns on an investment in an already established sector, it is possible to *quantify the probability* of returns by looking at the outcomes of previous investments in that industry. However, with initial investments in emerging sectors, for which there are no previous investments to act as a reference, one cannot quantify the probability; we have no previous precedent on which to make reliable future predictions. Instead, investing in emerging technologies is characterised by long lead times, a very high ratio of failures to successes, spill-over externalities where the benefits of an investment accrue to parties other than the original investor, and serendipity - where the investment yields a different type of product than the one originally hoped for.

It is for this reason that the economist and former venture capitalist Bill Janeway argues that 'efficiency is the enemy of innovation'. 'Efficiency' in this context being the use of quantifiable returns as the criteria for deciding which projects to invest in. This is, of course, the criteria that the private sector uses. However, as the returns for tomorrow cannot be quantified today, trying to maximise returns today means that returns cannot be maximised the day after tomorrow. It leads to sub-optimal investment. This is where the state comes in, fulfilling the entrepreneurial function that the private sector cannot because it does not invest to maximise quantifiable profit but to improve the wider economy. It does this both as an early stage consumer of the products of innovation and by directly investing in innovation.¹¹ As we shall see below, the UK did not have a civilian aerospace industry at the end of 1942 because it had concentrated on building aerial bombers during the war. Sustained public investment in the design and manufacture of civilian aircraft in the post-war period laid the foundations for the modern aerospace sector.

Even in established industries the state can facilitate investment by underwriting risk and subsidising investment. The aircraft manufacturer Airbus employs 10,000 people in the UK today. Yet Airbus only has a UK presence because Margaret Thatcher's government was prepared to offer BAe plc loans of £700 million in the 1980s so it could make the investments required to build the wings of the Airbus A380. The Japanese car manufacturer Nissan was persuaded to invest in the North-East after Thatcher's government sold it land at a highly discounted rate. After Nissan's investment proved profitable, its Japanese competitors Honda and Toyota followed suit by opening factories in

the UK. The government can correct market coordination failures by *subsidising mutually-supporting investments*. To ensure the UK gained the full benefit of participating in the pan-European Airbus initiative, the Thatcher government not only subsidised BAe's investment in wing manufacturing capability but also subsidised state-owned Rolls-Royce's investment in the IV2500, the engine which has since powered the Airbus A320.

The government can act as an *investor of last resort*. Nationalisation of both Rolls-Royce and British Leyland ensured that crucial capacity and skills were retained which would have been lost had the market been allowed to take its course and liquidate these firms after bankruptcy. Relatedly, it can also provide *institutional protection from the capital market*. Of course, this can sometimes lead to rent-seeking and monopoly, but it can also provide certain firms or sectors with crucial breathing space with which to reorganise or make crucial, long-term investments. In the case of Rolls-Royce, the government's golden share following privatisation protected the company from corporate takeover and the short-termist stock market pressures which led to the demise of Britain's two other industrial giants, ICI and GEC. Before that however, attention will first be turned to government efforts in the UK aerospace industry.

Section Two: The Aerospace Industry

The UK aerospace industry is that all-too-rare thing: a world-beating, advanced manufacturing sector based in Britain. It employs over 100,000 people and generated £24.2 billion worth of revenue in 2011.¹² With a 17 per cent share of the global market, the UK industry is number one in Europe and second only to the United States. Nearly half of the world's large aircraft fly with wings manufactured in the UK, which is also host to the third biggest engine maker in the world in Rolls-Royce Group plc. The UK industry also has key strengths in the manufacture of advanced systems such as landing gear and avionics, and the design and build of advanced helicopters. Nor is aerospace a relative success story like the automobile industry, in which Britain incurs a trade deficit and boasts no major indigenous firms. Seventy-five per cent of the industry's output is exported and with firms like Rolls-Royce, BAE systems and GKN Aerospace, the UK is home to several world-class firms in the sector.

Prospects for the industry globally are positive. It is forecast that nearly 27,000 or \$3.2 trillion worth of new planes will be needed by 2030 and that by 2020 there will be a global market for 9,500 civil helicopters worth \$50 billion a year. The UK is very well positioned to take advantage of this growth due to its established strengths in the industry. The government recognise this and have designated aerospace as one of eleven key sectors they are closely focusing on as part of their industrial strategy. How did the UK develop such a strong aerospace industry, particularly when we have not fared nearly as well in other manufacturing sectors?

The answer lies in the multitude of ways successive British governments have intervened in the sector, utilising the range of industrial policy forms identified above. The purpose of this section is to describe these policies and the subsequent impact they had on the industry. It is divided into three sub-sections. The first outlines the efforts of the Brabazon Committee to kick-start the UK aerospace sector immediately after World War Two. The second focuses on how government subsidies helped ensure Airbus' UK presence and the third looks at the various ways in which public support has been crucial to Rolls-Royce's success.

The Brabazon Committee

The origins and impact of the Brabazon Committee

Britain and the United States had a division of labour in aircraft production during the Second World War with Britain focusing on aerial bombers and the US on transport planes. While it may have been a war time necessity, there was great trepidation about this arrangement within Whitehall. It was becoming quite clear that a market in civilian airline production would take off after the war.

However, it would be the US, with all the capability and experience in producing transport planes that the UK lacked, which would be best placed to take advantage of it. If Britain was going to retain its great power status after the war, then developing a civilian airline capacity, especially to serve the empire, would be crucial.¹³ The Brabazon Committee was formed in 1943 and was headed by Conservative politician and aviation enthusiast, Baron Brabazon of Tara. The Committee's task was to determine what future requirements the British Empire would have of civilian airlines and propose a plan of national action to achieve it. In their final report, published in 1944, they identified the four types of aircraft they deemed the country needed and called for their construction and design. The Committee worked with the state-owned airlines, British Overseas Airways Corporation (BOAC) and British European Airways (BEA) to achieve this.

Looking back on the period, one cannot help but note how unashamedly *dirigiste* the whole enterprise was. It involved a central government department, headed by a Conservative minister no less, predicting the future requirements of a particular sector and working with state-owned industries to help meet them. This was the government trying to 'pick winners' in the most emphatic possible way. It is impossible to imagine a British government of any stripe implementing an equivalent policy today, despite the increased acceptability of industrial policy. The Committee's efforts turned out to be crucial for the later development of British aerospace. It is true that, as we shall see, most of the models were on their own terms economic failures, which may lead some to conclude that the Committee's efforts represent yet another failed instance of 'picking winners'. This would be misleading. The Brabazon Committee was an instance of the British state engaging in Schumpeterian entrepreneurship by investing in an industry of the future. As mentioned above, often the benefits gained from such innovation do not accrue to the original investor and 'inefficiency' today is the source of competitive advantage tomorrow. In the rest of this section, the development and outcome of the Committee's four general designs are explained.

Type One was to be a large transatlantic airline serving routes such as London to New York. The build contract was given to the Bristol Aerospace Company (BAC), which was based in Filton, Bristol, and was an industry pioneer since its founding in 1910. The firm received a £12 million advance from the government and in September 1949 the 'Bristol type 167 Brabazon' successfully completed its maiden flight. Following the Committee's designs, BAC built the largest land-based aircraft in the world with capacity for 100 passengers. It was a luxurious and spacious plane, aimed at wealthy consumers. This, however, would prove to be its Achilles' heel as the plane's high cost and low passenger numbers rendered it uneconomic. It received no orders, not even from the state-owned

airlines BOAC and BEA, and the second prototype never made it off the production line. The future was to belong to commercial travel on a mass scale rather than for the wealthy minority.¹⁴

Nevertheless, the process of building the Type 167 yielded wider benefits. The plane was one of the world's very first attempts at a modern civilian aircraft and as such forced BAC engineers to employ a host of innovations during the manufacturing process. The unprecedented size of the plane meant its outer skin had to be tested to new levels of tolerance, procedures which have since become the norm for aircraft construction. The Type 167 was also the first plane to have fully-powered flying controls, air-conditioning and full cabin pressurisation. The last was a particularly important innovation as it allowed the aircraft to fly at a greater altitude, making the engines more fuel efficient, while simultaneously maintaining a much lower altitude inside the plane for passenger comfort. In many respects, the Type 167 laid down the standards for future aircraft manufacture. BAC also invested extensively in its Filton site to be able to build the plane. The investments in Filton included new hangars and runways to accommodate the size of the plane, and new testing facilities.¹⁵

Type Two was to be a small, short-haul aircraft for UK and Commonwealth domestic services. This was the unambiguous success story of the Brabazon Committee, leading to two successful models of plane. One was the Vickers Viscount produced by Vickers Armstrong. This was the first aircraft to use a 'Turbo-prop' propulsion system in its engine, which continues to be used today in smaller planes. The plane was popular due to its stable pressurisation levels, low levels of noise and large panoramic windows. Four-hundred and forty-five models were sold to customers all over the world, with American clients being especially important, but there were also sales in China, Cuba and Africa. The other was the de Havilland Dove, a small, two-engine commuter aircraft which sold steadily between 1948 and 1967. Five-hundred and forty-two models were produced. Its successors, the HS 125 and the Hawker 850 would be even more successful, the latter selling thousands of units all over the world.¹⁶

Type Three was to be a medium-range aircraft to cover various multi-stop routes across the British Empire. This became the Bristol Type 75 'Britannia', built by BAC using the skills and upgraded facilities they had acquired while building the Bristol Brabazon. This was another landmark plane renowned for its speed, comfort and lack of vibration. It became known as the 'Whispering Giant' because it was so quiet.¹⁷ It was faster than any American aircraft during its maiden voyage in 1952. However, its introduction was beset by delays. When in 1953, three De Havilland 'Comets' mysteriously crashed (see below), the government demanded further, extensive tests on the Britannia. The plane also suffered from engine icing, when parts of the engine became so cold during

flight that they would freeze. Further delays were experienced as this problem was resolved. Unfortunately, when the Type 75 was eventually introduced in 1957, it had fallen behind the curve and failed to compete with the then new Boeing 707. Eighty-five units were built and sold. Canadian aviation expert Peter Pigott has written:

Had the Britannia appeared in 1950, when it was faster than every American aircraft, it would have put the British at the forefront of commercial aviation sales. Now, competing with the Boeing 707, the turboprop airliner had become passé.¹⁸

Type Four was created at the behest of Committee member, Geoffrey de Havilland, whose firm, the de Havilland Aircraft Company, produced the 'Mosquito' combat aircraft that were integral to the British war effort. The model eventually became the Comet, the world's first passenger jet airliner. It was designed and developed by De Havilland at their Broughton factory in Hatfield, Hertfordshire. The use of a jet-engine was a revolutionary step which American manufacturers would later copy with the Douglas DC-8 and the Boeing 707. The jet engine allowed the Comet to fly at 35,000 feet, providing a more comfortable and faster flight and cutting six hours off the flight time from London to New York. It was hailed as a feat of British engineering after its maiden flight in 1952. It looked like Britain had finally made the breakthrough needed to succeed in the civilian airline market. However, disaster was to strike with a series of accidents fatally ruining the plane's reputation. In March 1953 all 11 on board died when a Comet crashed on take-off from Karachi, Pakistan.

This was followed by further crashes in Calcutta, killing 43, and into the Mediterranean, killing 35. Subsequent investigations revealed a critical design flaw of metal fatigue. The plane's structure could not withstand the constant stress of pressurisation at high altitude. All Comets were grounded and a redesigned Comet entered service in 1958, but the plane never recovered from its damaged reputation.¹⁹ However, the plane would later find success in the defence sector. Hawker-Siddeley purchased de Havilland in 1960 and afterwards reworked it into a military transport plane, the Nimrod, which saw service until 2011. In assessing the legacy of the Comet, it is very important to note that Boeing and Douglas learned much from De Havilland's failure with the Comet. Engineers from both companies reportedly told De Havilland privately that they too would not have foreseen the pressurisation problems and would have very likely made the same mistake had they been the first to market with a passenger jet airliner.²⁰ In order to avoid a repeat of the Comet's crashes, they developed various forms of pressurisation testing and created new forms of extra-tough fuselage skins when designing the Douglas DC-8 and the Boeing 707.²¹

Assessing the Brabazon Committee

On the face of it, the Brabazon Committee's efforts were not a great success. Apart from the Type Two models, the Viscount and the Dove, the planes were not as successful as hoped. But this does not mean that there was a *laissez-faire* alternative to creating a successful aircraft industry. The high capital costs, long payback periods and 'Knightian' uncertainty over the returns in this emerging sector precluded that. The US government may have been less overtly *dirigiste* but nevertheless made very significant investments in civilian airline companies under the guise of defence spending. As Vernon Ruttan argues in his provocatively titled paper 'Is War Necessary for Economic Growth':

The U.S. military has been intimately involved in aircraft development since the Army Signal Corps purchased its first plane from the Wright Brothers in 1907.²²

The two principal ways the US government has supported its aerospace industry has been aircraft procurement and aeronautical research funding. Stable defence procurement on the part of the US government played a critical role in the development of Boeing 707 and 747. Boeing began considering the case for a jet airliner in the late 1940s but it felt that initial sales could not justify development costs. This financing issue was only resolved when Boeing won an Air Force contract to build a military jet designed for in-flight refuelling of the B-52 Bomber. That military jet eventually became the Boeing 707. In 1965, Boeing lost to Lockheed an Air Force contract to develop a large military transport. The design they developed for that competition became the Boeing 747, the plane that 'defined technological maturity in the modern commercial jet air transport industry'.²³

The creation of commercial air travel on a mass scale inevitably required Schumpeterian entrepreneurship on the part of the state. British and American governments were competing in this enterprise. The American government won. The US industry would dominate the airline market in the first few decades following the war, until the rise of Airbus. However, the impact of sheer bad luck should not be discounted. Had Boeing been the first to market with a jet-airliner while not knowing about the problem of metal fatigue, the Boeing 707 may have experienced crashes and the reputation damage that the Comet experienced. Then it would have been British manufacturers learning from the trial-and-error of the Americans, and not the other way round. If icing fatigue had not delayed the introduction of the Type-75, then BAC would likely have gained a much stronger foothold in the civilian airline market which Boeing would have found difficult to dislodge.

Moreover, the American victory in the commercial battle for the airline market did not mean the activities of the Brabazon Committee were in vain. They may not have made the taxpayer much of

an immediate return but they laid very important foundations for the development of the industry. It was documented above how BAC's work on the Type-75 and the Type-167 helped modernise the production site at Filton and also upgrade the skills of the workers there. Filton has today become a key industrial cluster for Britain's aerospace industry. Airbus, GKN, BAE systems and Rolls-Royce all have key production sites there. The Comet was built in de Havilland's factory in Broughton, Wales, which is today Airbus' centre of wing excellence. Both of these sites rose to prominence when their firms were servicing military contracts during World War Two. Had there been no continuing sustained public investment following the war through the Brabazon Committee, the loss of military contracts would have very likely meant their closure. It would have also spelt an uncertain future for British companies like Rolls-Royce, Hawker Siddeley and BAC which were given both a stable market and a chance to develop crucial competences by manufacturing these planes and their components.

Public investment in Airbus UK

Today there are two major aircraft manufacturers in the world, US-based Boeing and European-based Airbus. The origins of Airbus lay in the 1960s. As we have seen, it was clear by this time that the Americans had captured the civilian airline market. This was due to several factors: The United States' focus on manufacturing transport planes during the Second World War, the large distances within the country which made air travel the favoured mode of transport, and the sheer scale of the resources a large country like the US could devote to its aerospace sector compared to individual European countries. A collaborative pan-European solution was seen as the way forward and in the mid-1960s, Britain joined France and Germany in negotiating the terms of how such a venture would work. Britain brought to the table its expertise in the design and manufacture of aircraft wings. In 1967, the consortium set about designing the Airbus A300 civilian airliner.

However, Britain left in 1969 after France and Germany signalled they wanted to buy the engine from American firm General Electric rather than Rolls-Royce. Airbus Industrie was formally set up in 1970 and its ownership was split 50-50 between French firm Aerospatiale and German Deutsche Aerospace. Spanish Casa joined the consortium in 1971. Nevertheless, British firm Hawker Siddeley continued to supply the aircraft's wings. The Airbus A300 was launched in the 1972, with limited British involvement. Britain however, formally rejoined the consortium in 1979, the year of Margaret Thatcher's election, with British Aerospace (BAe plc) taking a 20 per cent stake in Airbus. BAe was formed in 1977 through the merger of BAC and Hawker Siddeley.

Today Airbus has a major presence in the UK with 13,000 employees. Its two major sites are Filton where the design and engineering functions are carried out, and Broughton, where the wing

assembly of the Airbus A380 planes take place. Airbus UK itself claims to indirectly support 100,000 jobs in the UK through an extended supply chain of over 400 companies.²⁴ The UK arm has built the wings for all Airbus aircraft since the A300. It has an annual turnover of £1.5 billion and its annual net exports are in excess of £1 billion. The rest of this section details how the success of Airbus UK would have been impossible without public action and investment. The legacy of the Brabazon Committee has already been noted, but equally important were the significant amounts of public investment in the form of the long-running 'launch aid' subsidy scheme.

A good starting point here is Britain's involvement in the successor to the A300 plane, the A320. The industrial policy efforts of Margaret Thatcher's government were crucial.²⁵ The Airbus A320 was in development throughout the early 1980s. The West German, French and Spanish governments had committed \$2 billion to the plane's development. Initially the British government was reluctant to financially commit and the other Airbus partners were prepared to go ahead without Britain's involvement. If Britain was to be involved it would be through the unaided efforts of BAe. Yet the company had already spent around \$20 million dollars on design work and felt that while the project would be profitable eventually, the initial set up costs would be prohibitive for them. They predicted these costs to be \$950 million, which was not a feasible undertaking for a company with profits of \$54 million dollars in 1984 and which, as Britain's premier defence contractor, had other defence-related projects to fund.

So the firm lobbied the government for \$647 million of public funds. Initially Margaret Thatcher was reluctant because any state investment would have seemed to contradict the tenets of her economic philosophy. However, unlike some of her more zealous contemporary acolytes, she was prepared to put ideology aside when it was clear that reliance on market solutions alone would prove to be insufficient. She was persuaded to give the company roughly half (\$370 million) of the amounts asked for. The decision was announced to parliament by Norman Tebbit, then Trade and Industry minister, on 2nd March 1984. It is important to note that Thatcher's support of British involvement with the A300 investment did not just consist of a single ad-hoc decision but involved coordinated action. On the day the BAe loan was announced, Tebbit also announced that the government was providing \$14.8 million to state-owned Rolls-Royce to fund its development of the V2500 engine, which was to power the Airbus A300. Margaret Thatcher also reportedly put the A320 at the top of the agenda in her summit meeting with Francois Mitterand and Helmut Kohl in 1984.

This was not the first sort of development loan given by the British government to an Aerospace firm. The A320 loan was but one instance of the wider policy of 'launch aid' loans provided by successive British governments to the aerospace industry since the mid-1950s. It is important to

note that launch aid is not a subsidy from the state but a direct investment. The government agrees to finance a given proportion of the up-front product and R&D costs of a project in return for a defined levy on subsequent product sales. As Kim Kaivanto puts it in his pioneering paper on the subject: 'Part of the ex-ante uncertainty over ex-post deliveries is thus borne by HMG, thereby allowing the civil aerospace manufacturer to proceed with the initial product R&D expenditure'.²⁶ In other words, Launch aid is a key mechanism by which the government engages in the process of Schumpeterian Entrepreneurship. By 1997, over 660 aircraft had been sold under the A320 programme - an amount sufficient to guarantee full repayment of the £250 million that BAe received. Thatcher's government would also go on to provide a further £450 million worth of launch aid for the A330 and A340 models, putting the total amount of support that she provided for BAe airbus programmes at £700 million. This is a trivial sum compared to Airbus' annual revenue of £1 billion and the economic activity its UK presence generates.

Launch aid was also critical for Rolls-Royce as it developed its pioneering RB211 engine while under state ownership during the 1970s and 1980s – a period analysed further in the sub-section below. One reason for the success of Launch Aid was that it involved discipline. The British governments which used launch aid never provided more than 50 per cent of the set up costs and, on principle, never gave additional funding. This helped ensure that the recipients still bore a significant amount of risk in the investment and did not merely become objects of state largesse. The repayment terms were often tough. For the Airbus A380 loan, £50 million was due to be repaid on a fixed schedule between 1990 and 1992 with the remaining £200 million to be repaid as a levy on sales. While excessive use of cost accounting and market discipline can be a severe drawback in innovation, the use of some discipline in the launch aid schemes may have been a critical factor behind their success. It also shows, crucially, that British governments can employ industrial policy tools while also being disciplined actors in the market. Industrial policy need not turn into open-ended subsidy.

The importance of government assistance to Rolls-Royce's survival and success

Rolls-Royce is the second largest aero-engine maker in the world behind General Electric and provides engines for a wide variety of aircraft, from the Airbus A300 family to personal business jets. The company employs 40,000 people worldwide, makes annual sales of £7.4 billion and invests £2 billion per annum with suppliers.²⁷ It also invests six-to-seven per cent of its revenue on R&D, a significantly higher percentage than the UK average. Unlike many other British manufacturers it has

escaped foreign takeover due to the special institutional protection of a golden share. Rolls-Royce's great success in recent years has been due to the innovative RB211 family of engines that it has developed and produced. Yet the development costs of the first RB211 engine bankrupted the company in 1971 and its survival was ensured only by nationalisation and state support in the form of launch aid.²⁸

Nationalisation, government subsidy and the development of the RB211 engine

Rolls-Royce limited was founded in 1906 by Henry Royce and Charles Rolls and established itself as Britain's most prominent engine maker during the two World Wars. The company produced almost half of the aircraft engines used by the allies in World War One and during World War Two produced over 160,000 Merlin engines. These powered the Hawker Hurricanes and Supermarine Spitfires that helped win the Battle of Britain. Rolls-Royce emerged in the post war period as Britain's premier aero engine maker, but by the 1960s the company realised that it had to break into the American market if it was to secure its future as a global player. It was increasingly clear by then that the Americans were going to dominate the aerospace market and the industry would consolidate. In 1966 Rolls-Royce bought Bristol-Siddeley Engines to become the only British engine manufacturer capable of operating on a global scale. A year earlier the company had begun developing the RB211, a highly innovative turbofan engine which they hoped would help them break into the critically important American market.

The breakthrough came in 1967. Aircraft manufacturer Lockheed agreed to purchase 450 RB211 engines. American airlines TWA and Eastern Airlines were to be the launch customers. The announcement was greeted very warmly in Britain but trouble lay ahead for Rolls-Royce. It faced two problems. Lockheed negotiated very hard, securing a very competitive price and also high compensation in case of late delivery.²⁹ Moreover, the development of a radically innovative engine like the RB211, which was more complex than anything Rolls-Royce had produced before, led to unforeseen delays and development costs. For example, after they failed initial testing, the composite fan blades of the engine had to be replaced with new titanium fan blades. Yet this change added a further 300lb to the engine's already phenomenal weight and so led to further redesign work. The sheer size of the engine also required the construction of new testing facilities. These and other problems led to the progress of the programme being delayed, and it was becoming highly likely that Rolls-Royce would incur late payment penalties. The firm's resources were also put under

strain by other projects it was working on such as the RB207, a larger engine intended for US jumbo jets and Airbus planes.³⁰

The government's initial contribution to the Lockheed deal had been launch aid investment of £47 million. This was in fact 70 per cent of the initial costs, far more than the usual 50 per cent limit and indicative of how important the deal was considered to be for the British Aerospace industry and the wider economy.³¹ However, given all the unexpected costs and delays, this proved to be insufficient. By May 1969, the company's financial position was seriously deteriorating and the company had to ask the British government for further help. Initially the government injected more funds, consisting of a £10 million loan from the Industrial Reorganisation Committee and £42 million more launch aid funding.³² Yet even this proved insufficient and Rolls-Royce went into receivership in 1971. The newly appointed Heath government had come into power promising a policy of disengagement from industrial policy and to support no more 'lame ducks'. Yet they still decided to nationalise Rolls-Royce because it was seen as too important to fail. As the government stated soon after the nationalisation:

To ensure continuity of those activities of Rolls-Royce which are important to our national defence, to our collaborative programmes with other countries and to many air forces and civil airlines all over the world, the Government has decided to acquire such assets of the aero-engine and marine and industrial gas turbine engine divisions of the company as they may be essential for these purposes.³³

There are three points worth noting before looking at how Rolls-Royce fared under nationalisation. Firstly, there was no viable alternative to nationalisation. Liquidation would have meant the loss of the country's premier auto-engine maker and the loss of thousands of jobs. The impact on the UK aerospace industry as a whole would have been severe. Secondly, the investment in the RB211 engine was characterised by just the sort of radical 'Knightian' uncertainty that was described above. Rolls-Royce's difficulty in financing the engine's development costs is a good example of why the private sector alone struggles to finance innovation. The development costs of the RB211 were uncertain because there were no past precedents of similar investments to use as a reference and as a consequence much of the costs were unforeseen. Lockheed was behaving just as one would expect from a profit-maximising company in negotiating for low unit prices and quick delivery times. So too was Rolls-Royce in trying to meet these contractual terms. Yet they simply did not give Rolls-Royce sufficient time or financial resources to embark on an innovative project like the RB211. That is what led to the firm's bankruptcy and the need to turn to the government. Thirdly, one of the principal objections to government investment in the economy is that it 'crowds out' private sector investment. Yet, the problem for Rolls-Royce in this instance was they had insufficient capital to finance both the RB211 and the RB207 engine projects. Similarly, we saw above that BAe had

insufficient capital to fund the Airbus project along with other on-going investments. In both these cases, public investment was not 'crowding out' private investment but filling in a gap.

The whole RB211 programme was almost cancelled after nationalisation. However, the government's mind was changed after a report by veteran Rolls-Royce engineers argued that the project could be successful if it received a cash injection of £120 million. A lengthy renegotiation with Lockheed ensued, involving both the British and the American governments. Under the new agreement Lockheed agreed to higher unit prices for the engine and the development of the RB211 engine continued while under nationalisation.³⁴ The relationship between the government and the Rolls-Royce management was often turbulent, especially when it was put under the control of the National Enterprise Board (NEB) by the Labour government after it came into power in 1974. Yet government support continued. From 1971 to 1979, Rolls-Royce received £425 million in state aid and preferential defence contracts.³⁵

Margaret Thatcher's government came into office in 1979. The development of the RB211 continued with the 1000th unit being produced in 1980. The early 1980s continued to be a difficult period for the company as it was hit hard by a downturn in the aerospace market. There was significant restructuring between 1980 and 1984 when the workforce was cut from 62,000 to 41,000.³⁶ One may have expected the Thatcher government to privatise Rolls-Royce as quickly as possible. This is not what happened. The company was privatised only in 1987. Margaret Thatcher's government continued to support Rolls-Royce with £437 million worth of launch aid between 1979 and 1988.³⁷

By the mid-1980s, Rolls-Royce began to see a substantial reversal in fortunes after the market for turbo-fan engines started to pick up. They started marketing their own engine, the RB211-524D4D, which by then had been developed to very high technical standards, against the equivalent engines produced by GE and Pratt and Whitney. After the lean years of the early 1980s, Rolls-Royce found itself with pre-tax profits of £120 million in 1985 and outstanding orders worth £3.1 billion. It was only after the company had established itself as a viable concern during the profitable years of 1985 and 1986 that the British government would go on to privatise in 1987. The Thatcher government also provided Rolls-Royce with a further £283 million worth of equity capital upon privatisation and retained a golden share in the company. This gave it the right to veto any takeover attempt, whether from home or abroad. As part of this, foreign ownership of Rolls-Royce shares was limited to 15 per cent, though this was later to be challenged by the European Commission and increased to 29.5 per cent in 1989 and then to 49.5 per cent in 1998.³⁸

Rolls-Royce market share of aero-engines was five per cent at the time of privatisation. By only 1990 it reached 20 per cent. The basis of its success was the technological prowess of the RB211 engine.

As Crooks explains:

... the RB211 engine core, whose development costs put the company into receivership, has become the key to its survival and success. Its revolutionary design, using three shafts rather than Pratt and GE's two, has proved so flexible that in successive upgrading since 1971 the engine power has been doubled without incurring the huge expense of significant design changes.

The three-shaft is shorter than two-shaft engines, more rigid and therefore more durable. It wears less in service, preserving its outstanding fuel economy over its full life. Along the way Rolls developed a new, wide fan blade, the "wide-chord" fan, which needs fewer blades to produce the same, or more, power, is quieter and more fuel-efficient than conventional fans.³⁹

Following privatisation, Rolls-Royce underwent a strenuous restructuring in the late 1980s and 1990s. They rationalised their supplier base and shed 20,000 jobs in the 1990s, or a third of their workforce. Inspired by Japanese practices of continuous produce line improvement, they launched Project 2000 in the early 1990s, which identified and removed those areas of the firm's business processes which did not add value. R&D spending was also increased, up to six-to-seven per cent of revenue, much of which was used to maintain the funding of the RB211 engine.⁴⁰

In summary, nationalisation saved Rolls-Royce from bankruptcy. Between 1971 and 1988, state financing worth £862 million in total allowed the company to keep developing its landmark engine which has been the source of its present day success. The company was under government stewardship for 17 years in total. Some may be tempted to argue that Rolls-Royce is just an isolated example and that usually state support and sheltering of a firm over such a time period leads to failure. However, it is not hard to find other examples of governments, in defiance of the market, protecting companies that went on to be successful. The Finnish firm Nokia was an industrial conglomerate before it entered the electronics and communications sector. It started its electronics division in the 1960s and subsidised the loss-making subsidiary also for 17 years until the late 1980s when the firm took advantage of the emerging mobile phone market to become a global giant. Nokia was not state-owned like Rolls-Royce but received substantial government support in other ways as it was Finland's biggest company. For example, during this time the company benefited from a regulated capital market which restricted foreign investments. As ha-Joon Chang puts it:

If Finland had liberalized foreign investment from early on...foreign financial investors who bought into Nokia would have demanded the parent company stop cross-subsidizing the no-hope electronics subsidiary, thus killing off the business.⁴¹

It is also important to note that the government did make a financial return on its investments into Rolls-Royce. Lazonick and Prenciple calculate that from the beginning of the RB211 programme in

the 1960s to privatisation in 1987, the British government provided Rolls-Royce with a net of £833 million in launch aid. They received £1.36 billion in the privatisation.⁴²

The golden share and Rolls-Royce's success since privatisation

The institutional protection of a golden share has been very important to Rolls-Royce's success. This has protected the incumbent management from takeover since privatisation, whether from home or abroad. As a result, it has insulated them from stock market pressure to generate high financial returns in the short-run and allowed them to focus on long-term, value-generating investments. In Britain, the threat of a takeover has traditionally been a key mechanism by which the stock-market disciplines firms which do not generate high financial returns. Investors will sell the shares of companies that are insufficiently profitable. The share price of these companies then falls and they are liable to be taken over by other companies, a process which more often than not leads to the incumbent management losing their jobs. The threat of takeover, combined in recent years with the increasing prevalence of linking management pay to share price performance, has given management an incentive to maximise the share price as much as possible.

The golden share greatly mitigated this pressure on Rolls-Royce's management since the firm's privatisation. Predictably, the firm's performance on the stock market was poor. The average dividend yield between 1988 and 2002 was minus 1.3 per cent. While the average annual real yield, which includes capital gains on shares held, was even worse at minus 3.2 per cent.⁴³ Intriguingly, its economic performance over this period, in terms of capturing market share and employment growth was excellent. Between 1987 and 2002 it raised its market share of the civil engine market from eight per cent to 30 per cent. Many would have predicted that protection from the stock market would have given management insufficient incentive to perform well and led to poor performance. Yet Rolls-Royce has become a world-beater. How may this protection have actually helped the firm to prosper? This question is best answered when we consider the core failing of contemporary equity markets which, as Martin Wolf and others have pointed out, is that they do not encourage proper ownership of firms.⁴⁴ This leads to short-termism.

It has been long observed that the average period of stock market ownership is in decline. Contemporary shareholders are increasingly less interested in patient, long-term value creation and more in short-term speculation. This has been an issue for UK companies which rely much more on the stock market for capital finance than do German, Japanese or even American companies. This may explain why, between 2000 and 2009, the UK's *average* investment share of GDP significantly lagged behind France, Germany and the USA.⁴⁵ Arguably, Rolls-Royce has performed well precisely

because it has been insulated from such short-term pressures. Investment decisions at the company have been controlled by corporate insiders, most of whom are engineers, who have focused on growing the business rather than boosting the stock price. Most of the executive team during the 1990s had spent their careers with the firm, the best example being the famed chief executive Sir Ralph Robins. Joining the firm as an apprentice in 1955, he served on the company board for 20 years until he retired in 2003. The company's rise to prominence following privatisation occurred under his watch. It was said of Sir Ralph: 'his priority is to maintain Rolls as an independent British company. Shareholder value is secondary to him'.⁴⁶ Also, unlike distant shareholders, for whom their holding in Rolls-Royce may have been one of several, the careers of the management depended on the success of the firm because they were salaried employees. Additionally, as Lazonick and Prencipe put it, putting control of investment in the hands of career-managers led to superior investment decisions:

It is career managers, not public shareholders or government bureaucrats, who have the understanding of the technologies, markets, and competitors in a complex-product industry required to make strategic allocation decisions that stand any chance of generating successful outcomes.⁴⁷

It is useful to compare Rolls-Royce with the performance of two other companies, GEC and ICI. At the turn of the 1990s, these three represented Britain's greatest industrial companies. Yet GEC and ICI had no institutional protection from the stock market and their fortunes have turned out to be very different from Rolls-Royce. ICI was created in 1926 when Harry McGowan merged four companies to create what would become Britain's leading industrial chemical company for the rest of the 20th century. At its height the company was so important that the City would come to a halt on its results day. Its production was integral during the Second World War and following the war, heavy capital investment took it to the forefront of the developing chemicals industry. It subsequently grew rapidly by selling chemicals at volume with high margins and generated successive rounds of applied innovations in agricultural chemicals, artificial fibres and new plastic materials. Unlike its large American competitor, Dupont, it successfully transitioned to pharmaceuticals in the post-war period. Its pharmaceutical breakthroughs included bringing the first beta blocker to market.

John Kay argues that up until the early 1990s ICI executives treated the securities market with 'disdain'. Instead, they focused on developing and reinvesting in the business rather than maximising shareholder value. However, there was a culture change in the 1990s after the firm had to fight off a hostile takeover bid by corporate raider Lord Hanson in 1991. The company successfully defended itself against the takeover bid but the incident appeared to change the ethos of the management.

They subsequently reorganised the company and adopted a mergers and acquisitions strategy to maximise shareholder value. The pharmaceutical division was spun off in 1993 to form AstraZeneca. ICI then proceeded to sell its stable but low growth subsidiaries and purchase high growth, emerging businesses to win the approval of the stock markets. Safe to say, this strategy did not prove successful. The company incurred significant losses and write downs on its new investments while incurring £4 billion of debt to fund its acquisition spree. In February 2003, losses forced the company to halve its dividend and the future liabilities of its pension fund exceeded the value of the firm. In 2007, it was purchased by Dutch firm Akzo Nobel for £7.2 billion.⁴⁸

We can see a similar story with GEC. General Electric Company plc was a major industrial conglomerate, focusing on electronics. Like ICI it was integral to British war efforts in the early part of the 20th century. Lord Weinstock became managing director in 1963 and patiently built up the form over the next 33 years such that its revenue had increased from £100 million when he started to £11 billion at the time of his retirement in 1996. He created a conglomerate of stable, 'safe-haven' companies such as Hotpoint, Marconi and Yarrow shipbuilders. His successor Lord Simpson had a different vision. As did the ICI management following Lord Hanson's takeover attempt, Lord Simpson had GEC adopt an aggressive mergers and acquisitions strategy to win the approval of the stock market. In January 1999 the defence business was sold off to British Aerospace (which formed BAE systems). GEC then renamed itself 'Marconi' and, armed with £2.7 billion in cash, embarked upon a debt-fuelled buying spree in the telecoms sector. It all turned sour when the telecoms bubble crashed, with many of the purchased businesses turning out to have little value. On 4th July 2001 the company took the unusual step of asking for its own shares to be suspended. After the stock market had closed for the evening, Lord Simpson announced that profits had halved and that there would be 4,000 job losses on top of 3,000 already previously announced. The next day the company's shares more than halved in value. Lord Simpson and other senior executives were forced to resign over the following months. The company went into liquidation in 2003. The majority of its assets were sold to Ericsson in 2005 and by 2006 it no longer existed.⁴⁹

Section Three: The Automobile Industry

The UK car industry has seen a substantial resurgence in recent years. UK factories built 1.46 million cars in 2012, with a record breaking 1.2 million of these exported.⁵⁰ Though Britain no longer hosts any indigenous high-volume manufacturers, the overseas firms who have invested in the British car industry – such as Tata, Nissan and BMW – appear to be committed for the long term. Six billion pounds of fresh investment has been announced in the last couple years.⁵¹ It is predicted that UK production of cars may almost double to 2.2 million vehicles by 2016.⁵² This would exceed the previous British production record of 1.9 million in 1972. The industry employed a total of 720,000 in 2011.⁵³ Many of these jobs, such as in Nissan’s Sunderland plant, are in parts of the country where private sector job creation is relatively scarce. This all represents a profound turnaround since the 1960s and 1970s when the British car industry was badly failing, beset by antagonistic labour relations, low productivity and poor quality manufactures. The standard narrative is that the British car industry was saved by free-market reforms in the 1980s. There is truth in this but it is far from the whole story, as we shall see below.

The creation and failure of British Leyland Motor Corporation

Britain entered the immediate post-war period as the world’s biggest car maker with landmark brands such as MG Rover, Jaguar and Rolls-Royce Motors. However, by the late 1960s, Britain had been overtaken by the US, France and Germany, all of which had maintained higher rates of investment and better industrial relations.⁵⁴ Harold Wilson’s Labour government was elected in 1964. He famously promised to modernise Britain’s industrial structure using the ‘White Heat of Technology’ and his government would employ a *dirigiste* policy of creating national champions as the means to improve productivity and competitiveness. In 1968, Tony Benn, then head of the government’s Industrial Reorganisation Committee, encouraged the creation of a national car champion. This new firm, British Leyland Motor Corporation (BLMC), was created through the merger of British Motor Holdings (BMH) and the Leyland Motoring Corporation (LMC). Prior to the merger, BMH was close to collapse despite being the home of several marquee British brands, the Mini, Austin, Morris, MG and Jaguar. The Leyland Motor Corporation, on the other hand, was performing rather well on the market, with successful brands such as Triumph and Rover. Lord Stokes, previously head of LMC, was to be the chief executive of the combined entity.

As is remembered all too well, British Leyland would go on to struggle, suffering from terrible labour relations, poor productivity and maybe above all, a bewilderingly complicated and difficult to manage organisational structure. When the company was formed in 1968, it had over 100 divisions and manufactured a vast range of product lines that included not only cars but also items like

refrigerators and construction equipment. There was a serious issue of duplication of car models. Lord Stokes did not pursue a much needed rationalisation strategy but attempted to run the company in the same expansionist manner as he did LMC before it.⁵⁵ Leyland's market share at home fell from 40 per cent in 1971 to 32 in 1973⁵⁶ and its exports more than halved during the 1970s⁵⁷. However, its death knell was sounded by the 1973 oil crisis, which raised its production and debt-servicing costs while reducing its sales.⁵⁸ By 1974 the firm was struggling financially and was forced to go to the government for financial assistance. The government commissioned Sir Don Ryder to write a report on the company. He was optimistic about its future, arguing that it could be a viable operation with sufficient capital investment. The government acted on his recommendations by creating a new holding company, British Leyland Limited which purchased BLMC in 1975 using £2.4bn of public money.

Today, the creation of BLMC in 1968 is seen as an emblematic example of the failure of the British corporatism and the industrial policy efforts of the 1960s and 1970s. Much of this criticism is well placed. The creation of a single, monopolistic 'national champion' in the car industry was misconceived. It reflected a blind faith in size and scale as inevitably being good things and a disregard for the benefits of competition and pluralism. The lesson that should *not* be taken away from the British Leyland debacle, however, is that it is a vindication of a laissez-faire approach. To see why, it is instructive to look at the rise of the Japanese car industry. When Margaret Thatcher reformed the British car industry in the 1980s, she did it by enticing the investment of Japanese companies.

Yet the Japanese took an approach far from laissez-faire in building up their car industry, as development economist Ha-Joon Chang documents. Toyota first entered the car industry in 1933. The Japanese government started protecting it from foreign competition in 1939, when Ford and General Motors were expelled from the country. Toyota designed its first car for export to the US twenty years later in 1959. This model failed and had to be withdrawn. Despite soul-searching at home with some Japanese calling for an end to support of the automobile industry, the government resolved to continue the strategy.⁵⁹ Over the next few decades the Japanese government continued to promote its car industry with selective government contracts, export subsidies and protection from foreign entrants. Of course, today Japan is one of the largest and most competitive car manufacturers in the world with leading companies such as Toyota, Nissan and Honda. In 2012 Toyota took GM's crown as the world's biggest car manufacturer.

There was one key difference between the Japanese approach to its automobile industry and that of the Harold Wilson's Labour government. The Japanese strategy left scope for competition. Between

1945 and 1960 about 30 companies entered the Japanese domestic car market. Only a few survived more than five years.⁶⁰ Firms that did not succeed were allowed to go bust. Contrast this with over-centralised British Leyland and its multitude of divisions which Lord Stokes was intent on expanding rather than rationalising. There was no room in the British strategy for market incentives or the innovations that flow from competition. Yet, as the Japanese example shows, one can combine robust industrial activism with competition and pluralism. Indeed, both are important. Moreover, while the initial creation of British Leyland was a mistake, it is important to remember that nationalisation was the only viable option after the firm had failed in 1975. Private financing was not forthcoming. In July 1974 British Leyland asked for \$1.2 billion from the four major British banks but was refused.⁶¹ At that time it produced a million cars annually, had served over a third of the British car market and employed 200,000 people directly.⁶² The economic impact of letting the firm go into administration would have been very damaging. It was too big to fail.

The restructuring of the British car industry during the 1980s

Hard-headed South African Michael Edwardes took the helm of British Leyland in 1977 and immediately started rationalising the company, laying off 18,000 workers in 18 months, modernising the Longbridge plant, halving the board size and centralising management.⁶³ The company's infamously bad industrial relations also improved after November 1979 when a landmark ballot to strike was thrown out by workers with an overwhelming 14,000 against to 600 in favour.⁶⁴ Nineteen-seventy-nine was also the same year of Margaret Thatcher's election. In Edwardes she had found a potential ally, but he needed more financial support from government if he was to continue the restructuring that British Leyland needed to survive. As with aerospace, Mrs Thatcher was astute enough to realise the limits of the market when it came to the automobile industry. She understood the terrible social and economic impacts of letting Leyland go bust. Her government provided British Leyland with £2.9 billion of taxpayer money from 1979 to 1988.⁶⁵

However, she made this state aid dependent on further rationalisation of the industry. Edwardes delivered with further rationalisation and job cuts. For example, over a third of the 12,000 commercial vehicle workforce was cut in 1982 alone. British Leyland started showing signs of a turnaround in 1980 when the Metro was introduced. This went on to be a highly successful car in the 1980s, selling over a million units. Slowly and cautiously, the government started to break up and privatise British Leyland. Each segment was only sold off when it was felt that it would be a viable private sector operation. Jaguar was privatised in 1984 through an Initial Public Offering (IPO) and was subsequently bought by Ford. The truck and bus divisions were spun-off in 1986 and 1987. The

now renamed and streamlined Rover group was sold to BAe PLC for £150 million, and then sold on to BMW for £800 million in 1994. Today, BMW retains production of the Mini brand in Crowley, Oxfordshire. In 2000, BMW sold the Land Rover group to Ford and the rest of the core manufacturing operation, including the Longbridge plant, was sold to the Phoenix consortium and became MG Rover. In 2008 Ford sold both the Land Rover and Jaguar brands to Tata motors, which continues to produce both brands today.

Automotive expert Garel Rhys argues that government support of British Leyland during the 1980s helped ensure the survival of marquee brands such as Land Rover, Jaguar and Mini.⁶⁶ All these brands were part of British Leyland when it was nationalised. The Land Rover brand, which had seen a continuous increase in sales from the 1950s to the 1970s, had experienced a crisis of declining sales in the 1980s. Sales fell by 21 per cent during the 1980/1981 year alone. It was under the shelter of public ownership that Land Rover reorganised and introduced its landmark 'Defender' series of vehicles, the first of which was released in 1983. These were the first series that Land Rover marketed as sports-utility vehicles. They contained a range of consumer innovations, from radio and cassette players to bike racks. The series sold handsomely and laid the ground work for the 'Discovery' model that was introduced in 1988.

The Land Rover division would be sold to BMW and then to Ford in 2000, ultimately being purchased by Tata Motors. In 2012 it earned revenue of £13.5 billion and a record profit of £1.51 billion.⁶⁷ Jaguar entered the 1980s with an outdated product range and too many employees. Sir John Egan spent three years restructuring the company before privatisation in 1984. Worth £300 million in 1980, the company was worth £1.6 billion when it was sold to Ford in 1989.⁶⁸ It too is now part of the Tata group. The iconic Mini Brand was also declining in popularity with ageing models by the beginning of the 1980s. The last year Mini made the top ten of UK car sales was 1981. Nevertheless production continued in the 1980s. The Mark V was introduced in 1984, the Mark VI in 1990 and the Mark VII in 1996. This kept the brand afloat until it was eventually resuscitated by BMW, with the first of the relaunched Mini series being released in 2008. Over 300,000 Minis were sold in 2012.

However, the government strategy was not limited to funding British Leyland while it restructured. Mrs Thatcher was also keen to introduce competition into the industry, particularly from the Japanese firms that had become dominant players in the sector globally. Edwardes had already started negotiations with Honda with the aim of a collaboration to create a British car with Japanese technology and production methods. The government approved of this initiative and granted Leyland £450 million worth of finance in return.⁶⁹ The collaboration resulted in Leyland's other successful car of the 1980s, the Honda Ballade, which was designed in Japan but made in Britain by

Leyland and sold under the Triumph brand. Mrs Thatcher also persuaded Nissan to make its landmark investment in Sunderland in 1984. She had already visited one of the firm's automated plants in Japan in 1977 and had been highly impressed. By the early 1980s, the ageing chairman of Nissan, Katsuji Kawamata, actually wanted to slow down Nissan's expansionism. But Mrs Thatcher had kept in touch with him since 1977 and visited him in 1982, making the case for investment in Britain.⁷⁰ Nissan agreed to build a plant in Sunderland in February 1984. In order to bring economic activity to an area of high unemployment and secure foreign investment, the UK government sold Nissan greenfield land outside of Sunderland for discounted agricultural prices of £1,800 per acre.⁷¹ This was effectively a subsidy of the investment. Sir Robin Mountfield, the civil servant in charge of the negotiations told the BBC that the deal was:

... one of the few occasions where government intervention has had a beneficial effect at relatively minor cost in improving not only the volume of UK car manufacturing, but setting a sort of gold standard for manufacturing technology right through the engineering sector.⁷²

Today the Sunderland plant is one of the most productive in Europe and has produced over six million cars since production began. Five hundred thousand cars were produced there in 2012 alone.⁷³ Yet its biggest legacy was to establish Britain as a profitable investment location for Japanese firms. Where Nissan would trod, other Japanese companies such as Toyota would follow. And not just in the car industry. By 1989, there were 100 Japanese manufacturers employing 30,000 Britons.⁷⁴ Prior to 1984, large scale investments in Britain would have been too uncertain for Japanese companies in the Knightian sense. Previous investments that Japanese firms had made in their home market could not act as a reference point with which to calculate the risk of investing in the UK because it was a very different market culturally, geographically and institutionally. By underwriting the initial investment by Nissan, which went on to be successful, Margaret Thatcher's government paved the way for further investments by other Japanese firms. It was another instance, albeit in a more background role, of the state engaging in Schumpeterian entrepreneurship.

Conclusion

The failures of Britain's industrial policy record have loomed much larger in the collective memory than the successes. This report has attempted to redress this imbalance by showing how various government interventions have been crucial to the present day success of the automobile and aerospace industries in the UK. Nor are these UK sectors particularly unique. As Dani Rodrik argues, all markets are in some sense a mixture of public action and private initiative. The range of necessary interventions extends beyond 'horizontal' measures of competitive taxation and low regulation to proactive interventions needed to create and sustain markets. In the analysis of the aerospace and automotive sectors, a 'typology' was identified of the various forms these interventions can take. These were: undertaking Schumpeterian entrepreneurship, co-ordinating private sector agents to ensure mutually supporting investments take place, acting as an 'investor of last resort' and providing institutional protection from the capital markets.

In the concluding section, there is scope for some remarks about the lesson for policy-makers from this historical analysis. The main point to convey here is that there should be more ambition in current industrial policy initiatives. As part of its industrial strategy, the government has identified eleven key growth sectors of the future where the UK has a comparative advantage. Both the automotive and aerospace sectors are part of this list. Each sector will have its own government-industry council that will help identify both the constraints to growth in the sector and the government interventions that will help resolve them. The problem is that the scope of these interventions is rather limited, focused on resolving narrowly defined 'market failures'. The aerospace sector council, the Aerospace Growth Partnership, has led to a range of useful measures from greater R&D funding from government to improving domestic supply chains. However there is no scope in the strategy for the sort of large-scale Schumpeterian entrepreneurship that the Brabazon Committee undertook and which laid the groundwork for today's industry. However, as successful entrepreneur and engineer Christopher Simpson shows in a Civitas report, such proactive measures are needed if the UK is to retain its pre-eminent position in the sector.⁷⁵

He observes that the UK industry is going to face major challenges in the upcoming decades. One is the impact of reduced defence spending in the UK and elsewhere and another is the entry of other countries such as China, Japan, Brazil and Canada that are trying to develop their domestic aerospace industries. China in particular has invested heavily in its aerospace industry.⁷⁶ The danger is that greater competition from abroad combined with less defence spending at home will eventually lead to aerospace jobs and production going overseas. Once lost these are very difficult if

not impossible to re-establish. Mr Simpson proposes that the UK government should invest in a single aisle, short-haul aircraft that can carry 200 passengers. His rationale is that the existing aircraft in the industry, the Boeing 737 and the Airbus A320, are decades old and their replacements are not expected until 2025. These planes do not meet the requirements of contemporary, low-cost airlines nor allow the utilisation of the most up-to-date production techniques. The new plane would aim to maintain Britain's place at the forefront of the aerospace industry by overcoming these two limitations. The main obstacle to Simpson's proposal is not economic but political. The Friedmanite idea that comparative advantage results purely from market spontaneity remains strong in government circles.

The UK automotive industry is facing an even more challenging future than UK Aerospace. Despite significant exports, the UK is a net importer of cars with a trade deficit of £1 billion in 2011.⁷⁷ This is because the domestic supply chain in the UK is weak. Karel Williams points out that 35 per cent of the value of UK automotive output is imported.⁷⁸ The UK market is dominated by foreign owned firms and lacks high-volume, indigenous manufacturers such as France's Renault or Germany's BMW. It has been frequently observed that multi-national companies tend to place a disproportionate amount of higher value activities such as R&D in their home market. This may be why R&D in the UK automotive sector has actually lagged behind our competitors. In 2007, the last year for which comparable figures were available, Germany spent €16,100 per employee on R&D, Austria spent €11,900 and France spent €7,900.⁷⁹ In comparison, the UK only spent €7,900. The UK faces the danger of being merely a low-level assembly location in the wider division of labour.

The government cannot create large-scale, indigenous manufacturer by fiat. However, the government can take more steps to improve the domestic supply chain. Shortage of finance is a key problem holding back automotive suppliers, but the government's strategy document for the sector lacks any substantive proposals to remedy this problem.⁸⁰ The government could be much more ambitious here, perhaps by introducing a government finance scheme designed specifically for automotive suppliers. The scheme could be modelled on the 'launch aid' scheme that has been so successful for the aerospace sector. The government could also increase the £1 billion it has already put into producing a low-carbon vehicle.

These suggestions about the aerospace and automotive industries can serve as point marks for wider discussion. The reason we have a successful car and aerospace industry today is that previous governments were proactive in shaping a comparative advantage for Britain in these sectors. This is particularly the case for Margaret Thatcher, whatever else the content of her ideology may have

been. What is required now is a similar ethos, not of 'big' or 'all-knowing' government but bold government, prepared to take the steps necessary today to ensure economic success tomorrow.

¹ Rodrik, D., 'Milton Friedman's Magical Thinking', Project Syndicate, 11th October 2011, available at: <http://www.project-syndicate.org/commentary/milton-friedman-s-magical-thinking>

² The discussion here is much indebted to Fred Block's pioneering paper: Block, F., 'Swimming Against the Current: The Rise of a Hidden Developmental State in the United States', *Politics and Society*, 2008, available at: <http://innovate.ucsb.edu/wp-content/uploads/2010/04/Block-swimming.pdf>

³ Ruttan, V., 'is war necessary for economic growth?', 2006, available at:
http://www.csbsju.edu/Documents/Clemens%20Lecture/HistoricallySpeaking-Issues%20merged%201%2016%2007_2_.pdf

⁴ 'Swimming Against the Current', p7-8.

⁵ IBID, p11-13.

⁶ IBID p6.

⁷ Mazuccato, M. 'Without state spending there'd be no Google or GlaxoSmithKline', *The Guardian*, 2012, available at:

<http://www.theguardian.com/commentisfree/2012/apr/22/without-state-spending-no-google-glaxosmithkline>

⁸ 'Swimming Against the Current', p6.

⁹ The discussion of state entrepreneurship draws greatly on:
Mazuccato, M. *The Entrepreneurial State*, Demos: London, 2011, p49-50, available at:

<http://www.demos.co.uk/publications/theentrepreneurialstate>

¹⁰ Quoted in *The Entrepreneurial State*, p49.

¹¹ Janeway, W.H. *Doing Capitalism in the Innovation Economy: Markets, Speculation and the State*, Cambridge University Press, 2012

¹² The statistics about the industry listed here have been obtained from:

BIS policy paper, 'Reach for the Skies: a Strategic Vision for UK Aerospace', Ref: BIS/12/954, 2012, p3-4, available at: <https://www.gov.uk/government/publications/aerospace-growth-partnership-a-strategic-vision-for-uk-aerospace>

¹³ An excellent history of the Committee is provided by:

Phipp, M. *The Brabazon Committee and British airliners 1945-1960*, Stroud: Tempus, 2007.

¹⁴ Castle, M. 'the plane that flew too soon', February 2008, available at:

<http://www.damninginteresting.com/the-plane-that-flew-too-soon/#more-93>

¹⁵ Aviation Archive website, 'The Bristol Brabazon - Engineering masterpiece or Great White Elephant', available at: <http://www.aviationarchive.org.uk/stories/storycontents.php?enum=GE121>

¹⁶ Comfort, N. *The Slow Death of British Industry: A Sixty-Year Suicide 1952-2012*, Biteback Publishing: London, 2012, p12.

¹⁷ RAF Museum Website, 'Bristol Britannia 312', available at:

<http://www.rafmuseum.org.uk/research/collections/bristol-britannia-312/>

¹⁸ Piggot, P. *On Canadian Wings: A Century of Flight*, Toronto: Dundurn Press Ltd, 2005, p138.

¹⁹ BBC online, '1952: Comet inaugurates the jet age', 2nd May 1952, available at:

http://news.bbc.co.uk/onthisday/hi/dates/stories/may/2/newsid_2480000/2480339.stm

²⁰ Faith, N. *Black Box: Why Air Safety is no Accident, The Book Every Air Traveller Should Read*, London: Boxtree, 1996, p72.

Cardinal, D. 'Lessons from some of the biggest hardware screw-ups', 25th May 2012, available at: <http://www.extremetech.com/extreme/129764-tech-wrecks-lessons-from-some-of-the-biggest-hardware-screw-ups/3>

²¹ Macarthur, J. *Air Disaster: Volume 1.*, Australian Capital Territory: Aerospace Publications, 1996, p21.

²² Ruttan, V. 'is war necessary for economic growth?', p6-7.

²³ IBID.

²⁴ Airbus website, 'Airbus in the UK', available at: <http://www.airbus.com/company/worldwide-presence/airbus-in-uk/>

²⁵ The discussion of Margaret Thatcher and her government's involvement with the Airbus A300 draws greatly on this NYT article:

Feder, B. 'Airbus Wins Support from British on A230', *The New York Times*, 2nd March 1984, available at: <http://www.nytimes.com/1984/03/02/business/airbus-wins-support-from-british-on-a230.html>

²⁶ Kaivanto, K. 'UK Launch Aid Experience', Warwick Business School Working paper No.260, p2, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=609125

²⁷ See Unite Union Report, 'Maintaining a world class commercial aerospace industry in the UK', p6, available at: <http://www.unitetheunion.org/uploaded/documents/AerospaceGrowthStrategy11-5452.pdf>

²⁸ The discussion of Rolls-Royce draws greatly on Lazonick and Prencipe's excellent paper: Lazonick, W. and Prencipe, A. 'Sustaining the Innovation Process: The Case of Rolls-Royce plc', TSER paper, December 2003, available at: <http://www.econ.uniurb.it/siepi/dec03/papers/lazonick.pdf>

²⁹ IBID, p7.

³⁰ IBID, p4.

³¹ IBID, p5.

³² IBID.

³³ Quoted in IBID, p7.

³⁴ IBID, p7.

³⁵ IBID, p10.

³⁶ IBID, p9.

³⁷ IBID, p10.

³⁸ IBID, p11-12.

³⁹ Quoted in IBID, p11.

⁴⁰ IBID, p12-13.

⁴¹ Chang, H. *Bad Samaritans: The Myth of Free Trade and the Secret History of Capitalism*, Bloomsbury press: London, 2007, p86-87.

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- ⁴² Lazonick, W. and Prencipe, A. 'Dynamic capabilities and sustained innovation: strategic control and financial commitment at Rolls-Royce plc', 9th May 2005, available at:
https://uml.edu/centers/CIC/Research/Lazonick_Research/Lazonick_Recent_Research/Dynamic%20Capabilities.pdf
- ⁴³ IBID, p22.
- ⁴⁴ Wolf, M. 'Seven ways to fix the system's flaws', *Financial Times*, 22nd January 2012, available at:
<http://www.ft.com/cms/s/0/c80b0d2c-4377-11e1-8489-00144feab49a.html#axzz2eO5Dd2Vj>
- ⁴⁵ CBI, *A vision for rebalancing the economy*, December 2012, p7, available at:
http://www.cbi.org.uk/media/1231301/cbi_rebalancing_the_economy_report_301211.pdf
- ⁴⁶ 'Sustaining the Innovation Process', p15.
- ⁴⁷ IBID, p21.
- ⁴⁸ See the following articles:
Aldrick, P. 'ICI finally consigned to history', *The Telegraph*, 2nd January 2008, available at:
<http://www.telegraph.co.uk/finance/newsbysector/supportservices/2781922/ICI-finally-consigned-to-history.html>
- Kay, J. 'The high cost of ICI's fall from grace', *Financial Times*, 13th February 2003, available at:
<http://www.johnkay.com/2003/02/13/the-high-cost-of-icis-fall-from-grace>
- ⁴⁹ A good account of Lord Simpson's disastrous tenure is given at:
White, D. 'Decline and fall of Weinstock's mighty empire', *The Telegraph*, 29th August 2002, available at:
<http://www.telegraph.co.uk/finance/2771938/Decline-and-fall-of-Weinstocks-mighty-empire.html>
- ⁵⁰ SMMT press release, 'UK car manufacturing achieves all-time record exports in 2012', 17th January 2013, available at:
<https://www.smmmt.co.uk/2013/01/uk-car-manufacturing-achieves-all-time-record-exports-in-2012/>
- ⁵¹ IBID.
- ⁵² Hills, S. 'Britain now producing MORE cars than Germany: How the UK has become the car production capital of Europe', *The Daily Mail*, 29th December 2012, available at:
<http://www.dailymail.co.uk/news/article-2210199/Britain-producing-MORE-cars-Germany-How-UK-car-production-capital-Europe.html>
- ⁵³ *SMMT Motor Industry Facts 2013*, available at:
<http://www.smmmt.co.uk/wp-content/uploads/SMMT-2013-Motor-Industry-Facts-guide.pdf?9b6f83>
- ⁵⁴ Wheeler, B. 'The politics of building cars', *BBC online*, 7th April 2005, available at:
http://news.bbc.co.uk/1/hi/uk_politics/4294709.stm
- ⁵⁵ Comfort, N. *The Slow Death of British Industry*, p64.
- ⁵⁶ IBID, p62.
- ⁵⁷ IBID, p64.
- ⁵⁸ Hutton, H. *The State We're In*, 1996. London: Vintage, p137.
- ⁵⁹ Ha-Joon, Bad Samaritans, 2008, London: Random House, p1-2.

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- ⁶⁰ Green, D. *Prosperity with Principles: Some Policies for Economic Growth*, April 2010, Civitas:London, p15.
- ⁶¹ IBID.
- ⁶² IBID.
- ⁶³ Comfort, N. *The Slow Death of British Industry*, p66.
- ⁶⁴ IBID, p69.
- ⁶⁵ Gibbs, N. 'Thatcher saved UK auto industry with bailout, academic says', *Automotive News Europe*, 9th April 2013, available at:
<http://europe.autonews.com/apps/pbcs.dll/article?AID=/20130409/ANE/130409890#axzz2Vv09k99>
- ⁶⁶ Quoted in IBID.
- ⁶⁷ Graham, R. 'Jaguar Land Rover reports record sales and £1.5bn profit', *The Telegraph*, 29th May 2012, available at: <http://www.telegraph.co.uk/finance/newsbysector/transport/9297508/Jaguar-Land-Rover-reports-record-sales-and-1.5bn-profit.html>
- ⁶⁸ Verdin, M. 'Egan roars into business leadership role', *BBC Online*, 20th May 2002, available at:
<http://news.bbc.co.uk/1/hi/business/1998124.stm>
- ⁶⁹ Merlin-Jones, D. 'Time for turning? Why the Conservatives need to rethink their industrial policy', Civitas Review, January 2010, p6. available at:
<http://www.civitas.org.uk/pdf/CivitasReviewJanuary2010.pdf>
- ⁷⁰ On Thatcher and Nissan see:
Edwards, G. 'Was this Thatcher's greatest legacy?', BBC online, 14th September 2009, available at:
<http://news.bbc.co.uk/1/hi/business/8253169.stm>
- ⁷¹ Merlin-Jones, D. 'Time for turning?', p3.
- ⁷² Edwards, G. 'Was this Thatcher's greatest legacy?'
- ⁷³ Knapman, C. 'The history of Nissan's Sunderland factory', *The Daily Telegraph*, 19th December 2012, available at:
<http://www.telegraph.co.uk/motoring/car-manufacturers/nissan/9753733/The-history-of-Nissans-Sunderland-factory.html>
- ⁷⁴ Merlin-Jones, D. 'Time for turning?', p4.
- ⁷⁵ Simpson, C. 'Future Prospects For Civil Aerospace in the UK', *Civitas*, May 2012, available at:
<http://www.civitas.org.uk/economy/CivilAircraftUKFuture.pdf>
- ⁷⁶ Charles, A. 'China Buys Its Way to Aerospace Growth with M&A Splurge', *AIN Online*, 12th August 2013, available at:
<http://www.ainonline.com/aviation-news/ain-air-transport-perspective/2013-08-12/china-buys-its-way-aerospace-growth-ma-splurge>
- ⁷⁷ 2012 ONS Pink Book, p41, available at:
<http://www.ons.gov.uk/ons/rel/bop/united-kingdom-balance-of-payments/2012/index.html>

⁷⁸ Williams, K. 'British industrial policy remains plagued by the antidote fallacy', *The Guardian*, 24th December 2012, available at:

<http://www.theguardian.com/global/2012/dec/24/government-lacks-insight-to-grow-british-industry>

⁷⁹ Clarke, S. 'Four Industries and a Funeral?', *Civitas*, July 2011, p5, available at:

<http://www.civitas.org.uk/pdf/FourIndustries.pdf>

⁸⁰ BIS Policy Paper, 'Driving success: UK automotive strategy for growth and sustainability', 12th July 2013, available at:

<https://www.gov.uk/government/publications/driving-success-uk-automotive-strategy-for-growth-and-sustainability>