



**The Slide down the Manufacturing
Hill:
How Singapore tempted Rolls
Royce from the UK**

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The slide down the manufacturing hill

In February 2009, Rolls-Royce - a corporation synonymous with British industrial history - uprooted its London-based marine headquarters to Singapore. This is only the latest instalment in its gradual relocation to the tiny state, following shortly after its construction of a \$320 million aero engine facility at the Seletar Aerospace Park.¹ In the 47 years since its independence from Britain, the nation has engineered a lightning transition that leaves it with a comparable GDP and conditions more conducive to industrial development than Britain.

The Seletar Aerospace Park stands on 140 hectares of land which existed formerly as scrap forestry around the site of Singapore's first international civil airport.² The authorities, recognising the rising growth potential of the aerospace industry, allotted space for an industrial park to house all stages of the value chain: technical and aviation training; design and manufacturing; maintenance, repair and overhaul (MRO); commerce and sales. Here, Rolls-Royce's aptly-named "Facility of the Future" houses the company's most capacious assembly and testing facility for large-range Trent 1000 and Trent XWB engines, as well as a regional training centre.³ This builds on the success of a MRO facility located in Singapore's Changi Airport: a nine-year old joint venture between Singapore Airlines Engineering Company, Rolls-Royce and Hong Kong Aero Engine Services Limited⁴.

For John Paterson, President of Rolls-Royce Marine, the move was intended to 'capitalise on Singapore's central position and maritime expertise to work closely with key customers and suppliers', 'to facilitate the development of growing markets in Asia' and consequently, to 'enhance [Rolls-Royce's] global position'.⁵ These aspirations were underpinned by the existing 'joint ventures and research & development collaborations' with Singapore.⁶

Industrial Policy in Singapore and the UK

Singapore has not always been as Paterson describes: industrialised, with island-wide highways, and bustling business and residential districts. Slightly more than 50 years ago, it would not have been an exaggeration to describe Singapore as an undeveloped post-colonial entrepôt state. The sole strategic resource it seemed to enjoy was geographic proximity to other Asian states and the Malayan archipelago, coupled with a deepwater harbour, the grounds upon which it was selected as a stopover along the Britain-Asia trade route.

Retrospective analysis shows how Singapore's economic development subsequent to this has been substantiated by industrial policies which have anticipated future economic trends and nurtured strategic resources.

Recent industrial policy in the UK has not enjoyed the excellent reputation of Singapore's, its name blackened by historical protectionism, tariff-slapping and quotas. The lack of transparency with which it 'picks winners' has aggravated asymmetry between companies and aligned critical opinion against industrial policy. These critics argue that the web of lobbying and clandestine politicking has led the government to 'pick losers' instead, as mature industries finance intense political lobbying and new entrants are discouraged by the enormous barrier costs.⁷

There are a few examples of heavyweights nurtured by direct industrial action. Airbus was conceived of by European governments in the mid-1960s to counter potential US dominance in civil aircraft manufacturing. The company was formed by collaboration between major European partners and now closely rivals the US-based incumbent Boeing in sales orders and deliveries.⁸ Despite this, the recent Airbus-Boeing tussle over the anti-competitiveness of significant state aid shows how compliance regulations can still temper the reach of industrial policy.

Yet, the inconsistencies in the performances of ‘picked winners’ have dealt a harsh blow to the costly policy of subsidising industries. A new horizon is the emerging paradigm shift in industrial policy, which moves the focus from top-down adjustments of supply towards ground-up expansions of long-run productive capacity. Government reports and budgets parallel academic literature to stress the significance of this change; they are realised by the increased focus on education and investment as the means by which to increase workforce productivity and buttress capital infrastructure⁹.

Sectoral challenges in the UK

The case for increasing productivity in the UK is pressing. As of 2002, the UK’s labour force productivity (indicated by ‘average value added per person per hour’) trailed far behind those of its chief competitors: 13% behind the US; 16% behind Germany and 23% behind France.

Estimates of relative labour productivity in total market sectors adjusted with sector-specific purchasing power parity¹⁰ (PPP) exchange rates, UK, US, France and Germany, 2002¹¹

	Average value added per person engaged (UK=100)		Average value added per hour worked (UK=100)		Average value added per person per hour (UK=100)
	Mason et al, 2002	O’Mahony & de Boer, 2002	Mason et al, 2002	O’Mahony & de Boer, 2002	Mason et al, 2002
United States	138	149	133	141	113
France	112	118	123	121	123
Germany	92*	101	110	117	116
UK	100	100	100	100	100

Lower productivity is particularly stark within the advanced technology industries. Even chief industries such as chemical production - which accounts for more than a tenth (11.3%) of UK GDP - suffer below-parity productivity.

Major primary industries - ‘food, drink and tobacco’ and ‘printing and publishing’ – on the other hand, enjoy above-parity productivity. The above-parity productivity in these major industries may currently ameliorate other gaping lags, but this reliance on primary industries does not bode well for the future. In January 2010, whilst total manufacturing output rose 0.2%, the print industry recorded the largest output decrease of 4.2%.¹² The decline is unlikely to be caused by a general slump but by sector-specific factors pushing the industry to its maturation. This exacerbates the need to raise productivity in industries of the future.

Why manufacturing, not services: the trend reversal

Once the need for industrial policies is established, it becomes a question of which industries to support. The far reach of the credit crisis exposed the vulnerability of over-reliance on excessively lucrative sectors, building the case for strategic interventions which promote sectoral development and modest diversification. This should secure the UK's long-term economic competitiveness in anticipation of future opportunities and challenges.

One such challenge is the country's current account deficit.¹³ Presently standing at £18.4b (-1.3% of GDP), it peaked at £43.8b in 2006.¹⁴ The recent reduction was spurred largely by a surplus trade in services (from £0.3b to £12.4b), but dampened by a rise in the deficit on trade in goods (-£1.2b to -£21b).¹⁵ This reveals the enormous capacity and impact an improved goods balance could exert on the current account position. Though dwindling in magnitude, reducing the current account gap should remain a significant national priority to remedy global imbalances and sustain currency and economic stability.

Current circumstances strengthen UK prospects. The weak sterling - down 24% on a trade weighted basis since August 2007¹⁶ - raises export competitiveness and drives up export consumption, enlarging consumer markets for manufactured goods. Exports could be a key factor in pulling Britain out of current sluggishness, amid the weak domestic demand and constrained government spending. Domestic manufacturers such as Rolls-Royce could have been key in this.

The Historical transition of Singapore's IP¹⁷

Taking GDP per capita to be roughly indicative of economic growth, a comparative analysis shows Singapore's economic expansion since post-independence to be a whopping thirty times that of the UK's; a magnitude that growth convergence theory alone fails to capture.

Estimated comparative growth rate of Singapore and the UK

Year	Singapore's GDP per capita (2009 US\$) ¹⁸	UK's GDP per capita (2003 £) ¹⁹
1965	US\$512	8,426.62
2008	US\$38,904	20,790.37
% growth (approximate)	7598.44%	246.72%

Prior to the 1960s in Singapore, function followed form without deliberate intervention by any active industrial policy. Colonial rule had instituted free trade policies and the administrative and legal framework to support Singapore's function as a strategically placed trading post and military base. However, heightened competition from neighbouring ports gradually eliminated Singapore's advantage and warranted the need for a more active policy post-independence.

The industrialisation drive of the 1960s intended to jumpstart the economy by expanding manufacturing beyond its 12% of GDP. In view of the potential Malayan-Singapore merger, the consequent enlargement of the consumer base that would accompany the common market and as recommended by the UN Industrial Survey Mission, industrialisation was

directed toward import substitution. High-growth industries such as shipbuilding were protected: tariffs and quotas were slapped onto incoming imports and subsidies dished out to nurture export-capacity.

However, the failure of the merger and loss of the common market led Singapore to revert to a free trade regime post-1965, abandoning import substitution for export orientation to a larger consumer base. The attraction of Foreign Direct Investment (FDI) was conceived as a viable route to bolster Singapore's competitive deficiency in both resource and labour-intensive industries, derived from its lack of natural resources, existing scale economies and talent pool. Industrial policy pursued an FDI-friendly environment: gradually eliminating quantitative restrictions, tariffs and other protectionist measures and creating the Economic Development Board (EDB), tasked to build up an infrastructure which would make outside investment profitable. Its initiatives include stricter educational standards and 'importing' foreign labour to augment productivity.

Primary export-oriented activities saw Singapore thrive through the 1970s, until recovery from the 1975 crisis led to labour shortages and wage pressures, exacerbated by growing low-cost competition from neighbouring Southeast Asian economies. To vanquish the competition, an education and automation-led economic restructuring was embarked upon to make Singapore a 'high value' economy.

The approach was strengthened in the 1990s by actively fostering 'clusters' of industry in sectors earmarked for growth. Activities spanning an entire value chain such as the Jurong Island petrochemical complex and the biomedical research and development centre *Biopolis* were concentrated in one place. To balance the economy, Singapore was also developed as a services 'hub', specialising in financial, logistical, and communications services. This capitalised on Singapore's geo-cultural 'middleman' status as well as the government's anticipation that services would begin to concentrate around a several global nodes.

Singapore's current Industrial Policy

Singapore's subsequent industrial policies have sought to fortify it against three potential areas of vulnerability: to sustain a broad base and capitalise on a blurred manufacturing-services boundary to mitigate against sector vulnerability; to reduce demand-vulnerability by balancing the global orientation of the manufacturing sector with the regional orientation of services; and to nurture local talent and enterprise to compete in global markets to resist vulnerability in the case of foreign-shock.

The first two aims were realised primarily through replication of the 'cluster' model. The third target required some divergence towards 'outward expansion'. The policies were intended to create a venture-friendly infrastructure: globalising local businesses through bilateral free trade agreements, the encouragement of joint public-private investment overseas and incentive disbursement.

This issue has become ever more pertinent over the last decade, as the market presence of home-grown enterprise has been overshadowed by the dominance of large government-linked corporations (GLCs) and multi-national corporations (MNCs). The top-down approach of the education system does little to nurture a creative enterprise culture.

The government sought to compensate for these domestic weaknesses with initiatives such as straightforward financial grants, tax deductions for angel investors and cross-border financing, and direct assistance such as public procurement. Indirect assistance came through the nurture of auxiliary services; the encouragement of public-private partnerships to reap scale economies (including a formidable public-private nineteen-player aerospace consortium to harness research and development scale economies); and provision of skills training and managerial education to increase labour competitiveness.²⁰

The Historical Transition of the UK's Industrial Policy

“Gone are the days when industrial policy meant planning, picking winners, pumping subsidies into firms. The new policy is about skills, about innovation and enterprise. Above all, it's about competition to create dynamic, innovative firms.”²¹ The UK's own industrial policy has transformed since the 1950s.

The days of ‘picking winners’ were driven by the rise of the newly industrialised Japanese and East Asian economies in the 1950s; these posed increasing threats to the established markets of European economies.²² Defensive industrial politics and social mechanisms prevented the critically-needed drastic restructuring and phase-out of declining sectors; authorities were relying on protectionist measures to stall the industrial decline.

By the 1960s it was recognised that industrial policy would have to actively enable British firms to bridge the technological gap between them and their major competitors. It favoured the creation of ‘national champions’ such as British Leyland to fund automobile research and development (R&D). The emphasis on improving productivity was reinforced by the 1965 National Plan. Suggested action plans were to divert expenditure from defence to sectors which would directly assist economic growth; to improve management education and vocational training; and to allow government-assisted rationalisation appropriate to the smaller scale of British industries.²³ Labour market policies and standards were made increasingly stringent in order to establish Britain as an attractive location for foreign inward investment owing to its sufficient ‘technological skill’ and ease of inter-industry labour mobility.²⁴

However, the 1966 sterling crisis and its subsequent devaluation led planners to embark on a confrontational investigation into the roots of poor productivity. The 1975 Industrial Strategy reverted back to ‘selective intervention’ - picking potential ‘winners’ - though fortunately not sliding back down the protectionism slope.²⁵

Yet amid the reality of political manoeuvring, the policy of ‘picking winners’ meant accounts were drained to resuscitate dying industries rather than assist innovation in industries with a high growth-potential.²⁶ The inability to yield profitable returns induced scepticism towards interventionist policies in the 1980s, prompting the Conservatives to reduce the role of industrial policy. They withdrew expenditure and directed a wave of privatisation in a bid to allow free market forces to sharpen stakeholder incentives and correct for government failure.

The 1990s agenda was one of heightened anxiety over an apparent widening gap in Euro-British economic productivity. It formed the foundation for policies of a more sector-neutral

approach, kicked off by efforts to urge closer affiliation between industry and the science base to speed up research translation and commercialisation.²⁷

UK's current Industrial Policy

The 2005 budget expounds on a general intention to increase productivity. It sought to enhance the adaptive capacity and inter-sectoral mobility of the labour force through education; to encourage enterprise and investment; to support long-term research to enhance knowledge-creation ability and economic efficiency, and to promote competitive markets.²⁸

Educational efforts have been sector-neutral: an increased emphasis on Higher Education, and attempts to link this with further education embodied by the Manufacturing Skills Academy and vocational two year Foundation degrees.²⁹ The *Skills for Growth* White Paper set out Labour's intention to expand apprenticeship and increase funding for skills progression programmes.³⁰ Enterprise has been supported through tax reduction tools: the continuation of the Business Payment Support Service, which enables tax payments to be spread over an agreed timetable; deferring the small companies' corporation tax rate increase and increasing capital allowance to 40%.³¹

There has been sector-specific direct investment to enhance infrastructure, such as a £1.1bn rail electrification programme for the Great Western Main Line³², while economy-wide financial incentives such as the Private Finance Initiative have been pushed out.³³ The initiatives to stimulate innovation have been more mixed: economy-wide access to R&D tax credits as well as direct government investment into industries identified as high-growth by the Strategic Investment Fund. These target areas include automotives, composites, life sciences and low-carbon technology in receipt of funding packages such as £140m towards a Low Carbon Vehicle Innovation Platform, £340m to Airbus, £250m to low carbon projects and £15m to nuclear energy.³⁴

A comparison of policies

Starting off at antipodal ends, Singapore and the UK have converged on similar solutions. Both countries recognise that competitive value is generated by a highly productive labour force and pro-business infrastructure. They diverge in the way they use education, training and financial tools to effect this.

The UK utilises direct financial backing to support high-growth industries: the £100m investment in wind turbine R&D at Mitsubishi Power Systems Europe³⁵, an £80m loan to assist civil nuclear supply chain Sheffield Forgemasters to build a forging facility to rival its Japanese competitors³⁶ and a £20.7m grant for Nissan to develop its low carbon car production capacity.³⁷

It has invested substantially in physical infrastructure, namely the £19m provided to develop the Midlands into a Low Carbon Economic Area³⁸ and £12m to expand an industrial biotechnology demonstrator in Teesside³⁹. Such infrastructural improvement has been

complemented by labour force upgrading: co-funding up to 25,000 wind energy apprentices and £15m to launch a Nuclear Advanced Manufacturing Research Centre co-led by the Universities of Sheffield and Manchester, with Rolls-Royce as the lead industrial partner.⁴⁰

Singapore also looks to anticipate high potential niches and direct resources toward nurturing their growth. However, the bulk of its focus goes to carefully assembling complementary elements of the industrial value-chain to construct a favourable ecosystem for these firms to grow.

Biopolis was launched in 2003 with \$2bn – it was to be the ‘world’s first integrated purpose-built biomedical research complex’.⁴¹ Housing public and private research institutes, industry partners like Novartis and GlaxoSmithKline PLC share specialised facilities; it also boasts proximity to a handful of universities and hospitals and prominent international scientists were incentivised to take up positions. The full-spectrum integration of the biomedical R&D value chain, encompassing ‘basic foundation science, translational medical research, drug discovery efforts, and medical technology research’⁴² aimed to usher in economies of scale and concentration, to cut costs and accelerate companies’ research translation timelines.

This building-block approach is also evident in Jurong Island, a 3200-hectare chemical complex erected upon an amalgamation of islands and reclaimed land. It houses an extensive array of facilities (common pipelines, logistics services) which are shared by an assembly of corporations like BP and Shell, as is the comprehensive supporting landscape with safety and transportation features.⁴³ The complex coalesces various stages, from R&D (on-site training at the Chemical Process Technology Centre) to manufacturing (products range from petroleum and petrochemical products to speciality chemicals and chemically-derived products, such as Lanxness’ butyl rubber and Mitsui Chemicals’ resin modifier TAFMER™ for automobile bumpers). Room has been made for support auxiliary companies such as the Institute of Chemical and Engineering Sciences, which produces supporting technology and processes for chemical plant operations.

Common to both clusters is the onus Singapore has put on corporate connectivity, marketing its role as a ‘middleman’ which is able to help businesses navigate the challenging economic and socio-political Asian landscape due to its geographical and cultural proximity to the emerging Asian economies.

Singapore’s role as an Asian gateway, while derived from its natural locality, has been assiduously reinforced. It has sought to intensively forge links which further broaden its potential market through bilateral free trade agreements and favourable trade terms within the ASEAN (Association of Southeast Asian Nations) partnership. This constitutes the critical last stage of the value chain – because Singapore as a gateway is able to reach out to a widened number of markets, foreign firms are able to see the justification in locating an extensive part of their value chain in Singapore, while domestic firms are able to reap spill-over effects from foreign MNCs and enjoy opportunities to expand beyond the limited domestic market. Public institutions such as the EDB and International Enterprise (IE) Singapore facilitate this nurture within - and expansion from - the Singaporean economy.

In place of the UK’s industrial emphasis on ‘picking technology’, Singapore attempts to expand its infrastructural and human capacity to facilitate sectoral growth. The varying endogenous characteristics and exogenous features of the two nations make it difficult to

identify the optimal approach; it remains debatable if there exists a universally optimal approach, transcendent of each country's static traits and dynamic differences.

Translational limitations due to country differences

Singapore's geographical proximity to the East-Asian economies is closely mirrored by the UK's opening to a neighbouring Europe: both countries are suitably sited to play the 'gateway' role. However, the challenges posed by their categories of neighbours are dissimilar.

Singapore's proximate competitors are primarily low-cost manufacturers utilising cheap labour (exaggerated by their huge populations) and abundant natural resources to produce goods along the lower end of the value spectrum; they are limited by a lack of skilled labour and advanced technology. The UK faces the entirely different challenge of bridging the productivity gap to catch up with European neighbours of similar characteristics and circumstance – high value-added manufacturers with a high-wage, skilled labour force working with an advanced level of technological infrastructure. The impetus for change differs and so the allocation of resources and subsequent course of industrial policies deviates too.

The political landscapes too are distinct: Singapore's 45 years of 'single-party dominance' is manifest in how its government can place pragmatism before persuasion, and look for long-term solutions. This is evident in the recent decision to construct a casino within the Marina Bay integrated resorts complex, where public concerns were overridden by justification of economic rationality. Closer tripartite cooperation between the government, the workers' union and corporations have reinforced political stability and contributed to greater wage flexibility in Singapore.

The growth accounting controversy

To posit Singapore's growth as indicative of the capital injection and productivity enhancement it has undergone is controversial. Critics argue that the growth in GDP may owe more to strategic it possessed initially and the quality of institutions economy-wide⁴⁴ than the liberalisation of worker entry and employment, as this may have de-incentivised firms working to secure long-term productivity enhancements.⁴⁵

Historically, studies on the growth of the East Asian tigers have taken productivity leaps as assumed. However, a 1995 study by Alwyn Young⁴⁶ found that Singapore's TFP growth was systematically lower than that of other East Asian tigers like Hong Kong. This below-parity level was subsequently confirmed by other studies:

Comparative TFP⁴⁷ figures between Hong Kong, Singapore, South Korea and Taiwan⁴⁸

	Hong Kong	Singapore	South Korea	Taiwan
Chen (1977)	4.3	3.6	5.0	4.3
World Bank (1993)	3.7	1.2	3.1	3.8
Young (1995)	2.3	0.2	1.7	2.6
Kim and Lau (1996)	2.4	1.9	1.2	1.2
Sarel (1995)	3.8 (1975 - 1990)	1.9 (1975 - 1990)	3.1 (1975 - 1990)	3.5 (1975 - 1990)
Gapinski (1999)				
Hsieh (2002)	2.0-2.1 (1966 - 1991) 2.9 (1973 - 1991)	1.5 (1971 - 1990) 2.2 (1968 - 1990) 1.6 (1973 - 1990)	1.6-2.1 (1966 - 1990)	3.4-3.9 (1966 - 1990)

The contrast between Hong Kong and Singapore is instructive. They have initial similarities - small densely populated landscapes, majority Chinese populations and Westminster-style civil administrations- but underwent deviations in approaches to economic policy, as Hong Kong's "laissez faire" approach contrasted to Singapore's active intervention.

Strong and consistent economic growth in East Asia has occurred both with and without large scale government intervention, yet it is arguable that initial government intervention in Singapore (as in South Korea and Taiwan) resolved coordination failures of the free market. It averted the risk of human capital levels exceeding physical capital, thus making latent returns to capital investment very high; this, British institutions in Hong Kong had already resolved. Sector-specific industrial policy assisted in the efficient accumulation of capital and labour, which resulted in significant quantitative growth for an economy starting from a low base in the 1960s.

The evidence of efficacy of sector-specific policies on the present-day priority of increasing productivity is unclear; this explains the Singapore government's recognition of the need to encourage home-enterprise and talent.

Discussion

A multifaceted web underlay Rolls-Royce's decision to relocate its Marine business headquarters to Singapore. While Singapore's natural endowments, such as prime geographical centrality to growing markets in Asia, are inalterable, dynamic strategic resources could be developed to retain businesses on British domestic shores. For Britain to enhance the pro-business capability of its manufacturing landscape there are two areas it must appraise.

The impetus to enhance productivity requires improvements in education and capital accumulation. Yet a cautionary note should be placed on the seemingly easy solution of restructuring education to better align it towards a vocational market-oriented focus. This has allegedly resulted in Singapore's inability to rapidly increase productivity owing to stifled creativity. Striking a balance between vocational and academic foci constitutes a key dilemma: where on the spectrum lies the balance that will optimise productivity? The long term implications of relying on market forces to direct curricula merits further research, as does the link between UK investment in education and the consequent contribution to GDP. Several researchers have cast doubt on the strength of this link in developed countries with

high levels of education, arguing that this is a relationship of correlation rather than cause and that returns to education are marginal, diminishing with initial literacy levels.⁴⁹

The second recommendation constitutes a relatively untouched area of study. It has become increasingly important for Britain to attract its fair share of foreign investment to complement efforts to retain domestic enterprise. Maintaining itself as a global marketplace, it capitalises on foreign companies' growth potential and spill-over benefits. Research could be carried out on the potential of Britain as socio-economic and geographical gateway to Europe, mimicking Singapore's marketisation of itself as a gateway to Asia. Preliminary research⁵⁰ supports this, citing US firms, particularly software companies⁵¹ such as Microsoft⁵² which have established their base in Britain as a first point of entry into the European market.

Central to Singapore's quest to establish its 'gateway' status was the care with which it solicited the investment of corporations involved in all stages of the industrial process to piece together a cohesive whole. A public declaration to private firms of the existence and broad structure of such a policy, though trivial, could also bring in oft understated value by reducing information asymmetry and second-guessing. It is of crucial importance to avoid future over-dependence on foreign input – to seek a long-term optimal approach toward attracting foreign investment which enhances domestic enterprise, such that Rolls Royce would have found themselves better served to stay on home soil.

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