



HARVARD | BUSINESS | SCHOOL

Microeconomics of Competitiveness

Professor Michael E. Porter



Hamburg Aviation Cluster

Roman Belotserkovskiy

Eva Gerlemann

Santiago Jariton

Campbell Lewis

Kirsten Porter

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1 Country Analysis

1.1 Country Overview

Germany is the fourth largest economy in the world representing 6.3% of World's GDP and with a population of 82 million Germany is the most populous state in the European Union (16% of EU25). It is a federal, parliamentary, representative democratic republic of sixteen states located in Central Europe. Each German state has an elected legislature and state governments and parliaments have significant responsibilities including education and policing. The political landscape since 1949 has been dominated by the Christian Democratic Union and the Social Democratic Party parties and all chancellors so far belonged to either of the two. Smaller parties such as the liberal Free Democratic Party and the Greens occasionally played important roles and are regular partners in coalitions.

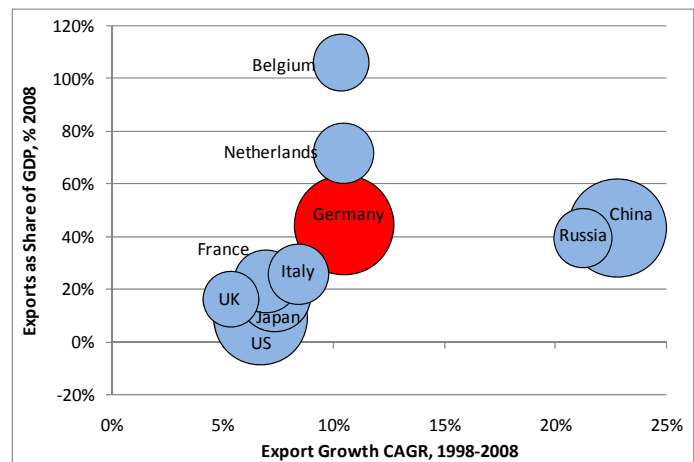
1.2 Economic History

1.2.1 Post WWII: Reconstruction and the Social Market Economy

Germany's re-emergence as a world power was arguably unforeseen after World War II. The country's wealth had been reduced by a third, industrial capacity had been decimated and unemployment was rampant. Responding to dire economic prospects German economic policy in the post-WWII period was dominated by a "Social Market Economy". The Social Market Economy attempted to balance liberal market economics and social welfare considerations through close

collaboration of business, labor and government. The Government focused on orchestrating competition through limited direct interference in business, encouraging R&D investments and, in contrast with other European nations, pursued few industry nationalizations. This provided for burgeoning growth in SME's which over time became increasingly competitive with each other. Fierce local competition

Figure 1: World exports (World Bank, 2008)



enhanced global competitiveness and gave rise to Germany's engine of growth (to this day, as can be observed in the graph in the prior page): global SMEs focused on producing high quality, highly engineered products. The development of SME's was complemented by Germany's unique banking system. Germany's banking system was (and still is) largely controlled by the government (federal and state) who was not only an important shareholder in the SMEs but also provided for long-term financing (debt continues to be the primary source of funding in Germany). To complement the strength of its Social Market Economy, Germany established an independent Central Bank ("Bundesbank") that, reflecting the memory of 1920's hyperinflation, focused on price stability at all costs. Germany also established one of the most extensive welfare systems in Europe, covering health care, unemployment, and family and social security benefits. To this day, Germany's welfare system is amongst the most comprehensive in the world. Despite the entrenchment of the welfare state, Germany's performance following World War II was quite remarkable. GDP growth averaged 9% from 1950 to 1966 as this period became known as the "German Economic Miracle".

1.2.2 Mixed Performance During the '70s and '80s

Germany was hit hard by the oil shocks of the 1970's. Demand for German goods declined across all of its trading partners as global consumption was tempered by higher energy costs. Furthermore, the Bundesbank's reaction to control the inflationary pressures resulting from the shocks was to tighten monetary policy even further. A combination of higher wage costs (due to the non-confrontational relationship with unions) coupled with the technological advances in the U.S. and Japan impacted Germany's SMEs and forced corporate elites to reconsider their focus and concentrate on developing more R&D intensive, highly engineered products. The 70's put a stop to the growth miracle of the 50's and 60's. Germany's performance in the decade of the 1980's started strong but finished with mixed results. At the beginning of the decade unemployment and inflation were low compared to its European peers, GDP growth was healthy and its exports were again well positioned vis-à-vis Japan and the U.S. However, the success in exports led to recurrent currency revaluations. Increasing conflicts between unions and employers mounted as wage pressures continued to increase from low cost competition in

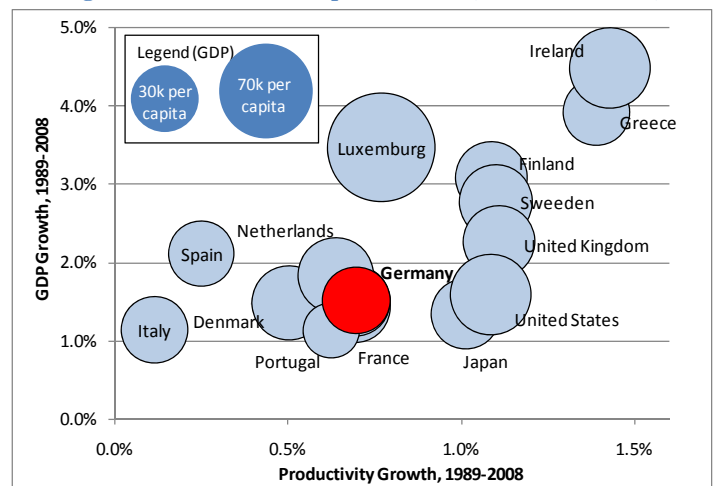
Asia. Strikes became more common. Ultimately, oil shocks and structural issues in the coal and mining industries, called for heavy government intervention and increased the cost of social welfare programs. Social contributions rose from 8-10% of GDP in 1950's to over 17% in 1980's. By the end of the decade corporate leaders continued to demand industry deregulations, tax system overhauls, streamlining of red tape and decreased wage costs.

1.2.3 Reunification

When the Berlin Wall fell in 1989, reunification between East and West Germany began almost immediately. West Germany faced the task of absorbing an essentially bankrupt country with one quarter of its population. East Germany's GDP was a meager 43% of West Germany's in 1991. Reunification put strain on the government as the public deficit climbed from a negligible amount to over 4% of GDP. Transfer payments to the East alone reached a stunning 6% of GDP in 1991. Moreover, the government's role transpired beyond simple capital transfers. The government invested heavily to rebuild infrastructure and extend its social net to the East. The Treuhandanstalt (public privatization agency) performed the daunting task of reorganizing, privatizing and closing all formerly state-owned enterprises. The country's integration took hold at a remarkable pace, yet the economic and

societal costs were quite meaningful. Unemployment surged by over 5% over this time period and the extended social welfare caused severe strain in the government's balance sheet as previously mentioned. East Germany has still some catching up to do as its GDP was only 70% of West Germany's in 2007.

Figure 2: Macroeconomic performance (World Bank, 2008)



1.2.4 Integration with Europe

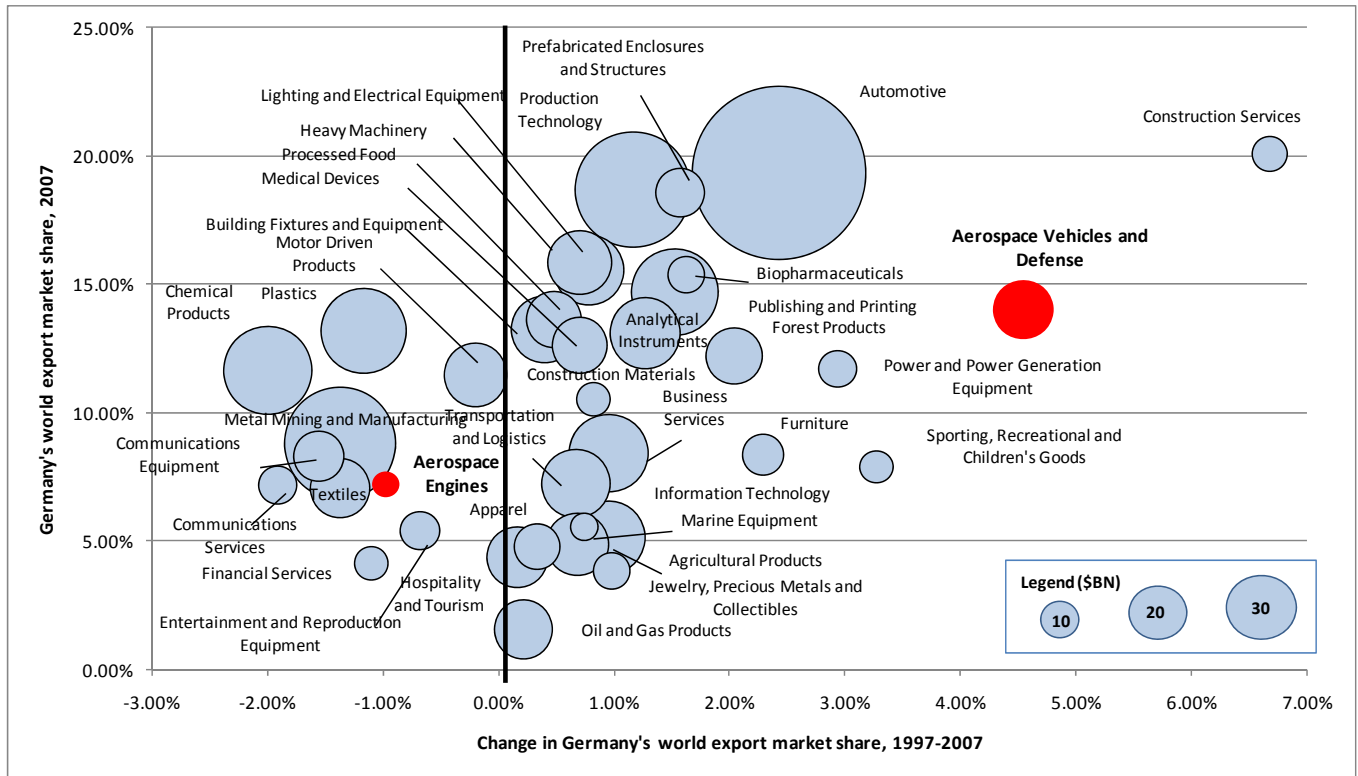
In parallel Germany continued to assimilate and integrate with the rest of Europe. It joined the European Coal and Steel Community in 1950, NATO in 1955 and was a founding member of the

European Community (EC) in 1957. The creation of a Single European Common Market in 1986 provided for access to broader markets to trade goods, services, capital and. Intra-region trade volumes surged and Germany's export market continued to grow. The creation of an area without internal frontiers was furthered in 1992 by the Maastricht Treaty which gave way for further unification among European nations. German monetary policy came under the roof of the European Central Bank and the Euro was introduced replacing national currencies. In 2004 ten 'New Member' States joined the EU 15 enhancing the European market's size further expanding the local consumption market. The Maastricht Treaty also contributed to the growth in fiscal authority of the EU as a regional oversight patrol by tripling the capital allocated to Structural and Cohesion Funds designed to help the poorer states of the union catch-up to the more advanced economies. Though major benefits resulted from the political and economic integration of the region, not everything was smooth. The Lisbon Agenda agreed upon in 2000 to address issues of productivity and high unemployment thru the transition to a knowledge-based economy and further diffusion of new technologies was largely a failure.

1.3 Economic Performance

As can be observed in figure 2, Germany's economic performance has been consistently positive but not remarkable. The breadth and depth of its social welfare resulted in an expensive and rigid labor force. Social Security contributions rose from around 9% in the 1950's and 11% in the 1960's to over 17% in 1980's and 1990's. In 1999 the labor cost per hour of work was US\$ 26 for Germany versus US\$ 21 for Japan and US\$ 19 for the United States (24% and 36% premiums respectively). Not only was German labor more expensive, they also worked less. Japanese workers worked 28% more hours per year and American workers worked 31% more hours per year than Germans did. (Huw Pill, 2002). That state's heavy involvement propagated beyond welfare. Exhaustive tax regimes, abundant red tape along with government subsidies and state control of many of the countries networks (telecom, postal, gas, water, etc.) also hindered entrepreneurship, stifled competition and precluded growth of the knowledge-based economy. As result, it is not surprising that productivity has lagged its peers.

Figure 3: Germany's very diverse export portfolio (Institute of Strategy and Competitiveness, 2009)



1.4 Key Structural Reforms 2002 – 2004

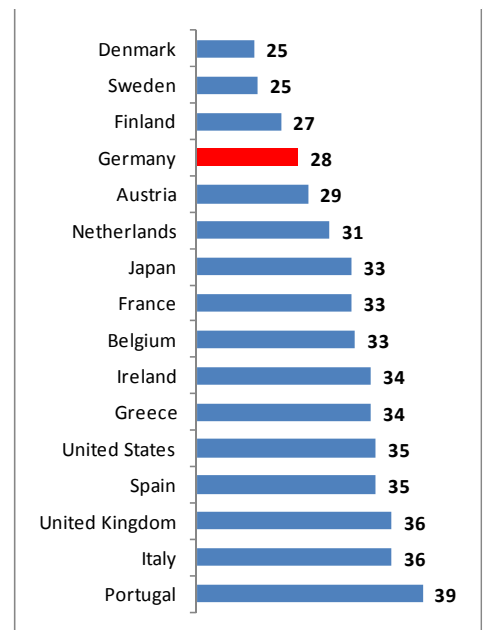
In order to address many of the aforementioned issues the government embarked on a series of structural reforms aimed at fueling growth and regaining competitiveness. The pivotal efforts of these reforms are highlighted below:

- Reducing unemployment benefits – unemployment benefits were reduced across the board and claims were curtailed to shorter periods of eligibility.
- Emphasis on Enticing Entrepreneurship – bankruptcy procedures were simplified, incorporation costs were reduced, and red-tape has been rationalized.
- Focus on development of service sector – government IFCs have been engaged to sponsor international meetings for cooperation amongst technology firms, open the field of public services to public-private partnerships and conduct studies of competitiveness.

- Strengthening of competition – fiscal subsidies were reduced by 23% between 2000 and 2003, privatizations of postal, airport and telecom industries were pursued and a comprehensive review of anti-trust issues concerning government monopolies was launched.
- Opening of networks – telecom, gas, water, electricity and other state-operated industries have been unlocked for competition.

The reforms have been effective in decreasing unemployment and stirring growth in GDP and GDP per capita. However, productivity as measured in output per hour has continued to lag as the labor force expanded through the inclusions of less productive people into the labor force. Economic growth, however, is only one dimension of performance. Distribution of wealth as measured by inequality is another, increasingly more relevant metric. As can be observed in the figure to the right, the state’s welfare programs have done quite a remarkable job in fighting inequality. In terms of Gini coefficient, Germany stacks fourth amongst its European counterparts and is ahead of the United States by a substantive margin. (Council of Europe, 2005)

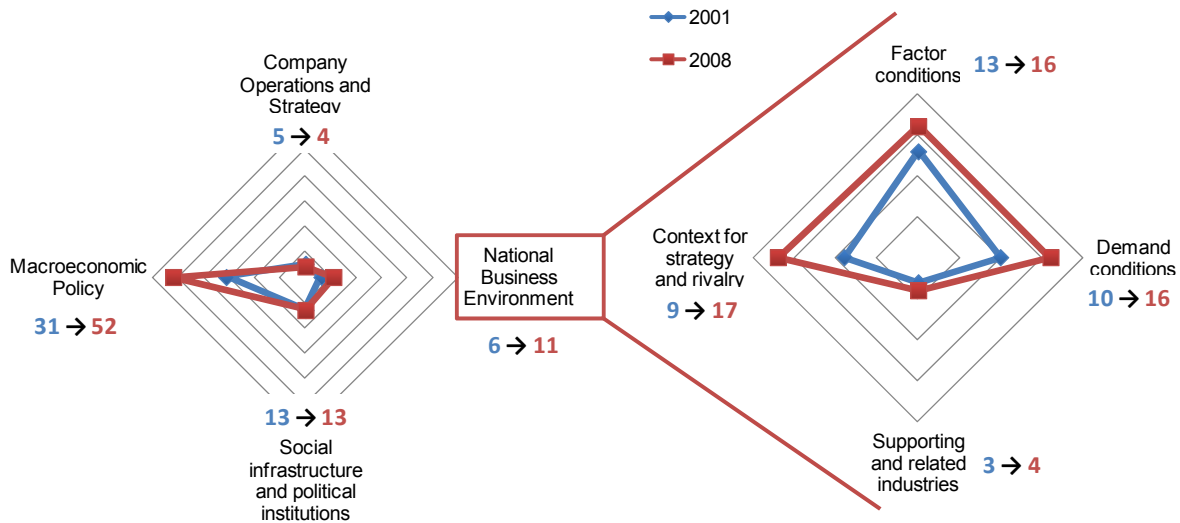
Figure 4: Inequality as measured by Gini coefficient (World Bank, 2008)



1.5 German Business Environment

Germany’s competitiveness rankings slipped across most competitiveness metrics with the only improvement being further strengthening of Germany’s already highly competitive companies through better governance, improved management practices and increasing incentive compensation in particular. On the other hand, Macroeconomic policy ranking declined primarily because of worsened government deficit. Business Environment metrics have all declined directly reflecting a worsening of the microcompetitive context within the country across the four dimensions of the diamond.

Figure 5: Germany's Competitiveness Ranking (Institute of Strategy and Competitiveness, 2009)



1.5.1 Factor Conditions

1.5.1.1 Physical Infrastructure

Because of its central location Germany is an important transportation hub of Europe with state of the art facilities (Port of Hamburg, Frankfurt Airport). Its world renowned autobahn network is the third longest in the world and Germany also has a well developed rail network which includes high-speed InterCityExpress (ICE) trains. Germany is the 5th largest consumer of energy in the world, with total electricity consumption of 549 BN kWh (2006). Renewable energy plays a prominent role in government policy and renewable capacity in 2007 reached 20% of Germany's installed generation capacity. Two thirds of Germany's primary sources are imported which results in significant dependence on imports of natural gas. Dependence is exacerbated by Germany's decision to phase out by 2020 its 17 nuclear plants that currently produce 25% of country's electricity. (International Energy Agency, 2008)

1.5.1.2 Communications Infrastructure

Information and communications technology infrastructure helped by advanced ICT laws and industry liberalization that accelerated since 2002 significantly lowered costs to consumer while increasing coverage and network quality. (Council of Europe, 2005) In particular, telephone

infrastructure is excellent and computer ownership has increased but overall and in-school internet access are still lagging. (World Economic Forum, 2008)

1.5.1.3 Administrative Infrastructure

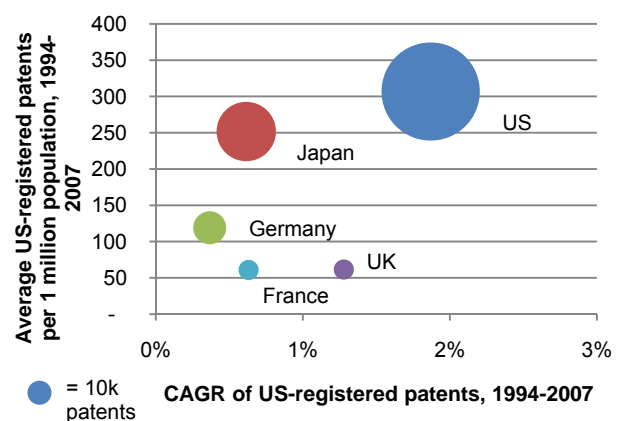
The World Bank's annual review of ease of doing business shows Germany losing ground both within the OECD and globally, with declines across most metrics, but particularly in those affected by government regulation. In terms of ease of doing business, Germany's global position declined from 16th to 25th according to World Bank's Doing Business Report with major negatives being complexity of starting a business (102nd), high labor costs (142nd), time consuming tax system (80th) and limited minority investor protection (88th). (World Bank, 2008)

1.5.1.4 Education and Innovation Infrastructure

German innovation infrastructure has remained stagnant since 2001, advancing only from 19th to 18th position in Business Competitiveness Index. Quality math and science education, brain drain, patenting rates and tertiary enrollment indicators all worsened. At the same time Germany is the largest investor in R&D in Europe. Together, Germany (€8 BN, 2006), France (€38 BN, 2006) and the United Kingdom (€32 BN, 2005) spent 60% of total R&D expenditure in the EU27. Germany's R&D expenditure is 2.5% of GDP compared to an average of 1.84% in EU27. (Eurostat, 2008)

The system of research in Germany comprises three sectors: research conducted in industry; government-funded research outside universities and research conducted in higher education institutions. Some of the most important research institutions in Germany, Max Planck Society, the Helmholtz-Gemeinschaft and the Fraunhofer Society, are external and independent of the university system. Germany's patenting rate of 128 patents per 1 million of population is the highest in Europe but globally it is thwarted by

Figure 6: US Registered Patents
(U.S. Patent and Trademark Office, 2008)



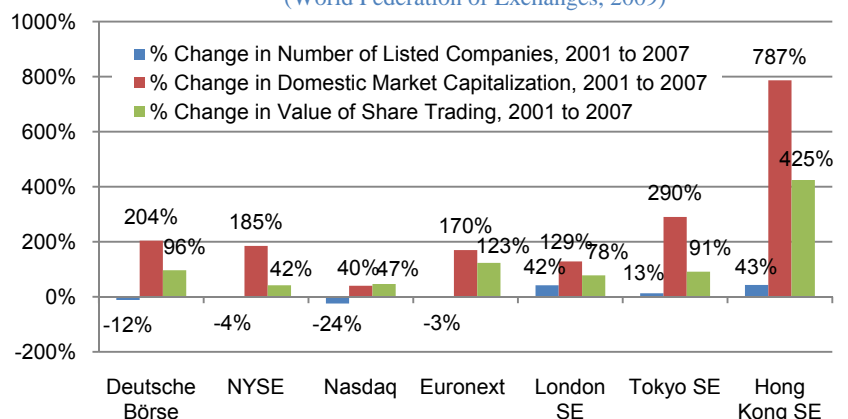
Japan or the US among leading industrial nations. Company research is mostly oriented towards applications required by the sponsor. Basic research is mostly responsibility of education institutions with increasing tendency to shift research to institutes. Globalization of corporations resulted in increased geographical diversification of R&D spending. Only 60% of German originated R&D spending was actually spent inside the country in 2007. (Booz & Company, 2008)

Germany’s university system is based on widely available, government-funded higher education, and a prevailing of equality of opportunity. Centralized and largely homogeneous with internal decision-making vested in university faculties, it lost ground internationally in recent years. After the rapid expansion of the German higher education system between the mid-1960s and the mid-1970s, stagnation began in the provision of public resources. Adjusted for inflation, funds provided to higher education institutions have hardly increased since the mid-1970s. At the same time, number of students increased by more than two thirds. Since teaching and research are supported by the same resource pool, this has resulted in declining public university investment in basic research at the same time that higher education institutions are increasingly confronted with pressures for delivering research of relevance for economic growth. (American Academy of Arts and Sciences, 2002)

1.5.1.5 Capital Markets Infrastructure

The Frankfurt stock exchange, operated by Deutsche Börse, has 90% of Germany’s trading volume and was the 3rd largest public exchange in the world at the end of 2007 with a capitalization of US\$2,100 billion; equivalent to about 40% of the US capitalization per capita. Eurex, the main European derivatives exchange, is also located in Frankfurt. In spite of all Frankfurt’s advance, capital markets development in Germany has been slow. The

Figure 7: Growth of World’s Top Stock Exchanges: 2001 to 2007
(World Federation of Exchanges, 2009)



Deutsche Borse with only 866 listed companies at the end of 2007 it is the smallest major exchange in the world. Venture capital investing in Germany is also quite limited, at 0.057% of GDP it is 50% below EU15 average and 70% lower than VC investing in United States. Private Equity investment in Germany in 2007 stood at 0.30% of GDP, also very low when compared to a 0.58% European average and 1.69% for UK, the leader in Europe. (European Private Equity and Venture Capital Association , 2008)

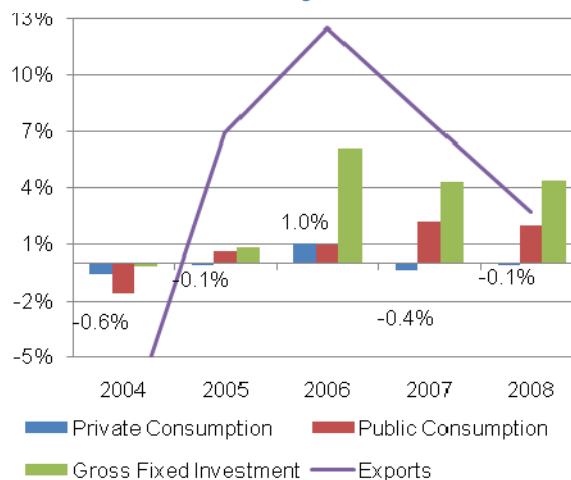
1.5.2 Context for Firm Rivalry and Strategy

Germany’s ranking has declined from 9th to 17th since 2001, impacted by high tax burden, distortive subsidies, low prevalence of foreign ownership and strong impact of strict business rules on inbound FDI. Investor protection and labor law rigidity remained bad with Germany ranked 46th and 52nd respectively on these issues. High personal tax burden is exacerbated by high total cost of welfare results in disincentive to work and invest. Germany has one of the most expensive welfare systems in the world with total all-in tax and contribution rate of over 50% compared to 30% OECD average. Federal subsidies declined in 2007 to 5.9 billion Euros from peak level of 10 billion Euros in 2000; but are still distortive and focused on specific industries. On the other hand, Germany is ranked 1st in “intensity of local competition”, as the result of a very strong policy framework shaped by post-WW2 allied decartelization policy inspired by US antitrust law, and by the paradigm of social market economy focused on incenting domestic competition. (World Economic Forum, 2008)

1.5.3 Demand conditions

Germany is the single largest market in Europe. Market sophistication is supported by advanced legislation and demanding regulatory and environmental standards. In recent years German domestic demand has been dominated by massive

Figure 8: Evolution in demand components of GDP
(Economist Intelligence Unit, 2009)



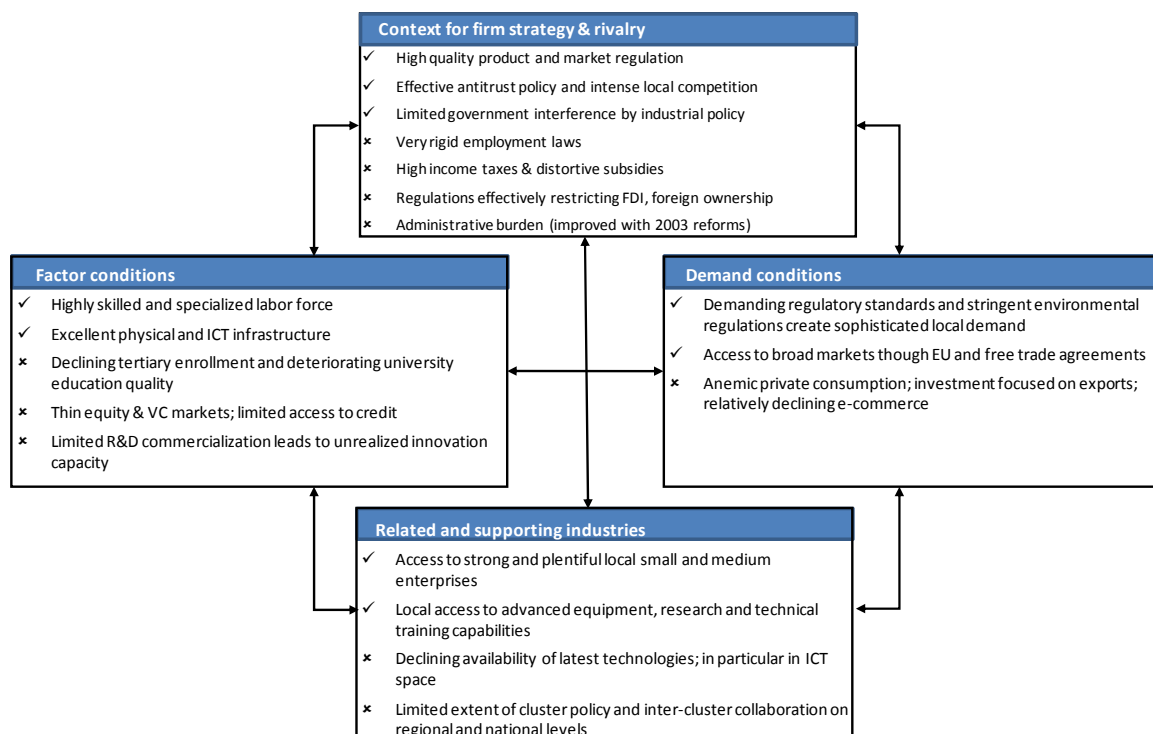
investment focused on developing export capacity and increasing public spending while private consumption has remained anemic due to depressed wage growth and recent tax increases (VAT increase in 2007). An externality of anemic recent private consumption is the lower relative consumer indebtedness; Germany's private consumption is expected to fare better in current downturn than countries with higher accumulated levels of consumer credit. (Economist Intelligence Unit, 2009)

1.5.4 Related & Supporting Industries

Germany's industry is extremely diverse. Top 50 German export industries in 2005 represented only 46.3% of total exports, very low compared to a European average of 69.6%. More significantly, German exports are primarily manufacturing and high value added processed products with natural resources representing only 12% of total exports. Overall, German companies are extremely competitive across the board (1st in competitive advantage) on a global scale (1st in extent of regional sales and breadth of international markets) and overall Company Operations and Strategy performance have improved from 5th to 4th position worldwide. (Institute of Strategy and Competitiveness, 2009)

1.6 Germany's National Diamond

Figure 9: Germany's National Diamond



Germany's recent economic performance was sustained by a diversified economic base of strong, globally competitive companies complemented by advanced local SMEs built upon advanced factor conditions and sophisticated local demand. However, Germany's business environment has worsening weaknesses including labor rigidity, high welfare costs, low private consumption, declining education quality and institutional rigidities that limit entrepreneurship and innovation. This is hardly sustainable in the long term. Germany was able to resist reform because of the massive global demand for its exports. In today's crisis, as exports are collapsing, the weaknesses of Germany's domestic environment are becoming highly visible and critical obstacles for renewed dynamic growth.

1.7 Country Level Policy Recommendations

DIAMOND IMPACT	KEY CHALLENGES	RECOMMENDATIONS	PLAYERS RESPONSIBLE FOR EXECUTION
Factor Conditions	Declining quality of education	<ul style="list-style-type: none"> Privatize universities and modernize leadership though increased self-regulation; Increase cooperation among universities/ industry/ research institutes and promote public-private partnerships; Modernize R&D evaluation promoting and facilitating commercialization; 	Ministry of Education, State Governments, (Cluster) IFCs
Factor Conditions	Shallow VC and PE markets, worsening ease of access to loans	<ul style="list-style-type: none"> Provide downside protection to banks to entice lending; Tax incentives for VC and PE markets; Streamline listing processes; Reform 3 pillar bank system to encourage consolidation and increased competition; 	Private and Public Banks, State and Federal Governments, IFCs
Factor Conditions	Energy dependence	<ul style="list-style-type: none"> Curb energy dependence by retooling nuclear plants; Continue expanding renewable energy sources; 	Federal and Local State Governments
Context for Firm Strategy and Rivalry	Entrepreneurship inhibited by red tape, hefty costs and bankruptcy stigma	<ul style="list-style-type: none"> Streamline federal and state government processes; Simplify new business incorporation and rationalize incorporation costs; Facilitate financial reorganizations though reduced enforcement against assets; 	Federal and Local State Governments
Context for Firm Strategy and Rivalry	Labor market rigidity and increased social contribution costs	<ul style="list-style-type: none"> Liberalize labor laws (e.g. hiring / firing costs) in particular for SMEs; Further decrease amount and time period of guaranteed benefits; Decrease union power and/or influence on SMEs though decentralization and increased flexibility of agreements; 	Unions, IFCs, Corporate Leaders and Federal Government
Demand Conditions	Weakening consumption and increased reliance on export markets	<ul style="list-style-type: none"> Reverse VAT increase (finance by continuing to curb subsidies); 	Federal Government

2 Cluster Analysis

2.1 Hamburg: Location, Economy, Performance

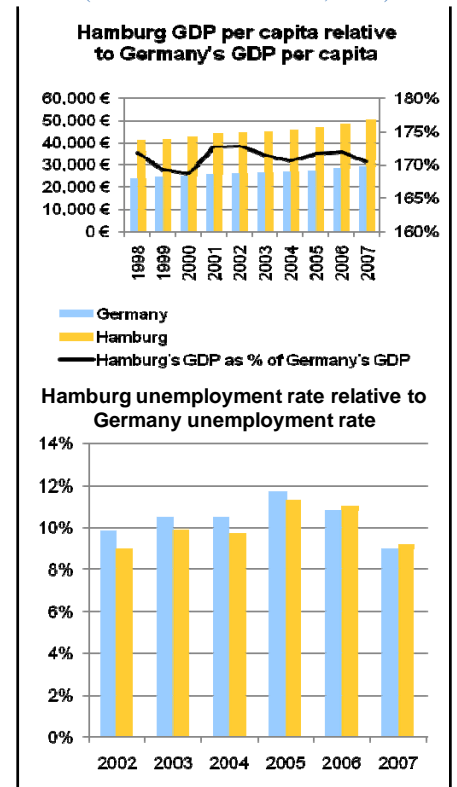
Hamburg's location on the North Sea has been strategically important as a trading location since the thirteenth century. Hamburg was an early member of the Hanseatic League, an alliance of cities and guilds that maintained a trade monopoly along the coast of Northern Europe between the thirteenth and seventeenth centuries. Today, The Free and Hanseatic City of Hamburg is a German city-state. Its metropolitan region stretches across three federal states: Hamburg, Lower Saxony and Schleswig-Holstein.

Figure 10 - Map of Hamburg
(Fordham University, 2009)



Hamburg has a diverse economy with more than 120K enterprises (Statistisches Bundesamt, 2008). Aside from the aviation cluster, Hamburg's economy is dominated by three related and service oriented clusters: Logistics, Media and IT/Telecommunications. The logistics cluster has 7,600 firms, 230K employees and contributed 12% of Hamburg's gross regional domestic product in 2001 (Handelskammer Hamburg, 2003). Hamburg's port is the second largest in Europe (ninth largest in the world) and shipped 134M tons of goods in 2007. The media cluster has 10,800 firms, 70K employees and produced €25B revenue in 2003 (Handelskammer Hamburg, 2004). The IT/Telecommunications cluster has 6,170 firms, 55K employees and produced €B revenue in 2008 (Handelskammer Hamburg, 2008)

Figure 11 - Hamburg macroeconomic performance
(Statistisches Bundesamt, 2008)



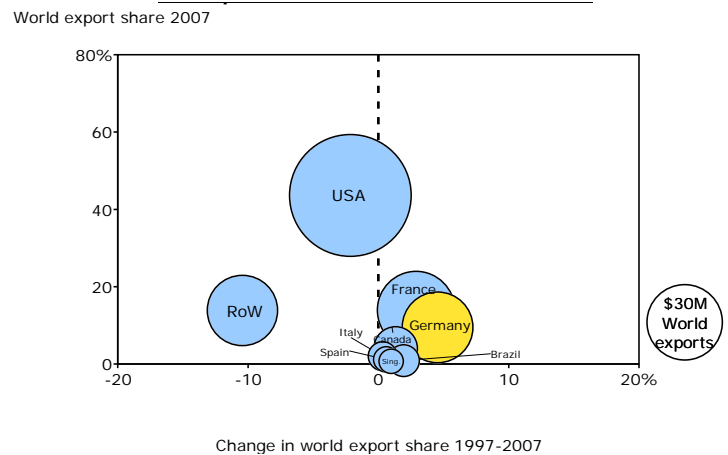
Hamburg is Germany's second largest city and richest federal state. Since 1998, Hamburg's GDP per capita as a percentage of Germany's GDP per capita has averaged 171%. From 2002-2007, Hamburg's unemployment rate was an average 0.4% below that of Germany. (Statistisches Bundesamt, 2008)

2.2 Global Civil Aviation Market

Civil aviation includes all non-military fixed wing aircraft, including both general aviation and scheduled air transport. The industry is currently dominated by six major manufacturers of civil transport aircraft: Airbus (France), Boeing (U.S.), Bombardier (Canada), Embraer (Brazil), United Aircraft Corporation (UAC – Russia)¹ and the ACAC consortium (China). Boeing and Airbus control the market for large aircraft (100+ seats) while the other four are largely focused on regional aircraft. Large networks of specialized parts suppliers from around the world support these manufacturers who sometimes provide only the initial design and final assembly in their own plants.

In 2007, the value of the global civil aviation market was \$188.9B with the industry concentrated in the US (41%), France (17%) and Germany (14%) (Institute of Strategy and Competitiveness, 2009). Between 1997-2007 Germany's share of the world export market grew 5% while that of France grew 3% and that of the US decreased 2%.

Figure 12 - Aerospace cluster performance
(Institute of Strategy and Competitiveness, 2009)



¹ After losing considerable share to Airbus/Boeing in Russia, President Putin combined Russia's 6 major aircraft design and manufacturing companies into a single holding with substantial state control by decree in February 2006; A.E. Kramer "Russian aircraft industry seeks revival through merger" *New York Times* 22 February 2006 at http://www.nytimes.com/2006/02/22/business/worldbusiness/22air.html?pagewanted=1&_r=2 (Accessed 15 March 2009).

2.3 Hamburg Aircraft Cluster

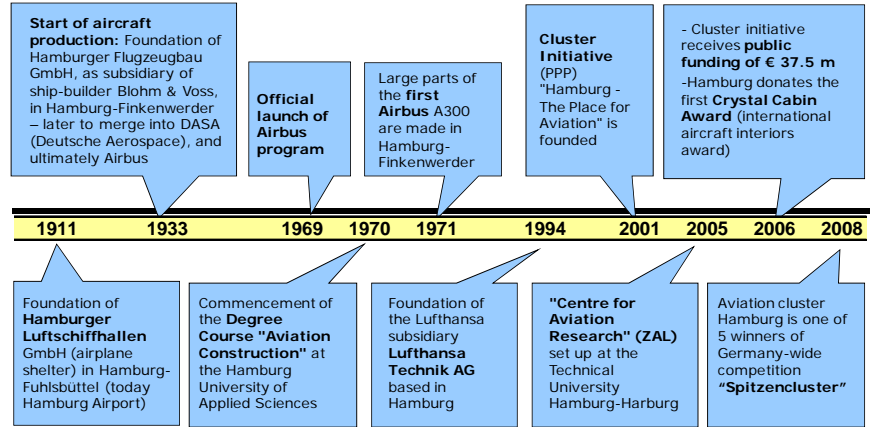
2.3.1 Development History²

Hamburg has been an aviation center since 1911, when the Hamburger Luftschiffhallen GmbH was founded, an airplane shelter in the Hamburg-Fuhlsbüttel district (now the Hamburg Airport). In 1933, Hamburg shipbuilder Blohm & Voss founded Hamburger Flugzeugbau GmbH as its

airplane production subsidiary, which later became part of DASA (Deutsche Aerospace), and ultimately Airbus in 1969 when the German government contributed its aerospace enterprises to the European conglomerates. The cluster expanded with Airbus' critical decision to locate major production operations in Hamburg as well as its Center of Excellence for Cabin and Cargo Customization. Hamburg ranks second only to Toulouse in importance of Airbus' operations, now playing a "decisive role in the development and engineering of all Airbus aircraft."³

Complementing these developments, Lufthansa located its major MRO facilities as well as research operations in Hamburg with the creation of Lufthansa Technik's in 1994. Subsequently, a host of suppliers and service providers (many of them SMEs) clustered around these two "anchor tenants". In 2001, a joint cluster initiative "Hamburg – the place for aviation" was started as a collaborative effort of government, business and educational institutions, with the aim to "enhance productivity, promote innovation, and increase the number of newly-established companies". The cluster is a member of Kompetenznetze Deutschland, an initiative of the German Federal Ministry of Economics and

Figure 13: Evolution of Hamburg aviation cluster



² Cluster initiative website: <http://www.luftfahrtstandort-hamburg.de/index.php?id=38&L=1> (Accessed 5 March 2009).

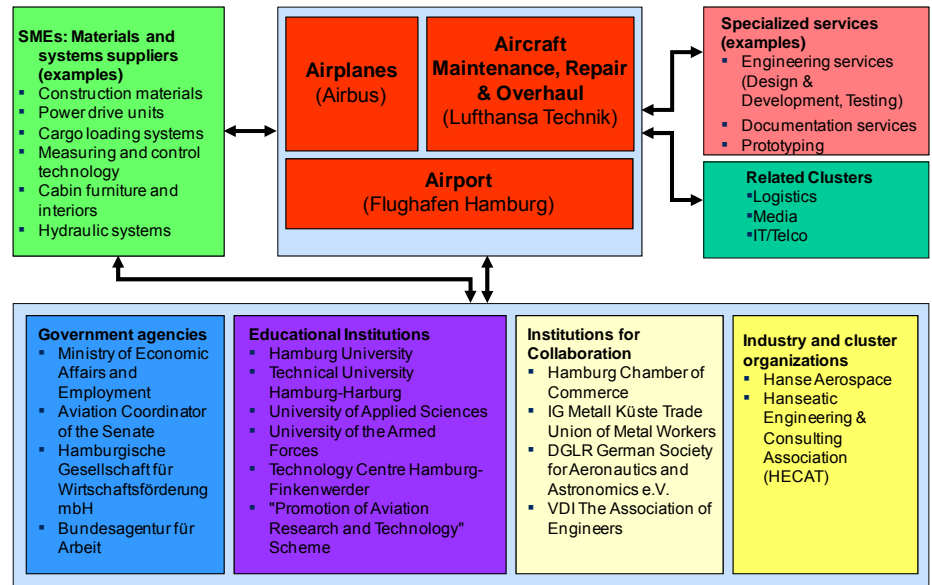
³ Airbus website: http://www.airbus.com/en/worldwide/airbus_in_germany.html. Accessed May 5, 2009.

Technology. In 2008, the cluster was among the 5 winners of the nationwide "Spitzencluster" awards by the German Ministry for Education and Research.

2.3.2 Overview: Activities and Participants

Today, the cluster comprises most of the relevant activities in the aviation industry from aircraft design and production (Airbus), to aircraft lifecycle maintenance, repair and overhaul (MRO) services (Lufthansa Technik), to air transportation (Hamburg

Figure 14: Cluster map



Airport), and a range of supporting products and services, all provided by about 300 SME suppliers and service providers located in the cluster. Government, especially local government through the Aviation Coordination of the Hamburg Senate, is highly involved and active in the cluster initiative. Government institutions support the cluster development process by providing funding, help and advice in various forms. To further develop the cluster, the city of Hamburg provided funding of €37.5m in the areas R&D, qualification, cabin design competence, service and marketing, and international cooperation⁴. The government sees its role more as an intermediary who helps increase intra-cluster communication and cooperation, and provides common goods such as trade fairs, PR/ Marketing for the cluster and networking databases so that cluster participants can freely operate – less than a role of regulator. The government also supports and contributes to various cluster PPPs, such as the Center for Applied Aviation on Research (ZAL), a joint R&D facility by universities and companies. The Hamburg

⁴ <http://www.luftfahrtstandort-hamburg.de/index.php?id=35>. Accessed March 2009.

educational institutions, especially the Technical University, are important in helping develop the necessary human capital, especially highly qualified engineers. Industry and cluster organizations (such as the SME community Hanse Aerospace), and institutions for collaboration (such as the German Metalworkers' Federation, the Chamber of Commerce, and the German Society for Aeronautics and Astronautics) are active cluster participants and provide opportunities for networking and information exchange. Finally, the aviation cluster is strengthened by its related clusters – logistics, media, and telco/IT (see below for details).

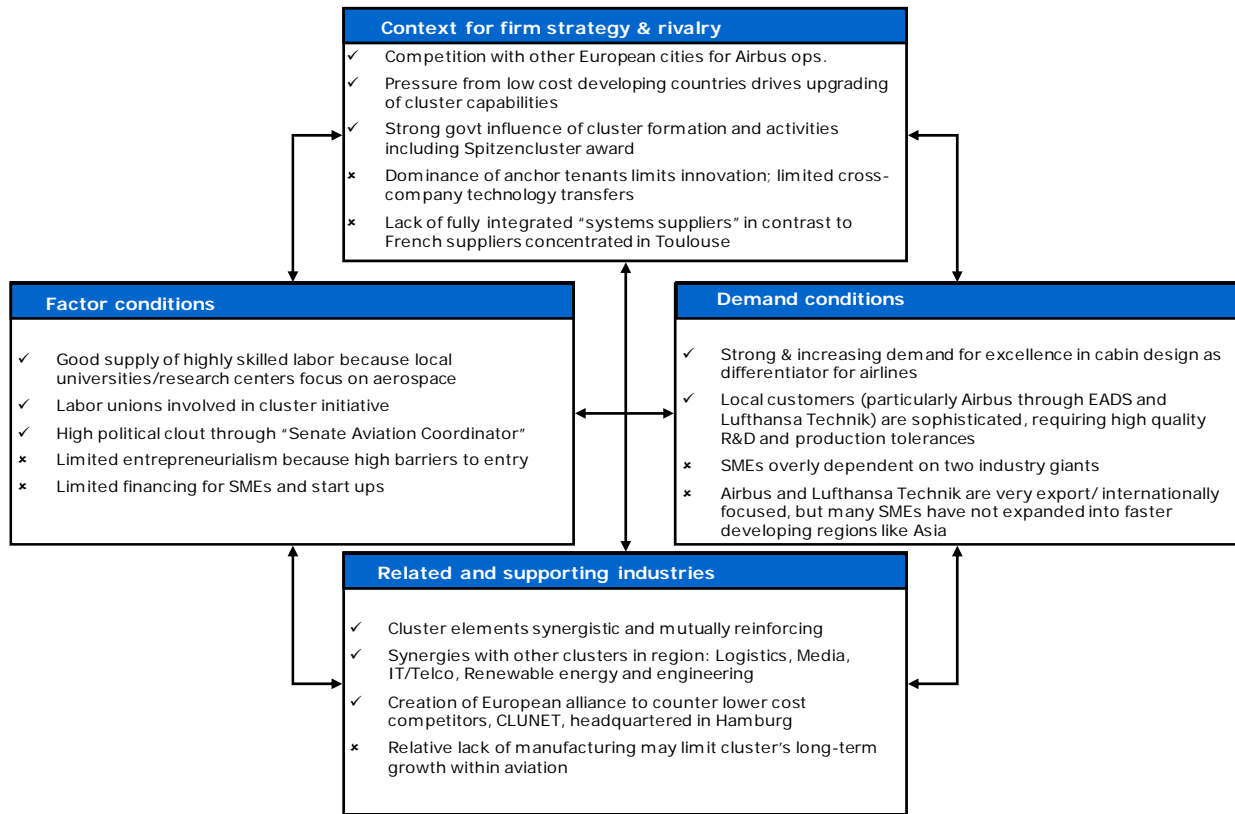
2.3.3 Cluster Performance

Using three performance metrics – market share growth, employment growth and revenue productivity – the Hamburg aviation cluster has performed strongly. First, Germany's 5% market share growth 1997-2007 was faster than any other country (Institute of Strategy and Competitiveness, 2009). However this success is somewhat tempered by the slowing of the growth of Germany's aircraft exports from 14% per annum 1997-2005 to only 6% per annum 2005-2007 (Institute of Strategy and Competitiveness, 2009). Secondly, employment in the cluster grew at 6.4% per annum 2000-2006 which is faster than either the Hamburg average (0.7% per annum) or German average (0% per annum). Finally the Hamburg aviation cluster has the highest productivity of any aviation cluster globally, testament to the high value add services provided in the region. However, when compared to its primary competitors, Seattle and Toulouse, the cluster lags in terms of total employment as well as number of enterprises (both SME's and multinationals). (Luftfahrtcluster Metropolregion Hamburg, 2008)

2.4 Cluster Diamond

The strong performance of Hamburg's aviation cluster is driven by strong Factor Conditions and Related and Supporting Industries. However significant weaknesses remain in both Demand Conditions and Context for Firm Strategy and Rivalry which must be addressed if the cluster is to remain competitive longer term.

Figure 15: Cluster diamond



2.4.1 Factor Conditions

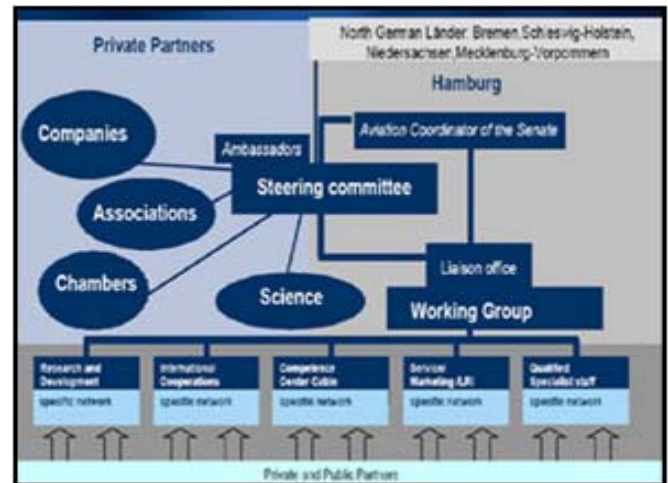
Hamburg has a good supply of highly skilled labor due to four public universities (Helmut Schmidt University, Hamburg University for Applied Sciences, Hamburg University of Technology and University of Hamburg) and five public/private research and training initiatives (German Aerospace Center, Center for Applied Aviation, Fuel Cell Lab, Hanseatic Center of Aviation Training and Center for Technology Hamburg-Finkenweder) that have aerospace specific programs. There have been moves to strengthen the global competitiveness of these programs by allowing students to graduate with globally recognized Bachelor of Arts and Master of Science degrees and better facilitating intensive cooperation between academia and business through the establishment of the Hanseatic Center of Aviation Training and Center for Applied Aviation⁵. However room for improvement remains, for

⁵ Hamburg Business Development Corporation (www.hamburg-economy.de). Accessed March 2009.

example Hamburg University of Technology is ranked 247 out of 300 universities in the world and the Technical University Hamburg only educates 5K students at any one time⁶.

The cluster also has strong political clout and a cooperative relationship with labor unions such as the German Metalworkers' Federation and trade associations such as the Association of German Engineers and German Society for Aeronautics and Astronautics through the cluster management organization. Much of this collaboration and cooperation is the result of government coordination of the PPP's companies, trade associations and

Figure 16
(Hamburg Business Development Corporation, 2008)



unions through the “Aviation Coordinator of the Senate” who serves as the cluster institution responsible for defining a common cluster strategy, aligning policy goals, increasing cooperation among cluster members and increasing public perception of the industry. (Luftfahrtcluster Metropolregion Hamburg, 2008). However the limitation of these strong Factor Conditions comes in the form of weak financing availability for SMEs and start ups which results in limited entrepreneurship because of the high barrier to entry. According to a manager of one of the Hamburg aviation cluster SMEs: “Hamburg has weaker capital sources than other aviation clusters. Airbus’ focus on larger, full integrated suppliers has led to SME struggles and even bankruptcies as few capital providers were willing to provide financing for projects that represented a disproportionate share of suppliers’ revenues”⁷.

⁶ CHE Germany University Ranking (www.che-ranking.de), Technical University Hamburg-Harburg (www.tu-harburg.de), THE Top Universities (www.topuniversities.com); Interviews. March 2009.

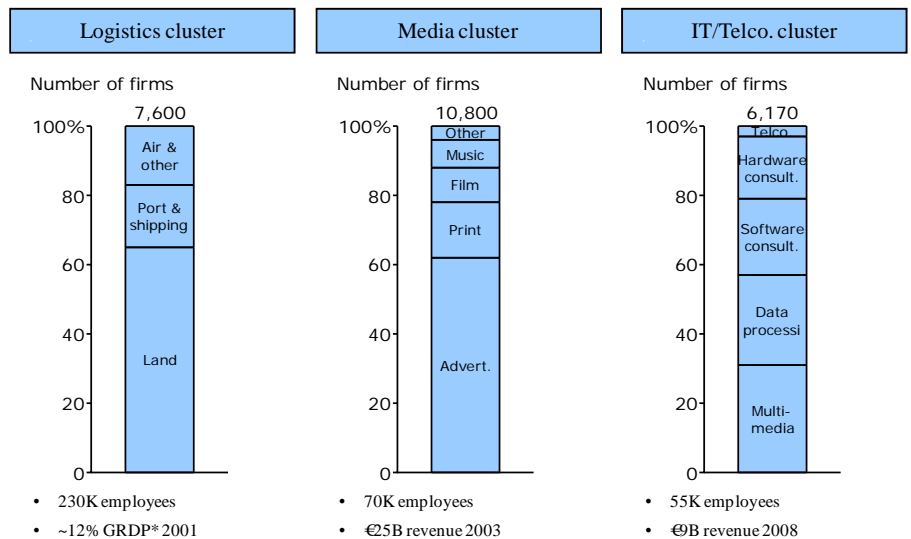
⁷ Interview with Manager of Hamburg Aviation cluster SME by Eva Gerlemann on 30 March 2009

2.4.2 Related and Supporting Industries

Hamburg’s aviation cluster significantly benefits from the city’s strengths in service businesses such as logistics, media, and IT / telecommunications. Although the cluster has fewer employees than other local clusters, it contributes significantly to local research, engineering development, and prestige (through its contribution to the production of the A380, for example). Despite the relative lack of a manufacturing base (compared to Toulouse, Seattle, or other German regions), the cluster has leveraged the city’s capabilities in other industries to develop thriving niches in cabin design, research, engineering, aircraft overhaul, and aircraft completions. Rather than chase gains in the highly competitive manufacturing segment of the industry, the cluster has successfully focused on research and knowledge development as well as service capabilities.

Dominated by its large port, the second largest in Europe behind Rotterdam, Hamburg’s shipping industry allows for efficient export of finished goods as well as sure access to supplies. Airbus, for example, assembles the large fore and aft fuselage sections of the new A380 in Hamburg before loading the

Figure 17: Hamburg sector profiles
(Handelskammer Hamburg, 2003)



sections on specially designed barges for shipment to Toulouse⁸. Only a handful of other ports in Europe are capable of handling tasks of this magnitude. From an air freight perspective, Hamburg’s airport, the fifth largest in Germany⁹, easily accommodates the region’s cargo and passenger volumes.

⁸ Airbus website: www.airbus.com, (accessed April 3, 2009).

⁹ Hamburg Airport website: www.ham.airport.de, (accessed April 3, 2009).

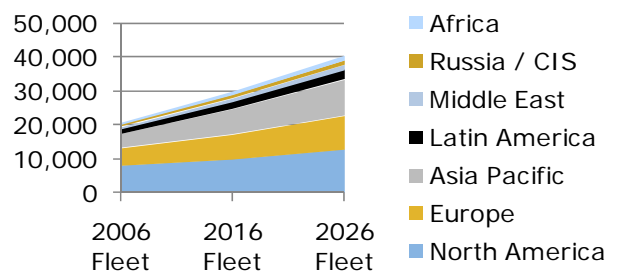
Further, the city, one of the founding members of the Hanseatic League, has a long history in maritime engineering and ship building. Both the aviation industry and marine industry benefit from shared knowledge transfer in aeronautics (as well as fluid mechanics), materials development, and interior / cabin finishing. Many of the members of Hanseatic Engineering & Consulting Association (HECAS) are active in both industries¹⁰, quickly taking advantage of developments in one industry to improve design and engineering in the other.

Finally, the aviation cluster has benefitted from Hamburg’s growing media, telecommunications, and information technology clusters. As avionics have grown more advanced, Hamburg’s technology strengths place the aviation cluster at the forefront of industry research and development. Lufthansa Technik’s strong local research and engineering presence leverages many of these strengths as well as the media cluster. The company, for example, is one of the industry leaders in in-flight entertainment systems as well as passenger communications¹¹. This focus reinforces the cluster’s leadership in cabin design and refurbishment.

2.4.3 Demand Conditions

The aviation industry is dominated by the pitched battle between Airbus and Boeing, which together have a virtual lock on all aircraft with 125 or more seats. While smaller players such as Embraer and Bombardier have been successful in individual niches such as the market for regional jets, the bulk of industry

Figure 18: World demand for passenger aircraft (100 seats and larger)
(Airbus Industrie, 2007)



growth and focus has been centered on the two industry giants. Demand for these jets, in turn, is driven by growth in both passenger and cargo volumes as globalization continues to increase. In recent years, much of this growth has come in Asia, a trend that is only expected to accelerate. Airbus estimates that

¹⁰ Hanseatic Engineering & Consulting Association: http://www.hecas-ev.de/en_index.html (accessed April 3, 2009).

¹¹ Lufthansa Technik website: www.lufthansa-technik.com (accessed April 3, 2009).

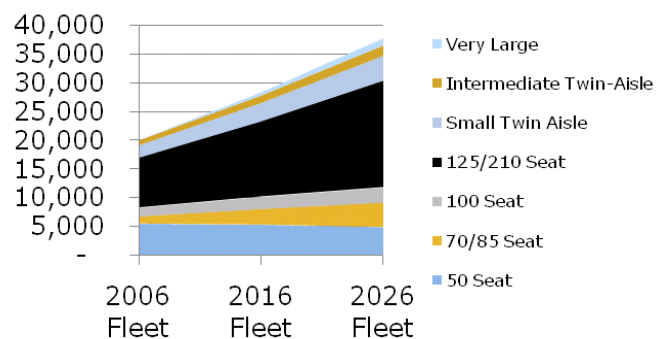
over the next 20 years, 31% of all new aircraft over 100 seats will be sold in the Asia Pacific region, which currently accounts for only 19% of the world’s fleet. In terms of estimated spending, Asia’s rise is even more pronounced as local preference for wide body aircraft means that the region is expected to account for 38% of total spending. In response, producers as well as their suppliers are increasingly focused on the region. Airbus, for example has already placed some production and sourcing in China. (Airbus Industrie, 2007)

Further enhancing the competitive position of the two industry giants, the industry is responding to increased demand for greater efficiency and volumes (both passenger and cargo) with ever larger aircraft. Airbus’ A380 is a direct response to this demand as the company sought to design an aircraft capable of moving large

numbers of passengers (and cargo) between global hub cities such as Singapore and London (Airbus Industrie, 2007). Hamburg, with its strong Airbus presence, should continue to benefit from these trends.

The city is also well positioned to take advantage of airlines’ attempts to differentiate themselves in an essentially commoditized business with features like unique cabin design and new entertainment systems. Lufthansa Technik is an industry leader in the space and has pushed to develop a strong network of local suppliers and service firms specializing in the space. Airbus has also focused the interiors component of its manufacturing chain in Hamburg, designating the city a Centre for Excellence in Cabin and Cargo Customization¹². The cluster focus on cabins and interiors has the added benefit of repeated business. An individual aircraft will need multiple refurbishments over the course of its useful life, creating steadier demand for cluster services than new manufacturing.

Figure 19: World demand for passenger aircraft by size
(Airbus Industrie, 2007)



¹² Airbus company website: www.airbus.com (accessed April 3, 2009).

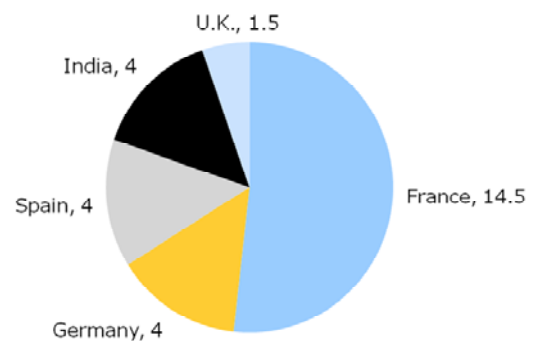
Overall, the cluster is well positioned to take advantage of industry developments, but local industry structure does present a couple of impediments to future growth. First, is the dependence on both Airbus and Lufthansa Technik. While both companies have been highly successful and will likely be industry leaders for years to come, the cluster’s SMEs would benefit from a more diversified customer base. Working with other players such as Boeing, Embraer, and Bombardier would steady demand as well as force local suppliers to develop new capabilities. Second, the aviation industry is highly globalized, but many of the local SMEs have done little to expand ties to high growth regions like Asia. Industry giants like Airbus and Lufthansa Technik are working to expand their operations; the cluster should follow their lead.

2.4.4 Context for Firm Strategy and Rivalry

The cluster dependence on Airbus and Lufthansa Technik has forced local suppliers to adapt the demands of these two giants in order to insure future viability and growth. Airbus itself is quite safe in this milieu, as the company has strong political protection in the German government. Former German Economic Minister Michael Glos highlighted this point in a 2007 interview with

Spiegel, saying he “expected Germany to maintain as much high technology – including new development – as France.” (Steingart & Reiermann, 2007) The German government, like the other government shareholders of EADS, offers much more than empty rhetoric, extending loans and other aid in support new product development and launch. In November 2000, for example, the Federal government granted a DM2 billion loan to EADS to support the development of the A380 line (Airbus Press Release: German government agrees to grant repayable loan to EADS for costs of A3XX development, 2000). Interestingly, however, France is home to more of the company’s Tier 1 suppliers, many of whom are large multinationals like Safran Group (Air et Cosmos, 2008). The supplier base in Hamburg, in contrast, is largely comprised of SMEs, few of whom are capable of delivering complete

Figure 20 - Preferred Airbus suppliers
(Air et Cosmos, 2008)



systems on their own. In response, many of these companies have begun to turn to cooperative arrangements and joint ventures in order to meet manufacturer's needs. Looking forward, this shift should be of long term benefit to the cluster as many cluster companies were discouraged from engaging in cross-company technology transfers due to mutual dependence on Airbus. The local aviation industry has also benefitted from a strong government focus on cluster development, yielding a recent Spitzencluster award as well as investment in education and infrastructure. This investment will be of particular importance as the cluster seeks to cement its place in the global aviation industry despite increased sophistication in lower labor cost countries like China and Brazil.

2.5 Current cluster challenges and proposed recommendations

Our recommendations (in order of importance) to the Hamburg aviation cluster flow from its existing competitive advantage in the context of future industry dynamics described above.

- The most pressing change the cluster needs to achieve is to **counterbalance the 3 large "anchor tenants" power**. A gap exists between the giants Airbus, Lufthansa Technik, the airport; and the SMEs. The SMEs are overly dependent on these industry giants – the cluster lacks suppliers like the French SAFRAN Group in Toulouse, capable of producing fully integrated systems, conducting in-house research and development, and counteracting OEM clout. To correct this imbalance, the cluster initiative needs to support the development of a continuum of companies, from the SME level through giants like Airbus in Hamburg in order to remain competitive vis-à-vis other clusters. Recognizing this issue, the cluster is already working to create at least one major supplier. Looking forward, the SMEs should actively seek consolidation or joint ventures, to secure the advantages of increased scale. The government and Airbus itself could also support and enforce consolidation by bringing together firms that are judged as good matches and encourage them to merge or form JVs. A second way to achieve this company and cluster growth is for the SMEs to expand customer portfolio to other aircraft producers (including Airbus' competitors as well as other parts of EADS) and to airlines directly. The cluster initiative could

help SMEs make these new contacts by making relevant information available via the cluster's communication channels (e.g., databases, trade fairs). *Context for firm strategy and rivalry / demand conditions*

- Secondly, the cluster must **overcome the problem of limited cross-company technology transfers**, which currently prevent the cluster from achieving its full innovation capacity. The cluster could foster further technology transfer between cluster participants by enhancing the opportunities for information exchange and sharing of best practices among cluster participants via improved cluster initiatives as well as renewed focus on industry associations like HECAS. Further, the formation of JVs and other cooperative enterprises will also encourage greater technology transfers as company's combine technology to create the complete systems increasingly demanded by the OEMs. The cluster is already working to foster greater cooperation amongst its members and has actively pushed membership in the various industry associations. Another approach would require much greater involvement in research and development by the universities, more akin to the U.S. model, instead of largely relying on proprietary, in house efforts. *Factor conditions / context for firm strategy and rivalry*
- Moreover, the cluster faces the **risk of obsolescence in the supply chain as production moves to emerging markets** with the advantage of lower factor costs. The Hamburg cluster must constantly strive to remain competitive at the top of the value chain, where the most knowledge-based and therefore highest value-added activities reside. In order to be competitive at this end, the cluster should focus even more on investing into its superior factor endowments, especially human capital. To do this, the government should make targeted investments into those university programs, training institutions and research institutes that are key for the aviation sector. Companies and universities should institute a regular dialogue about how to develop the qualifications and skills relevant in aviation-focused jobs, and cooperate to build these e.g. by

investing into joint R&D and education facilities and by exchanging professors and practitioners between company and university. *Context for firm strategy and rivalry*

- Finally, the cluster initiative should **foster cooperation and exchange between related clusters and industries** even more. As of now, such exchange exists on a very limited scale. Increasing this exchange could result in significant benefits such as economies of scale in pooled research, better customer focus through cooperation in product development, increased lobbying clout, and more efficient factor markets. *Related and supporting industries*

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