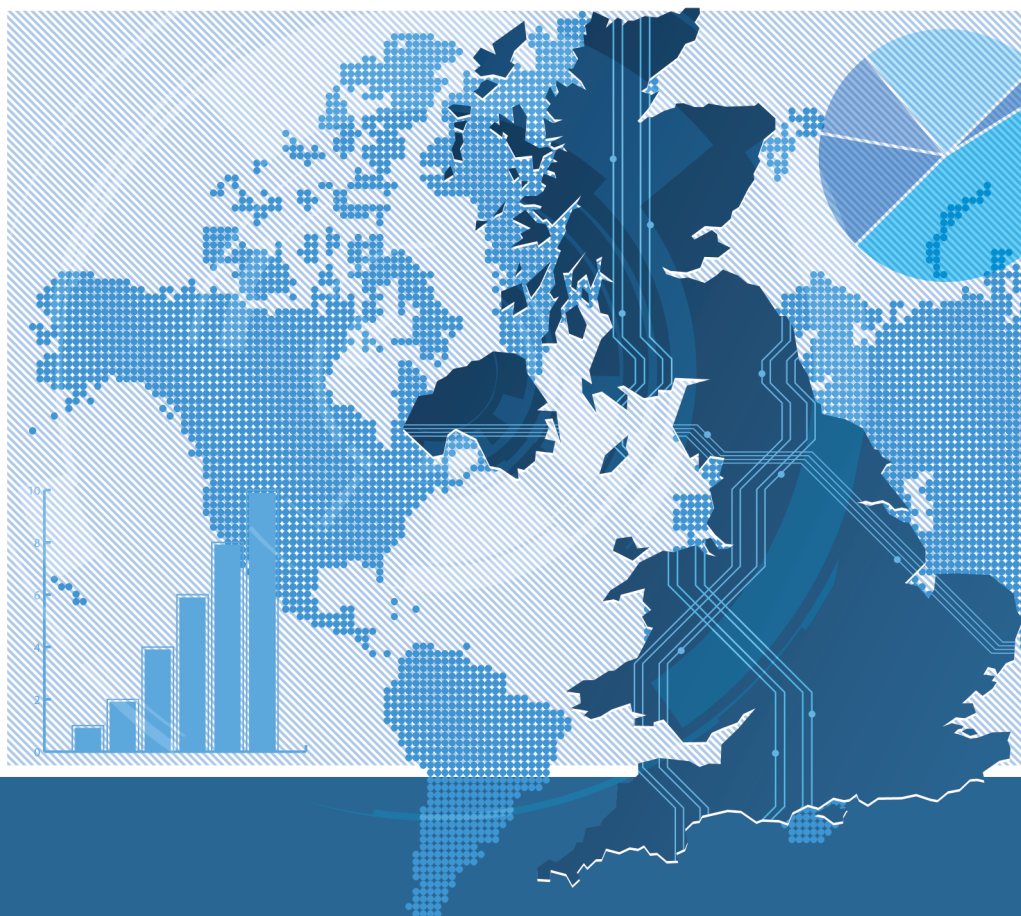




The contribution of Finmeccanica to the UK

technology, growth, investment 





The contribution of Finmeccanica to the UK

technology, growth, investment

This report has been jointly produced by Oxford Economics and Prometeia, at the request of the Finmeccanica's Research Department on behalf of the Finmeccanica Group.

Finmeccanica's Research Department has coordinated the project phase of internal data collection and, in this regard, we would like to thank the many colleagues who were involved in this activity.

The report was prepared based on information available as of 31 July 2013.

Finmeccanica SpA
Piazza Monte Grappa 4, 00195 Roma
tel.+39 06 324731, fax: +39 06 3208621
www.finmeccanica.com

Oxford Economics
London office
Broadwall House, 21 Broadwall
London, SE1 9PL, UK Tel: +44 207 803 1400
email: mailbox@oxfordeconomics.com
www.oxfordeconomics.com

Prometeia Spa
Via G. Marconi 43, 40122 Bologna
tel. +39 051 648 0911, fax +39 051 220 753
info@prometeia.com
www.prometeia.com

Contents

Foreword	5
Executive summary	7
1. Introduction	13
1.1. <i>Finmeccanica in the UK</i>	13
1.2. <i>Framework of analysis</i>	14
2. The direct economic contribution of Finmeccanica in the UK	19
2.1. <i>Employment at Finmeccanica</i>	20
2.2. <i>Value added of Finmeccanica</i>	21
2.3. <i>Fixed investment, exports, R&D and the tax contribution of Finmeccanica</i>	22
3. The indirect and induced economic contribution of Finmeccanica	25
3.1. <i>Indirect employment supported by Finmeccanica</i>	25
3.2. <i>Indirect value added supported by Finmeccanica</i>	27
3.3. <i>Indirect contribution to taxes supported by Finmeccanica</i>	27
3.4. <i>Induced value added, employment and tax supported by Finmeccanica</i>	29
3.5. <i>Total economic contributions of Finmeccanica</i>	30
4. Contribution to Scotland	33
4.1. <i>Introduction</i>	34

4.2. Direct contribution of Finmeccanica in Scotland	35
4.3. Indirect and induced contribution of Finmeccanica in Scotland ...	38
4.4. Total economic contribution of Finmeccanica in Scotland	38
5. The wider catalytic contribution of Finmeccanica	41
5.1. Spillover effects of R&D investment	42
5.2. Innovation at Finmeccanica	45
5.3. Skills, education and innovation within Finmeccanica	47
5.4. Finmeccanica's wider contribution to skills, education and innovation	49
Appendix:	
Impact Assessment Methodology	51
A.1 Static Input-Output Modelling	51
References	56

Foreword

5

At a time of relatively high unemployment in Europe in the recovery from the financial crisis, innovative companies that contribute to the future growth potential of the economy are especially important.

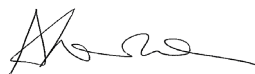
This report, split into two parts, explains how the activities of Finmeccanica, an important global firm in the aerospace, defence and security markets, contributes to the Italian and UK economies, two of its four domestic markets. The report shows the contribution Finmeccanica makes to Italian and UK GDP, the number of people it employs in both countries, and the amount of tax receipts it supports in Italy and the UK. The Italian report looks at Finmeccanica's local contribution in each region of Italy, whereas the UK report breaks out Finmeccanica's local contribution for Scotland.

The presence of Finmeccanica also boosts the supply-side of the economies of Italy and the UK by increasing the skillset of its labour force as well as the efficiency and innovation of its entire supply chain. In addition, it contributes to Italy's and the UK's "knowledge economy" via the Research & Development it undertakes, thus enhancing both economies' long-term technological advancement.

We hope you enjoy the report.



Sam Moore
Chief Operating Officer
Economic Impact and Cities Services
Oxford Economics



Alessandra Lanza
Partner
Industrial and regional strategies
Prometeia

Executive summary

Finmeccanica in the UK is part of the Italian-based Finmeccanica Group

Finmeccanica Group operates globally in the aerospace, defence and security markets. It is one of the world's leading suppliers of helicopters, aircraft, aeronautics and defence systems, as well as a European leader in space systems, security, cyber, transportation and power generation solutions. The company operates 9 major sites in the UK and comprises of a number of businesses, as well as involvement in joint ventures. Finmeccanica works actively with 1,250 SMEs in the UK.

Finmeccanica Group companies within the UK include Selex ES, AgustaWestland, Ansaldo STS, DRS Technologies, and Telespazio VEGA. This report focuses on the combined activities of Selex ES and AgustaWestland. These two companies comprise the great majority of Finmeccanica's activity within the UK. References to "Finmeccanica in the UK" in this report are therefore equivalent to the combined activities of Selex ES and AgustaWestland.

Finmeccanica provides an important direct contribution to the UK economy...

Finmeccanica in the UK directly employed **7,858 people** in 2012, in a diverse range of skilled occupations with a focus on the aerospace, defence and security sectors. As an illustration of the strength of the company's skill base in the UK, some **67%** of the company's employees hold **highly skilled** positions.

Finmeccanica in the UK earned **revenues of £2.3 billion** in 2012, making a **direct gross value added (GVA) contribution** to the UK economy of **£679**

million in that year.

The Group's UK operations are an important export earner for the UK. Of the Group's £2.3 billion in UK revenues, approximately £1 billion comprise of **export earnings**, with the remainder attributable to domestic (UK) sales.

The group also **invested some £32.6 million** in fixed capital during the year and tax paid directly by Finmeccanica and its employees contributed **£221 million to the Exchequer**.

...while also creating jobs and value across the broader economy

The direct benefits provided by Finmeccanica in the UK, noted above, are only the start of the story. The Group's activities also have important "ripple" (or multiplier effects) across the UK economy as a whole. Finmeccanica's spending on goods and services also supports jobs and GDP in firms and industries in the wider economy, through supply chain – or "indirect" – effects.

In 2012, Finmeccanica in the UK procured an estimated £864 million in equipment, raw materials, services and energy from UK suppliers, creating jobs and GVA across the entire country. Further, the spending resulting from employment directly dependent on both the Group and the supply chain provides further rounds of stimulus across the economy, known as "induced effects".

Oxford Economics and Prometeia analysis indicates that when these three types of contribution (direct, indirect and induced) are taken into account, Finmeccanica in the UK supports approximately **28,000 jobs** and **GVA** of some **£1.6 billion** across the UK economy as a whole.

Finmeccanica's UK **employment multiplier** is therefore **3.6**, so for every 10 jobs at Finmeccanica in the UK, 36 jobs are supported across the economy as a whole (including those directly employed at Finmeccanica).

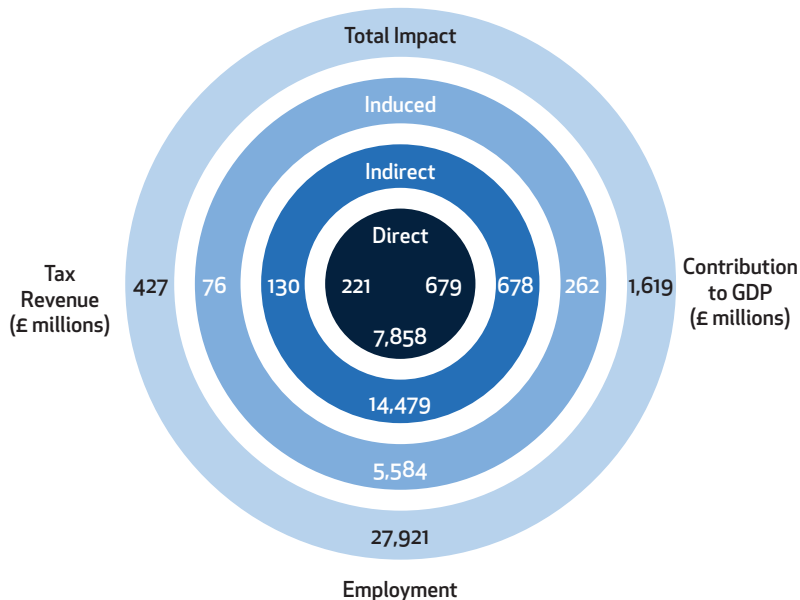
Likewise, the Group's UK **GVA multiplier** is **2.4**. So for every £1 of GVA creat-

ed by Finmeccanica, £2.4 worth of GVA is created across the UK economy as a whole (including the £1 directly created at Finmeccanica). As a result, Finmeccanica's direct value-added contribution of £679.2 million expands to a total value-added contribution of £1.6 billion. Finally, **indirect and induced taxes of £207 million** are paid by companies and employees to the Exchequer as a result, meaning that Finmeccanica's total tax contribution amounts to £427 million when direct taxes are included. Figure ES-1 below provides a summary of Finmeccanica's contribution to the UK economy in 2012.

Finmeccanica is a high productivity employer...

Future economic growth in the UK and other countries is critical to increasing productivity. High productivity employers therefore play a particular-

Figure ES-1 Summary of Finmeccanica's contribution to the UK economy, 2012



Source: Finmeccanica, Oxford Economics, Prometeia

ly important role in the economy. Finmeccanica in the UK's **labour productivity** (i.e. GVA per employee) was **£86,400** in 2012. This is **114%** higher than the economy wide labour productivity average of some £40,400 – an indication of the highly skilled, highly productive nature of the company's UK workforce.

...supporting training and R&D

10

Staff training helps support and develop Finmeccanica in the UK's skill base and maintain high productivity levels. Some **£3.5 million** was spent on **staff training** in 2012. Staff turnover was also relatively modest (10% in 2012). In 2012, Finmeccanica in the UK was given a Top Employer certification for the first time by the CRF Institute.

AgustaWestland was a top 100 apprenticeship employer in 2012, with 230 trainees, ranging from apprentices to graduates. 95% of Selex's apprentices progress to have full-time status with the company. The apprenticeship programmes for both Selex and AgustaWestland have been rated "Outstanding" by the UK Office for Standards in Education, Children's Services and Skills (OFSTED), reflecting the advanced learning and career development offered to apprentices. This is the highest rating that can be given and Finmeccanica's rating in the UK even exceeds the ratings of some of their main competitors. Yeovil College, Prospects College, Bedford College, and Thurrock and Basildon College provide off-site training for the apprenticeship programmes.

The company also plays an important role in fostering and developing R&D within the UK. R&D can also help support national productivity through "spill-over effects" which improve the productivity of other industries and thereby support productivity and growth in the economy as a whole. In 2012, Finmeccanica in the UK spent **£185 million on R&D** in 2012, of which £64 million was internally funded.

AgustaWestland forms part of the European Clean Sky Joint Technology In-

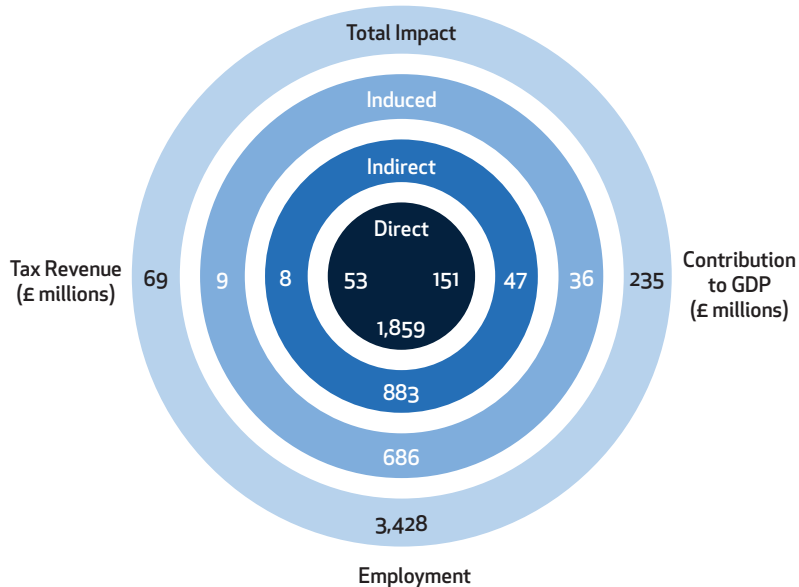
initiative, as co-lead of the Green Rotorcraft Integrated Technology Demonstration. This work stream seeks to innovate on external noise reduction technologies, clean and efficient use of power, and environmentally friendly flight paths for rotorcraft. In addition, AgustaWestland is researching advanced Tiltrotor concepts that combine turboprop performance and helicopter flexibility in order to develop a new generation of rotorcraft.

...and making an important contribution to the Scottish regional economy

Approximately 24% of Finmeccanica in the UK's employment is in Scotland. Finmeccanica's **1,859 employees in Scotland** are highly productive, with **labour productivity (GVA per employee) of £81,280** in 2012, **106% higher than the average employee in Scotland** with a labour productivity of £39,550. The

11

Figure ES-2 Summary of Finmeccanica's contribution to the Scottish economy, 2012



Source: Finmeccanica, Oxford Economics, Prometeia

total employment contribution of Finmeccanica's Scottish operations was 3,428. The employment multiplier was 1.84, meaning that for every 10 jobs at Finmeccanica in Scotland 18.4 jobs are supported across the Scottish economy as a whole (including those directly employed at Finmeccanica).

In 2012, the direct value added of Finmeccanica's Scottish operations was £151 million, approximately 22% of Finmeccanica in the UK's total value added. The **total value added of Finmeccanica's Scottish operations was £235 million** in 2012. The multiplier for value added was 1.55, meaning that for every £1 value added created by Finmeccanica in Scotland, £1.55 of value added was created across the Scottish economy as a whole (including the £1 directly created at Finmeccanica).

The **total tax contribution of Finmeccanica in Scotland to the Exchequer was £69 million** in 2012. The tax multiplier of Finmeccanica in Scotland was 1.32, meaning that for every £1 in tax contributed to the Exchequer by Finmeccanica's Scottish operations, £1.32 was contributed by the Scottish economy as a whole (Including the £1 directly contributed by Finmeccanica). Figure ES-2 shows Finmeccanica's contribution to the Scottish economy.

1. Introduction

Key points

- ▶ *Finmeccanica Group operates globally in the aerospace, defence and security markets.*
- ▶ *Finmeccanica is the largest Italian investor in the United Kingdom, the second largest defence equipment provider operating in the UK and the third largest exporter of defence products.*

Finmeccanica Group operates globally in the aerospace, defence and security markets. It is one of the world's leading suppliers of helicopters, aircraft, aeronautics and defence systems, as well as a European leader in space systems, security, cyber, transportation and power generation solutions. It ranks as one of the top ten international players in the Aerospace, Defence and Security business segments.¹ It employs 67,408 staff globally², with permanent establishments in Italy, the United Kingdom, the United States and Poland.

1.1. Finmeccanica in the UK

Finmeccanica is the largest Italian investor in the United Kingdom, the second largest defence equipment provider operating in the UK and the third largest exporter of defence products. The company operates 9 major sites in the UK and comprises of a number of businesses, as well as involvement in joint ventures. Finmeccanica works actively with 1,250 SMEs in the UK. Figure 1.1 below shows Finmeccanica sites in the UK.

¹ Aviation Week, "Top Performing Companies", 2012.

² Finmeccanica 2012 Sustainability Report.

Figure 1.1 Finmeccanica sites in the UK

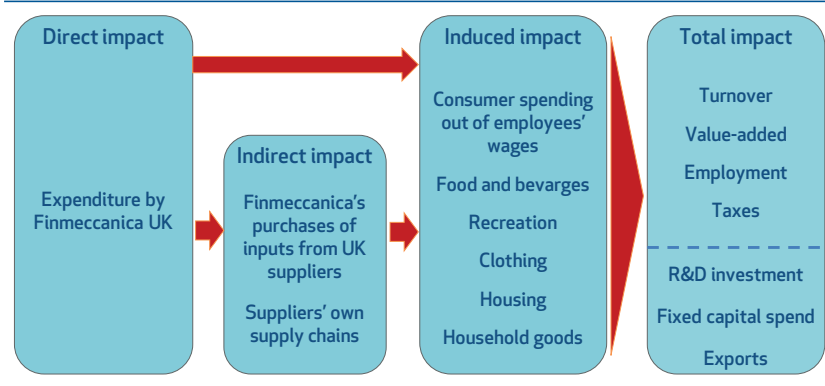


1.2. Framework of analysis

Economic impact modelling

Economic impact modelling is a standard tool used to quantify the economic contribution of an investment or company. Technical detail about the methodology and assumptions used can be found in the appendix. Here we define the framework of analysis in more general terms in order to help contextualise the results presented later in this report.

Figure 1.2 Direct, Indirect, Induced, and Total Economic Impacts



Impact analysis traces the economic contribution of an investment through three separate channels:

- Direct impact – refers to activity conducted directly by Finmeccanica in the UK.
- Indirect impact – consists of activity that is supported as a result of the procurement of goods and services by Finmeccanica in the UK, purchases by those companies in turn and so on.
- Induced impact – reflects activity supported by the spending of wage income by direct and indirect employees.

Figure 1.2 illustrates the interaction between the different channels of impact.

Spillover effects of investment in R&D

In addition to the direct, indirect, and induced effects of Finmeccanica detailed in this report for the year 2012, there are also catalytic effects, which have a long-term effect on economic growth. The effects, described in the last chapter of the report, include skills education, innovation within Finmec-

canica Group and in its supply chain, as well as the spillover effects of R&D investment.

This last effect, spillovers from R&D, is critically important for a company such as Finmeccanica that is in the business of producing high technology security and defence products. Knowledge spillovers from R&D promote economic growth via productivity improvements in the use of capital and labour. These knowledge spillovers can occur via:

- The transfer of technology, processes and know-how through the diffusion of manufacturing standards, from one firm to another in its supply chain or from one firm to another across industries.
- Formal or informal diffusion of knowledge within a supply chain through firms' participation in new high technology development programmes, or through supplier development activities or through the simple migration of staff.
- Participation in collaborative research programmes permitting access to intellectual capital, such as those through links with universities and other research institutes.
- Other transfers of knowledge through interlocking supply chains across industries, either through knowledge-sharing or through simple imitation of products or technologies.

Much of the defence industry's R&D funding is provided by government. Public investment in R&D was instituted to solve the market failure whereby too little R&D is undertaken by individual private actors. This is because the social returns to R&D are far higher than the private returns. Prior work done by Oxford Economics reported that the social return of defence R&D in the UK of 69% incorporates a private return of 10% and a spillover return of 59%³. More generally, the R&D literature finds that while private returns to R&D are shown to be between 10 to 26%, social returns range between

³ *Oxford Economics and Geo Economics (2009).*

25 and 66%⁴. In addition, the size of the firm is important for spillover effects. Bloom, Schankerman and Van Reenen (2013) find that smaller firms produce lower social returns to R&D because they operate more in technological niches. A large conglomerate like the Finmeccanica Group therefore generates higher social returns to R&D.

In addition, public investment in R&D is often used to finance national security and defence research because it is a public good. Moreover, public financing of R&D can reduce the marginal cost of private firms and reduce the risk of investment for the firm. Public R&D funding is also a signal to industry for the future demand for these products, promoting private investment.

In the case of the UK, prior work done by Oxford Economics demonstrated that the UK defence industry is the second largest investor in R&D, behind the pharmaceuticals sector⁵. In addition, this work highlighted that in 2007, the industry spent 4% of its turnover on R&D. Moreover, using a variety of measures such as gross output multipliers, jobs supported, skill level of employees, R&D intensity, export intensity, returns to the Exchequer, and capital intensity to compare UK industries results in the defence sector ranking third overall out of the 27 industries studied⁶. Finally, the UK's defence industry is globally competitive, being the second largest exporter of defence goods and services in the world behind the United States with a 20% share of world exports⁷.

Key metrics

In accordance with standard economic impact assessments, the scale of the impact of the company's presence is measured using three metrics:

■ **Gross value added** – Gross value added (GVA) is the contribution an insti-

⁴ Sveikauskas (2007).

⁵ Oxford Economics and Geo Economics (2009).

⁶ Ibid.

⁷ Oxford Economics (2011).

tution, company or industry makes to Gross Domestic Product (GDP). The sum of the gross value added of all companies in the UK is – with minor adjustments for taxes and subsidies – equal to UK GDP. GVA is most simply understood as turnover (i.e. value of sales) minus the cost of brought in goods and services used up in the production process.

- Employment – Employment figures presented represent total employment, including a very limited number of part-time employees.
- Tax receipts – Increases in profits and employment translate into additional tax revenues for the UK treasury. This study considers the receipts generated by direct taxes on wage income, indirect taxes paid by employees and direct taxes on corporate profits.

Structure of the report

The remainder of the report is structured as follows:

- Chapter 2 describes the direct contribution of Finmeccanica in the UK.
- Chapter 3 describes the results of the economic impact modelling of the indirect, induced and total contribution of Finmeccanica in the UK.
- Chapter 4 describes the direct, indirect, induced and total contribution of Finmeccanica in Scotland.
- Chapter 5 describes the wider catalytic contribution of Finmeccanica in the UK.

2. The direct economic contribution of Finmeccanica in the UK

Key points

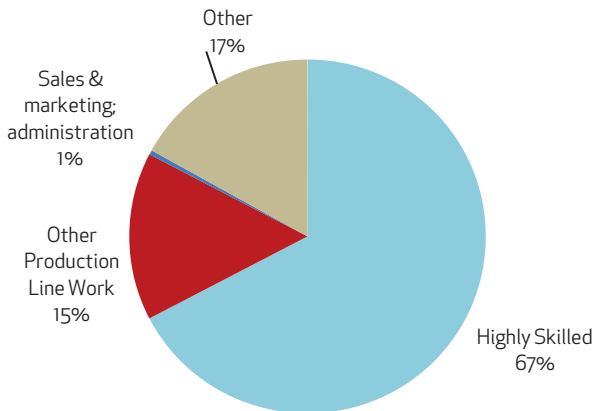
- ▶ *Employment at Finmeccanica in the UK was 7,858 in 2012, representing approximately 12% of total Finmeccanica Group employees.*
- ▶ *Finmeccanica in the UK's labour productivity (i.e. GVA per employee) was 114% higher than the UK economy wide labour productivity, an indication of the highly skilled and productive nature of Finmeccanica in the UK's workforce.*
- ▶ *Finmeccanica's UK operations are an important export earner for the UK. Of the Group's £2.3 billion in UK revenues, approximately £1 billion comprise of export earnings.*
- ▶ *In 2012, Finmeccanica in the UK and its employees contributed a net £221 million to the Exchequer in taxes.*
- ▶ *In 2012, £185 million was channelled into research and development (R&D) through Finmeccanica in the UK. £64 million of this sum was funded internally by Finmeccanica.*

Finmeccanica in the UK is a major UK employer with large operations in a number of regions, including Scotland, the South West and the South East. The economic contribution in this report relates only to the two major entities within Finmeccanica Group in the UK – Selex ES and AugustaWestland. The economic benefit from joint ventures is not captured as these are not wholly owned elements of Finmeccanica in the UK.

2.1. Employment at Finmeccanica

Employment at Finmeccanica in the UK was 7,858 in 2012, not including agency or contract workers. This represents approximately 12% of total Finmeccanica Group employees. Of those employed in the UK, 97% are full-time employees. The productive capacity of the company is significantly above the UK average. **Finmeccanica in the UK's labour productivity (i.e. GVA per employee) was £86,400 in 2012. This is 114% higher than the economy wide labour productivity average of some £40,400** – an indication of the highly skilled, highly productive nature of the company's UK workforce. A skilled workforce is important to productivity (and therefore economic) growth in the UK. The highly skilled workforce of Finmeccanica in the UK has greater benefits for the UK economy. Of the total workforce, **67% are classified as working in highly skilled roles**. Furthermore, Finmeccanica in the UK spent a total of £3.5 million on training for employees in 2012. Over the 2010-2012 period, Finmeccanica spent a total of £11.3 million on employee training and development. Figure 2.1 shows the skills split of Finmeccanica employees in the UK.

Figure 2.1 Finmeccanica employment by skills split, 2012



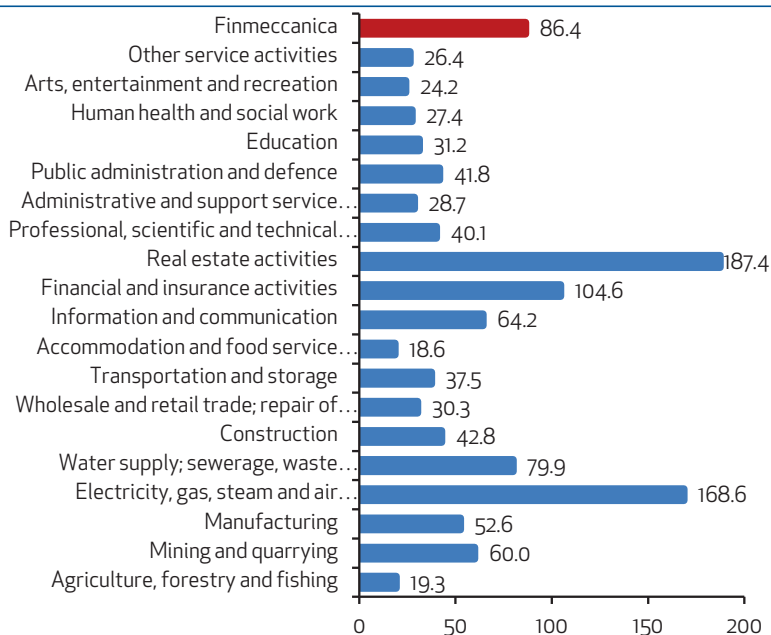
Source: Finmeccanica

2.2. Value added of Finmeccanica

The value added (i.e. a company's contribution to GDP) is calculated as the sum of wages and profits. In 2012, the direct **value added of Finmeccanica in the UK was worth £679 million**. Over the 2010-2012 period, the value added of Finmeccanica totalled to £2.1 billion. The value added per employee for Finmeccanica in the UK in 2012 was £86,400¹. This was 64% higher than the estimated average for the manufacturing sector of approximately £52,600. Figure 2.2 shows that it is also above the estimated value added per employee for most sectors. **Only three sectors have a higher productivity than Finmeccanica:** Real estate activities; Financial and insurance activities; and

21

Figure 2.2 Value added per employee, £000s, 2013 prices



Source: Finmeccanica, Oxford Economics, Prometeia

¹ This value added per employee figure of £86,400 is derived by dividing the value added estimate of £679 million by the number of employees (7,858).

Electricity, gas, steam and air conditioning. All of these sectors are very capital-intensive industries requiring relatively small amounts of labour.

2.3. Fixed investment, exports, R&D and the tax contribution of Finmeccanica

Finmeccanica in the UK invested **£32.6 million in fixed capital** over the course of 2012. Investment per employee was approximately £4,150. Over the 2010-2012 period, Finmeccanica invested a total of £130 million in fixed capital. Finmeccanica's UK operations are an important export earner for the UK. Exports comprised 45% of the Group's revenues in 2012. **Of the Group's £2.3 billion in UK revenues, approximately £1 billion comprise of export earnings**, with the remainder attributable to domestic (UK) sales. Over the 2010-2012 period, exports totalled to £3 billion, or 43% of total revenues of £7 billion in the UK. In 2012, **£185 million was channelled into research and development (R&D)** through Finmeccanica in the UK. £64 million of this sum was funded internally by Finmeccanica. Over the 2010 to 2012 period, total R&D spending by Finmeccanica in the UK was £605 million. The catalytic effects of Finmeccanica's R&D expenditure are discussed further in Chapter 5.

In 2012, Finmeccanica in the UK and its employees contributed a net £221 million to the Exchequer in taxes. This consisted of direct taxes paid by employees (i.e. employee income tax, national insurance contributions) and Finmeccanica in the UK's corporate tax and business rates tax, to the amount of £155 million. A further £66 million is contributed in the form of other taxes paid by employees (e.g. VAT). Table 2.1 shows Finmeccanica's direct tax contribution. Over the 2010-2012 period, Finmec-

Table 2.1 Finmeccanica in the UK's direct tax contribution, 2012

Category	Tax Payments (£m)
Direct Taxes	155
Other Taxes	66
Subtotal	221

Source: Finmeccanica, Oxford Economics, Prometeia

canica in the UK paid a total of £466 million in direct taxes and £202 million in other taxes paid by employees, for a total tax contribution of £667 million over those three years.

3. The indirect and induced economic contribution of Finmeccanica

Key points

- ▶ The 7,858 direct jobs at Finmeccanica in the UK in 2012 supported 14,479 indirect jobs further down the supply chain.
- ▶ For every £1 of value added created at Finmeccanica in the UK, approximately £1 of value added is indirectly supported further down the supply chain, for a total of £678 million of indirectly supported value added in 2012.
- ▶ Finmeccanica in the UK's £221 million in direct tax payments in 2012 supported a further £130 million in tax payments to the Exchequer via the supply chain.
- ▶ The induced effects increase employment by 5,584 jobs, GVA by £262 million and tax payments by £220 million.
- ▶ The total economic contribution of Finmeccanica in the UK consists of 27,921 jobs, £427 million in tax receipts, and £1.6 billion GVA. Finmeccanica's UK employment multiplier is therefore 3.6, while the tax multiplier is 1.9 and the GVA multiplier is 2.4.

3.1. Indirect employment supported by Finmeccanica

In addition to their own activities and employees, described in the previous chapter, Finmeccanica is indirectly responsible for supporting activity and employment in other firms that rely on sales to Finmeccanica. Furthermore, the firms that benefit from sales to Finmeccanica will in turn buy goods and services from a range of other firms. These sales further down the supply chain can be said to be indirectly attributable to Finmeccanica. The reliance of all these firms on initial demand from Finmeccanica can be thought of as the “indirect” contribution of Finmeccanica to the

Table 3.1 Finmeccanica in the UK, indirectly supported employment, 2012

Sector	Indirectly Supported Employment
Agriculture, forestry and fishing	48
Mining and quarrying	259
Manufacturing	4180
Electricity, gas, steam and air conditioning supply	93
Water supply; sewerage, waste management and remediation activities	56
Construction	311
Wholesale and retail trade; repair of motor vehicles and motorcycles	1674
Transportation and storage	981
Accommodation and food service activities	146
Information and communication	135
Financial and insurance activities	378
Real estate activities	170
Professional, scientific and technical activities	4621
Administrative and support service activities	393
Public administration and defence; compulsory social security	170
Education	275
Human health and social work activities	172
Arts, entertainment and recreation	354
Other service activities	62
Total	14,479

Source: Oxford Economics, Prometeia

economy. In 2012, Finmeccanica spent approximately £1.6 billion on procurement of equipment, components, raw materials, rent, energy and services from its suppliers. Out of this total procurement, £864 million was spent in the UK. This procurement expenditure supports jobs further down in the supply chain. Distributing Finmeccanica's UK procurement spending across industrial sectors and examining the impact of that spending on total sales of different industries (using input/output tables) shows that **a typical job at Finmeccanica in the UK supports of 1.8 jobs elsewhere in the economy**. In other words, taking into account the first and second layers of suppliers, **the 7,858 UK jobs at Finmeccanica in 2012 supported a further 14,479 jobs further down the supply chain**. These 14,479 jobs were distributed across various sectors of the UK economy, as shown in Table 3.1.

3.2. Indirect value added supported by Finmeccanica

In the same way that Finmeccanica supports employment in other firms down the supply chain, it also supports the value added created by those firms. For every £1 of value added created at Finmeccanica in the UK, approximately £1 of additional value added is indirectly supported further down the supply chain. **In total, £678 million of indirect value added is created**. Table 3.2 shoes the distribution of indirect value added across industries.

3.3. Indirect contribution to taxes supported by Finmeccanica

To the extent that Finmeccanica in the UK supports the activities of other firms in its supply chain, it also supports tax contributions from those firms. The estimation of industry value added, together with an estimate of average industry gross operating surplus (i.e. profit) and an allowance for depreciation-related corporate tax write-offs allows for the derivation of corpo-

Table 3.2 Finmeccanica in the UK, indirectly supported value added, 2012

Sector	Indirectly Supported Value Added (£000s)
Agriculture, forestry and fishing	929
Mining and quarrying	15516
Manufacturing	220020
Electricity, gas, steam and air conditioning supply	15730
Water supply; sewerage, waste management and remediation activities	4480
Construction	13296
Wholesale and retail trade; repair of motor vehicles and motorcycles	50736
Transportation and storage	39399
Accommodation and food service activities	2705
Information and communication	8664
Financial and insurance activities	39534
Real estate activities	31935
Professional, scientific and technical activities	193157
Administrative and support service activities	11292
Public administration and defence; compulsory social security	7113
Education	8595
Human health and social work activities	4729
Arts, entertainment and recreation	8705
Other service activities	1631
Total	678,166

Source: Oxford Economics, Prometeia

rate tax effects. It has been estimated that gross operating surplus typically accounts for 38% of value added¹. In addition, employees indirectly supported by Finmeccanica in the UK (i.e. in Finmeccanica's supply chain) also pay personal taxes. Therefore the impact of these taxes (e.g. income tax, employee NIC) has also been calculated². These assumptions suggest that **Finmeccanica in the UK's £221 million in direct tax payments in 2012 indirectly supported a further £130 million in tax payments to the Exchequer.**

3.4. Induced value added, employment and tax supported by Finmeccanica

Employees supported by Finmeccanica in the UK (whether directly or indirectly) use their income to purchase goods and services for their own consumption. This spending then helps to support additional businesses, leading to additional value added and jobs in the industries that supply these purchases. These benefits from consumer spending are known as induced effects. Our past simulations, conducted on the Oxford Economics Macroeconomic Model of the UK economy, suggest that induced employment is approximately equal to 25% of direct and indirect employment. By these estimates, **induced employment is equal to 5,584 jobs.** Induced value added can be estimated using the estimate of indirect value added per employee and scaling up by induced employment. In this way, **induced value added can be shown to be £262 million.** The estimated induced value added allows for induced tax effects to be derived, using a similar methodology to that adopted for indirect tax effects and an allowance for employee VAT contribution similar to that for direct tax. **Induced taxes are estimated to total to £76 million.**

¹ The estimate of 38% was based on the average of all UK industries, and the most recent release of detailed UK input-output tables (relating to 2005). This allowed for the use of GOS as a proxy for firm profits, subject to statutory tax rates.

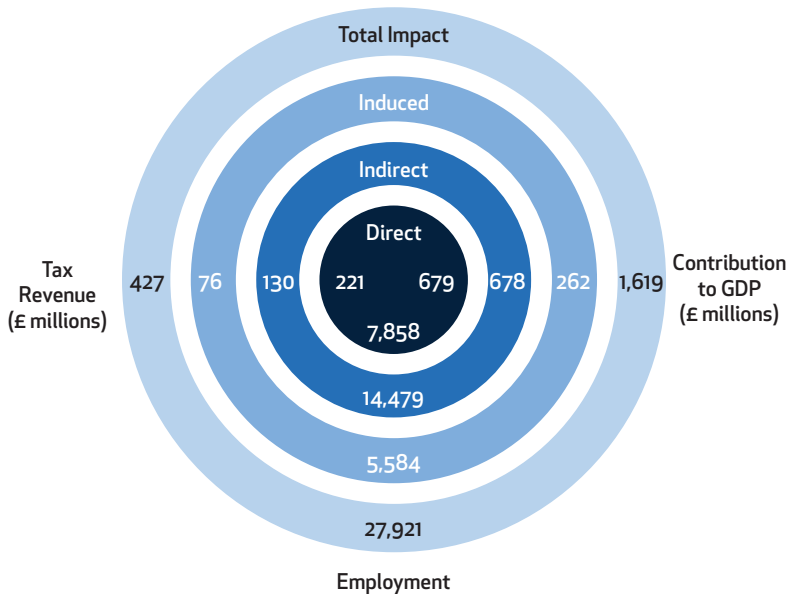
² Data from the ONS' *Effects of Taxes and Benefits on Household Income* 2011/12, July 2013 indicated that these taxes account for some 21.2% of non-retired household gross income. Combined with a UK average wage of £32,708 (sourced from the ONS' 2012 Annual Survey of Hours and Earnings) and the number of indirectly supported employees (14,479) this allowed for the estimation of the personal tax contribution.

3.5. Total economic contributions of Finmeccanica

The figures for Finmeccanica's direct economic contributions, provided in Chapter 2, can be added to the induced and indirect economic contributions detailed in this chapter to provide an estimate of Finmeccanica in the UK's total economic impacts in 2012. Figure 3.1 provides these figures.

First, **Finmeccanica's UK employment multiplier is therefore 3.6**, so for every 10 jobs at Finmeccanica in the UK, 36 jobs are supported across the economy as a whole (including those directly employed at Finmeccanica). Second, indirect and induced taxes of £207 million are paid by companies and employees to the Exchequer as a result, meaning that Finmeccanica's total tax contribution amounts to £427 million when direct taxes are included. **This implies a tax multiplier of 1.9**. Finally, Finmeccanica in the UK's **GVA multi-**

Figure 3.1 Summary of Finmeccanica in the UK's economic impact, 2012



Source: Finmeccanica, Oxford Economics, Prometeia

plier is 2.4. So for every £1 of GVA created by Finmeccanica, £2.4 worth of GVA is created across the UK economy as a whole (including the £1 directly created at Finmeccanica). As a result, Finmeccanica's direct value-added contribution of £679 million expands to a **total value-added contribution of £1.6 billion**. Directly supported employment of 7,858 at Finmeccanica in the UK increases to a **total number of jobs supported of 27,921**. Lastly, Finmeccanica's direct tax contribution in the UK increases to a **total tax contribution of £427 million**.

These estimates of total economic impact provide a snapshot for a single year, 2012. However, Finmeccanica is also an important contributor to regional development and provides “catalytic” and “dynamic” contributions to the UK economy, which will also contribute to increased productivity and living standards in the longer term. The following chapters examine the regional contribution for Scotland and the catalytic impacts more closely.

4. Contribution to Scotland

Key points

- ▶ *Finmeccanica in the UK is an important part of a significant aerospace, defence and marine cluster in Scotland through the operations of Selex ES' Edinburgh facility.*
- ▶ *Finmeccanica's 1,859 employees in Scotland are highly productive, with labour productivity (GVA per employee) of £81,280 in 2012, 106% higher than the average employee in Scotland with a labour productivity of £39,550.*
- ▶ *In 2012, the direct value added of Finmeccanica's Scottish operations was £151 million, approximately 22% of Finmeccanica in the UK's total value added.*
- ▶ *The total value added of Finmeccanica's Scottish operations was £235 million in 2012. The multiplier for value added was 1.55, meaning that for every £1 value added created by Finmeccanica in Scotland, £1.55 of value added was created across the Scottish economy as a whole (including the £1 directly created at Finmeccanica).*
- ▶ *The total employment contribution of Finmeccanica's Scottish operations was 3,428. The employment multiplier was 1.84, meaning that for every 10 jobs at Finmeccanica in Scotland 18.4 jobs are supported across the Scottish economy as a whole (including those directly employed at Finmeccanica).*
- ▶ *The total tax contribution of Finmeccanica in Scotland to the Exchequer was £69 million in 2012. The tax multiplier of Finmeccanica in Scotland was 1.32, meaning that for every £1 in tax contributed to the Exchequer by Finmeccanica's Scottish operations, £1.32 was contributed by the Scottish economy as a whole (Including the £1 directly contributed by Finmeccanica).*

4.1. Introduction

Finmeccanica in the UK is an important part of a significant aerospace, defence and marine cluster in Scotland. This cluster is one of Scotland's highest value sectors, with nearly 40,000 employees¹. Clusters boost economic growth in several ways. Clusters improve own firm productivity by providing access to highly specialised inputs and employees. In addition, clusters promote and enhance firms' innovation by diffusing technological knowledge and innovations more rapidly. Lastly, clusters spur higher rates of new business formation, with employees becoming entrepreneurs in spin-

Figure 4.1 Finmeccanica's presence in Scotland



¹ Scottish Development International, "MRO in Scotland"

off ventures. Typically, clusters are internationally competitive, competing with other similar clusters globally for a share of the total world market. Hence the formation and growth of specialised clusters feature prominently in many local and national development strategies promoted by governments. Selex ES' Scottish operations are located at their Edinburgh site and form an important part of this cluster. Selex ES' Edinburgh site is the largest defence electronics site in the UK and is involved in a range of programmes such as Eurofighter, SAAB Vixen and the F-35 Joint Strike Fighter². Figure 4.1 shows Finmeccanica's presence in Scotland (where Scotland is shaded in blue).

4.2. Direct contribution of Finmeccanica in Scotland

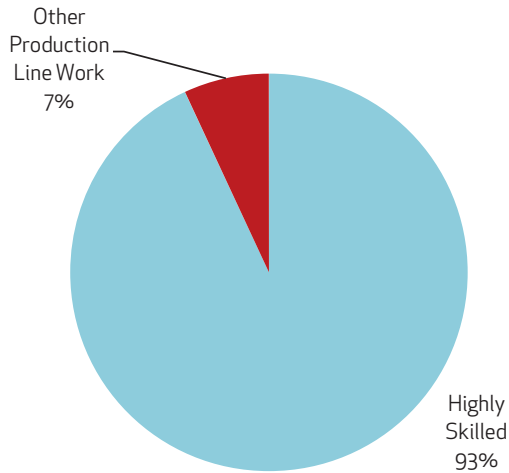
Using the share of employees of Finmeccanica in the UK employed in Scotland, one can attribute a proportion of direct impacts from Finmeccanica in the UK to the Scottish economy. Selex ES' Edinburgh site employs 1,859 workers, approximately 24% of Finmeccanica's total UK employment³. **Finmeccanica's employees in Scotland are highly productive, with labour productivity (GVA per employee) of £81,280 in 2012, 106% higher than the average employee in Scotland** with a labour productivity of £39,550. High-skill jobs in Scotland improve Scotland's overall labour productivity, which feeds into higher economic growth. Of the total workforce, **93% are classified as working in highly skilled roles**.

In 2012, the direct value added of Finmeccanica attributable to Scotland was £151 million, approximately 22% of Finmeccanica total UK value added. The value added per employee for Finmeccanica in Scotland in 2012 was £81,280. This was 26% higher than the estimated average for the Scottish manufacturing sector of approximately £64,600. Figure 4.3

² <http://www.scottish-enterprise.com/your-sector/aerospace-defence-and-marine/adm-strategy/adm-facts/defence-facts.aspx>

³ This number does not include contract workers.

Figure 4.2 Finmeccanica employment in Scotland by skills split, 2012

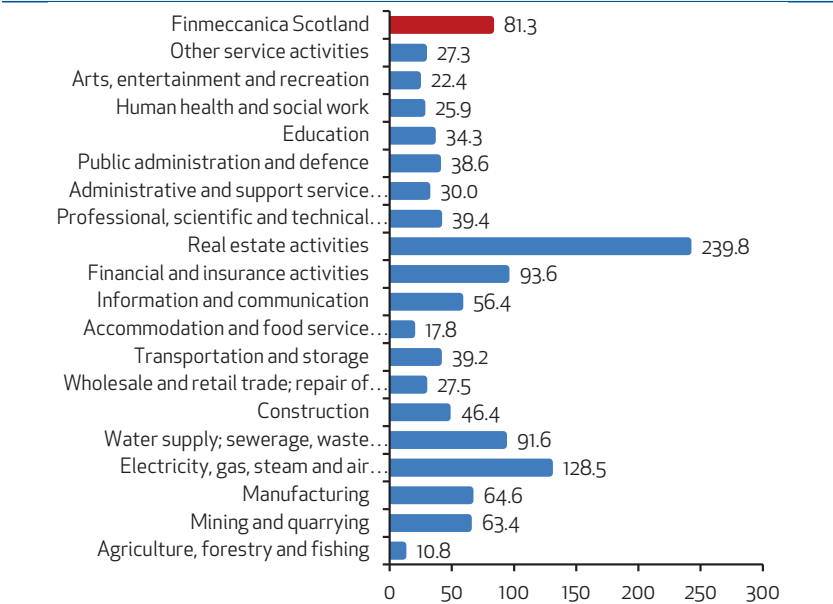


Source: Finmeccanica

shows that it is also above the estimated value added per employee for most sectors. **Only four sectors have a higher productivity than Finmeccanica in Scotland** (real estate; financial and insurance activities; water supply, sewerage and waste; and electricity, gas, steam and air conditioning). All of these sectors are very capital-intensive industries requiring relatively small amounts of labour.

A total of **£9.3 million in fixed capital investments** over the course of 2012 can be attributed to Finmeccanica in Scotland. Investment per employee was approximately £4,990. Out of the £185 million channelled into research and development (R&D) through Finmeccanica in the UK in 2012, £57 million is attributable to Scotland based on Finmeccanica's employment share in Scotland. **Of the Group's £426 million in Scottish revenues, £204 million comprise of export earnings**, with the remainder attributable to domestic sales. In 2012, **Finmeccanica's Scottish operations contributed £53 million to the UK Exchequer**. Direct taxes paid by employ-

Figure 4.3 Scottish value added per employee, £000s, 2013 prices



Source: Finmeccanica, Oxford Economics, Prometeia

ees (i.e. employee income tax, national insurance contributions) and corporate and business rates taxes, account for £37 million of this. A further £15 million is contributed in the form of other taxes paid by employees (e.g. VAT). Table 4.1 shows the breakdown in the direct tax contribution of Finmeccanica in Scotland.

Table 4.1 Finmeccanica in the UK’s direct tax contribution to Scotland

Category	Tax Payments (£m)
Direct Taxes	37
Other Taxes	15
Subtotal	53

Source: Finmeccanica, Oxford Economics, Prometeia

4.3. Indirect and induced contribution of Finmeccanica in Scotland

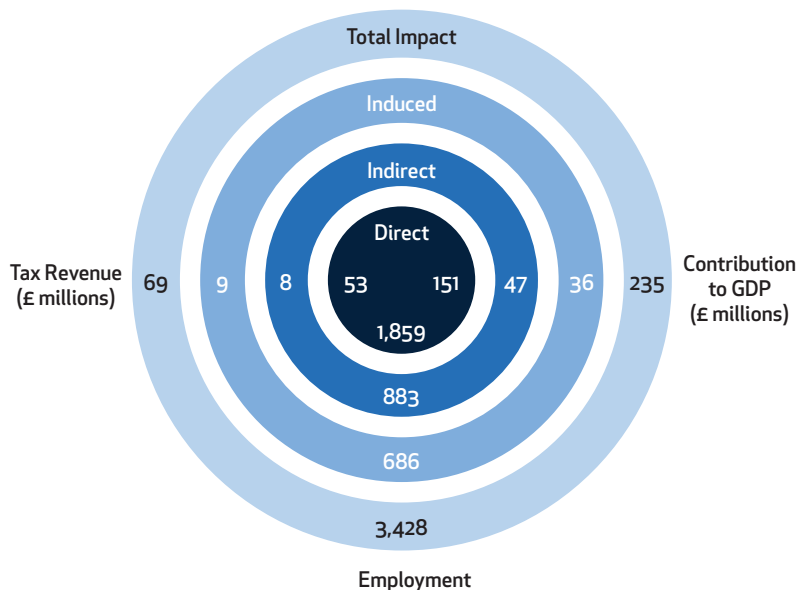
In addition to the direct contribution elaborated on above, there are indirect and induced contributions of Finmeccanica's presence in Scotland. These operate through the impact on the supply chain and on the impact of employee spending respectively. **Finmeccanica indirectly contributed £47 million to Scottish value added in 2012 through its supply chain. The corresponding indirect employment attributable to Finmeccanica's Scottish operations was 883.** Finmeccanica's indirect tax contribution for Scotland includes income taxes and other local taxes paid by employees of supply chain firms as well as corporate tax paid by supply chain firms. **This indirect tax contribution totalled £7.8 million in 2012. Finmeccanica's Scottish induced value added (representing value added created by the expenditure of Finmeccanica and associated supply chain employees) was £36 million in 2012. Induced employment totalled 686.** Finmeccanica's induced tax contribution to Scotland incorporates consumption taxes, income taxes and other local taxes, and corporate tax. **This induced tax contribution amounted to £9 million in 2012.**

4.4. Total economic contribution of Finmeccanica in Scotland

The sum of the direct, indirect and induced impacts represents the total economic contribution of Finmeccanica in Scotland in 2012. (Note however, that longer term catalytic impacts are separate and additional to this and are covered in the next chapter). **The total value added contributed by Finmeccanica's Scottish operations was £235 million in 2012.** The value added multiplier was 1.55, meaning that for every £1 value added created by Finmeccanica in Scotland, £1.55 of value added was created across the Scottish economy as a whole (including the £1 directly created at Finmeccanica). **The total employment contribution of Finmeccanica's Scottish operations was 3,428 employees in 2012.** The employment multiplier was 1.84, meaning

that for every 10 jobs at Finmeccanica in Scotland 18.4 jobs were supported across the Scottish economy as a whole (including those directly employed at Finmeccanica. **Finally, the total tax contribution of Finmeccanica's Scottish operations was £69 million in 2012.** The tax multiplier of Finmeccanica in Scotland was 1.32, meaning that for every £1 in tax contributed to the Exchequer by Finmeccanica in Scotland, £1.32 was contributed by the Scottish economy as a whole (Including the £1 directly contributed by Finmeccanica). Figure 4.4 summarises these figures.

Figure 4.4 Summary of Finmeccanica's economic contribution to Scotland, 2012



Source: Finmeccanica, Oxford Economics, Prometeia

5. The wider catalytic contribution of Finmeccanica

Key points

- ▶ *By 2040, but for Finmeccanica's R&D investment, the UK's cumulative TFP, a measure of an economy's long-term technological advancement, would be 0.14% lower.*
- ▶ *In addition to R&D, Finmeccanica encourages innovation within the company and with its suppliers in a variety of ways. Finmeccanica hosts an annual Innovation Award competition that celebrates the wide range of inventive ideas to come from across the group. It helps to reveal new technical innovations and raise group-wide awareness of them.*
- ▶ *£3.5 million was spent on staff training in 2012. Staff turnover was also relatively modest (10% in 2012).*
- ▶ *In 2012, Finmeccanica in the UK was given a Top Employer certification for the first time by the CRF Institute.*
- ▶ *As well as the skills development Finmeccanica provides to its own employees, it also makes a significant investment in the wider education sector, both through encouraging interest in science and technology throughout the school system.*

The catalytic contribution of Finmeccanica in the UK relates to a variety of ways in which it contributes to increased productivity and living standards across the wider community and the development of a knowledge economy. Catalytic factors contribute to economic growth in the long-run. While some (such as the annual contribution to R&D expenditure) may be quantifiable to an extent, others (such as encouraging science and engineering education in schools or support, guidance and assistance along the supply chain) are less directly measurable. However, all clearly have important longer term eco-

conomic effects.

Catalytic effects may include:

- Spillover effects of R&D spending by Finmeccanica in the UK
- Skills education and innovation within Finmeccanica in the UK
- Finmeccanica in the UK's wider contribution to skills education and innovation
- Other Corporate Responsibility Programmes

5.1. Spillover effects of R&D investment

R&D increases productivity in a variety of ways: By improving the quality of goods, by reducing the costs of producing existing goods, and by increasing the range of goods or intermediate inputs available¹. Furthermore, R&D carried out in one firm can have positive spillovers to other firms or industries as the benefits accrue to competitors, other firms, suppliers and customers. Figure 5.1 summarises pathways by which R&D investment leads to productivity increases.

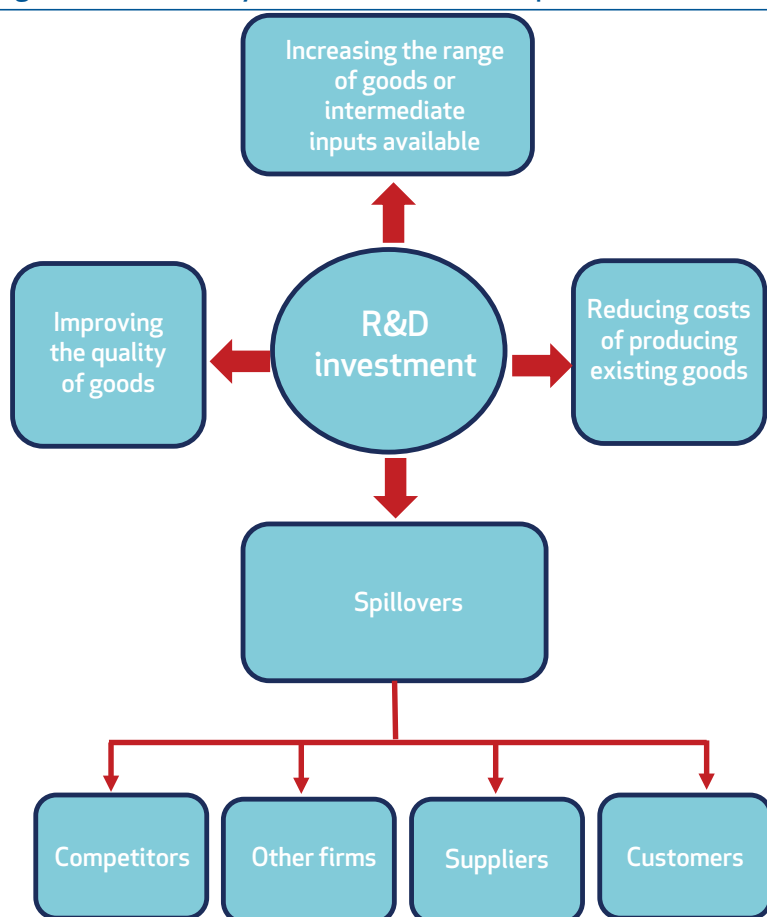
Typically, social returns to R&D are much greater than private (own-firm) returns. The social returns to R&D expenditure, the amount of resources saved due to increased productivity spurred by R&D, can be measured by the sum of the producer and consumer surpluses generated by it². For ease of aggregation across industries, regression-based studies are typically conducted to measure these social returns. Sveikauskas (2007) reviews the R&D literature, finding that while private returns to R&D are shown to be between 10 to 26%, social returns range between 25 and 66%.

The increase in productivity due to R&D can be measured by estimating the

¹ Hall, Mairesse & Mohnen (2009)

² Griliches (1998).

Figure 5.1 Productivity increases due to R&D expenditure



impact of R&D on total factor productivity (TFP), a measure of the economy's long-term technological advancement. Duverger and van Pottelsberghe de la Potterie (2011) find that the long term elasticity of TFP with respect to business R&D is 0.14, meaning that for every percent increase in R&D, TFP increases by 0.14%. Using Finmeccanica's 2012 R&D investment to construct a model of R&D investment and the corresponding TFP impact from

2012 to 2040 shows that by 2040, but for Finmeccanica's R&D investment, the UK's cumulative TFP would be 0.14% lower, commensurate with the cumulative 1.03% lower level of R&D expenditure by 2040 without Finmeccanica's contribution³.

The R&D conducted by Finmeccanica therefore has a not negligible effect on the UK's productivity and these innovations are extremely important. The aerospace and defence sector is a leader in innovation, having introduced commercial air transport, supersonic flight, and space flight to the world. The sector has pioneered many innovations that have then gone on to have a major impact in consumer products. For example, GPS technology, originally designed for military and intelligence use during the Cold War, is now ubiquitous⁴. In addition, today's wireless headsets are inspired by NASA-developed technology for Neil Armstrong's moon landing⁵. Also, shock absorbing athletic shoes utilise technology developed for space boots⁶. Further, a report by CHI-research⁷ shows that the aerospace sector, due to the R&D it invests in, is more efficient in producing technological innovations – measured by the number of new patent filings – compared to the UK average.

Major examples of Finmeccanica's investment in R&D in the UK with important future applications include:

- *Eurofighter Typhoon* — Selex ES provides 60% of the defence electronics for the Eurofighter Typhoon. These technologies include the Captor fire control radar, the PIRATE infrared search and track and the Praetorian defensive aids system. The Eurofighter Typhoon supported the recent international mission over Libya.

³ Assuming that Finmeccanica's investment in R&D and total R&D continues to grow at the rate it has grown at over the 2009-2011 period.

⁴ <http://www.mio.com/technology-history-of-gps.htm>

⁵ <http://spinoff.nasa.gov/index.html>

⁶ *Ibid.*

⁷ CHI-Research, New Jersey, quoted in the *Financial Times*, 26 August 2003.

- *Sentinels mission* — The mission, a joint initiative between the European Commission and the European Space Agency, involves multiple Earth observation satellites, carrying advanced instruments to measure variations in land and sea surface conditions, topography, temperature and atmospheric composition. Telespazio VEGA has been supporting research activities developing image processing algorithm prototypes and developing Payload Data Ground Segment systems for this mission. Selex ES is responsible for one of the key sensors on Sentinel 3, which will measure the temperature of land, sea and air composition for environmental monitoring activities.
- *Rotorcraft programmes* — AgustaWestland is the UK's only onshore Rotary Wing manufacturer. The company invests significant sums each year to ensure it provides leading edge and affordable platforms and support solutions for both Civil and Military customers. As well as being a full onshore design, manufacture and support operation the company also has specific international centres of excellence in Blades and Transmission design and development.

In addition, Finmeccanica collaborates with more than 30 UK universities on R&D, including: Imperial College, University of Bristol, University of Liverpool, University of York and Cranfield University. In general, these technologies and products are an important illustration of the way Finmeccanica's work in the UK is an important contributor to the "knowledge economy". As illustrated, such work has the potential to generate widespread and long term economic benefits across the broader economy.

5.2. Innovation at Finmeccanica

In addition to R&D, Finmeccanica encourages innovation within the company and with its suppliers in a variety of ways. Finmeccanica hosts an annual Innovation Award competition that celebrates the wide range of inventive ideas to come from across the group. It helps to reveal new technical inno-

ventions and raise group-wide awareness of them. The awards also encourage improved co-operation between teams working in similar technological fields, wherever they are based in the international Finmeccanica Group. A total of more than 3,000 high quality, innovative projects have been submitted to the programme, involving around 10,000 people across numerous project teams. In addition to internal entrants, Finmeccanica recognises the importance of innovation throughout its business and also presents an award for the Best Supplier. Finmeccanica holds supplier engagement events throughout the year to speak and interact with suppliers about best practices. Finmeccanica's supply chain includes 1,250 SMEs and Finmeccanica carries many of them into domestic and international markets. Furthermore, Finmeccanica has a domestic supply chain, thereby providing higher economy-wide impacts in the UK by virtue of greater procurement from UK firms.

Moreover, Finmeccanica's relationship with suppliers is beneficial for both Finmeccanica and the firms it supplies. For example, suppliers noted that Finmeccanica in the UK is proactive in helping them with applying best practices, carrying those over from their other vendors, as well as mentoring and coaching them. Finmeccanica has sponsored suppliers to take part in the Supply Chain of the 21st Century (SC21) Programme, a key industry venture for Aerospace, Defence, Security and Space to achieve supply chain improvement. Three suppliers it has sponsored are Reliance Precision Limited, Surface Technology International (STI), and Castle Precision Engineering. With Finmeccanica's support and guidance through the manufacturing excellence and business excellence workshop assessments, Castle Precision achieved the SC21 (Supply Chain 21st century) bronze award in July 2010. This award status was one of the contributing factors which led to Castle Precision winning Manufacturer of the Year 2010; an award which recognises all-round excellence in UK manufacturing. In some cases, Finmeccanica and their suppliers both purchase from the same third-party companies. In one specific case, due to their supplier relationship with Finmeccanica over the last twenty years, STI has gained new customers because Finmeccanica has suggested to these suppliers to use STI services.

Plus, Finmeccanica's presence has prodded suppliers to enter new areas of manufacturing and make new investments. For example, Finmeccanica's presence has spurred Reliance Precision Limited to enter the field of optics. Finmeccanica has provided much in the way of help and encouragement throughout the process, including teaching them how to make optical products. Some suppliers develop new products for Finmeccanica that they are then able to sell on to other customers. For instance, Surface Technology International (STI), has grown into different manufacturing processes as per Finmeccanica's request. Castle Precision has built a clean room just for Finmeccanica orders, spending £50,000 to build it. For its parts, Reliance has increased their clean assembly facilities with investments which have been underpinned by Finmeccanica orders. In both cases, this is an investment that can now be used to assemble products for other customers as well.

Lastly, suppliers undertake R&D initiatives as a result of their relationship with Finmeccanica. For example, Reliance has conducted R&D on gear boxes that they supply to Finmeccanica. STI has developed the latest Package on Package (POP) technology in anticipation of future Finmeccanica needs. This technology aims to package as much technology into as little space as possible without expanding the size of the object, but improving its functionality. In all of these cases, Finmeccanica's presence has encouraged innovation in its supply chain.

5.3. Skills, education and innovation within Finmeccanica

Finmeccanica in the UK recruits the highest-calibre staff and runs flourishing graduate and apprentice schemes. Staff training helps support and develop Finmeccanica in the UK's skill base and maintain high productivity levels. Some £3.5 million was spent on staff training in 2012. Staff turnover was also relatively modest (10% in 2012). In 2012, Finmeccanica in the UK was given a Top Employer certification for the first time by the CRF Institute. AgustaWestland was a top 100 apprenticeship employer in 2012, with 230 train-

ees, ranging from apprentices to graduates. 95% of Selex's apprentices progress to have full-time status with the company. The apprenticeship programmes for both Selex and AgustaWestland have been rated "Outstanding" by the UK Office for Standards in Education, Children's Services and Skills (OFSTED), reflecting the advanced learning and career development offered to apprentices. This is the highest rating that can be given and Finmeccanica's rating in the UK even exceeds the ratings of some of their main competitors. Yeovil College, Prospects College, Bedford College, Thurrock College and Basildon College provide off-site training for the apprenticeship programmes.

The Finmeccanica Group holds a four-month induction training for new graduate recruits across the group's companies. This ensures that new recruits receive a consistent induction to Finmeccanica. It also creates a strong sense of identity and culture, offering graduates the chance to make international contacts within the group and meet face-to-face in different countries. Employees working at Selex ES receive personal development training to enhance their management and motivational capability. This course was specially tailored for Selex ES by external specialists and is made up of five separate modules, which can take up to nine months to complete. The modules aim to produce a consistent style of leadership and also focus on developing motivational skills to improve performance at all levels across the business. The modules are highly participative and mixed with learning activities that involve individuals and their managers. Training is provided both internally and externally and there is 360 degree feedback at the beginning and end of the programme so that participants can track their progress. Members of the Selex ES senior management team play a prominent part in the final module, supporting and providing feedback to the participants.

The effects of Finmeccanica's staff development programmes are not merely internal but are ultimately spread across the broader economy. For example, the training capabilities developed for in-house employees have also been used to develop a line of business that delivers training to customers.

Also, Finmeccanica staff are in high demand by other firms, who, in turn, benefit from many of the human capital programmes described above.

5.4. Finmeccanica's wider contribution to skills, education and innovation

As well as the skills development Finmeccanica provides to its own employees, it also makes a significant investment in the wider education sector, through encouraging interest in science and technology throughout the school system.

Key facts and highlights include:

- *Finmeccanica FHINK Masters Programme* — The FHINK Masters Programme, conducted in partnership with Imperial College Business School, is an innovative one year programme that aims to develop professionals capable of making an impact across the organisation from an international perspective. The course takes around 30 of the best graduates from the world's top universities and gives them a rounded mix of academic training, business skills and industrial experience to produce dynamic individuals who can competently manage complex, international projects. The FHINK Faculty includes world class academics, industry experts and company executives. After one year and 1,500 hours of training, FHINK graduates are offered an opportunity to take up a role within a Finmeccanica Group company.
- *Edinburgh International Science Festival sponsorship* — Finmeccanica sponsors the annual festival, which is regarded as one of the best examples of interactive, educational entertainment in the world. The two week festival is host to more than 100,000 children and young people who attend specially designed workshops that present science and engineering in a meaningful and engaging way. In the Selex ES stand, children were given the opportunity to assemble Rampaging Chariot robots in the work-

shop area and test the resilience of their creations on an assault course.

- *Promoting engineering in schools* — Finmeccanica, via AgustaWestland, conducts a year-round programme of activities with around 25 schools and sixth-form colleges in the local Yeovil area to encourage an interest in engineering. 'Imagineering Clubs' are run at the end of the primary school day to demonstrate various engineering concepts. AgustaWestland also has a key presence at the Imagineering exhibition at the Bath and West Show, displaying a number of hands-on engineering activities from the stand and running a 'schools challenge' competition. In support of the science and technology curriculum, 'Flight Packs' of eight consecutive lessons on the principles of helicopters and flight are provided to schools.

Appendix:

Impact Assessment Methodology

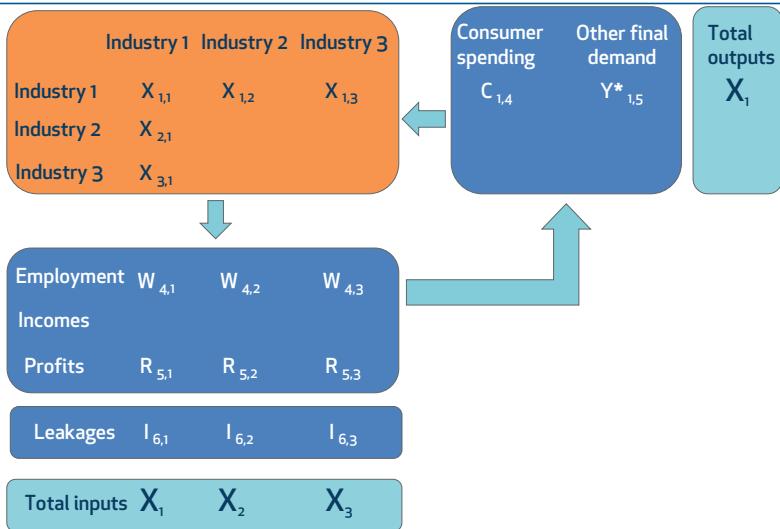
A.1 Static Input-Output Modelling

Static input-output modelling, a technique originally developed by Nobel laureate Wassily Leontief, gives a snapshot of an economy at any point in time. As these models measure activity within an economy, the direct impact figures will often not match company annual accounts, which follow accounting standards and rules.

The model shows the major spending flows from “final demand” (i.e. consumer spending, government spending investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment and other forms such as corporate profits. Static input-output modelling is used to model the impact of a firm or investment at one point in time. This model assumes substitution between goods is impossible, and therefore changing factor prices have no influence on the output coefficients. For this reason, static input-output modelling provides a snapshot at one point in time.

An input-output model uses a matrix representation of a nation’s interconnected economy to calculate the effect of changes by consumers, by an industry, or by others, on other industries and therefore on the economy as a whole. The input-output models are created using matrix representation of an economy and these input-output tables ultimately measure “multipli-

Figure A.1 A stylized Input-Output model



er effects” of an industry by tracing the effects of its inter-industry transactions – that is the number value of goods and services that are needed (inputs) to produce each dollar of output for the individual sector being studied. These models can be used to measure the relationship between an economic change or “shock,” and the final outcome across the whole of the economy. In essence an input-output model is a table which shows who buys what from whom in the economy. Figure A.1 provides an illustrative guide to a stylized input-output model.

For the purposes of this project the 2005 detailed input output table for the UK produced by the ONS and the 2009 input output table for Scotland produced by the Scottish National Statistics Office were used as the basis for modelling.

Symmetric input output tables are themselves constructed from supply and use tables. Supply tables show the supply of goods and services by type of

product of an economy while use tables show the use of goods and services by product and by type of use for intermediate consumption by industry, final consumption expenditure, gross capital formation or exports. The use table also shows the components of gross value added by industry for compensation of employees, other taxes less subsidies on production, consumption of fixed capital, and net operating surplus.

Input-output analysis starts with the calculation of input coefficients, using the symmetric input output table. The input coefficients can be interpreted as the corresponding shares of costs for goods, services and primary inputs in total output. They are calculated by dividing each entry of the input-output table by the column total. This means that each column in the matrix of input coefficients will sum to one.

Mathematically, $a_{ij} = X_{ij}/X_j$ where:

a_{ij} = the input from sector i into sector j per unit of output of sector j ,

X_{ij} = the transaction flow from sector i to sector j ,

X_j = the total output of sector j .

Afterwards, the matrix equation $Ax + y = x$ can be constructed, where:

A = $n \times n$ matrix of input coefficients

x = $n \times 1$ vector of output

y = $n \times 1$ vector of final demand

Note that in matrix algebra we denote vectors in small letters and matrices in capital letters. Vector Ax reflects the requirements for intermediates, while vector y represents the exogenous aggregate final demand.

The equation can be re-arranged to yield $x - Ax = y$, or $(I - A)x = y$, where I is the $n \times n$ identity matrix. The matrix $(I - A)$ is called the Leontief matrix. On the diagonal of this matrix the net output is given for each sector with positive coefficients (revenues) while the rest of the matrix covers the input requirements with negative coefficients (costs).

Using the rules of linear algebra, pre-multiplying both sides of this equation by $(I-A)^{-1}$ yields:

$$x = (I-A)^{-1} y$$

The matrix $(I-A)^{-1}$ is known as the Leontief inverse. The Leontief inverse $(I-A)^{-1}$ reflects the direct and indirect requirements for intermediates. Economically, this matrix shows how much each sector must produce to meet not only the final demand for its own output, but also the input requirement of other sectors. Summing the columns of the Leontief inverse matrix yields the output multiplier for each sector, which is the total impact on output of an expansion in that sector of 1 unit¹.

This inverse matrix is then multiplied by a vector of procurement in the economy being modelled by the firm in question, split across all industries to arrive at the economy-wide indirect output by sector. Next, the ratio of value added over output is calculated for each sector using the input-output table, and this ratio is multiplied by the indirect output by sector, yielding the value added impacts by sector. Mathematically, this means that the Leontief inverse has to be multiplied by a diagonal matrix B that contains the ratio of value added over output and also by the vector of procurement. z represents the output with the effects in terms of value added generated by a shift in demand and y in this case represents the procurement vector:

$$z = B(I-A)^{-1} y$$

Lastly, taking the ratio of value added per worker by industry (represented by diagonal matrix C) and multiplying that by value added impacts gives the indirect employment impact (vector e):

$$e = C z$$

¹ For a more technical explanation of the theoretical underpinnings of the Leontief Input-Output Model, see *Microeconomic Theory* by Andreu Mas-Colell, Michael D. Whinston and Jerry R. Green (1995), Chapter 5 Appendix A.

Induced impacts are calculated using prior Oxford Economic modelling results, showing that induced employment is equal to 25% of the sum of direct and indirect employment.

The full set of economic assumptions underlying static input-output modelling are as follows:

1. The economy is initially in equilibrium, meaning that any change in demand for a sector must be met by a change in output rather than a change in inventories.
2. There are no scale economies, meaning that inputs are always strictly proportional to output.
3. Strict proportionality implies that there are no changes in relative prices, i.e. no substitution.
4. Resources are always available when firms wish to expand their output.

References

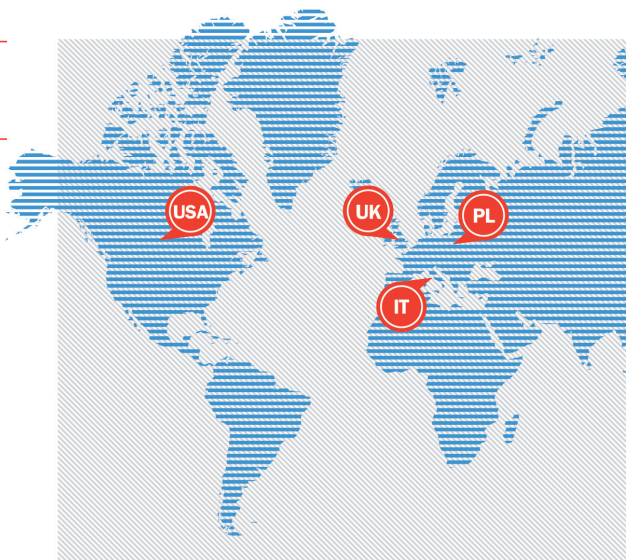
- Aviation Week, "Top Performing Companies", 2012.
- Bloom, Nicholas, Mark Schankerman and John Van Reenen (2013), "Identifying technology spillovers and product market rivalry," *Econometrica*, Vol. 81, Issue 4, pp. 1347-1393.
- CHI-Research, New Jersey, quoted in the *Financial Times*, 26 August 2003.
- Duverger, Catherine; van Pottelsberghe de la Potterie, Bruno (2011), "Determinants of productivity growth: Science and technology policies and the contribution of R&D," *EIB Papers*, ISSN 0257-7755, Vol. 16, Iss. 1, pp. 53-60.
- Eurostat, "Eurostat Manual of Supply, Use and Input-Output Tables," Eurostat methodologies and working papers, ISSN 1977-0375, 2008 edition.
- Finmeccanica, 2012 Sustainability Report.
- Griliches, Zvi (1998), "The Search for R&D Spillovers," *R&D and Productivity: The Econometric Evidence*, University of Chicago Press, ISBN 0-226-30886-3, pp. 251-268.
- Hall, Bronwyn H; Mairesse, Jacques; Mohnen, Pierre (2009), "Measuring the Returns to R&D," *NBER Working Paper Series*, Working Paper 15622.
- Mio, "History of GPS," <http://www.mio.com/technology-history-of-gps.htm>, accessed on 29/7/2013.
- NASA Spinoff, <http://spinoff.nasa.gov/index.html>, accessed on 29/7/2013.
- Office of National Statistics, "Annual Survey of Hours and Earnings," 2012.
- Office of National Statistics, "Effects of Taxes and Benefits on Household Income 2011/12", July 2013.
- Office of National Statistics, "United Kingdom Input-Output Analytical Tables", 2005.
- Oxford Economics, "Economic case for investing in the UK defence industry," April 2011.
- Oxford Economics and Geo Economics, "The economic case for investing in the UK defence industry," August 2009.
- Scottish Development International, "MRO in Scotland"
- Scottish Enterprise, "Aerospace, defence and marine," <http://www.scottish-enterprise.com/your-sector/aerospace-defence-and-marine/adm-strategy/adm-facts/aerospace-facts.aspx>, accessed on 29/7/2013.
- Sveikauskas, Leo, "R&D and Productivity Growth: A Review of the Literature," Bureau of Labor Statistics Working Paper 408, September 2007.



Finmeccanica is an industrial leader in the high technology sector and ranks among the top ten global players in **Aerospace, Defence** and **Security** and employs about 67,000 people in over 50 countries around the world.

WORKFORCE
AROUND THE
WORLD

IT	39,418
UK	8,712
USA	8,938
PL	3,224
OTHER COUNTRIES	7,127



2012 Group results

NEW ORDERS 2012	REVENUES 2012	ORDER BACKLOG 2012
16,703	17,218	44,908
{2012 results € millions}		

