



SCOTLAND

# CONTRIBUTION OF PHARMA-RELATED BUSINESSES TO THE SCOTTISH ECONOMY

2008 UPDATE FOR ABPI SCOTLAND



EWEN PETERS ASSOCIATES

Prepared by EP Associates



## Foreword by Nicola Sturgeon MSP



The Scottish Government's vision for Scotland and its people is driven by five strategic objectives: that Scotland should be wealthier and fairer; healthier; safer and stronger; smarter; and greener.

The Life Sciences sector not only delivers on many of these fronts. It is also one of the key sectors that we have identified on which Scotland can build a great and sustainable economic future.

The sector brings together academics and researchers, medicines and vaccines companies and the NHS. One of its great strengths is its people. Our medical universities continue to be world-leading. Our scientists remain on the cutting edge while the staff of NHSScotland are increasingly playing their part in research and innovation as part of their care for patients. Now, for the first time, the sector is seeing the training of the support staff of the future through the Life Science Apprenticeships scheme.

This year we have been delighted to create the Scottish Life Sciences Advisory Board, which I co-chair. We are pleased that Ministers have been joined at the table by leading players from the pharmaceutical industry as well as counterparts from universities, biotechnology companies, research organisations, NHSScotland and Scottish Enterprise. The Board is taking forward a collaborative strategy for the sector in Scotland to create the right environment to enable our talent and technology to continue to prosper in the global life sciences marketplace.

The pharma-related business sector is important to Scotland because of its investment in people, knowledge, research and development, as well as medicines and vaccines manufacture.

I welcome this report as an important barometer for an important industry.

*Nicola Sturgeon MSP*

*Deputy First Minister and Cabinet Secretary for Health and Wellbeing*

## Executive Summary

This is the third in a series of independent reports commissioned by ABPI Scotland with Ewen Peters' Associates (EPA) which estimates the economic impact of "pharma-related businesses" in Scotland, both directly and more widely.

On all key metrics, the report shows that pharma-related businesses continue to make a significant contribution to the Scottish economy. Indeed, in an increasingly difficult economic climate and highly competitive global environment:

- the output from pharma-related businesses has held up well;
- productivity has improved, and
- employees in pharma-related businesses continue to benefit from wage and salary levels well above the average for the wider economy, although the employment base has declined.

## Key Findings

### Direct Contribution

On an annual basis, when direct effects alone are considered, pharma-related businesses are estimated to:

- contribute £839 million to the turnover (gross output) of the Scottish economy;
- spend over £480 million on raw materials, components, semi-finished goods, and other consumables - including utilities and industrial services;
- add nearly £380 million to the gross value of the Scottish economy;
- support spending in the Scottish economy through gross wages and salaries worth over £200 million; and
- create and/or safeguard around 7,000 jobs.

### Total Contribution

On an annual basis, when direct, indirect and induced effects are taken into account, pharma-related businesses are estimated to:

- contribute £1.34 billion to the gross output of the Scottish economy;
- add over £600 million to the gross value of the Scottish economy;
- support spending in the Scottish economy through gross wages and salaries worth around £330 million; and
- create and safeguard over 11,000 jobs – and many of these jobs are of high-value to the Scottish economy.

### Other Findings

A distinctive and dominant trait of pharma-related businesses is their very high R&D intensity relative to most businesses in the rest of the Scottish economy. And this trait is in itself important to the future of the Scottish economy. As such, a significant component of pharma-related business activity is pre-market where output-based measures of economic contribution are inappropriate.

Based therefore on the trading and manufacturing effort of the pharma-related business sector, it is estimated on an annual basis that each employee:

- contributes over £121,000 directly to the gross output of the Scottish economy – this compares favourably with the equivalent contribution from businesses in the wider Scottish economy;
- adds around 20% more value to the Scottish economy on average than employees in businesses elsewhere in the Scottish economy; and
- earns around 20% above the average level of gross wages and salaries in the wider Scottish economy.

Compared with previous report findings, a 15% contraction is evident in the level of direct and total employment in pharma-related businesses in Scotland. This reflects, at least in part, the very rapid deterioration in the business and economic climate brought about by the credit crunch and global recession. On all other measures (i.e. gross output, purchases, gross value added and gross wages and salaries) a more stable picture emerges as only marginal changes are estimated to have occurred.

## Introduction and Background

This report has been commissioned by the Association of the British Pharmaceutical Industry (ABPI) Scotland. It is intended to provide an authoritative and independent estimate of the overall economic contribution which key pharma-related business activity makes to the wider Scottish economy - including direct, indirect and induced effects. This assessment updates previously published reports<sup>1</sup>.

The business constituency which is the focus of this report comprises 101 companies and organisations identified by ABPI Scotland. This business constituency represents a wide spectrum of “pre” and “in” market activity along the therapeutics value chain from drug discovery through drug manufacture to drug delivery. Accordingly, *inter alia*, this includes emerging biopharmaceutical companies, contract research and contract manufacturing companies.

The need for this work has in part been driven by reliance on Official Statistics where the industry definition for pharmaceuticals:

- *includes* business activity, such as non-medicaments, which is not directly relevant to the work of ABPI Scotland, and
- *excludes* other commercial activity, such as early stage drug discovery and development, which is highly relevant to the work of ABPI Scotland.

Accordingly, it is the human healthcare and therapeutics focus which differentiates ABPI Scotland’s constituency from the pharmaceutical industry as defined by Official Statistics. This constituency is referred to as “pharma-related business activity” throughout this report.

The key measures of economic contribution used in this assessment are turnover (gross output), purchases, gross value added (GVA), and gross wages and salaries. The definition of these measures, together with the estimation method utilised in this report, are set out in Section 4 and the related annexes.

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<sup>1</sup> See “Contribution of Pharma-Related Business Activity to the Scottish Economy – A Final Report for ABPI Scotland”, prepared by EP Associates (July 2006) & (Dec 2007).

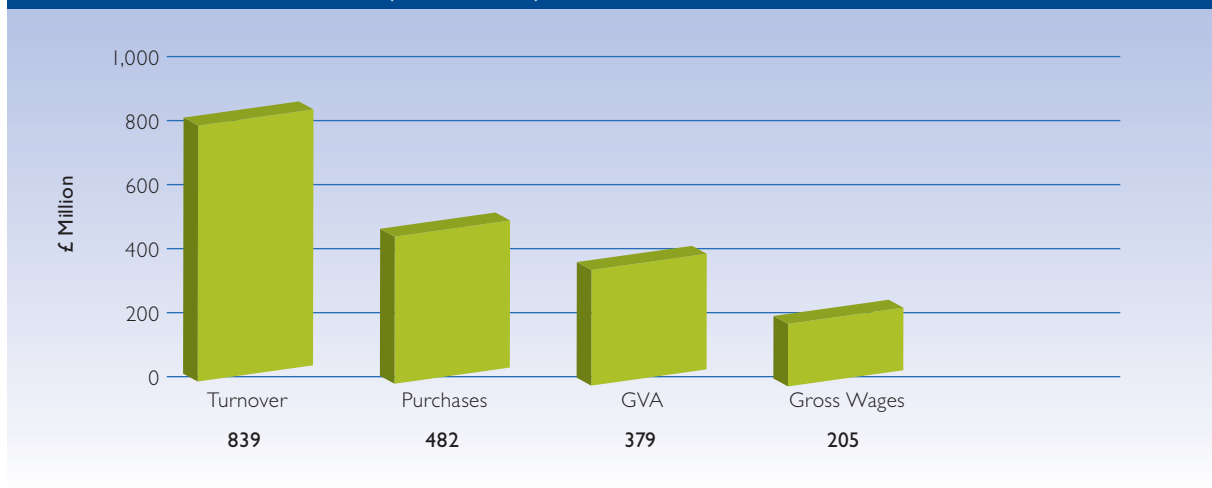
# 1. Contribution to the Scottish Economy

## Estimate of Direct Contribution

On a full time equivalent basis, pharma-related business activity directly helped to create and/or safeguard around 7000 jobs in the Scottish economy in 2008 – the base year of the analysis. Also in direct terms (see chart below), pharma-related business activity is estimated on an annual basis to:

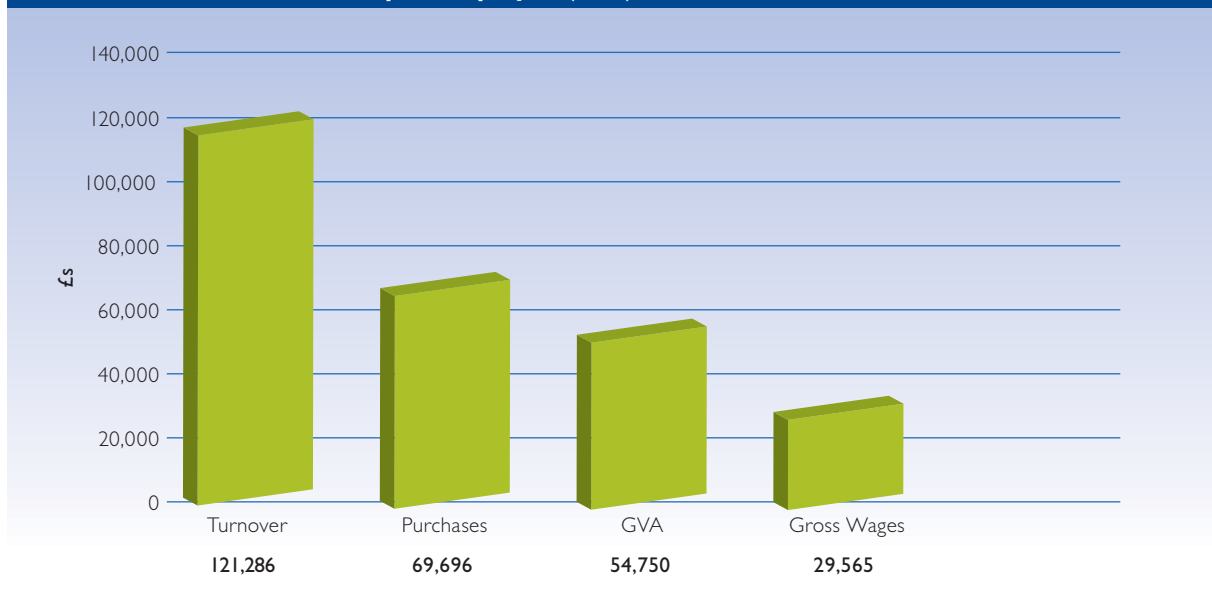
- contribute £839 million to the turnover (gross output) of the Scottish economy;
- spend over £480 million on raw materials, components, semi-finished goods, and other consumables - including utilities and industrial services;
- add nearly £380 million to the gross value of the Scottish economy; and
- support spending in the Scottish economy through gross wages and salaries worth over £200 million.

Chart 1 Direct Contribution (in £s Millions)



On average each employee in the pharma-related business sector (see chart below) is estimated to add around £55,000 a year to the gross value of the Scottish economy. The average gross annual salary which an employee working in the pharma-related business sector in Scotland receives is estimated to be around £30,000. This is about 20% above the average salary level for the economy as a whole and in keeping with the Scottish Government's definition of a high-value job.

Chart 2 Direct Contribution per Employee (in £s)



### Estimate of Total Contribution (including direct and induced effects)

When direct, indirect and induced effects are taken into account (see table below), on an annual basis pharma-related business activity is estimated to:

- contribute £1.34 billion to the gross output of the Scottish economy;
- add over £600 million to the gross value of the Scottish economy;
- support spending in the Scottish economy through gross wages and salaries worth around £330 million; and
- create and safeguard over 11,000 jobs – and many of these jobs are of high-value.

	Turnover	GVA	Gross Wages	Employment
Direct Effects	£839m	£379m	£205m	6920
Indirect/ Induced Effects	£504m	£227m	£122m	4152
<b>Total</b>	<b>£1343m</b>	<b>£606m</b>	<b>£327m</b>	<b>11,072</b>

## 2. Comparative Performance

The following analysis is based on data derived from the Government's Annual Business Inquiry<sup>2</sup>. The ABI provides 66% coverage of the Scottish economy. It includes the vast majority of businesses (both service and manufacturing) which are active and trading in the wider Scottish economy, but excludes public and financial services.

A distinctive and dominant trait of pharma-related businesses is their very high R&D intensity relative to most businesses in the rest of the Scottish economy. And this trait is in itself important to the future of the Scottish economy. As such, a significant component of pharma-related business activity is pre-market where output-based measures of economic contribution are inappropriate.

Based on the trading and manufacturing effort of the pharma-related business sector, it is estimated on an annual basis (see chart below) that each employee:

- contributes over £121,000 directly to the gross output of the Scottish economy – this compares favourably with the equivalent contribution from businesses in the wider Scottish economy;
- adds around 20% more value to the Scottish economy on average than employees in businesses elsewhere in the Scottish economy; and
- earns around 20% above the average level of gross wages and salaries of businesses in the wider Scottish economy.

**Chart 3 Key per Employee Metrics (Comparison with Businesses in the wider Scottish Economy)**



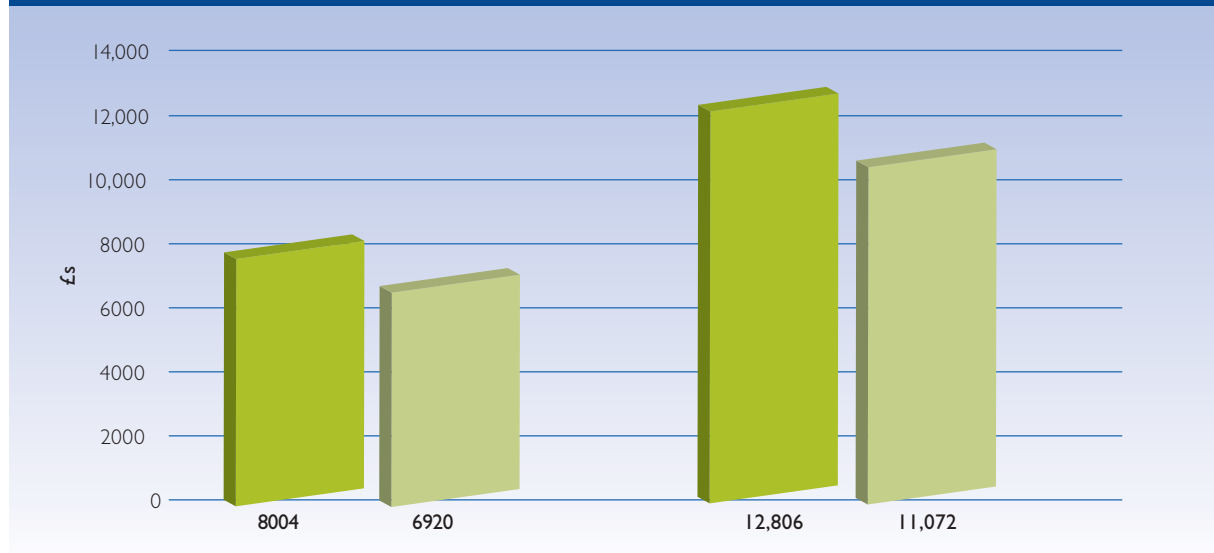
<sup>2</sup> See [http://www.statistics.gov.uk/abi/background\\_info.asp](http://www.statistics.gov.uk/abi/background_info.asp) for details.



### 3. Change since the Previous Report

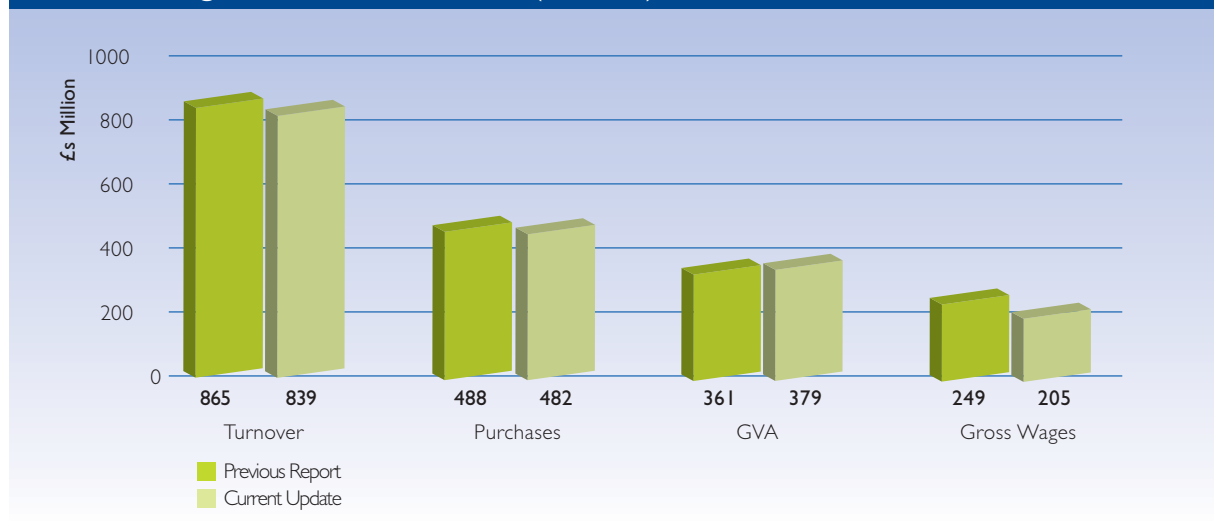
With the rapid onset of a deep global recession and the unprecedented nature of the liquidity problems faced by the banking sector, 2008, the base year for our employment analysis, was extremely difficult and challenging for all businesses. Compared with our previous findings, this is reflected, in part at least, in a fall in direct and total employment of around 15% (see below).

**Chart 4 Change in Direct and Total Employment**

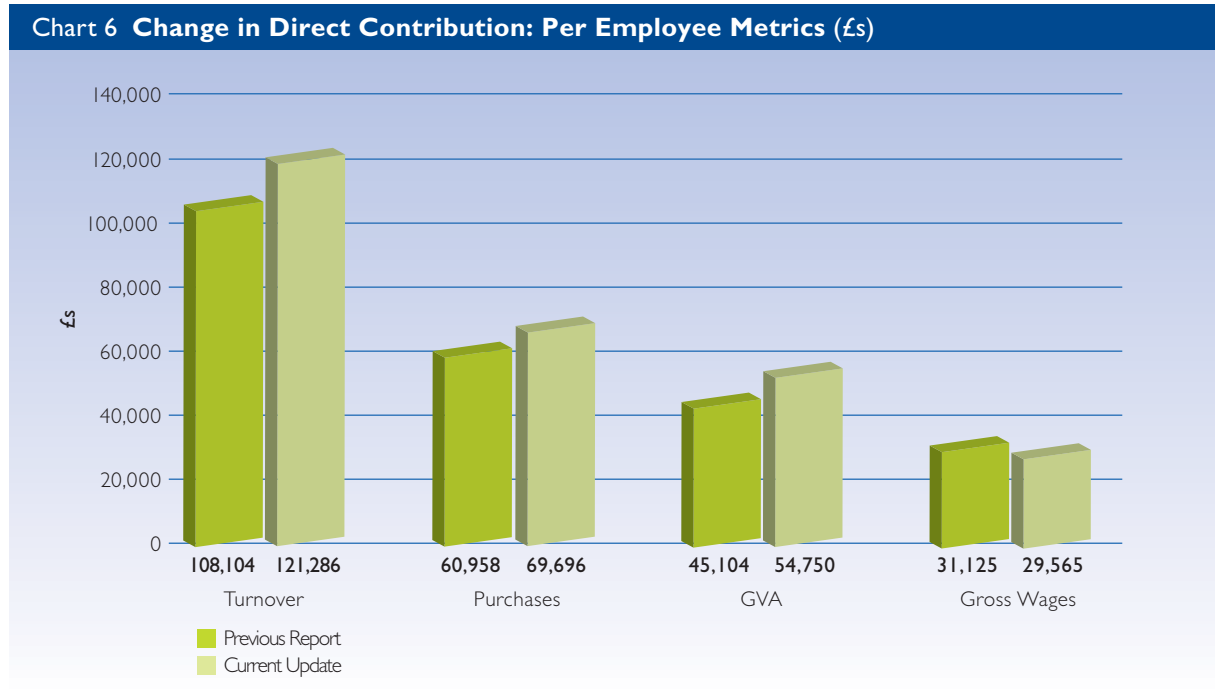


Again compared with previous findings, a more stable picture emerges when the change in other key measures of contribution are considered: a marginal increase in the level of gross added value and a marginal decrease in the level of gross output, purchases and gross wages and salaries is apparent (see chart below).

**Chart 5 Change in Direct Contribution (£s Million)**



Compared with previous findings, on a per employee basis, purchases rose while gross wages and salaries fell. Moreover, employees in pharma-related businesses increased their contribution to gross output and added significantly greater value to the Scottish economy (see chart below).



## 4. Method and Approach

### 4.1 The Need for “Bottom Up” Data Set Construction

It is well recognised that the economic boundaries of the commercial sector of the life sciences, including pharma-related businesses, are increasingly hard to define (see Annex 1) and that the relationship between the changing boundaries and the relevant codes of the UK SIC (see Annexe 2) is becoming less and less contiguous.

This problem has reduced the relevance of Official Statistics from an ABPI Scotland perspective. Other sources of SIC-based economic and business intelligence available in Scotland are similarly deficient and also suffer from an inability to generate sample sizes which are sufficiently large and statistically representative for the present research and analysis<sup>3</sup>.

Thus, the need for greater statistical relevance in an era of accelerated change has led academics and others<sup>4</sup> to call for the more wide-spread adoption of “bottom up” approaches to data construction and analysis. Again, in the Scottish context, work undertaken by EP Associates on behalf of the Life Science Cluster Team in Scottish Enterprise pioneered new approaches which attempt to address this challenge.

In essence, drawing on Scottish results from the Annual Business Inquiry (ABI) conducted by the Office for National Statistics (ONS), the “bottom up” method of data set construction developed by EP Associates allowed the direct contribution of the Life Science Cluster (as defined by Scottish Enterprise) to be estimated for the first time using key measures such as:

- Turnover;
- Total Purchases (Goods and Services);
- Gross Value Added (at basic prices);
- Gross Wages and Salaries.

These measures of contribution are defined in Annex 5. As Official Statistics, such measures are widely recognised and accepted as standard indicators by policymakers in the UK and elsewhere. This opens up the possibility of this estimation exercise being repeated in the future on a reliable and consistent basis. Working with Scottish Government statisticians, Scottish Enterprise has since extended this approach to other priority clusters.

In this study, the above method has been replicated for the company constituency identified by ABPI Scotland.

### 4.2 Estimating Economic Contribution

Conventionally, the economic impact or contribution of business activity is measured by the direct, indirect and induced effects as captured by key economic variables such as employment, output and gross value added (see The Greenbook, HM Treasury, 2004). The procedure adopted in this study for estimating the economic contribution of pharma-related business activity in Scotland is based on Greenbook guidance and is summarised below:

**“Direct” effects were estimated in the following manner:**

- Current postcode details were obtained for the company constituency identified by ABPI Scotland;

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<sup>3</sup> Our previous research reviewed other sources of potentially useful information and found that the main surveys undertaken in Scotland by established bodies such as the CBI, FAI and SCD&I etc. could not be used in their present form. This is largely due to the significant under representation in all the survey samples of companies, research organisations and institutions in the Scottish life sciences, including the therapeutics value chain.

<sup>4</sup> See, for example, Peters E and Hood N in *Leading Edge Multinationals and Leading Edge Clusters*, International Studies of Management and Organisation, Summer 2000, Vol. 30 No 2

- These details were passed to Scottish Government statisticians for postcode matching with ABI returns for Scotland;
- Working within ONS disclosure rules, every effort was made to ensure that the sample size and mix could be reliably used for estimation purposes. For relatively small populations, for example, it is especially important to try to establish a) that all the leading companies and b) that companies providing significant employment are included in the sample. This test was undertaken for all companies employing 40 or more people;
- Per employee ratios were calculated for all the key economic measures of contribution. Grossed up totals were then calculated on the basis of the total estimated direct employment (7,000) for the 101 companies and organisations identified by ABPI Scotland.
- Total employment was estimated using employment figures compiled by Scottish Enterprise. Total employment does not in this instance include the regional sales and marketing staff of Big Pharma in Scotland - estimated by ABPI Scotland to number around 700 people.

***“Indirect” and “Induced” effects were estimated in the following manner:***

- Based on the Input/Output tables for the Scottish economy prepared and published by the Scottish Government, a range of Type I and Type II multipliers were reviewed;
- The most relevant Type II multiplier was then selected and applied to the direct employment total for the pharma-related businesses identified by ABPI Scotland;
- Indirect and induced effects for output and GVA were then estimated using the relevant per employee ratios in conjunction with the relevant Type II multiplier.
- Annexes 3 and 4 provide further details on how this procedure was applied.

## Annex 1: The Blurring of Traditional Industry Boundaries

The commercial domain of the life sciences sector, including the therapeutics value chain, is becoming increasingly complex, inter-related and systemic. A number of factors underpin this change including:

- the accelerated rate of scientific advance in the post-genomic era and the increasingly multi-disciplinary nature of the science underpinning advances in drug discovery and development;
- the blurring of traditional distinctions between the pharmaceutical industry and biotechnology;
- the continuous widening and deepening of the development process whereby life science advance is transformed into successful products and services;
- the further strengthening of organisational trends such as downsizing, outsourcing and increased specialisation; and
- the interaction of the life sciences sector with a wider range of key end-user markets and key factor markets (e.g., semiconductors, opto-electronics, information technology and global financial markets).

SIC codes are unable to capture and reflect this rapidly growing complexity and new “bottom up” data gathering methods are becoming increasingly appropriate.

## Annex 2: UK SIC Classification of the Pharmaceutical Sector

Manufacture of pharmaceuticals, medicinal chemicals and botanical products (24.4) including:

- Manufacture of basic pharmaceuticals (24.41);
- Manufacture of pharmaceutical preparations (24.42);
- Manufacture of medicaments (24.42/1);
- Manufacture of non-medicaments (24.42/2).

## Annex 3: Drawing the Matched Sample

To facilitate estimation, Scottish Government statisticians provided baseline data derived from the most recent Annual Business Inquiry (ABI) - a national sample-based business survey conducted by the ONS.

On a post-code basis, this involved cross-referencing the list of companies and organisations identified by ABPI Scotland with ABI returns for Scotland held by ONS. This produced matches for 60 companies. We believe this to include around 65% of companies and organisations employing 40 or more people, and 95% of the companies and organisation which employ over 100 people. The baseline data obtained for the matched sample is shown below.

### Results of Matching Exercise

No. of Units Matched	Total Employees (000's)	Total Turnover (£m)	Purchases of goods and services (£m)	GVA Basic Prices (£m)	Gross Wages and Salaries (£m)
60	5.6	679.2	390.3	306.6	148.7

Source: Office for National Statistics, Annual Business Inquiry

1. EP Associates provided statisticians with a list of pharma-related businesses identified by ABPI Scotland. This list was postcode matched with ABI returns.

2. For the definitional reasons stated at the outset of this report, the results in the table above are different to those produced if the relevant SIC for the pharmaceutical industry is used. A SIC code is allocated by the ONS to a company based on its main activity. Pharmaceutical companies are classified to SIC24.4.

## Annex 4: Indirect and Induced Effects

Indirect and induced effects of economic activity are conventionally captured through “multiplier effects”. Multiplier effects represent the knock-on consequences for economic activity at the local, Scottish or UK levels.

**Conventionally, two main effects require to be considered:**

- Supply linkage effects (i.e. the indirect benefits to Scottish-based suppliers of goods and services) – and these are captured in a Type I multiplier;
- Income effects (i.e. the induced expenditure benefits derived from the income of those affected by the direct and supply-linkage) - and these are captured, along with indirect effects, in a Type II multiplier.

**For this study a wide range of material was gathered and reviewed to identify the range values for a Type II multiplier which could be used. This included a review of:**

- The Type II Employment, Output and Income Multipliers for 2001 for Pharmaceuticals, Research and Development and Other Business Services published by the Scottish Government (see <http://www.scotland.gov.uk/Topics/Statistics/14713/22254> );
- The Type II Employment, Output and Income Multipliers used by NERA in the report prepared for the London and Thames Pharmaceutical Group;
- Type II Regional Employment Multipliers used in various economic impact assessments undertaken by Scottish Enterprise in the context of major investments planned by pharma-related businesses in Scotland;
- The findings of the in-house study undertaken by Pfizer of the direct, indirect and induced effects of its activity on the UK economy;
- Guidance on the selection and use of Type II Regional Multipliers contained in English Partnerships “Additionality Guide” published in September 2004.

On this basis a value of 1.6 was selected for all Type II regional multipliers used in this analysis.



## Annex 5: ONS Definition of Key Measures

### 1. Total Turnover or Gross Output:

Turnover is defined as total sales and work done. This is calculated by adding to the value of sales of goods produced, goods purchased and resold without further processing, work done and industrial services rendered and non industrial services rendered.

### 2. Gross Value Added at Basic Prices:

Approximate gross value added represents the income generated by businesses out of which is paid wages and salaries, the cost of capital investment and financial charges, before arriving at a figure for profit. It includes taxes on production (e.g. business rates), net of subsidies but excludes subsidies and taxes on products (e.g. VAT and excise duty).

GVA at Basic Prices is calculated by adjusting gross value added at factor cost for taxes and subsidies incurred during production. This definition is ESA95 consistent. (N.B. The difference between GVA at Factor Cost and GVA at Basic Prices figures is small. For example, the disparity between the two figures in 1998 is around 2%. GVA is Gross Domestic Product minus taxes on products and plus subsidies on products.)

### 3. Total Purchases (Goods and Services): These include:

- The cost of raw materials, components, semi-manufactured goods and workshop materials, replacement parts and consumable tools not charged to capital account, packaging materials of all types, stationery and printed matter, fuel, electricity and water, materials of all types used by the businesses or given out to others, for the production of machinery or other capital items used in the business, and materials used when working on goods supplied by customers. The figures exclude VAT, purchases of machinery and plant, which are included in capital expenditure, and amounts payable to transport firms or credited to the business's own transport departments for delivery of materials.
- Increase during the year in materials, stores & fuel: This represents the increase during the year to the value of stocks of materials, stores and fuel that are purchased by the business and those held for processing by other organisations. Stocks of consumable tools etc., not chargeable to capital account are also included.
- The value of industrial services purchased: This includes amounts payable to other organisations for work done on materials supplied, for repairs, installation and maintenance of machinery and for work subcontracted. Direct payments to outworkers and amounts charged to capital account are excluded

### 4. Gross Wages and Salaries:

This includes gross wages and salaries and redundancy and severance payments to employees less employers' National Insurance contributions and contributions to other pension and welfare schemes.

**Association of the British Pharmaceutical Industry**

Crichton House, 4 Crichton's Close, Canongate, Edinburgh EH8 8DT  
T: +44 (0)870 890 4333 F: +44 (0)131 523 0491  
[www.abpi.org.uk](http://www.abpi.org.uk)



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