Analysis of effects in case of relocation of the European Medicines Agency (EMA) to the Netherlands

Final Report

7 April 2017

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Final Report

A report submitted by ICF Consulting Services Limited

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Headline summary

Purpose

- This Final Report has been prepared by ICF as part of a study for the Dutch Ministry of Health, Welfare and Sport (Ministry of VWS) involving the "Analysis of effects in case of relocation of the European Medicines Agency (EMA) to the Netherlands".
- The role of this study is to provide the Dutch Government with insights into the likely impacts of hosting the EMA. This report includes estimates of the short-term impacts of the EMA on the UK economy and the expected impacts on the Dutch economy if the EMA moves to the Netherlands.

Background

- With the formal announcement on 29 March 2017 by the UK government that the UK will leave the European Union, the EMA is likely to need to move from London to an alternative location in the EU. Against the backdrop of deciding on a candidature to host the EMA, the Dutch Government sought to explore the likely economic impacts of having the EMA based in the Netherlands.

Headline findings

- **EMA activities and expenditures currently contribute €193 million to the UK economy and support 2,989 jobs in the UK.** This is estimated to account for 1.7 per cent of all full-time equivalent (FTE) jobs and 1.9 per cent of the Gross Value Added (GVA) supported by the overall life sciences and health (LSH) sector in the UK. The associated taxation impacts, measured in terms of tax receipts for the Exchequer, are estimated to total €21.1 million per annum in the UK.
- **The EMA has also provided long-term benefits for the UK.** The scale of these benefits is uncertain but could represent up to 5 per cent of revenues, GVA and employment within the LSH sector as a result of:
  - improved knowledge sharing through formal and informal contact with the EMA;
  - increased regulatory expertise, particularly within the Oxford/Cambridge/London triangle;
  - benefits to UK regulators from close working relationships with the EMA; and
  - the EMA adding to the critical mass of LSH activity and helping to attract new companies.
- **If the EMA is relocated to the Netherlands, it could contribute around €135 million to the Dutch economy and support some 2,538 jobs**. This is estimated to account for 7.5 per cent of all FTE jobs and 4.1 per cent of the GVA supported by the overall LSH sector in the Netherlands. The impacts are expected to be lower in the Netherlands (relative to the UK) due to slightly lower:
  - wages (and associated staff costs) for EMA employees in the Netherlands;
  - allowances/expenditures of EMA visitors to the Netherlands to visit the EMA;
  - EMA purchases from suppliers in the Netherlands; and
  - induced multipliers, which suggest that a lower proportion of the employee incomes will be retained, re-spent and recirculated in the Netherlands economy, relative to the UK.

  The associated tax receipts for the Tax and Customs Administration in the Netherlands are estimated to total €21.6 million per annum.
- **The EMA would also be expected to deliver long-term benefits for the Netherlands**. While the scale of these benefits is uncertain, indicative estimates – based on simplifying assumptions regarding the potential scale of impact – suggest that they could potentially support up to 3,700 additional FTE jobs and €350 million of GVA per annum in the Netherlands economy by supporting:
  - an increased pool of regulatory talent and skills;
  - a closer relationship between the EMA and the Medicines Evaluation Board (MEB);
  - the relocation of some private sector operations and service providers from the UK;
  - reduced travel costs for Dutch SMEs and regulators;
  - increased informal contacts with the EMA; and
  - reputational benefits from hosting the EMA.

- Table 1 presents a summary of the current impacts of the EMA for the UK economy and the potential impacts for the Netherlands economy. It covers short-term impacts and provides an indication of the potential longer-term impacts based on simplifying assumptions.

Table 1 Summary of economic impacts		Current impacts for the UK economy		Potential impacts for the Netherlands	
		GVA (€m)	Employment (FTE jobs)	GVA (€m)	Employment (FTE jobs)
Short-term impacts					
Direct impacts	EMA staff/wages	€59m	891	€39m	891
	Visitor/supplier expenditures	€59m	1,260	€59m	1,002
	Total direct impacts	**€118m**	**2,151**	**€98m**	**1,893**
Indirect impacts	EMA staff/wages	N/A	N/A	N/A	N/A
	Visitor/supplier expenditures	€19m	244	€14m	209
	Total indirect impacts	**€19m**	**244**	**€14m**	**209**
Indirect impacts	EMA staff/wages	€29m	365	€9m	249
	Visitor/supplier expenditures	€28m	229	€13m	187
	Total induced impacts	**€56m**	**594**	**€23m**	**437**
Total short-term impacts	EMA staff/wages	€88m	1,256	€49m	1,140
	Visitor/supplier expenditures	€106m	1,733	€86m	1,397
	Total short-term impacts	**€193m**	**2,989**	**€135m**	**2,538**
Long-term & wider impacts					
Direct impacts		€100m-€500m	1,800-9,000	€33m-€165m	340-1,700
Indirect impacts		€15m-€80m	1,750-8,700	€28m-€140m	280-1,400
Induced impacts		€40m-€200m	3,300-16,600	€9m-€45m	120-600
Total longer-term impacts		**€155m-€780m**	**6,850-34,300**	**€70m-€350m**	**740-3,700**
Total economic impact associated with the EMA		**€350m-€970m**	**9,800-37,300**	**€205m-€485m**	**3,300-6,200**

UK GROSS VALUE ADDED (GVA)

€193m

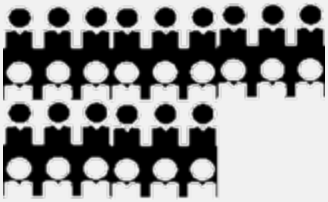
In 2015, the EMA generated an estimated **€193m** of GVA for the UK economy (including direct, indirect and induced effects). This represents 0.01 per cent of total GVA in the UK and 1.9 per cent of the GVA supported by the life sciences and health (LSH) sector.

NL GVA

€135m

It is estimated that the EMA would generate **€135m** of GVA per year for the NL economy when in full operation (as it was in the UK in 2015). This represents 0.02 per cent of total GVA in the NL and 4.1 per cent of the GVA supported by the LSH sector.

UK JOBS

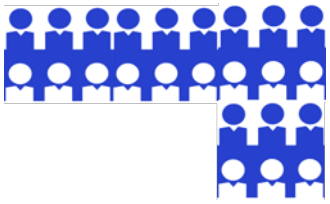


2,989 jobs

In 2015, the EMA generated an estimated **2,989 FTE jobs** in the UK (including 891 EMA jobs, of which 835 are held by expats). The total 2,989 jobs supported by the EMA represents 0.01 per cent of total employment in the UK in 2015 and 1.7 per cent of all FTE jobs supported by the LSH sector.

NL JOBS

2,538 jobs



It is estimated that the EMA would generate **2,538 FTE jobs** in the NL when in full operation (including the 891 relocating EMA jobs). The total 2,538 jobs would represent 0.04 per cent of total employment in the NL and 7.5 per cent of all FTE jobs supported by the LSH sector.

VISITORS TO THE EMA IN THE NL

The EMA would be expected to attract some 36,000 additional visitors to the NL each year, spending an estimated **€12.5 m** in the local economy. The majority of these visitors are expected to be visiting from outside the NL (as is currently the case in the UK).

36,000 additional visitors spending €12.5m in the NL economy per year

EMA LONG TERM IMPACTS

The relocation of the EMA could also provide long-term impacts for the LSH sector in the Netherlands including: an increased pool of regulatory talent and skills; a closer relationship between the EMA and the Medicines Evaluation Board (MEB); the relocation of some private sector operations and service providers from the UK; reduced travel costs for Dutch SMEs and regulators; increased informal contacts with the EMA; and reputational benefits from hosting the EMA.

There is considerable uncertainty associated with the potential scale of these impacts, although they could support additional growth of GVA and employment in the LSH sector of between 1 per cent and 5 per cent per annum. This could potentially support up to 3,700 additional FTE jobs and €350 million of GVA per annum in the Netherlands economy.

1 Introduction

This Final Report was prepared by ICF as part of a study for the Dutch Ministry of Health, Welfare and Sport (Ministry of VWS) involving the "Analysis of effects in case of relocation of the European Medicines Agency (EMA) to the Netherlands". It is the third and final deliverable of the study that was launched by the Ministry of VWS in November 2016 and presents the overall findings of the study.

1.1 Background to the study

With the formal announcement on 29 March 2017 by the UK government that the UK will leave the European Union, the EMA is likely to need to move from London to an alternative location in the EU. There are reports that a number of Member States would be interested in hosting the EMA if it was to relocate.

However, in support of its decision on the candidature to host the EMA, the Dutch Government sought to explore the likely economic impacts of the EMA relocating to the Netherlands. The Government sought evidence of the impacts of the EMA on the UK economy (and the life sciences and health sector specifically) and the extent to which these impacts might be transferrable to the Netherlands should the EMA relocate there.

Defining the life sciences and health sector

For the purposes of this study we define the life sciences and health (LSH) sector as comprising a broad scope of disciplines associated with the pharmaceuticals, medical biotechnology and medical technology subsectors[1] related to the development of medicinal products for human and/or veterinary use. It covers activities delivered by a range of organisations including profit-making companies, charities, research institutes, regulators and other government-funded organisations.

The LSH sector is one of nine 'top sectors' that the Dutch Government has identified as being key drivers of the Dutch economy.

1.2 Objectives of the study

The objectives of this study were to provide the Dutch Government with insights into the likely impacts of hosting the EMA.

The study aimed to provide evidence of the potential costs, benefits and strategic advantages to the Netherlands of hosting the EMA to answer the core research question: "What would be the economic effects of relocation of the EMA to the Netherlands in terms of costs and benefits and what might be the impact of relocation on companies, professional networks, research, regulators and civil society organisations in the LSH sector related to medicinal products for human and/or veterinary use?"

In this regard, the study was intended to inform the Dutch Government's decision making as to the desirability and feasibility of a Dutch candidature for hosting the EMA.

The study has explored a range of potential impacts including quantifiable direct and indirect impacts and non-quantifiable impacts on the LSH sector, academic institutions, regulators and civil society organisations more broadly. This report presents the key findings of the study in terms of:

- the current impacts of the EMA on the UK economy; and
- the extent to which these impacts could be replicated in the Netherlands following relocation and what costs might be involved.

[1] Office for Life Sciences (2011) Strategy for UK Life Sciences

2 Methodology

2.1 Developing a conceptual approach

This study uses a quantitative economic impact analysis (EIA) method to estimate the economic benefits of the EMA to the UK economy and the potential benefits for the Netherlands economy should the EMA relocate there.

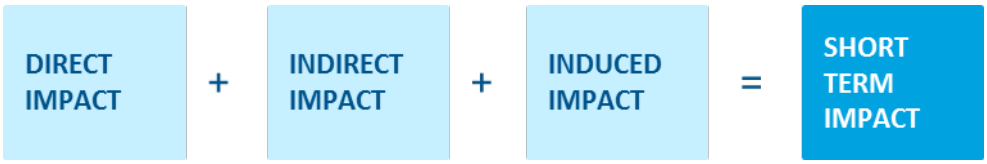
Such benefits are typically estimated in terms of the contribution to local employment and to Gross Domestic Product (GDP). The contribution to local employment is measured as additionally created full-time equivalent (FTE) jobs, while the contribution to GDP is measured as additional Gross Value Added (GVA) to the economy.

The EIA method has two main components:

- **Short-term economic impact** based on the commonly adopted EIA method of estimating direct, indirect and induced impacts to the economy associated with the EMA's operations.
- **Long-term economic impact** based on a tailored set of assumptions regarding the impact of the location of the EMA on the wider life sciences and health (LSH) sectors.

Furthermore, the short-term economic impact is commonly estimated as a summary of direct, indirect and induced levels of impact:

- **Direct impact:** results from expenditures associated with the EMA operations, including spending on its personnel and activities as well as associated goods and services (i.e. consultancy studies, evaluations, information provisions and monitoring work).
- **Indirect impact:** results from suppliers of the EMA purchasing goods and services and hiring workers to meet demand.
- **Induced impact:** results from spending on goods and services in the local economy by the employees of the EMA and employees of the suppliers of the EMA.



2.2 Approach to data collection

Data collection to inform the assessment of the short-term economic impact of the EMA was based on desk research. The following publicly-available information and sources[2] were used for the assessment:

- **Financial and organisational data and information on the EMA** from the EMA 2015 Annual Report and the Annexes, the EMA website, work programmes of EMA Committees and working groups, the EMA multi-annual work programme to 2020, rules for reimbursement of expenses for delegates and experts attending meetings and press articles.

[2] See Annex 4 for a list of references. .

- Financial and organisational data and information on the UK Medicines and Healthcare products Regulatory Agency (MHRA)[3] and Netherlands Medicines Evaluation Board.
- **UK and Netherlands national statistical data** including national accounts, labour force statistics and industry statistics.
- **Existing market research and information on the UK and Netherlands LSH sectors** such as The State of the UK Healthcare & Life Sciences Sectors; BIS Life Science Competitiveness Indicators; investinholland.com; Dutch Life Sciences Outlook 2015; NL Statistics Office on Topsectors; Development of the LSH sector NL, How 'Brexit' might affect the pharmaceutical industry, etc.

Data collection to inform the assessment of the long-term economic impact of the location of the EMA on the wider LSH sectors was based on stakeholder consultations. Fourteen stakeholders were consulted between December 2016 and March 2017. Table 2.1 gives an overview of the consulted stakeholders. The topic guide used as a basis for these discussions is included in Annex 5.

Table 2.1 List of consulted stakeholders

Stakeholder type	Interviewed stakeholder representatives
Regulators	■ EMA, MHRA, Medicines Evaluation Board (NL)
Companies	■ Jansen/ J&J, Piramal Healthcare, Proveca, Eisai
Advisors	■ Norton Rose Fulbright, Arcinova, Four Shaw Consulting
Investors	■ Scottish Enterprise / Scottish Development International
Industry representative bodies	■ ABPI ■ Holland Bio
Others	■ BioNow, Utrecht University

2.3 Approach to data analysis

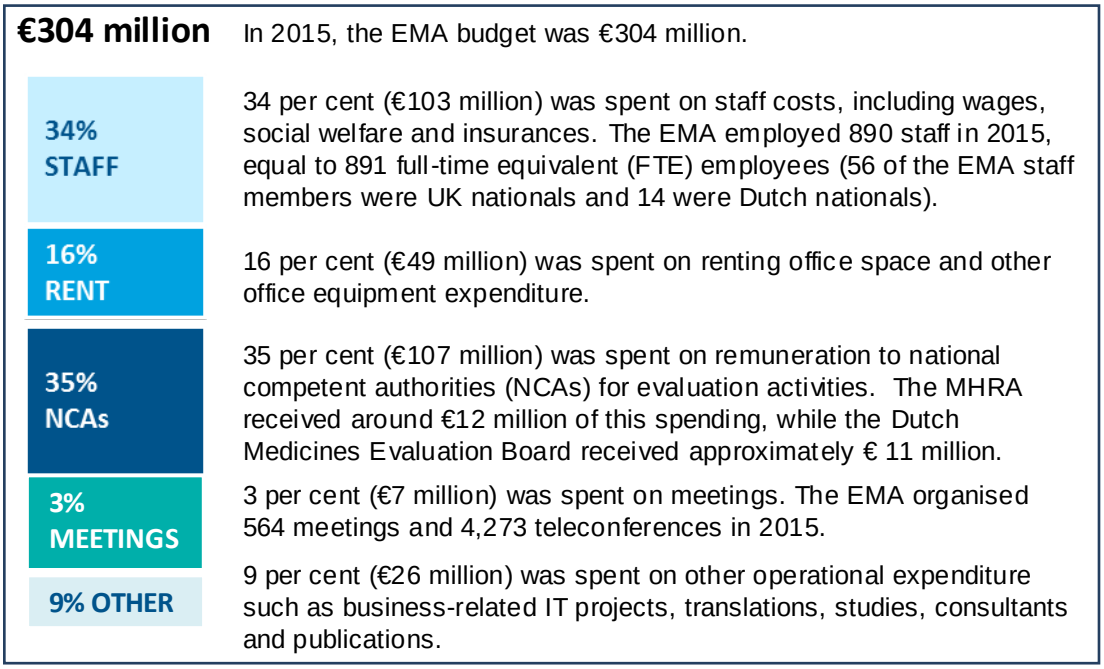
The short-term economic impact analysis covers the initial economic activity generated by the EMA's activities, including accommodation and subsistence for visiting experts, employment of in-house staff and the services the EMA contracts from UK providers (the direct impact). The analysis then assesses the impacts on the suppliers of these services to the UK economy (the indirect impact), before considering the impacts of the direct and indirect impacts on household expenditure through incomes (the induced impacts).

These short-term economic impacts are considered in terms of employment, the GVA contribution to GDP, tax revenues and leakage (where EMA expenditure leaks out of the host country and reaches recipients in other countries, such as remittances from earnings and EMA employee expenditure overseas, on property, taxation, payment to national competent authorities other than the MHRA, etc.).

The short-term economic impact is based on the EMA budget. A high-level breakdown of the 2015 budget is presented below.

[3] MHRA (2015) Medicines and Healthcare Products Regulatory Agency Annual Report and Accounts 2014/15

Figure 2.1 The EMA 2015 budget



Source: ICF estimates based on the EMA Annual Report 2015

For the purposes of the short-term economic impact analysis, the expenditure of the EMA was further categorised across the following economic sectors:

- **Public sector:** wages to employees, social welfare, socio-medical infrastructure, administration and expenditure on NCA.
- **Insurance and pensions:** staff insurances.
- **Hospitality and travel sector**, including duty travel, subsistence expenses, meeting/event venues, meeting materials and visitor accommodation.
- **Property and utilities sector:** renting of building and associated utilities and property related expenditure.
- **Information services and computer services sector** for IT-related expenditure.
- **Other professional services sectors** including expenditure on consultants and translation services.
- **Other sectors**, including expenditure on retail and postal and courier services.

This classification is necessary for estimating the indirect and induced impacts, as the multiplier effects of expenditures differ between sectors (see the box below for a definition of multipliers). The multiplier effects for each sector also differ from country to country depending on the structure of the national economy. A consistent methodology was used to derive sector- and country-specific multipliers from the latest national industry data published by the relevant statistical authorities in the UK and NL. Those multipliers were then used to estimate the indirect and induced impacts.

Economic multipliers

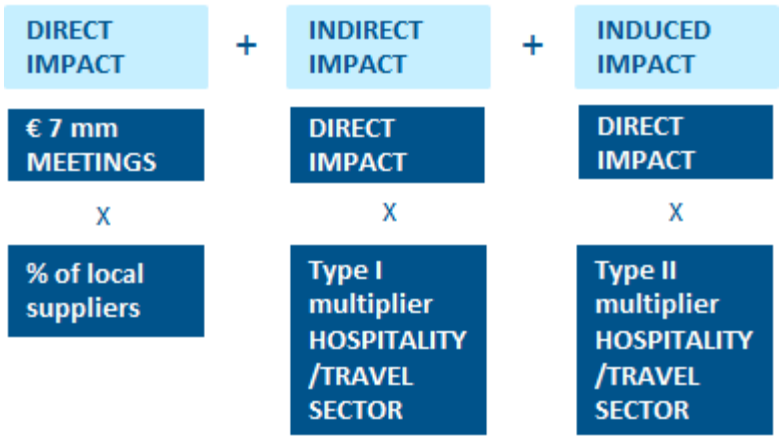
When money is spent, it typically results in a multiplied effect on the overall output of an economy (i.e. on incomes/GVA and employment supported). This is because of the circular flow of income and spending (i.e. money that is earned flows from one person or business to another). While some incomes are saved, most are re-spent, which supports additional incomes and employment. The money circulates multiple times and means that small increases in expenditure can lead to much larger increases in economic output.

Multiplier effects can be estimated using economic multipliers that are relevant to the size, location and structure of the selected economy. The size of the multiplier effect varies between different economies and sectors, depending on the extent to which money is retained in the local or national economy through:

- purchases of goods and services from other businesses in the same economy (**indirect effects**); and
- wages and profits paid to residents of a particular economy and the extent to which these incomes are also re-spent in that economy (**induced effects**).

Figure 2.2 provides an example of the calculations used to derive the short-term economic impact of expenditures associated with EMA meetings. A description of the step-by-step methodology used to derive the multipliers that formed the basis of the economic impact analysis for this study is provided in Annex 6.

Figure 2.2 Example of calculations to estimate the EMA short-term economic impact from expenditure on meetings



Note: The multipliers used for the EIA are included in Annex 6.

Adopting this approach enables a systematic analysis, ensuring that each calculation considers the extent to which each component could shift to the Netherlands if the EMA were to relocate.

For simplicity, the analysis has estimated separately the impacts stemming from the earnings of EMA staff and the impacts of relevant EMA activities, such as the impacts of studies commissioned by the EMA and visitors to EMA meetings, which involve outside entities and therefore contributes additional economic activity to the UK economy.

Increase in the EMA budget outlook 2017 – 2020

The economic impact analysis presented in this report is based on EMA operations in 2015. In 2015, the EMA budget was €304 million and the Agency employed 890 staff (891 FTE jobs).

Based on the EMA programming for 2017 and 2018–2020 the EMA budget is expected to increase by 4.4 per cent in 2017 and 6.3 per cent in 2018. The Agency also plans to recruit some 22 additional staff by 2018.

With the expected future growth of the Agency, the estimated impact of the EMA presented in this report, based on the 2015 figures, can be seen as conservative. The planed budget increases for 2018, suggest that the impact could be up to 10 per cent higher than the estimates presented in this report.

3 Short-term economic impact of the EMA in the UK

This section presents the short-term economic contribution of the EMA and its activities to the UK economy. The section discusses:

- direct impacts;
- indirect impacts;
- induced impacts; and
- total short-term impacts.

3.1 Direct impact

The EMA is estimated to directly support €118 million of GVA and around 2,151 FTE jobs in the UK economy (based on EMA data for 2015). This suggests that the average FTE job directly supported by EMA activities and expenditures generates approximately €54,770 of GVA for the UK economy each year. This direct impact is a result of the EMA expenditure on staff as well as expenditures on UK goods and services to support its daily activities.

It is estimated that some 39 per cent of the total EMA expenditure adds direct value to the UK economy after allowing for:

- purchases of goods and services from suppliers (as GVA is defined as the value of goods and services that have been produced, less the cost of all inputs that are directly attributable to that production);
- purchases of goods and services from outside the UK (e.g. purchases from NCAs other than MHRA); and
- leakage of a proportion of wages paid to non-UK citizens employed by the EMA.

According to its latest annual report, the EMA currently employs 891 FTE staff, of which only 56 are UK citizens. The EMA provides employment for 835 expatriates (expats) to the UK (i.e. expatriates who moved to London to take on a job at the EMA). In total, the EMA expenditure on staff is estimated to directly support GVA of approximately €103 million in the EU as a whole, however only €59 million is estimated to add value to the UK economy. This analysis assumes that 40 per cent of the wages paid to expat EMA staff leak out of the UK economy [4]. If a lower leakage level is assumed (i.e. leakage of 27.5 per cent as assumed by Decisio in 2013 [5]), an additional €11 million is added to the UK economy. However, the Dutch Government has raised some concerns with the Decisio estimates, which are summarised in the box below.

Reservations about the leakage assumptions from the 2013 Decisio report

A number of concerns were raised, during this study, about the assumptions used in the 2013 Decisio report to estimate the leakage of wages of expats working in The Hague:

[4] For the purpose of this EIA a conservative estimate of 60 per cent has been applied by ICF to estimate the proportion of wages spent locally by expat staff. This is lower than the assumption applied by Decisio for the Ministry of Foreign Affairs in the Netherlands (see footnote below), which assumed that 72.5 per cent of expat wages in The Hague are spent locally. However, as stated in the box above, reservations were raised by experts about the low leakage assumptions used in the Decisio report. A more conservative assumption has therefore been used for this analysis, although no direct evidence was found to support higher leakage assumptions. Based on limited reports on spending habits of expats, higher wages often result in higher consumption whereas saving patterns remain unchanged.

[5] The results of the Economisch belang intergouvernementele organisaties in Nederland Economische impact studie from 2013 carried out by Decisio for the Ministry of Foreign Affairs in the Netherlands assumed 72.5 per cent of the expat wages in The Hague are spent locally.

- The Decisio report did not take account of the tax benefits for expats (i.e. their VAT exempt status), which should have been treated as a cost for the Netherlands economy.
- The Decisio assumption did not account for leakage/displacement of income resulting from income tax paid to the expat employees' countries of origin, or for the exportation of savings to the expat employees' countries of origin. This is relevant for the EMA as its employees pay income tax to the European Commission, which also represents leakage from their country of employment.
- The Decisio assumptions did not take account of the fact that purchases of imported goods and services represent leakage from the 'local' economy, while the approaches used to estimate job creation and visitor expenditures were not clear.
- The effects of staff salaries were included twice: as a direct expenditure of the employer; and as employee expenditures on consumption.

The EMA also spends money purchasing goods and services which directly support jobs and incomes in supplier businesses, while visitors to the EMA also spend money on hospitality, travel and other tourism activities, which also directly support jobs and incomes in the tourism industry. These expenditures are estimated to total €201 million, but some leak out of the UK economy (e.g. goods and services purchased from non-UK businesses and organisations such as the €96 million paid to NCAs other than the MHRA). It is estimated that approximately half of these expenditures (€106 million) are spent in the UK economy, directly supporting an additional 1,260 jobs and €59 million of GVA per annum amongst local supplier businesses.

These estimates suggest that GVA per FTE job is relatively high amongst EMA staff at €115,700 (although only €66,000 adds value to the UK economy after allowing for leakage). However, this remains significantly higher than the estimated GVA per FTE job of €46,800 amongst supplier businesses, many of which are in sectors such as hospitality and administration services, where GVA per FTE is typically lower. Comparisons can be made to the UK average of €84,400 of GVA per FTE job, which is higher than the estimate for supplier businesses but lower than the estimate of overall GVA generated by EMA staff, although some of this does leak out of the UK economy.

Table 3.1 Direct economic impact on the UK economy

	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	891	€59 million
EMA impact through suppliers and visitors	1,260	€59 million
Total EMA direct impact	**2,151**	**€118 million**

Source: ICF analysis

Note: figures may not sum to total due to rounding

3.2 Indirect impact

Indirect impacts occur as a result of the expenditures of the EMA's supplier businesses, which in turn support additional employment and GVA throughout their respective supply chains. These expenditures have wider multiplier effects for the UK economy as a proportion of business revenues are re-spent in purchasing other goods and services, thereby creating additional revenues for other UK businesses. For example, the MHRA will use the income from the EMA to purchase goods and services from UK businesses to deliver their work to the EMA. Those supplier businesses will also purchase goods and services from their own suppliers, and so on. However, some of these expenditures will also leak out of the UK

economy, when goods and services are purchased from suppliers outside the UK.[6] These indirect effects have been estimated using economic multipliers outlined in Annex 6, and the results are presented in Table 3.2.

It shows that indirect effects of EMA activities and expenditures are estimated to support a further €19 million of GVA and 244 FTE jobs in the UK economy. This implies indirect multipliers of 1.16 for GVA effects and 1.11 for employment effects.

Table 3.2 Indirect economic impact on the UK economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through suppliers and visitors	244	€19 million
Total indirect economic impact	**244**	**€19 million**
Implied average indirect multiplier	*1.11*	*1.16*

Source: ICF analysis

Note: figures may not sum to total due to rounding

3.3 Induced impact

Induced impacts occur as a result of the expenditures of employees directly and indirectly supported by EMA activities and expenditures. These expenditures also support additional employment and GVA amongst suppliers of a broad range of household goods and services including accommodation, food and drink, education, financial services, entertainment and recreation. The scale of these induced effects for the UK economy is reduced as a result of the large proportion of expats employed by the EMA, who will spend a relatively large proportion of their income outside of the UK compared to the average UK employee. To account for this, and as already noted, the analysis has assumed that only 60 per cent of expenditures of expat employees is spent in the UK economy[7].

The induced effects have then been estimated using economic multipliers presented in Annex 6. The estimated induced impacts are provided in Table 3.3 which implies that 365 FTE jobs are supported by the expenditures of EMA staff in the UK economy (after allowing for the lower expenditures of expats) and a further 229 jobs are supported by the expenditures of staff in the EMA's supplier businesses, supporting a total of 594 jobs and €56 million of GVA. The implied induced multipliers are slightly higher than the indirect multipliers and are estimated at 1.41 for GVA effects and 1.25 for employment effects.

Table 3.3 Induced economic impact on the UK economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	365	€29 million
EMA impact through suppliers and visitors	229	€28 million
Total induced economic impact	**594**	**€56 million**
Implied average induced multiplier from direct + indirect expenditure	*1.25*	*1.41*

Source: ICF analysis

Note: figures may not sum to total due to rounding

[6] Based on a review of recent EMA tenders, ICF estimates that 80 per cent of the EMA suppliers (of studies, consultancy services, publications and IT projects) are UK based.

[7] The assumption is conservative and estimated by ICF. The results of the Economisch belang intergouvernementele organisaties in Nederland Economische impact studie from 2013 carried out by Decisio for the Ministry of Foreign Affairs in the Netherlands assumed 73 per cent of the expat wages in the Hague are spent locally.

3.4 Total short-term economic impact

Summing the direct, indirect and induced impacts yields an estimate of the total economic impact of EMA activities and expenditures on the UK economy. The results are summarised in Table 3.4 and estimate that the presence of the EMA in the UK contributes around €193 million to the UK economy each year and supports more than 2,989 FTE jobs. This represents 0.01 per cent of total GVA and employment in the UK in 2015 and is estimated to account for 1.7 per cent of all FTE jobs and 1.9 per cent of the GVA supported by the overall life sciences and health (LSH) sector in the UK.

Taxation impacts should also be considered. Taxes are normally considered a form of leakage, but are not estimated in this case as the EMA does not pay VAT and its staff do not pay UK income tax. The profits of the suppliers in the UK and the wages of their employees will however be subject to taxation. The associated tax receipts for the UK Exchequer are estimated to total €21.1 million per annum[8].

Table 3.4 Total economic impact on the UK economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	1,256	€88 million
EMA impact through suppliers and visitors	1,733	€106 million
Total economic impact	**2,989**	**€193 million**

Source: ICF analysis

Note: figures may not sum to total due to rounding

[8] The estimate assumes that 20 per cent of GVA (wages and profits) amongst suppliers is paid through VAT, corporation and income taxes. This assumption is based on the current rates of VAT, corporation tax and the basic rate of income tax, all of which are currently 20 per cent in the UK.

4 Long-term impact of the EMA in the UK

There are also longer-term benefits associated with the presence of the EMA in the UK, in addition to the short-term benefits described above in Section 3. These longer-term impacts are more qualitative in nature, since they are much more difficult to quantify, and concern the EMA's role in supporting the success of the life sciences and health (LSH) sector in the UK.

4.1 The UK life sciences and health sector

The UK has 'one of the strongest and most dynamic life sciences industries in the world', according to the Minister for Life Sciences in the UK[9]. The LSH sector comprises some 4,800 companies, generating revenues of more than €84 billion per year and employing more than 180,000 people[10]. It makes a significant contribution to the UK economy, with the manufacture of pharmaceuticals directly supporting approximately €10 billion of GVA per annum[11].

The LSH sector is also a major exporter of goods and services. In 2014, for example, exports of LSH goods totalled approximately €41 billion, representing almost half of the total revenue of the sector, and around 10 per cent of all UK exports of manufactured products[12].

The LSH sector is a key priority for the UK Government[13], which spends approximately €4.2 billion on health R&D each year, while non-industry spend from the National Institute of Health and Research, the Medical Research Council and member charities from the Association of Medical Research Charities added a further €5.2 billion in 2014. The pharmaceutical industry is also a major investor in R&D activities, spending €6.5 billion in 2014. This implies the total combined R&D expenditure for the LSH sector was almost €16 billion in 2014.

4.2 Benefits of the EMA to the UK LSH sector

This section discusses the extent to which the EMA's current location in London has delivered benefits for the wider LSH sector in the UK. It extends beyond the EMA's own activities and expenditures, which were analysed above in Section 3, and explores the extent to which the EMA's location has delivered additional benefits such as:

- improved knowledge sharing and/or strategic advantages for the LSH sector in the UK;
- benefits for the UK Government, regulators, academics and their respective supply chains; and
- influencing the decisions of companies and institutions to establish operations in, or relocate to, the UK and contribute to the LSH sector in the UK.

These types of impacts are more qualitative in nature and difficult to quantify. This section therefore draws heavily on the stakeholder consultations that were undertaken to inform this study. As described above, interviews were undertaken with private companies, industry representative bodies, investors, advisors and regulators from the UK and the Netherlands. The stakeholders were asked about the extent to which the EMA had delivered the above impacts for the LSH sector and regulators in the UK, and the likely nature and scale of any impacts.

[9] The Life Sciences in the UK: A letter from George Freeman, Minister for Life Sciences, included within: Biotech and money (2016) The State of the UK Healthcare and Life Sciences Sectors

[10] The All-Party Parliamentary Group of Global Health (2015) The UK's Contribution to Health Globally – Benefiting the country and the world

[11] Office for Life Sciences (May 2016) Life Science Competitiveness Indicators (BIS/16/236)

[12] The Life Sciences in the UK: A letter from George Freeman, Minister for Life Sciences, included within: Biotech and money (2016) The State of the UK Healthcare and Life Sciences Sectors

[13] Office for Life Sciences (2011) Strategy for UK Life Sciences

The consultations found overall agreement that the EMA being located in London had delivered additional benefits, although views differed regarding the potential scale of any benefits. The key findings are described below:

- **The EMA is believed to have contributed to the development of the LSH sector's industrial base in the UK** – The stakeholders suggested that the EMA has contributed to the growth of industrial activity in and around London, particularly within the Oxford/Cambridge/London triangle. This growth was generally considered to have been driven by the increasing scale and expertise of regulatory teams within larger companies (and in some cases the location of European headquarters) as well as the number of specialist advisers providing support to the LSH sector more broadly. As Marketing Authorisation Holders of medicinal products that are centrally marketed within the EU need to be based in an EU country, the EMA may have attracted many regulatory teams to the UK in the course of the past 20 years. Examples provided by stakeholders included Indian pharmaceutical companies that located in the UK for a number of reasons including: gaining access to EU markets; to be close to the EMA; and because of the global importance of London as a financial centre.
- **UK regulators, and the regulatory supply chain, have benefited from the close proximity of the EMA** – As stated above, the EMA is reported to have contributed to the growth of life science-related regulatory advisers and lawyers offering patent and regulatory services. Stakeholders were also in agreement that the MHRA has built-up a very close working relationship with the EMA, which is made easier by the close proximity of the EMA in terms of: the MHRA attending EMA meetings that it might not otherwise be in a position to attend; the MHRA having more informal contact with the EMA; the MHRA chairing a number of working groups within the EMA. This close working relationship is believed to have had a positive influence on the scale of activities undertaken by the MHRA, although the relationship involves much more than the contractual, fee-funded elements of work and, in practice, the MHRA has a disproportionate level of responsibility/input. The regulatory supply chain is also likely to have benefited from this increasing concentration of regulatory activity, particularly in London and the surrounding area.
- **The EMA has also contributed to the 'pull-factor' of the UK in attracting LSH companies** – Most stakeholders suggested that while the location of the EMA in and of itself is unlikely to have influenced many decisions to locate in the UK, it is likely to have been a 'secondary' factor for many companies. The presence of the EMA in London has added to the critical mass of LSH activity that already exists in the UK, and is likely to have been one of a number of 'pull-factors' for companies deciding to locate in the UK.
- **The EMA has improved knowledge sharing in the UK through formal and informal channels** – It was reported that the EMA has strict rules regarding engagement and interactions with industry and regulators, to ensure there are no unfair advantages to particular organisations or countries. This should mean that UK organisations are unlikely to have benefited disproportionately from their interactions with the EMA. However, most stakeholders suggested that such benefits did exist and the location of the EMA had realised a number of benefits via improved knowledge sharing. For example, it was reported that the recruitment of staff in and out of the EMA, UK regulators and the wider LSH sector has helped to enhance the UK's regulatory expertise and provided benefits for organisations by providing valuable knowledge and experience of the EMA and its procedures.

  Stakeholder views regarding the benefits arising from informal contacts with the EMA were more mixed. Around half of the stakeholders suggested that the UK had benefited from more informal contact with EMA staff. Some stakeholders stated that this was one of the key benefits for UK companies, by helping them to plan the steps that they must take to meet EMA requirements and gain regulatory approval. For these stakeholders, the close proximity of the EMA made it easier to keep in contact and have face-to-face contacts with the EMA, rather than communicating by telephone.

The proximity of UK stakeholders to the EMA and to networking and events (which mainly take place in London) was also mentioned as an important benefit for SMEs in terms of reducing the costs associated with attending these events or having face-to-face meetings with the EMA. Similarly, EMA staff were reported to be more likely to attend outside events and conferences in the UK, but may not have sufficient travel budgets to allow attendance at events located outside the UK.

- **There are some strategic advantages to the UK in relation to the regulatory approval process and collaborative working with US and Japanese regulators** – Stakeholders suggested that the growth of regulatory expertise in the UK and improved knowledge sharing had enabled the UK to create a well-understood regulatory approval process. This in turn was reported to have helped the UK to establish connections with regulators in other jurisdictions, specifically the US and Japan, providing informational advantages to companies and regulators operating in close proximity to the EMA. Consequently, UK companies and regulators are more aware of the latest clinical developments and regulatory trends from outside Europe, which provides a strategic advantage relative to companies and regulators outside the UK.
- **The UK's influence on regulatory/legislative issues is not significantly enhanced by the presence of the EMA** – The strength of the UK's influence on regulatory and legislative issues was widely reported by stakeholders. Many felt that the UK has a disproportionate influence on regulatory and legislative issues in Europe, particularly in terms of helping the EMA to develop a better and more consistent regulatory framework across the EU. For example, one stakeholder suggested that the EMA is responding to the need for more flexible approaches to reflect the development of biotechnology and personalised medicines and the needs of patients, which has been driven, in part, by the active role of the MHRA and pressure from the industry in the UK.

  Several stakeholders stated that the MHRA has had a profound influence on the work and effectiveness of the EMA, particularly relating to the EMA's development of regulations. However, this was again felt to be due to factors such as the size and importance of the UK market, the strength of the LSH sector and research base, the concentration of regulatory expertise and other support industries within the UK (and especially London), rather than the presence of the EMA.
- **The UK and the EMA have enjoyed a mutually beneficial relationship** – Stakeholders suggested that the close relationships between the EMA, MHRA and regulatory teams in the private sector, and the development of the regulatory talent in the UK, have supported the effective functioning of the EMA as well as providing benefits to the UK. One stakeholder suggested that the future effectiveness of the EMA would depend critically on its ability to attract staff with the necessary regulatory experience in its chosen location. It was also suggested that NICE had helped to support the EMA through its work to determine whether drug treatments are cost effective, a role which is considered relatively unique to the UK.
- **The location of the EMA has little impact on the clustering of universities, and the extent to which clinical trials and R&D activities are undertaken in the UK** – The stakeholders generally felt that the EMA has not been a primary determinant of joint and collaborative research in the UK and has not been a deciding factor in decisions concerning the location of research trials. It is also considered unlikely to have influenced the clustering of universities, although it may have provided an added incentive for academic institutions located close to the EMA to increase their capabilities and capacity relating to life sciences and health. It was generally felt that location decisions, specifically in relation to R&D activities, are more likely to be determined by the quality, expertise and reliability of science and research facilities and service providers and access to talent in a particular country. Therefore, the location of some of the world's best 'science' universities, and the highly-skilled talent in the LSH sector in the UK, are likely to have had a greater influence on the strategic decisions regarding the location of clinical trials and R&D investments, than the location of the EMA.

- **The research identified conflicting views of the influence of the EMA on the UK's international position in research, technology and development (RTD)** – Some stakeholders felt that the EMA has had a strong positive influence on the innovation climate in the UK, which would be weakened if the EMA was to relocate elsewhere. However, others felt that the EMA had only provided an indirect impact on RTD in the UK, by increasing the concentration of regulatory talent in the UK, and this was much less significant than the demand generated by the NHS, MHRA and NICE and the existing strength of the UK research base.

4.2.1 Quantified estimates

As stated previously, it is difficult to quantify the extent to which the size and growth of the LSH sector, its exports and R&D spend have been influenced by the location of the EMA in London. Overall, the above analysis of the stakeholder consultations suggests that the EMA is considered to have had a positive, but relatively small, impact on the growth of the wider LSH sector in the UK. It has enhanced the scale and expertise of the UK's regulatory capacity and is also believed to have influenced the decisions of some companies to locate in the UK, alongside a number of other 'pull-factors' for companies deciding to locate in the UK. It is therefore expected to have resulted in some additional activity and expenditures in the sector (over and above the EMA's own activities and expenditures that have been assessed above in Section 3).

While it is difficult to estimate the scale of these impacts with any certainty, an indicative and conservative estimate has been produced based on an assumption that the EMA has added to the growth of the LSH sector by between 1 per cent and 5 per cent per annum. In other words, this assumes that between 1 per cent and 5 per cent of the revenues, GVA and jobs directly supported by the current LSH sector might be attributed to the EMA being located in London. The findings of the stakeholder consultations also suggest that the EMA's impact on R&D activity in the UK is likely to have been less significant. It has therefore been assumed that R&D spend relating to life sciences and health in the UK has increased by between 1 per cent and 2.5 per cent per annum as a result of the EMA being located in London.

However, it is important to exercise caution in interpreting these estimates, which aim to provide an indication of the potential impacts of the EMA on the wider LSH sector and are based on simplifying assumptions in the absence of available data.

Table 4.1 applies these assumptions to the figures for the current size of the sector and suggests that the EMA's location in London may have directly supported between 1,800 and 9,000 additional FTE jobs in the LSH sector in the UK, and between €100 million and €500 million of additional GVA per annum. Applying the slightly lower assumptions for R&D expenditures suggests that they may have been enhanced by between €160 million and €400 million per annum.

Table 4.1 Impact of EMA on LSH sector and R&D spend in the UK

Indicator	Current size of the LSH sector	Indicative attribution to EMA location in London	
		%	Direct impact of EMA on LSH sector
Employment	180,000 FTE jobs	1%-5%	1,800 – 9,000 FTE jobs
GVA	€10bn per annum	1%-5%	€100m – €500m per annum
R&D spend	€16bn per annum	1%-2.5%	€160m – €400m per annum

Source: ICF analysis

Note: figures may not sum to total due to rounding

The figures in Table 4.1 provide indicative estimates of the direct longer-term impacts for the wider LSH sector that may result from the EMA being located in London if we assume that its location added to the growth of the LSH sector by between 1 per cent and 5 per cent per annum. The figures in Table 4.2 show the associated indirect and induced effects of these additional impacts that would be expected to result from the associated increases in supplier and employee expenditures. These effects have been estimated using the GVA and

employment multipliers for the LSH sector that are presented in Annex 6. The results show that if the EMA had increased the direct revenues, GVA and jobs of the wider LSH sector by between 1 per cent and 5 per cent, the associated total impact (including indirect and induced effects) would have supported between 6,850 and 34,300 FTE jobs and between €155 million and €780 million of GVA in the UK economy.

Table 4.2 Total impact of EMA on LSH sector in the UK

	Employment	GVA
Direct Impact	1,800 – 9,000 FTE jobs	€100m - €500m per annum
Indirect Impact	1,750 – 8,700 FTE jobs	€15m - €80m per annum
Induced Impact	3,300 – 16,600 FTE jobs	€40m - €200m per annum
Total Impact	**6,850 – 34,300 FTE jobs**	**€155m - €780m per annum**

Source: ICF analysis

Note: figures may not sum to total due to rounding

The additional R&D expenditures will also support additional jobs and GVA, although many of these jobs are likely to be included within the LSH sector, and are therefore likely to have already been counted in the figures in Table 4.2 above. Nevertheless, the additional R&D expenditures of between €160 million and €400 million would be expected to support between 1,450 and 3,650 FTE jobs and between €145 million and €360 million of GVA per annum, including indirect and induced effects.

Table 4.3 Total impact of R&D spend attributed to EMA

	Employment	GVA
Direct Impact	750 – 1,900 FTE jobs	€85m - €210m per annum
Indirect Impact	350 – 900 FTE jobs	€20m - €55m per annum
Induced Impact	350 – 850 FTE jobs	€40m - €95m per annum
Total Impact	**1,450 – 3,650 FTE jobs**	**€145m - €360m per annum**

Source: ICF analysis

Note: figures may not sum to total due to rounding

The data in Table 4.4 show the total short-term economic impacts from Section 3, alongside the indicative long-term impacts for the LSH sector, to provide an indicative total impact of the EMA for the UK economy[14]. It shows that the overall impact of the EMA for the UK economy, including short and long term impacts, could support between 10,000 and 37,000 FTE jobs and between €350 million and €1 billion of GVA in the UK economy.

As stated above, it is important to exercise caution in the interpretation of these indicative estimates, which are based on simplifying assumptions in the absence of available data. The large variation in the possible impacts reflects the considerable uncertainty regarding the longer-term impacts that may or may not be associated with the EMA. This was also evidenced by the different views amongst the stakeholder interviews, particularly regarding the extent to which benefits were the result of the strength of the LSH companies and regulators in the UK, or could be attributed to the EMA being located in London.

It also shows that, given the significant size of the LSH sector in the UK, even a relatively small percentage impact on the wider LSH sector can deliver significant impacts that are likely to exceed the short-term impacts generated by the EMA's own activities and expenditures.

[14] The impacts of the R&D expenditure have been excluded to avoid double counting the long-term impacts for the LSH sector in the UK.

Table 4.4 Total short-term and long-term impact on the UK economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
Short-term economic impacts	2,989	€193 million
Long-term economic impacts for the LSH sector in the UK	6,850 – 34,300	€155 million - €780 million
Total economic impact associated with the EMA	**9,800 – 37,300**	**€350 million - €970 million**

Source: ICF analysis

Note: figures may not sum to total due to rounding

5 Potential future impact of the EMA in the Netherlands

5.1 Potential future short-term impact of the EMA in the Netherlands

This section presents the results of the analysis of the potential future impact of the EMA should it relocate to the Netherlands. The analysis focuses on the expected short-term economic contribution of the relocated EMA and its activities to the Netherlands economy. It has adjusted the estimates of the current economic impact of the EMA (presented in Section 3) to reflect differences in the local economies and expected changes in allowances for the travel and subsistence of delegates and experts attending EMA meetings following relocation to the Netherlands (see box below for comparison of key assumptions between UK and the NL).

The results are presented for a 'mature' year following the potential relocation of the EMA to the Netherlands and therefore do not take account of any short-term, temporary reductions in EMA activities and expenditures that may occur as a result of the relocation process itself. The results are also consistent with the previous section in terms of presenting financial data in euros (2015 prices) to allow comparisons with the current direct, indirect, induced and overall impacts of the EMA in the UK.

Key assumptions underpinning the economic impact analysis in the UK and NL

Indicator	UK	NL	Source
Share of EMA expat staff income spent in the host country of the EMA	60%	60%	ICF estimate. A conservative estimate. The results of the Study carried out by Decisio in 2013 for the Ministry of Foreign Affairs in the Netherlands assumed 73 per cent of the expat wages in the Hague are spent locally. The Dutch Government had reservations about such low leakage assumptions. The assumption was revised to 60 per cent, however no direct evidence was found to support higher leakage assumptions. Based on limited reports on spending habits of expats, higher wages often result in higher consumption whereas saving patterns remain unchanged.
Correction coefficient for EMA staff basic salaries	1.418	1.08	Annex to the 2016 Annual Update of the Remuneration and Pensions of the Officials and Other Servants of the European Union and the Correction Coefficient Applied Thereto (COM(2016) 717 final). These EU data on differences in salaries for staff employed by the EU in different Member States (including the UK and Netherlands) have been used to estimate the EMA wages that would be paid if the EMA was to relocate to the Netherlands.
Number of the EMA staff (FTE)	891	891	EMA Annual report 2015.
Share of EMA remuneration to civil servants and experts on exchange spent in the host country of the EMA	80%	80%	ICF Estimate. The impact assessment does not specifically account for additional income received by visiting experts from home institutions because EMA agreements with visiting experts differ from case to case and are therefore difficult to estimate with accuracy. To account for additional income, the share of UK spending from the EMA was adjusted upwards slightly, to 80 per cent.

Number of meetings per annum at the EMA's premises	564	564	The European Medicines Agency: A well-established Agency of the EU protecting human and animal health for the EU citizens EMA/457243/2016EMA/2016
Number of return flights per annum to the EMA	36,000	36,000	
Total days spent in the country (by non-residents) to attend EMA meetings / events	65,000	65,000	
Total number of hotel nights spent to attend EMA meetings/events	30,068	30,068	
Daily allowance	€105	€93	EMA Rules for reimbursement of expenses. Assumed 70 per cent of the daily allowance is spent in the host country.
Hotel allowance	€245	€184	EMA Rules for reimbursement of expenses. Assumed 100 per cent of the hotel allowance is spent in the host country.
Travel budget	€300	€300	ICF estimate. Travel budget of €300 per person per trip for flights/trains/car/bus/taxis. Assumed 25 per cent stays within the host country.
Share of host country suppliers	80%	80%	ICF estimate. Based on the review of recent EMA tenders the majority of the EMA suppliers are UK based. The same assumption has been applied for the Netherlands.
Share of host country NCA revenue from the EMA	€12m	€12m	Based on MHRA annual budget from 2015. According to internal information, the Medicines Evaluation Board in the Netherlands already receives more than €11m per year from the EMA.
The EMA rental cost	€30m	€30m	Rental costs are assumed to remain unchanged. The EMA is currently paying rents of approximately €500/m^2 in London[15]. Average Dutch rents for premium office space are likely to be lower at around €350/m^2 [16] but it is assumed that the rent will be unchanged for the purposes of the analysis given the uncertainty regarding the exact location, type of accommodation and scale of costs.

5.1.1 Direct impact

If the EMA was to relocate to the Netherlands it is estimated that it would directly support €98 million of GVA and around 1,893 FTE jobs in the Netherlands economy.

These estimates assume there is no change in the numbers of people employed by the EMA (or in the numbers of local citizens and expats employed) and no change to the proportion of wages paid to expats that leak out of the Netherlands economy. The estimates also assume the same proportion of EMA expenditures on local suppliers of studies, consultancy services, publications and IT projects (i.e. 80 per cent in both the UK and the Netherlands) as these services are widely available in the Netherlands.

[15] EMA (2016) Annual Activity Report 2015, which states a basic rental cost of £11.8m and a total floor area of 26,450m^2, suggesting a basic rent of £444 per m^2.

[16] NVM Business, Een Stand van Zaken. Kantorenmarkt Randstad 2016. Available at https://www.nvm.nl/~/media/files/marktinformatie/business/kantorenmarkt%20randstad%202016.pdf

However, there are also differences in the assumptions for wages for EMA staff and travel allowances for visitors to the EMA. The wages paid to EMA staff have been adjusted for the Netherlands using the official 'correction coefficients' for salaries paid to EU staff in different Member States[17] [18]. In addition, it assumes a reduction of around 10 per cent in the allowances paid to delegates at EMA meetings and visitors to the EMA (compared to the UK)[19]. The analysis also uses local economic data to estimate the GVA and FTE jobs directly supported by EMA activities and expenditures.

The above estimates suggest that the direct impacts of the EMA are expected to support 17 per cent less GVA and 12 per cent fewer jobs in the Netherlands economy than is currently supported in the UK. This is primarily because of lower wages of EU staff in the Netherlands compared to the UK. GVA per job is similar to the UK at €51,700 per FTE job compared to €54,800 in the UK. This suggests that a slightly lower level of expenditure will typically support the same number of jobs in the Netherlands as in the UK.

EMA expenditures are estimated to directly support €59 million of GVA and 1,002 FTE jobs amongst direct supplier businesses, which suggests an average of €58,600 of GVA per FTE job. This is a 12 per cent increase in GVA per FTE job if compared to the UK but remains below the national average in the Netherlands as in the UK. GVA per FTE job for EMA staff is however 33 per cent lower than in the UK due to the lower correction coefficient on basic salaries for the EU staff based in the Netherlands at €70,400 to the EU as a whole (although only €44,000 adds value to the Netherlands economy after allowing for leakage).

Table 5.1 Direct economic impact on the Netherlands economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	891	€39 million
EMA impact through suppliers and visitors	1,002	€59 million
Total EMA related expenditure	**1,893**	**€98 million**

Source: ICF analysis

Note: figures may not sum to total due to rounding

5.1.2 Indirect impact

Table 5.2 presents estimates of the indirect impacts that occur as a result of the expenditures of the EMA's supplier businesses and support additional employment and GVA in supply chains across the Netherlands. It shows that indirect effects of EMA activities and expenditures are estimated to support some €14 million of GVA and 209 FTE jobs in the Netherlands economy. These estimates are lower than the corresponding estimates produced for the UK (i.e. GVA of €19 million and 244 FTE jobs) due to lower direct impacts.

[17] Official Journal of the European Union (2016) 2016 Annual update of the remuneration and pensions of the officials and other servants of the European Union and the correction coefficients applied thereto (COM(2016) 717 final)

[18] The change in staff costs would result in significant cost savings for the EMA, at least in the short term, which it may decide to spend on additional staff or services should the total income for the Agency remain unchanged. However, this has not been included in this analysis given the high levels of uncertainty.

[19] The assumption is based on the EMA Rules for Reimbursement of Expenses for Delegates and Experts Attending Meetings from June 2014 where daily allowance for travel in the UK is €105 and the hotel allowance in the UK is €245 compared to daily allowance in the Netherlands of €93 and hotel allowance of €184.

Table 5.2 Indirect economic impact on the Netherlands economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through suppliers and visitors	209	€14 million
Total indirect economic impact	**209**	**€14 million**
Implied average indirect multiplier	*1.11*	*1.15*

Source: ICF analysis

Note: figures may not sum to total due to rounding

5.1.3 Induced impact

The analysis also suggests that induced impacts are expected to be lower in the Netherlands as a result of smaller wages for the EMA staff and a smaller proportion of Dutch suppliers to the EMA. Table 5.3 shows that 437 FTE jobs and €23 million of GVA are estimated to be supported by the expenditures of EMA staff and other employees directly and indirectly supported by EMA activities and expenditures (compared to the 594 FTE jobs and €56 million of GVA currently supported in the UK).

The implied induced multipliers are also slightly lower than the equivalent multipliers for the UK and are estimated at 1.20 for GVA and 1.21 for employment effects (compared to 1.41 and 1.25 for GVA and employment effects in the UK). This may reflect the larger size of the UK economy and the fact that it is an island economy, which in turn may result in greater retention, re-spending and recirculation of incomes relative to the Netherlands.

Table 5.3 Induced economic impact on the Netherlands economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	249	€9 million
EMA impact through suppliers and visitors	187	€13 million
Total induced economic impact	**437**	**€23 million**
Implied average induced multiplier from direct + indirect expenditure	*1.21*	*1.20*

Source: ICF analysis

Note: figures may not sum to total due to rounding

5.1.4 Total short-term economic impact

Overall, the total short-term economic impacts of EMA activities and expenditures are estimated to support approximately 2,538 FTE jobs and contribute around €135 million of GVA per annum to the Netherlands economy following the potential relocation of the EMA to the Netherlands.

These figures are 30 per cent and 15 per cent lower than the equivalent GVA and employment estimates of the current impact of EMA activities and expenditures in the UK economy. The estimates suggest that the EMA activities and expenditures are estimated to support some €58 million less GVA and 450 fewer FTE jobs in the Netherlands compared to the equivalent estimates for the UK.

This is mainly due to the lower estimated wages of the EMA staff in the Netherlands (based on lower salaries for EU staff in the Netherlands compared to the UK as described above), and the lower prices of hotels and subsistence expenditure for the EMA visitors[20].

[20] Although, as stated above, the savings in staff costs may allow for the recruitment of additional staff or additional expenditures, if overall budgets remain unchanged.

However, the impact estimates for the Netherlands are more significant in terms of their overall share of the national economy. The overall impacts of €135 million of GVA and 2,538 FTE jobs would represent 0.02 per cent of all GVA and 0.04 per cent of employment in the Netherlands economy, compared to the equivalent figure of just 0.01 per cent for the UK. It is also estimated to account for 7.5 per cent of all FTE jobs and 4.1 per cent of the GVA supported by the overall life sciences and health (LSH) sector in the Netherlands. This is significantly higher than the equivalent estimates for the UK, which suggests that EMA activities and expenditures account for only 1.7 per cent of all FTE jobs and 1.9 per cent of the GVA supported by the UK LSH sector.

As before, taxation impacts should also be considered but do not apply to the EMA and its staff. However, the profits of suppliers and the wages of their employees will be subject to taxation. The associated tax receipts for the Tax and Customs Administration in the Netherlands are estimated to total €21.6 million per annum[21]. This is similar to the UK estimate of €21.1 million.

Table 5.4 Total economic impact on the Netherlands economy

Activity	Employment (FTE jobs)	Gross value added (GVA)
EMA impact through staff	1,140	€49 million
EMA impact through suppliers and visitors	1,397	€86 million
Total economic impact	**2,538**	**€135 million**

Source: ICF analysis

Note: figures may not sum to total due to rounding

5.1.5 EMA additionality and substitution impacts

Additionality is a measure of how much of any increase in output and employment can be attributed to the EMA (i.e. the part of economic impact that would not have materialised in the Netherlands had the EMA not relocated). If the economic activity would have taken place to the same extent in the Netherlands then it is not considered to be additional; rather there is substitution from elsewhere in the Dutch economy. In part, these impacts are dependent on the absorptive capacity of the local economy to accommodate a large EU agency, without displacing existing economic activity, and the ability of the labour market to provide the additional workforce and skills the activities of the EMA require.

Once adjusted for additionality, the GVA and employment figures are then referred to as 'Net' as the additional economic impacts are netted from those that are merely substituted from other economic activities in the Netherlands. This substitution component is also referred to as displacement effects.

The unique role of the EMA connecting experts, regulators and industry, through a large number of workshops, meeting and events, suggests the economic impacts are likely to result in a high level of additionality, as participants to these events would be unlikely to consume accommodation, hospitality and travel services in the absence of the EMA. At the same time, the future EMA employees would unlikely to have moved to the Netherlands and live there in the absence of the Agency. Similarly, the work the Dutch national regulators could potentially deliver for the EMA and the consultancy services the EMA may commission from Dutch providers would also be net benefits to the economy.

However, displacement may occur in the labour market if the presence of the EMA attracts skilled workers from the local economy which are not immediately replaceable in local companies and regulators, due to bottlenecks in the labour market. For example, the increasing demand for accommodation and hospitality may in the short-term drive lower

[21] The estimate assumes that 25 per cent of GVA (wages and profits) amongst suppliers is paid through VAT, corporation and income taxes. This assumption is based on the current rates of VAT (21 per cent), corporation tax (20 per cent on profits up to €200,000, rising to 25 per cent on profits above €200,000) and the basic rate of income tax (40 per cent) in the Netherlands.

skilled workers to these professions, away from the manufacturing or retail sectors. The effect on the local economy may include wage inflation and shortages of workers in some industries. In the longer-term, one would expect labour supply and demand to equalise as workers are attracted from elsewhere in the Netherlands and Europe, and more workers become skilled in a given profession. In short, given the free movement of labour in the EU, limited displacement is expected in the long-term.

5.1.5.1 Bottlenecks in labour supply and demand

The economic impact analysis assumes that the Netherlands economy will be able to accommodate the needs of the EMA and absorb the additional demand for goods, services and labour associated with the EMA, its employees and visitors. In reality, bottlenecks are likely in the short-term, specifically in the Dutch labour market. In lower skilled jobs in the accommodation and hospitality sector, the relocation of a large number EMA activities may initially create shortages in staff from cleaners, waiters, and hotel managers to taxi drivers. Shortages of labour and competition for staff as indicated above is likely to drive up wages in the short term. Bottlenecks can be avoided in any transition by planning for the number of activities the EMA will undertake and supporting the development of the hospitality, hotel and travel sector in the local economy to accommodate such an influx. For example, increasing training courses for hospitality and hotel management in local colleges.

The most likely bottleneck is among highly skilled and specialist workers in science and regulatory fields. In the short-term, if a number of EMA employees and regulatory specialists decide to remain in the UK following relocation, replacements with these specialist skills may be attracted from Dutch regulators and life science companies. Not only does this take time, it also requires national regulators and companies to recruit from a limited supply of such talented individuals. In the short-term, there is consequently a displacement effect on the local economy, which will dissipate in the longer-term as new graduates and overseas experts enter the labour force. This effect could also be mitigated to some extent by the EMA seconding staff from NCAs in other Member States, until the local labour market has time to adjust.

However, there is likely to be a period of adjustment, which may prevent Dutch regulators and consultants benefiting from the presence of the EMA as much as UK counterparts, at least in the short-term. Early decision-making on where to locate the EMA post-Brexit and planning would help mitigate this by encouraging regulatory consultants to establish offices in the Netherlands, recruit and relocate the relevant staff.

5.2 Potential future long-term impact of the EMA in the Netherlands

The relocation of the EMA to the Netherlands will also deliver long-term impacts, similar in nature to those for the UK described in Section 4. These longer-term impacts are more qualitative in nature and concern the potential impacts of the relocation of the EMA in supporting the growth and increased competitiveness and investment within the LSH sector in the Netherlands.

5.2.1 The LSH sector in the Netherlands

The Dutch Government has identified the LSH sector as a 'top sector' for driving future growth in the Netherlands. It suggests that there are significant opportunities for the Netherlands to gain market share in this sector and increase exports and R&D expenditures. The Dutch Government also highlights the importance of research institutes, companies, health funds and government/regulators working more closely to deliver innovative solutions and unlock the potential growth of the LSH sector[22].

The LSH sector is well established in the Netherlands. The Netherlands is already reported to have the most concentrated cluster of LSH companies in the world and is ranked 2nd in the world in terms of patent applications for biotechnology[23]. The Ministry of Economics reports

[22] Ministerie van Economische Zaken (2016) Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016

[23] Ministry of Foreign Affairs (2016) Holland Compared: Facts and Figures, 2nd edition 2016

that the LSH sector comprises 2,920 companies, providing employment for approximately 34,000 people, and added €3.3 billion of value to the Netherlands economy in 2014[24].

The Dutch Government also suggests that the LSH sector is the most intensive R&D sector of all of its leading sectors. It attracted €4.3 billion of private investment in 2015, in addition to €0.7 billion of public sector R&D expenditures, such that R&D spend totals approximately €5 billion per annum. These statistics suggest that the total GVA and R&D expenditures of the LSH sector in the Netherlands are approximately one third of the equivalent levels in the UK, while the corresponding metrics per head of population are approximately 20 to 25 per cent higher in the Netherlands.

5.2.2 Impacts of the EMA for the LSH sector in the Netherlands

This section provides an analysis of the information and evidence arising from interviews with stakeholders to consider the extent to which the EMA could deliver long-term impacts for the LSH sector in the Netherlands if it was to relocate from the UK. As stated above, these impacts extend beyond the EMA's own activities and expenditures, which were already assessed as part of the short-term impacts covered in Section 5.1. They are also more qualitative in nature and focus on:

- the conditions that would need to be in place for the LSH sector in the Netherlands to experience the same type of impacts as the UK;
- regulatory obstacles and/or factors that may hinder the full transfer of benefits from the UK to the Netherlands;
- the potential costs and benefits associated with the relocation of the EMA;
- the impacts on the employment of EMA staff that may result from its relocation;
- the likelihood of companies relocating some or all of their existing functions to the Netherlands (from the UK and other EU and non-EU countries);
- the likely impacts on research institutions and the number of clinical trials in the UK and the Netherlands; and
- impacts on any other related European authorities, industry and academic institutions.

The key findings are described in the following subsections.

5.2.2.1 Conditions that would be required for the Netherlands to experience similar impacts to the UK

Stakeholders listed a number of conditions that would need to be met: for the EMA's new location to successfully deliver the requirements of the EMA; and for that location to be able to experience similar types of impacts to those currently experienced in the UK. These conditions, or critical success factors, included:

- a strong and integrated LSH sector with sufficient critical mass of companies, research institutes and regulators;
- a strong NCA with capacity for growth;
- availability of an experienced regulatory talent pool;
- a country capable of attracting investment in LSH companies and research institutes;
- good transport connectivity, including an international airport with links across the EU;
- availability of appropriate office space and facilities;
- good quality hotel accommodation and conference facilities of sufficient scale to accommodate large numbers of visitors to the EMA;

[24] Ministerie van Economische Zaken (2016) Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016

- an attractive location for staff to want to live with a good quality of life (e.g. good quality and choice of schools, housing, childcare, public health system, and a safe socio-cultural environment);
- an English speaking location (the EMA's common language); and
- political stability to reduce the risk of needing to relocate again in the future.

Despite this comprehensive list of conditions, stakeholders were unable (or unwilling) to predict the likely new location for the EMA. Several stakeholders suggested that this unpredictability was because this would be a political decision and could therefore be allocated to a country that is currently underrepresented in terms of EU institutions, even if that location was not the strongest candidate based on the above criteria. These stakeholders suggested a long list of potential locations that could put forward a strong case for hosting the EMA (many of which already have) including Austria, Germany, Sweden, Ireland, Denmark, Spain, Italy and the Netherlands. Germany and the Netherlands were generally considered to be the strongest candidates amongst these stakeholders, several of whom stated that the Netherlands was particularly well placed as it meets all of the above criteria and the Medicines Evaluation Board (MEB) is already heavily involved with the EMA. These views were shared by some UK and international stakeholders (as well as Dutch stakeholders), who described the Netherlands as a credible option and a strong or preferred candidate.

5.2.2.2 *Regulatory obstacles and/or barriers to the full transfer of benefits*

The relocation of an EU institution of the EMA's size is unprecedented and stakeholders were uncertain about the potential regulatory obstacles associated with the relocation of the EMA. The most common concerns among stakeholders were related to the loss of continuity of the regulatory process[25] caused by:

- the potential loss of up to 50 per cent of EMA staff (based on reports of an EMA internal staff survey), who might be reluctant to relocate with the EMA, and subsequent delays in recruiting suitable replacements with appropriate experience (these employment impacts are described in more detail below);
- the potential loss of UK expertise that currently accounts for around 20 per cent of the EMA's procedures, approvals, etc.; and
- dislocation during the time taken to relocate the EMA and establish operations in the new location.

Most stakeholders suggested that the disruption caused by the relocation process was likely to last between three and five years. It was also felt that the selection of the new location would affect the scale of disruption as some locations are considered more likely to disrupt EMA operations than others. For example, locations that are unable to meet the above criteria, or those that are less attractive to staff and therefore result in lower staff retention, are likely to cause greater obstacles than others, such as the Netherlands. There were also mixed views about the extent to which operations could be shared between London and a new location, both during the relocation phase and on a more permanent basis. Some felt this was a sensible compromise, while others felt a split operation would hinder communications. It is also uncertain whether data security policies would permit split operations, or whether it would be feasible for expert committees to work across multiple sites. A more general point raised by stakeholders concerned the uncertainty surrounding Brexit and the decision to move the EMA and the associated timings.

The loss of continuity was considered a significant risk by most stakeholders, which could result in significant delays in securing regulatory approval during the transition period, and interrupt developmental work to simplify regulations. Some stakeholders also suggested that

[25] There were also concerns relating to the loss of continuity (and increased costs) in the UK if it was to choose to withdraw from the EMA and establish its own separate regulatory framework.

this would have knock-on impacts for the release of new drugs, and could potentially have consequences for patient health.

5.2.2.3 *Potential costs and benefits associated with the relocation of the EMA*

Stakeholders generally felt that the Netherlands would experience similar types of benefits to the UK from hosting the EMA. However, that is not to say that the EMA would deliver similar benefits in any location. As described above, stakeholders raised concerns about the EMA moving to a location that does not meet the above criteria, both in terms of the effectiveness of the EMA and the nature and scale of benefits for the host country.

In addition to the short-term impacts associated with the EMA activities and expenditures (discussed in Section 5.1), the key longer-term benefits for the Netherlands identified by stakeholders included:

- an increased pool of regulatory talent, which would provide significant benefits for the LSH sector, regulators and the EMA;
- a closer relationship between the EMA and the MEB. Stakeholders suggested that while the MEB already does a relatively large proportion of the centralised work for the EMA, there could be opportunities for this workload to increase and for greater informal contact between the MEB and the EMA;
- relocation of some private sector companies and operations and service providers, which may follow the EMA to its new location;
- Dutch SMEs and regulators benefiting from lower travel costs, increased attendance at EMA meetings and conferences and increased informal contact with the EMA; and
- the prestige of hosting the EMA, and the associated reputational benefits for the LSH sector.

However, there is significant uncertainty regarding the potential scale of these longer-term benefits and the associated timings. Stakeholders suggested that many of these longer-term benefits may take 10-15 years to be realised, as companies would be unlikely to relocate in the short-term, if at all, and it would take time to build the pool of regulatory talent and for informal contacts to be developed. Most stakeholders also felt that companies would be more likely to focus relocation on their regulatory teams, rather than move their entire operations to be close to the EMA. Such relocation decisions are also likely to be affected by the outcome of the Brexit negotiations and whether the UK remains part of the the European Economic Area (EEA). This is particularly relevant as the current EU legislation requires Marketing Authorisation Holders of medicinal products to be located in a Member State of the EU or EEA[26].

The costs associated with the relocation of the EMA were considered relatively moderate. For the EMA, the main costs were expected to arise from relocating staff to the new country, compensating staff who do not want to relocate, recruiting and training replacement staff, and the costs of operating from two locations during the transition period. The costs for the host country would depend upon its ability to meet the criteria described above, and would focus on any infrastructure improvements that would be required in order to meet the criteria. These costs are discussed below in Section 5.3.

5.2.2.4 *Impacts on the employment of EMA staff*

It is difficult to estimate the scale of impacts on the employment of EMA staff, given the uncertainty surrounding the location of the EMA, as well as the many factors affecting the relocation decisions of individuals. A recent survey of EMA staff is reported to suggest that

[26] Article 2 of Regulation 726/2004/EU: (…) “The holder of a marketing authorisation for medicinal products covered by this Regulation must be established in the Community. The holder shall be responsible for the placing on the market of those medicinal products, whether he does it himself or via one or more persons designated to that effect”.

up to 50 per cent may decide not to relocate, although this is considered a worst case scenario. It is also possible that temporary solutions, such as remote working during the transitional period of relocation, may be used to minimise the disruption.

The stakeholder consultations suggested that the scale of employment impacts would predominantly be influenced by:

- The attractiveness of the EMA's new location for staff. It was generally felt that a relatively high proportion of EMA staff might be expected to relocate to the Netherlands due to the quality of the local infrastructure, quality of life and the critical mass of bioscience activity, thereby minimising potential employment impacts.
- The financial implications associated with compensation packages and salaries in the new location. As described above, London receives the highest weighting for EU salaries, so this weighting will decrease with any relocation.
- The ability for EMA staff to find alternative employment in the UK. Most stakeholders felt that there would be significant opportunities for EMA employees to find employment with private companies and regulators in the UK. It was suggested that EMA staff are much sought after by companies and regulators because of their experience, knowledge and contacts. Some stakeholders suggested that the relocation of the EMA could provide short-term benefits for London and the UK by strengthening the pool of available regulatory expertise.

Stakeholders were also in agreement that the number of Dutch citizens employed by the EMA would be likely to increase if it was to relocate to the Netherlands. This is consistent with the short-term analysis of impacts, described above, which assumed that the EMA would increase its employment of Dutch citizens to more closely match the current numbers of UK staff employed by the EMA in London.

5.2.2.5 *The likelihood of companies relocating to the Netherlands*

The stakeholder consultations identified mixed views regarding the extent to which companies might relocate to remain close to the EMA. As stated previously, stakeholders generally felt that the location of the EMA is usually a minor factor for the location decisions of companies. Stakeholders suggested that it was more likely for larger companies to move their regulatory teams to remain close to the EMA, but even this was likely to happen slowly, over a 10 to 15 year period. It would also depend on the availability of suitably qualified regulatory staff in the Netherlands.

Other stakeholders suggested that other service providers and support companies, such as legal firms and regulatory consultants, may also follow the EMA to its new location. There were also suggestions that some European company head offices could follow the EMA to the Netherlands, particularly if London's financial position was eroded as a result of Brexit. In contrast, other stakeholders suggested that the ease of travelling from London to other places in Europe, including the Netherlands, could minimise any relocation decisions.

There were similar mixed views relating to relocation from third, non-EU countries. Several stakeholders, including industry representative bodies and advisors, suggested that the presence of the EMA would only be likely to have a limited impact on the location decisions for companies and institutions from third, non-EU countries. However, it was also suggested that the outcomes of Brexit negotiations and particularly whether the UK remains part of the EEA (and is therefore still able to host Marketing Authorisation Holders of EU medicinal products), and any perceived risks to London's financial position could have a greater influence on relocation decisions.

It should also be noted that these views are in contrast to an open letter sent to the UK Government and the EU from the Ministry of Foreign Affairs in Japan, which suggests that the location of the EMA could have a more significant impact on Japanese companies and activities. The letter lists a number of requests directed at both the UK and the EU, relating to Brexit, which include maintaining the current location of the EMA and the certification system for medicines between the UK and the EU. It also states that many Japanese pharmaceutical companies are operating in London due to the EMA's location, and *"the*

appeal of London as an environment for the development of pharmaceuticals would be lost" if the EMA was to relocate elsewhere. It suggests that this *"could possibly lead to a shift in the flow of R&D expenditure and personnel to Continental Europe"* and *"force Japanese companies to reconsider their business activities"*.[27]

5.2.2.6 *Impacts on research institutions and the number of clinical trials*

The potential impacts of the EMA's relocation for research institutions and the location of clinical trials were generally expected to be minimal. Most stakeholders suggested that the location of clinical trials is more likely to be determined by the medical facilities, the quality of the medical professionals, and the transparency and reputation of the country, rather than the location of the EMA. It was suggested that this is true of most clinical trials that have been undertaken in the UK and would be expected to be the case in any other host country. There can also be political reasons to undertake trials in a particular country (e.g. so that the results are recognised).

However, while the potential impacts on clinical trials in the Netherlands were expected to be relatively minor, there is considerable uncertainty regarding the outcomes of Brexit negotiations. For example, the UK could again be negatively affected if it was no longer able to participate in the EU Clinical Trials Directive. Further, the Netherlands would be well positioned to attract clinical trials that would otherwise have been undertaken in the UK as the hospital infrastructure (including eight major University Medical Centres) to support trials is relatively strong in the Netherlands. This may also help the Netherlands to be seen as an appealing location for the EMA.

5.2.2.7 *Impacts on other European authorities and organisations*

The relocation of the EMA was not expected to have any significant impact on the location of other European authorities. The only exception, mentioned by one stakeholder, is an international trade organisation for regulatory professionals, which is currently located close to the EMA in London. The EMA is their major client and the reason for their current location, so they may decide to follow the EMA if it was to relocate.

5.2.3 Quantified estimates

The above analysis shows that there are many factors that are likely to affect the extent to which the relocation of the EMA would create long-term impacts for the LSH sector in the Netherlands. There are different views amongst stakeholders, although the overall view appears to suggest that the type and scale of long-term impacts is likely to be similar to those experienced in the UK.

It is therefore assumed that the relocation of the EMA would be expected to have a relatively small, positive impact on the wider LSH sector in the Netherlands. The most likely impacts include the ability to influence the location decisions of some individuals and companies (especially regulatory teams), and additional benefits for the Medicines Evaluation Board and companies in the Netherlands as a result of closer and more informal contacts with the EMA.

As in the UK, a conservative, simplifying assumption has been applied to estimate the potential impact of the EMA on the wider LSH sector and R&D expenditures in the Netherlands. The following analysis assumes that the relocation of the EMA to the Netherlands has the potential to add to the growth of the LSH sector, by between 1 per cent and 5 per cent per annum, and its associated R&D expenditures, by between 1 per cent and 2.5 per cent per annum. These are the same assumptions as were applied to the UK estimates and are intended purely to demonstrate the scale of impact based on different conservative, simplifying assumptions.

Table 5.5 applies these assumptions to the figures for the current size of the sector and suggests that the relocation of the EMA to the Netherlands could directly support between 340 and 1,700 additional FTE jobs in the LSH sector, and between €33 million and

[27] Ministry of Foreign Affairs of Japan (2016) Japan's Message to the United Kingdom and the European Union. Available at: http://www.mofa.go.jp/files/000185466.pdf

€165 million of additional GVA per annum. Similarly, R&D expenditures could increase by between €50 million and €125 million per annum.

However, it is important to stress that these are long-term impacts and the stakeholder consultations suggested that they are unlikely to reach maturity for at least 10 to 15 years after the relocation. It is also important to stress that these are indicative estimates based on simplifying assumptions in the absence of evidence-based estimates and should therefore be interpreted with caution.

Table 5.5 Potential impact of EMA on LSH sector and R&D spend in the Netherlands

Indicator	Current size of the LSH sector in NL	Indicative growth due to EMA relocation	
		%	Direct impact of EMA on LSH sector in NL
Employment	34,000 FTE jobs	1%-5%	340 – 1,700 FTE jobs
GVA	€3.3bn per annum	1%-5%	€33m – €165m per annum
R&D spend	€5.0bn per annum	1%-2.5%	€50m – €125m per annum

Source: ICF analysis

Note: figures may not sum to total due to rounding

The figures in Table 5.6 show the indirect and induced effects associated with the direct impacts presented earlier, and have been calculated using the GVA and employment multipliers presented in Annex 6. The results show that if the EMA could increase the growth of the LSH sector by between 1 per cent and 5 per cent, the associated total impact would support between 740 and 3,700 FTE jobs and between €70 million and €350 million of GVA in the Netherlands economy.

Table 5.6 Total potential impact of EMA on LSH sector in the Netherlands

	Employment	GVA
Direct Impact	340 – 1,700 FTE jobs	€33m – €165m per annum
Indirect Impact	280 – 1,400 FTE jobs	€28m - €140m per annum
Induced Impact	120 – 600 FTE jobs	€9m - €45m per annum
Total Impact	**740 – 3,700 FTE jobs**	**€70m - €350m per annum**

Source: ICF analysis

Note: figures may not sum to total due to rounding

Table 5.7 shows the total impacts that could be generated if the relocation of the EMA was able to increase R&D expenditures in the Netherlands' LSH sector by between 1 per cent and 2.5 per cent. It suggests that the increased R&D expenditures could support between 570 and 1,400 FTE jobs and between €45 million and €110 million of GVA per annum, including indirect and induced effects. However, many of the jobs and GVA supported by these expenditures are likely to overlap with the above estimates for the LSH sector, so it is important not to combine these estimates as this could double-count some of the impacts.

Table 5.7 Total potential impact of EMA on R&D spend in the Netherlands

	Employment	GVA
Direct Impact	340 – 850 FTE jobs	€30m - €75m per annum
Indirect Impact	120 – 300 FTE jobs	€7m - €19m per annum
Induced Impact	110 – 250 FTE jobs	€7m - €18m per annum
Total Impact	**570 – 1,400 FTE jobs**	**€45m - €112m per annum**

Source: ICF analysis

Note: figures may not sum to total due to rounding

5.3 Expected costs to the Dutch Government associated with relocation of the EMA to the Netherlands

The costs to the Dutch Government of relocating the EMA to the Netherlands will depend on the new location of the EMA and the existing capacity of that city to absorb the additional visitors and residents associated with the EMA's operations. While the preferred location for the EMA is yet to be decided, the working assumption used for the purposes of this analysis is that the EMA would be located within the Randstad area of the Netherlands. It was necessary to make an assumption of location in order to be able to provide an assessment of likely costs.

The following are potential costs to the city or the Dutch Government associated with relocation of the EMA:

- **Cost of providing facilities for the EMA's operations is estimated to be low.** The EMA currently rents nine floors and 26,450 m^2 of office space in London including conference space capacity for up to 109 people, a lounge and a restaurant. The EMA spends €30 million per year on renting the office space and on associated expenditures. However, depending on the new location of the EMA, the host city might need to invest in order to offer a comparable working environment.

  Table 5.8 gives an overview of estimated free office space in each city in 2015, based on a study of the office space market in the Netherlands [28]. The data suggest that all three major cities within the Randstad area (Amsterdam, The Hague and Rotterdam) appear to have sufficient capacity to provide the required office space for the EMA. However, the data does not show whether individual sites would be appropriate in terms of their size, quality, location, services, etc.

  Should new office space not be available, the Ministry of Health, Welfare and Sports estimates that a new building for the EMA will cost approximately €130 million to €150 million (free of VAT and excluding ground charges). It assumes that no additional investment in infrastructure would be needed, however there might be incentives from the hosting city to reduce the ground charges for the new building. The cost is expected to be a one-off investment, made by a commercial project developer. The Government expects the EMA to secure a long-term rental agreement.

Table 5.8 Requirements for, and availability of, office space to accommodate the EMA in the Netherlands

EMA minimum office space required	**26,450 m^2**
Amsterdam (available capacity)	160,000 m^2
The Hague (available capacity)	78,000 m^2
Rotterdam (available capacity)	157,500 m^2

- **Cost of upgrading transport infrastructure for an additional 36,000 business travellers is estimated to be low.** The travel costs are covered by the EMA budget. However, the Dutch Government or local municipality might need to upgrade the current transport capacity in the city where the EMA would be located to ensure the new EMA location is well-served by the airport and international train stations.

  The additional 36,000 visitors to the Netherlands each year will give rise to demand for at least 72,000 additional air or train (i.e. Eurostar) passenger journeys (based on inbound and outbound journeys for each additional visitor). These visitors will be expected to travel to the EMA from at least 27 different EU MS and additional third countries. During

[28] NVM Business, Een Stand van Zaken. Kantorenmarkt Randstad 2016 Available at https://www.nvm.nl/~/media/files/marktinformatie/business/kantorenmarkt%20randstad%202016.pdf

peak periods, some 350 visitors per day could commute to the EMA from international travel hubs such as the Amsterdam-Schiphol airport and Rotterdam The Hague Airport.

Currently, Rotterdam The Hague Airport connects to more than 40 destinations mainly within Europe. Regular daily flights are available between London, Rome and Vienna. Amsterdam-Schiphol airport is the main international airport in the Netherlands and the fourth biggest in the EU-28[29]. It serviced 58 million passengers in 2015 and offers daily flights to all major European cities.

In comparative terms, the impact of EMA visitors on the overall numbers of daily commuters and airport passengers is low as shown in Table 5.9. Additional EMA travellers would represent less than 0.1 per cent of current daily commuters in the city of Amsterdam, The Hague and Rotterdam. Similarly the additional EMA air passengers would account for some 0.1 per cent of yearly traffic at Amsterdam-Schiphol airport, whereas the impact on Rotterdam The Hague Airport would be higher (4.4 per cent) given the much lower level of passengers handled by this airport.

Table 5.9 Expected impact of the EMA on numbers of commuters and air passengers in the Netherlands

	Commuters per day (EMA visitors as a share of total)	Air passengers per year (EMA visitors as a share of total)
EMA	350	72,000
Amsterdam	270,900 (0.1%)	58,167,815 (0.1%)
The Hague	114,500 (0.3%)	1,645,362 (4.4%)
Rotterdam	178.800 (0.2%)	1,645,362 (4.4%)

Note: The city of Amsterdam is served by Amsterdam-Schiphol airport, the cities of The Hague and Rotterdam are both served by Rotterdam The Hague Airport. Source: Statistics Netherlands, Eurostat [avia_paoa].

Public transport in the major cities in the Netherlands faces challenges such as overcrowding on trains in peak hours, despite investments in smart mobility and similar initiatives. In the event of a relocation of the EMA, some specific investment might be needed, although major investments are already planned. For instance, the latest The Hague Mobility Strategy includes a major 'Randstadrail' network (light trains) to connect cities. Public transport changes are also planned in Leiden and Amsterdam[30].

- **Cost of upgrading hotel accommodation for an additional 30,000 hotel nights per year is estimated to be low.** The EMA activities require the city to provide accommodation for some 36,000 visitors spending 30,000 nights in the city per year. This translates to some 350 additional hotel rooms needed during peak days.

  In 2015, the occupancy rate of hotels in Amsterdam was 78 per cent, the fourth highest in Europe after London, Dublin and Edinburgh. Some 3.5 million room nights remain free in Amsterdam through the year and EMA visitors would be expected to fill 1 per cent of this remaining capacity. In The Hague and Rotterdam, the occupancy rate of hotels in lower at around 65 per cent and 69 per cent respectively, but the total number of hotel rooms is lower as well. The EMA visitors would hence fill some 4-5 per cent of the remaining capacity in Rotterdam and The Hague. These figures are summarised in Table 5.10 below and suggest that there is unlikely to be a need for additional hotel capacity to accommodate EMA visitors in any of these locations.

[29] After London Heathrow, Paris' Charles de Gaulle and Frankfurt airport.

[30] https://www.denhaag.nl/home/bewoners/verkeer-en-vervoer/to/Haagse-Nota-Mobiliteit.htm; http://www.anwb.nl/verkeer/nieuws/nederland/2015/december/filezwaarte-december-jaaroverzicht; https://www.cijfers.net/file.html

Table 5.10 Expected impact of EMA visitors on the demand for hotel rooms in the Netherlands

	Free capacity of hotel room nights	EMA visitors as a share of free hotel room nights
EMA	30,000	.
Amsterdam	3,500,000	1%
The Hague	650,000	5%
Rotterdam	750,000	4%

- **Cost of providing accommodation for 890 staff and their families is estimated to be low.** The cost of providing accommodation for the EMA staff and their families will be covered by the EMA employees through their wages. However, the Dutch Government might need to invest in providing additional housing space in the city where the EMA would be located and/or there may be other cost-related impacts (e.g. an increase in market rents) associated with the increased demand for housing.

  Based on the '2015 The Dutch Property Market In Focus' report[31], the expat housing market in the Netherlands is thriving. It states that expats are particularly interested in furnished or semi-furnished houses and most of these properties exist in The Hague, Amsterdam, Rotterdam, Wassenaar and Delft. The prices of these properties have been steadily increasing in recent years. According to the report, the Dutch Government's priority is to further improve the supply of such property and encourage construction companies and investors to build non-subsidised rented houses. This suggests that there are already plans to improve the housing supply for expats in the Netherlands (regardless of any decision regarding the relocation of the EMA).

  However, the 890 additional EMA staff and their family members would be expected to further enhance the observed trends in the expat housing market in the city accommodating the EMA.

- **Cost of providing education for children of the EMA staff is estimated to be of medium scale.** Currently, the EMA staff have 648 children. Given that 43 per cent of EMA employees are between 30 and 40 years of age, the number of children is likely to further increase in the next few years when the EMA is relocated. Applying the EU average birth rate of 1.58 births per woman in the EU in 2014 to those between 30 and 40 years, and subtracting 444 children aged between 0 and 11 years, and those above 18 years of age, it is estimated that EMA employees could have around 750 school age children that would need to be placed in international schools if the EMA is relocated to the Netherlands. The EMA pays its employees an allowance of €386.60 per child per month and an education allowance including reimbursement of up to €14,300 per year for primary school and €17,000 per year for secondary school[32]. Whereas the costs of education would be covered by EMA staff (or, in the case of the European School, by the European Commission), the Government might need to invest in additional space in international schools.

  According to a report published by the 'Innovation Platform'[33] in 2010, there were at that time 40 international schools in the Netherlands:

  – 8 foreign international schools where fees range from €300 to €9,400;
  – 10 independent international schools where fees range from €3,500 to €22,000; and

[31] Available at https://www.nvm.nl/overnvm/about/marketinformation

[32] Those allowances are for London and adjustment would be made for allowances in the Netherlands if the EMA moves.

[33] Available at https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2010/07/21/rapport-deuren-open/deuren-open.pdf :

– 22 Dutch international schools where fees range from €3,000 to €8,400. The Dutch Government provides further subsidies of €4,500 to €7,000 per child and the Ministry of Education provides an additional contribution of €575 to €650 per child [34].

Whereas most of these international schools are concentrated in the cities of Amsterdam, The Hague and Rotterdam, some online sources [35] suggest that the supply of international schools is not meeting growing levels of demand. This potential shortage of international schools is already being investigated by the Dutch Government and we therefore conclude that there may be some moderate costs for the Dutch Government in providing additional capacity within international schools in the Netherlands.

However, there are also two European Schools in the Netherlands. One is located in Bergen and the other is located in The Hague. The Dutch Government reports that both schools have adequate capacity to expand and would also be willing to consider starting a new European School in the Netherlands including, if necessary, near to the City of Amsterdam. In both cases, EMA staff would not need to pay extra fees other than the allowance provided to them on the basis of the EU Staff Regulations.

5.4 Potential future total impact of the EMA in the Netherlands

The potential future impact of the EMA in the Netherlands needs to consider the short-term and long-term impacts and the potential costs to the EMA and the new hosting country. The above sections have used the available data to produce quantified estimates where possible, although there is considerable uncertainty associated with the long-term impacts, and the figures should be considered indicative, and treated with caution as they are based on simplifying assumptions only in the absence of hard data and evidence.

Table 5.11 summarises the potential total impacts associated with the relocation of the EMA to the Netherlands, by summing the short-term and long-term impacts from the above analysis. The R&D expenditures have been excluded to avoid double-counting any of the long-term impacts. The data suggest that the overall impact of the EMA to the Netherlands economy, including short- and long-term impacts, could support between 3,000 and 6,000 FTE jobs and between €200 million and €500 million of GVA. As with the UK estimates, the large variation in the possible impacts reflects the considerable uncertainty regarding the scale of the long-term impacts associated with the relocation of the EMA and these estimates should therefore be treated with caution.

These estimates are smaller than the indicative impacts for the UK, primarily because the LSH sector and the overall economy in the Netherlands is smaller than the UK, and relocation of the wider LSH sector is expected to focus on regulatory teams, and head offices, rather than complete operations.

Table 5.11 Total potential future impact of EMA in the Netherlands

	Employment	GVA
Short-term impact	2,538	€135m
Long-term Impact	740 – 3,700 FTE jobs	€70m - €350m
Total Impact	3,200 – 6,200 FTE jobs	€205m - €485m

Source: ICF analysis

Note: figures may not sum to total due to rounding

It is also important to consider the potential one-off costs for the Dutch Government associated with providing appropriate office accommodation, transport infrastructure, hotel accommodation, residential space, and places in international schools. However, as stated above, these requirements will depend on the specific location selected and it has not been possible to produce quantified estimates at this stage.

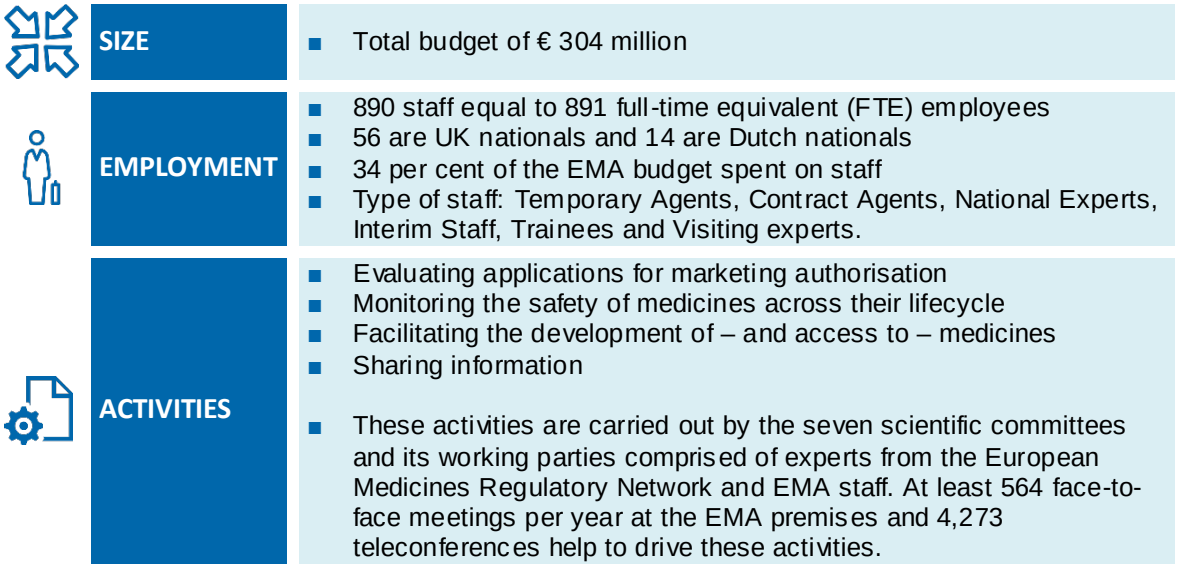
[34] Dutch Ministry of Education (2017).

[35] http://www.dutchnews.nl/news/archives/2016/01/84073-2/

ANNEXES

Annex 1 EMA Fact Sheet

Figure A1.1 Key figures in 2015



Source: ICF estimates based on EMA website, EMA Annual Report 2015 with Annexes and MHRA Annual report

A1.1 Why the EMA?[36]

Before a new medicine can be placed on the market, it must undergo a comprehensive series of tests. Public health authorities must evaluate the results of these tests to verify that the medicine meets the necessary quality, safety and efficacy requirements set out in the relevant legislation[37]. Only then can the medicine be authorised for use. Legislation in the European Union (EU) harmonises the test requirements between the Member States to ensure consistency and a high level of public health protection across the EU.

The EMA was created to evaluate tests results for medicines in the EU. The Agency began operating in 1995 in London. Prior to 2004 it was known as the European Agency for the Evaluation of Medicinal Products (EMEA). Today, the Agency is responsible for the scientific evaluation, supervision and safety monitoring of medicines developed by pharmaceutical companies for use in the EU.

The Agency supports (but does not replace) the work of existing national regulatory bodies for medicine, helping to harmonise practices and procedures. The EMA provides scientific opinions for granting a centralised marketing authorisation decision (i.e. the right to market and use a medicine) valid for the whole EU. Prior to the establishment of the EMA, the pharmaceutical companies had to obtain marketing authorisations individually in each EU Member State.

The centralised authorisation procedure is compulsory for specific medicines[38] and optional[39] for others. However, the EMA only gives a scientific opinion for marketing authorisations. Based on the EMA's assessment, the European Commission then grants or rejects authorisation.

[36] www.ema.europa.eu – Who are we & EMA

[37] Directive 2001/82/EC, Directive 2001/83/EC, Regulation (EC) No 726/2004

[38] Compulsory medicines for centralised authorisation include: Human medicines containing a new active substance to treat HIV or AIDS, cancer, diabetes, neurodegenerative diseases, auto-immune and the immune dysfunctions and viral diseases; medicines derived from biotechnology processes, such as genetic engineering; advanced-therapy medicines, such as gene-therapy, somatic cell-therapy or tissue-engineered medicines; orphan medicines (medicines for rare diseases); and veterinary medicines for use as growth or yield enhancers.

[39] Optional medicines for centralised authorisation include: medicines containing new active substances for indications other than those stated under compulsory; medicines that are a significant therapeutic, scientific or technical innovation and medicines whose authorisation would be in the interest of public or animal health at EU level.

The legal foundation of the EMA

- Directive 2001/82/EC, on the Community code relating to veterinary medicinal products, as amended. The amendments are incorporated into the consolidated text of Directive 2001/82/EC;
- Directive 2001/83/EC on the Community code relating to medicinal products for human use, as amended. The amendments are incorporated into the consolidated text of Directive 2001/83/EC;
- Regulation (EC) No 726/2004, laying down Community procedures for the authorisation and supervision of medicinal products for human and veterinary use and establishing a European Medicines Agency, as amended. The amendments are incorporated into the consolidated text of Regulation (EC) No 726/2004.

A1.2 What does the EMA do?[40]

Among its principal activities, the Agency:

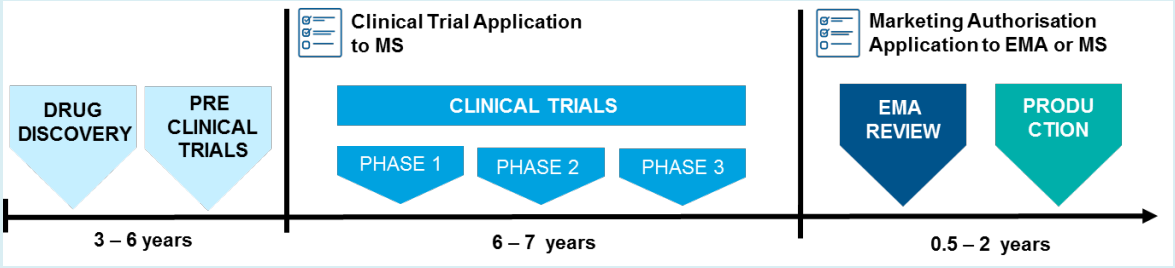
- **Evaluates applications for marketing authorisation by issuing recommendations for authorisation:** The EMA is responsible for the scientific evaluation of centralised marketing authorisation applications (MAA). Once granted by the European Commission, the centralised marketing authorisation is valid in all EU Member States, Iceland, Norway and Liechtenstein. The recommendations are issued based on a single market authorisation application to the EMA from pharmaceutical companies. Recommendations for authorisation are carried out by two of the EMA's scientific committees: Committee for Medicinal Products for Human Use (CHMP) and the Committee for Medical products for Veterinary Use (CVMP).
- **Monitors the safety of medicines across their lifecycle:** The EMA continuously monitors and supervises the safety of medicines that have been authorised in the EU by:
  - developing guidelines and setting standards;
  - coordinating the monitoring of pharmaceutical companies' compliance with their pharmacovigilance obligations;
  - contributing to international pharmacovigilance activities with authorities outside the EU; and
  - informing the public on the safety of medicines and cooperating with external parties such as patients and healthcare professionals.
- **Facilitates the development of – and access to – medicines** to enable timely patient access to new medicines. These activities include:
  - *Support for early access:* The EMA offers regulatory mechanisms such as accelerated assessment, conditional marketing authorisation and compassionate use to help promising new medicines reach patients as early as possible.
  - *Scientific advice:* The EMA gives advice to a company on the appropriate tests and studies in the development of a medicine. Companies can request scientific advice from the EMA at any stage of development of a medicine, whether the medicine is eligible for the centralised authorisation procedure or not. The Agency gives scientific advice by answering questions posed by companies. For human medicines, scientific advice and protocol assistance are given by the CHMP on the recommendation of the Scientific Advice Working Party (SAWP).
  - *Paediatric procedures.*
  - *Scientific support for advanced-therapy medicines:* Companies can consult the EMA to determine whether a medicine they are developing is an advanced therapy medicinal product (ATMP). The procedure allows them to receive confirmation that a medicine, which is based on genes, cells or tissues, meets the scientific criteria for defining an ATMP.
  - *Orphan designation of medicines for rare diseases;*
  - *Scientific guidance on requirement for the quality, safety and efficacy testing of medicines;*
  - *The Innovation Task Force, a forum for early dialogue applicants and*
  - Support for research and innovation in the pharmaceutical sector, and especially to SMEs.

[40] www.ema.europa.eu

- **Provides information to healthcare professionals and patients** by publishing clear and impartial information about medicines and their approved uses. This includes public versions of scientific assessment reports and summaries written in non-technical language.

Position and role of the EMA within the drug development process

The figure below outlines the drug development process. Submissions of data to the EMA for a Marketing Authorisation and the EMA review is made at the end of clinical trials. The application for clinical trials is made to the Member State.



The average cost of drug development has increase to around €1.5bn over the past 12-15 years. Generic drugs need marketing approval as well.

Until about 20 years ago, all lead compounds (i.e. potential new drugs) were developed by big pharmaceutical companies. Currently about 50 per cent of lead compounds are developed by (very) small companies. Experts suggest small companies develop products until they are halfway through Phase 2 of clinical trials. At that point they sell or license the products to one of the big pharmaceutical companies for further development.

In addition to the pharmaceutical companies, many consultants and contract research organisations (CROs) are involved in the drug development process.

Source: ICF experts

A1.3 How does the EMA operate?[41]

The Agency comprises of:

- **Management Board,** composed of 37 members who are representatives from each EU Member State and EEA-EFTA country, the European Parliament, the European Commission, patients' organisations, healthcare professionals' organisations and veterinarians' organisations. The Board sets the Agency's budget, approves the annual work programme and is responsible for ensuring that the Agency works effectively.
- **Executive Director,** has overall responsibility for the day-to-day management of the Agency. He is supported in his role by the Deputy Executive Director, an Office of the Executive Director, Advisory Functions (Chief Policy Advisor, Senior Medical Officer, Programme Design Board, International Affairs, Audit and Legal Department) and Corporate Governance.
- **Eight Divisions and their various Departments**, responsible for the daily operations of the Agency and for providing scientific, technical and administrative support to the work of the scientific committees and their working parties.
- **Seven scientific committees**, composed of representatives from each EU Member State and EEA-EFTA countries plus various other representatives and observers, with responsibility for preparing the Agency's opinions on questions relating to medicinal products in their respective fields. The committees are:
  - Committee for Medicinal Products for Human Use (CHMP);
  - Pharmacovigilance Risk Assessment Committee (PRAC);
  - Committee for Medicinal Products for Veterinary Use (CVMP);

[41] 7 April 2016, Recruitment at the European Medicines Agency

- Committee for Orphan Medicinal Products (COMP);
- Committee on Herbal Medicinal Products (HMPC);
- Paediatric Committee (PDCO); and
- Committee for Advanced Therapies (CAT).

The committees are supported by more than 50 working parties, working groups and scientific advisory groups.

EMA Scientific Committees

EMA has seven scientific committees that carry-out scientific assessments to submit to the European Commission. EMA's scientific committees meet each month at the EMA premises. The assessment is led by a rapporteur and a co-rapporteur who prepare the assessment reports and lead the discussions in the committees.

Out of 267 rapporteurs and co-rapporteurs in 2015, 45 were from the UK, followed by 37 rapporteurs and co-rapporteurs from the Netherlands. Other countries with a high number or rapporteurs and co-rapporteurs were Sweden (35) and Portugal (28).

The EMA financially remunerates the national authorities for certain types of work carried out by their staff on behalf of the EMA committees (e.g. as rapporteurs or experts).

The Agency also draws on the expertise of a European Medicines Regulatory Network of over 4,500 'European experts', made available by the Member States, who serve as members of the Agency's scientific committees, working parties or scientific assessment teams.

European Medicines Regulatory Network

The European Medicines Regulatory Network is a partnership between the EMA, the European Commission and 50 medicines regulatory authorities (national competent authorities) in the EU and the EEA. The EMA operates in the centre of this network, coordinating and supporting interactions between over 50 national competent authorities for both human and veterinary medicines.

These national authorities supply over 4,500 experts to take part in EMA's scientific committees, working parties and scientific advisory groups described above. The national authorities receive a share of the EMA's revenue from fees for the assessment they carry-out on behalf of the Agency. In 2015, a total of €108 million (or 35 per cent of the EMA budget) was paid to national competent authorities.

The Agency works in very close collaboration with the EU institutions, primarily the European Parliament and European Commission, as well as with various other European Union agencies.

A1.4 Who does the EMA work with internationally?

At the international level, the Agency collaborates with non-EU regulatory authorities such as the US-FDA and the Ministry for Health, Labour and Welfare in Japan on issues of common interest (e.g. orphan medicines), and contributes to international forums in the global regulatory arena.

For instance, to advance medicine development and evaluation the European Commission, EMA and US-FDA organise in-person bilateral meetings on a routine basis. The EMA and US-FDA interact daily, mostly structured around scientific and regulatory working groups or "clusters" .

A1.5 What could happen to the EMA in the event of Brexit?

In the event of Brexit, the EMA may need to move from London to an alternative location in the EU. Current public speculation suggests the following potential scenarios:

- **Pharmaceutical companies might move from London:** For instance, the Japanese Government urged the UK to maintain the current location of the EMA and the certification system for medicines between the UK and the EU. As noted in the official message[42], "the Japanese companies are concerned about the relocation of the EU agency. Many Japanese pharmaceutical companies are operating in London, due to the EMA's location in London. If the EMA were to transfer to other EU MS, the appeal of London as an environment for the development of pharmaceuticals would be lost, which would possibly lead to a shift in the flow of R&D funds and personnel to Continental Europe".
- **New drugs might take longer to reach the British market[43].** With Brexit, the cost of authorising a medicine both in the UK and the EU might increase if two separate market authorisations will be needed. The pharmaceutical and biotechnology industry is stressing the importance[44] for the UK to remain closely aligned with the EU regulation on the discovery, manufacture and delivery of medicine. In early December 2016, the UK Government announced it will ratify the single European patent agreement enforced by a Unified Patent Court (UPC). The pharmaceutical and biotechnology industries hope[45] this strengthens the case for keeping Britain within the EMA – or very closely aligned. If not, new drugs might take longer to reach the British market[46].
- **EMA authorisation procedures might take longer during the transition process.**
- **There might be less work for the MHRA.** The Financial Times noted that the EMA outsources up to a third of its work to the MHRA and this work is responsible for a third of the MHRA's income[47]. However based the review of the EMA and MHRA Annual reports for 2015 ICF estimates only €12 million per year goes to the MHRA (some 11 per cent of total EMA budget spent on evaluation of medicines).
- **There might be fewer clinical trials conducted in the UK.** The British Medical Journal noted the work of the MHRA also makes the UK an attractive location to carry-out clinical trials "The MHRA conducts 30 per cent of approvals for the EMA making the UK an attractive place for global players to conduct clinical trials"[48]. Based on the opinion from PwC UK pharma and life sciences consulting practice some clinical trial locations have already been changed after the Brexit vote[49].
- **There might be less foreign direct investment in the UK LSH market[50];**
- **Talent might move from the UK:** Based on the insights from Novasecta "some CEOs are saying that several senior level people had decided not to apply to work in their companies" .. "The whole talent pool and system of MHRA, EMA and clinical trials in the UK requires a strong network, close relationships and a hub location. Our research reveals that executives do not view the UK as favourably as they used to."[51]
- **There might be restricted access to research networks and funding for the UK** including limited mobility of scientists, researchers and company staff[52].
- **There might be less investment into the LSH in EU as a whole: "**Novasecta also noted some executives were concerned that the EU itself would "become weakened as a pharmaceutical hub compared with an increase in the strength of the US and Asia." One said that an Asian company had postponed its planned European entry because of the Brexit vote"[53].

[42] Japan's message to the United Kingdom and the European Union http://www.mofa.go.jp/files/000185466.pdf

[43] Thebmj, How "Brexit" might affect the pharmaceutical industry, 10 May 2016

[44] Ibid.

[45] FT December 1st 2016, Brexit Briefing: Britain's EU patent opt-in

[46] Ibid

[47] Financial Times, Brexit Briefing: Bitter medicine, 4 August 2016

[48] Thebmj, How "Brexit" might affect the pharmaceutical industry, 10 May 2016

[49] Pharma intelligence "What can the Life Sciences Industry Do About It?", 12 December 2016

[50] Ibid.

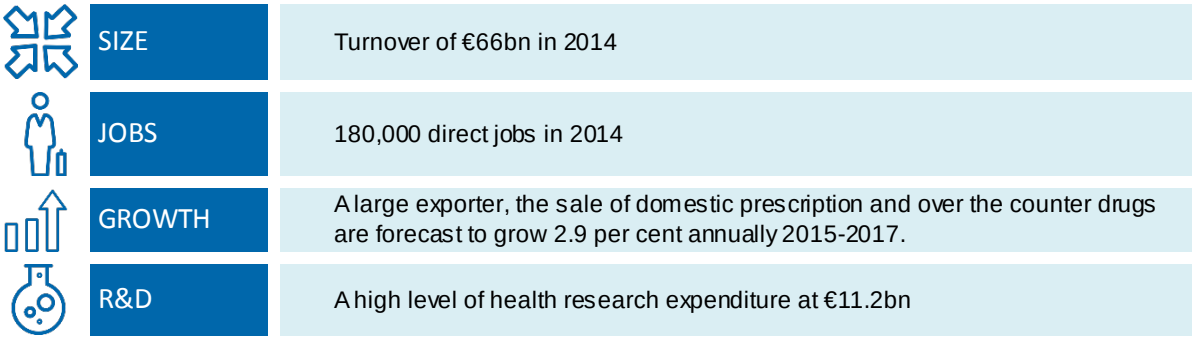
[51] Ibid.

[52] Ibid.

[53] Ibid.

Annex 2 UK Life sciences and Health Sector Fact Sheet

Figure A2.1 Key Figures



A2.1 Market size and structure

The UK is home to a global life sciences and health (LSH) sector which generates an annual turnover of £56 billion (€66bn), of which £27 billion (€32bn) came from exports in 2014[54]. The UK is also the top-ranked country in Europe for attracting foreign direct investment in the LSH sector, and is also ranked first for medical research in the G7[55].

The LSH sector combines the pharmaceutical, biotechnology, medical technology, and health industries. With no single industrial classification for the LSH sector, consistent and reliable headline data is not available. Instead, figures on industry segments offer a snapshot of the sector:

- The UK **pharmaceutica**l manufacturing industry alone was worth £12.7 billion (€15bn) in 2015, representing 1 per cent of total UK output, and 8 per cent of manufacturing output[56]. Of the 545 pharmaceutical companies in the UK in 2013, 47 had a turnover of greater than £100 million (€118m). Combined, they employ 70,000 people and have an annual turnover £32.4 billion (€38.2).
- The **medical technology** segment has an annual turnover of £18.1 billion (€21.4bn), with some overlap with the other segments of the LSH sector.

A mature and innovative sector, the success of the UK LSH sector is characterised by:

- 4,398 life science companies, developing, manufacturing and marketing LSH products and services, including 545 pharmaceutical companies, and over 3,200 medical technology companies, of which 97 per cent are SMEs.
- The presence of world-leading companies, including GlaxoSmithKline, AstraZeneca, and Shire, which are the UK's largest by market capitalisation. By this measure, GlaxoSmithKline and AstraZeneca are also among the world's largest 25 pharmaceutical and biotechnology companies[57].
- High levels of health research expenditure (€11.2bn), second only to Germany (€12bn) in Europe and fourth globally behind the USA (€111bn) and Japan (€17bn).
- A total of €8.8 billion in R&D funding from the EU between 2007 and 2013, of which €3.4 billion is net of its own contribution.
- World-class universities and research base, with the second-largest number of top 100 universities in both medicine and life science worldwide, including internationally renowned Oxford, Cambridge and Imperial College universities which feature in the world's top 10.
- A skilled workforce of 180,000 direct employees, attracted from Europe and around the world.

[54] Klein, N., et al. (2015),*The State of UK Healthcare and Life Sciences Sectors*, produced by Biotech & Money, p.4

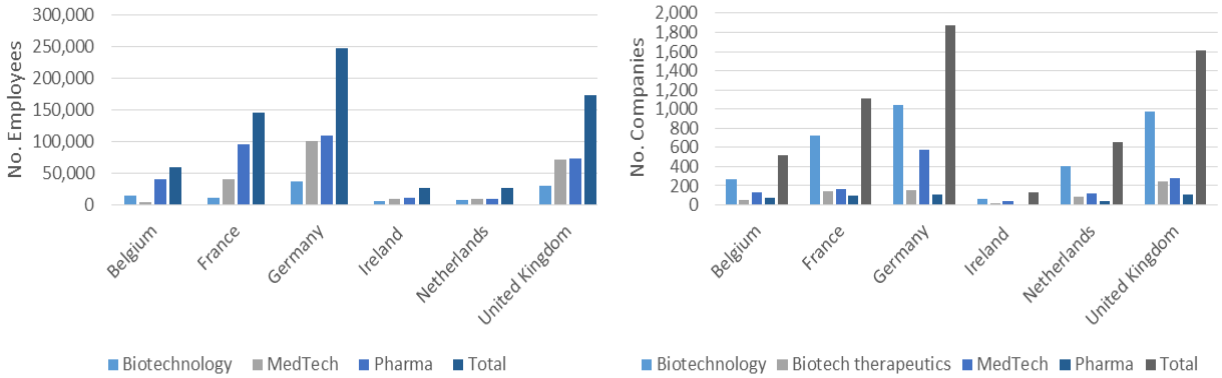
[55] Canada, France, Germany, Italy, Japan, UK, US, EU

[56] UK House of Commons (2016), *Future of the European Medicines Agency – Debate Pack*, No. CDP-2016/0173 12 October 2016

[57] Forbes (2016), *World's 25 Biggest Drugs & Biotech Companies*

Figure A2.2 provides a comparison of indicators on the structure of the UK LSH sector compared to other European countries.

Figure A2.2 Number of employees (left) and companies (right) in the life sciences sectors of selected European countries



Source: Site Selection for Life Science Companies in Europe, KPMG, June 2016

A2.2 Recent industry trends and developments

Global healthcare and life sciences markets face common challenges. An ageing population, combined with a higher burden of disease, has resulted in increasing demand for pharmaceutical products, healthcare solutions and medical technologies. While these trends also indicate an increase in LSH-related expenditure in absolute terms, pressures on public finances in many countries mean that growth in real terms or as a share of GDP is slowing. In contrast, healthcare and life science expenditure in developing economies continues to grow rapidly, providing export opportunities.

Globally, healthcare spending is estimate to be rising at 5.2 per cent per annum between 2014 and 2017[58]. The next decade forecasts growth of up to 10 per cent per year, with lower rates of growth expected in Europe and the US. This suggests that the greatest growth potential for UK LSH sector exports is likely to be found outside Europe and the US..

The UK has maintained real term increases in healthcare and R&D expenditure[59]. Underlying this trend is a move away from generic drugs with companies responding to the expiration of patents and thinning of pipelines, by focussing on growth areas such as innovative biotechnology and genomics.

In parallel, the costs of bringing new therapies and treatments to market are increasing, requiring greater investment in R&D, and increased availability of finance for LSH companies to conduct trials. Measures to reduce cost, improve efficiency and bring solutions to market quicker are therefore needed.

The impact of these trends on the LSH industry include:

- An increasing level of close working between industry and regulators to increase approvals of new therapies, in particular for the most innovative therapies and fast tracking others (i.e. the Medicines and Healthcare products Regulatory Agency (MHRA)offers an expedited review timeframe for phase one clinical trials of an average of 14 days for initial assessment).
- Increased merger and acquisition (M&A) activity between large LSH companies ("mega mergers"), but also involving smaller companies, as larger companies seek to acquire new technologies and therapies to supplement their thinning pipelines.
- An increasing number of nimble and creative SMEs developing new therapies, driving some of this M&A activity.
- An increasing number of LSH companies seeking an IPO to raise finance, leading to the growth of a unique IP commercialisation sector in the UK, supporting a wider economy of venture capital specialists, lawyers and business advisors.

[58] Klein, N., et al. (2015), The State of UK Healthcare and Life Sciences Sectors, produced by Biotech & Money. p. 15

[59] Ibid. p. 4

- Increased collaboration between universities and industry, in particular where clustering is taking place, at over 100 UK Science Parks[60] and within regional hubs like London, Cambridge and Oxford, tied strongly to world-leading research.

A2.3 Regulatory and supporting environment

The UK and EU benefit from a highly-sophisticated regulatory system (including the regulation of medicines and devices). This system contributes to the UK's success by providing industry with the scale and certainty to bring innovative, effective and safe medical technologies to patients. The UK's MHRA has a prominent role in the European regulatory system due to its capacity and expertise. The MHRA has undertaken a significant proportion of the EMA's workload and contributed expertise in the most advanced areas of the EMA's work. According to the Financial Times, the EMA outsources up to a third of its work to the MHRA and this work is responsible for a third of the MHRA's income[61]. A report in the British Medical Journal states that this work by the MHRA also makes the UK an attractive location to carry out clinical trials[62]. A summary of the MHRA is provided in the box below.

The Medicines and Healthcare products Regulatory Agency (MHRA)

- Budget: income 2015/16 was £149.5 million (€176m)[63]
- Staff: An average of 1,216 permanent full-time equivalent staff during the year 2015/2016[64]
- Activities in 2015[65]:
  - Rapporteur/Co-rapporteur in 14 per cent of the Centralised Procedures
  - Scientific Advice Co-ordinator in 24 per cent of cases
  - Reference Member State in 44 per cent of decentralised procedures involving the UK
  - The MHRA also holds hundreds of regulatory or scientific advice meetings to help applicants overcome a range of issues.
- MHRA is also a prominent assessor of new medicines for Europe, having conducted a third of all EU wide safety reviews since 2012[66]
- Other roles include prominence in the European Risk Management Strategy Facilitation Group (ERMS-FG) on pharmacovigilance and support to two scientific committees - the Scientific Advice Working Party and the Pharmacovigilance and Risk Assessment Committee.

Wider government support is also important for the success of the LSH sector, including funding for research, support in commercialisation through the UK Government's Catalyst programmes (nine set up by the Government, of which two are in the health area[67]), and direct grants to promising technologies and projects through Innovate UK. Headline statistics include:

- £2 billion (€2.4bn) of public investment in health and life science research via the research councils and National Institute for Health Research Programme.
- The Biomedical Catalyst has awarded more than £250 million (€294m) to 318 early stage companies and university ventures, attracting a further £120 million (€141m) of industry investment and more than £1billion (€1.18bn) in post-project financing. Catalysts support innovative technologies by providing technical advice, facilitating connections between industries and post-project financing.
- Single project funding of over £200 million (€235m) to sequence 100,000 whole genomes.
- £55 million (€65m) to develop the dedicated Cell Therapy Manufacturing Centre in the UK.
- The Patent Box scheme introducing an effective 10 per cent corporation rate tax incentive for qualifying profits on products derived from UK or EU patents.

[60] Ibid, p. 27

[61] Financial Times (2016), *Brexit Briefing: Bitter medicine*, 4 August 2016

[62] BMJ (2016), *How "Brexit" might affect the pharmaceutical industry*, 10 May 2016

[63] MHRA Annual report and Accounts 2015/16, p.75

[64] MHRA Annual report and Accounts 2015/16, p.71

[65] BIS (2016), *Life Sciences competitiveness indicators*, underlying data sheet, May 2016: https://www.gov.uk/government/publications/life-science-sector-data-2016, accessed 30/11/2016

[66] MHRA (2016), *Post Referendum Briefing: Business Continues*, September 2016

[67] Klein, N., et al. (2015), *The State of UK Healthcare and Life Sciences Sectors*, produced by Biotech & Money. p. 31

- A UK Government commitment to invest an additional £6.9 billion (€8.1bn) in science capital 2015-2021[68].

General taxation in the UK also has a role to play, including a 20 per cent corporate tax rate, the lowest in the G7 and G20, and an open labour market, enabling the LSH sector to pool the highest skilled employees from around the world.

A2.4 Competitiveness

The UK LSH companies compete in a global market[69]. The competitiveness of the UK sector is defined by the following factors:

- A strong industrial base characterised by high levels of R&D investment, innovation, and successful commercialisation:
  - In 2014, UK biotech companies raised the most capital of any European market[70].
  - The UK spends large sums on health research (see earlier figures).
  - The AIM (Alternative Investment Market) provides easier access to finance, with less-complicated rules that come with a London Stock Exchange listing[71].
- A strong network of relationships with numerous hospitals and agencies in the UK and around the world, through both government and NGO sectors[72].
- The UK has some of the best research in the world, helped by strong collaboration between universities, the wider research community and industry:
  - Life science companies comprise the highest proportion of spin-outs from UK universities (42 per cent of the total).
  - The UK is home to two of the world's top three universities for life sciences[73].
  - The UK ranks first for medical research in the G7 by citation impact, and two of the top four medical journals in the world are located in the UK.
- The UK has exploited the benefits of clustering to share knowledge and collaborate, creating strong centres of excellence and geographic hubs in the leading LSH segments:
  - The "Golden Triangle" – the region between London, Cambridge and Oxford has an "unrivalled cluster of outstanding research and technology businesses"[74].
  - Clusters around the key universities[75]; science parks in Cambridge and Oxford, possibly considered the most famous[76]; an important cluster has evolved in Cambridge[77].
  - Life science and medical technology cluster initiatives in London, Manchester, Nottingham and Alderley Park in Scotland[78].
- High levels of expenditure on R&D:
  - The UK pharmaceutical sector accounts for 20 per cent of all UK business R&D.
  - The UK Government spent £2.6 billion (€3bn) on health R&D in 2014[79].
  - Non-industry spend on R&D (health, medical) in the UK was £3.1 billion (€3.6bn) in 2014.
  - Pharmaceutical industry spend on R&D in the UK amounted to £3.9 billion (€4.6bn) in 2014.

[68] Ibid. p.4

[69] Ibid. p.4

[70] Ibid. p. 20

[71] Ibid. p. 22

[72] Ibid. p. 20

[73] Ibid, p. 4

[74] http://www.imperialinnovations.co.uk/about/ , accessed 1/12/2016

[75] Klein, N., et al. (2015), *The State of UK Healthcare and Life Sciences Sectors*, produced by Biotech & Money. p. 27

[76] Ibid. p. 27

[77] Klein, N., et al. (2015), *The State of UK Healthcare and Life Sciences Sectors*, produced by Biotech & Money. , p. 32

[78] https://www.biocity.co.uk/ , accessed 1/12/2016

[79] BIS Life Sciences competitiveness indicators, underlying data sheet, May 2016: https://www.gov.uk/government/publications/life-science-sector-data-2016, accessed 30/11/2016

Annex 3 NL Life sciences and Health Sector Fact Sheet

Figure A3.1 Key figures

SIZE	€3.3 billion or 0.6 per cent of GDP in 2014
JOBS	34,000 direct jobs or 0.5 per cent of total employment in 2015
GROWTH	Strong growth over the period 2010-2015.
R&D	€731 million expenditure on R&D in 2014. 104 new products in the development portfolio in 2009, 62 products in development in 2016.

A3.1 Market size and structure

The Netherlands has a competitive and growing global life sciences and health (LSH) sector which generates an annual turnover of €3.3 billion, or 0.6 per cent of GDP.[80]

The LSH sector combines the pharmaceutical, biotechnology, medical technology, and health industries. With no single industrial classification for the LSH sector, consistent and reliable headline data is not available.

The total number of employees of the approximately 455 companies in the sector was 24,000. Direct employment within the Life Sciences and Health Sector was 0.28 per cent of the working population[81].

In terms of companies the sector is characterised by small and micro enterprises, as just over 16 per cent of companies in the Life Sciences sector have 50 or more employees, with micro companies accounting for 55 per cent and small firms companies for 29 per cent. It has a strong cluster focused on BioTech services, and strong in diagnostics and rare diseases[82]. The reported downside is that the pipeline is relatively limited, at 62, compared to 239 in the UK.[83]

The geographical concentration of the sector is mostly in the Randstad area, specifically in the province of Zuid Holland (in cities such as Leiden and Rotterdam). The largest life sciences cluster is found at the Leiden Bio Science Park, an area of 2.7m^2 building capacity and 1m^2 development space, supporting 130 companies (equivalent to 28.6 per cent of all companies), 18,283 jobs (76.2 per cent of jobs), further supporting 24,695 students (of whom 1,500 international students), and total spending of 175 million over 2010-2015, and another projected 300 million for 2016-2020.[84]

The Netherlands is a growing player in research, development and innovation are several factors from the LSH sector and beyond are testament to that:

- A total of EUR 731 million in R&D funding in the LSH sector and having attracted 4.3 EUR billion in private investment.
- World-class universities and research base, having four universities in the global top 100, below the UK, France, Germany and Switzerland but higher in per capita levels than all except Switzerland;

[80] In 2015 GDP of the Netherlands was 677 billion euros.

[81] In 2016 (Q3) the workforce of the country was 8.46 million people. See: CBS: http://statline.cbs.nl/statweb/publication/?vw=t&dm=slnl&pa=82309ned&d1=0,2-10,22&d2=0&d3=0&d4=0&d5=(l-13)-l&hd=151216-1202&hdr=g1,g2,g3,t&stb=g4

[82] KPMG (2016), *Study the Site Selection for Life Sciences Companies in Europe*

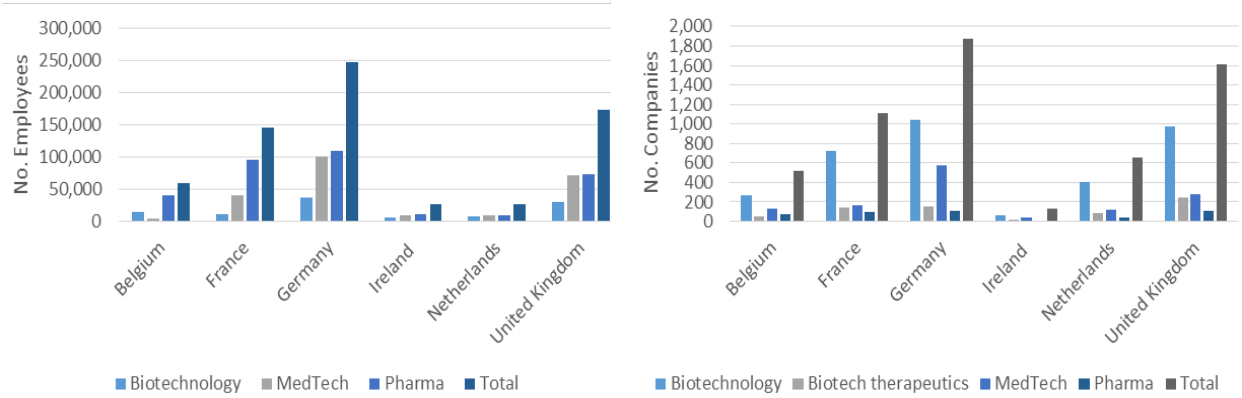
[83] KPMG (2016), *Study the Site Selection for Life Sciences Companies in Europe*

[84] Dutch government, *Top Science & Innovation Parks in the Netherlands, Motor of a strong and sustainable economy*, September 2016

- The Netherlands features in the top tier of the Innovation Scoreboard, ahead of the UK, though behind Switzerland, Sweden, Denmark, Finland and Germany;
- Having a modern and strong labour market and high workforce productivity[85], behind Germany and Switzerland, but ahead of the UK, Finland, Denmark and Sweden;
- Top position in quality of infrastructure and leading in air transportation infrastructure[86], and featuring in the top-five in the EU in average and peak internet speed. [87]
- It ranked 12th in the Insead Global Talent Competitiveness Index 2016
- though behind the UK (7th), Switzerland (1st), Denmark (5th), Sweden (6th) , Finland (10th);
- In an index on the ease of attracting foreign skilled workforce it ranked 14th, behind Switzerland (1st) and the UK (6th) but ahead of other countries such as Germany (19th), Denmark (31st), Sweden (26th), France (39th)[88]
- Relatively high number of regional and global headquarters of firms, it ranks behind France, Germany, Switzerland and the UK, but high in per capita numbers.

Figure A3.2 provides a comparison of indicators on the structure of the NL LSH sector compared to other European countries.

Figure A3.2 Number of employees (left) and companies (right) in the life sciences sectors of selected European countries



Source: Site Selection for Life Science Companies in Europe, KPMG, June 2016

A3.2 Recent industry trends and developments

Global healthcare and life sciences markets face common challenges. An ageing population, combined with a higher burden of disease, has resulted in increasing demand for pharmaceutical products, healthcare solutions and medical technologies. While these trends also indicate an increase in LSH-related expenditure in absolute terms, pressures on public finances in many countries mean that growth in real terms or as a share of GDP is slowing. In contrast, healthcare and life science expenditure in developing economies continues to grow rapidly, providing export opportunities.

The target for 2030 according to one report[89] is growth from 455 companies to 1,200 companies, 60,000 employees (from 24,000) and sustaining the development of 1,000 products.

Globally, healthcare spending is estimate to be rising at 5.2 per cent per annum between 2014 and 2017[90]. The next decade forecasts growth of up to 10 per cent per year, with lower rates of growth expected in Europe and the US. This suggests that the greatest growth potential for NL LSH sector exports is likely to be found outside Europe and the US.

[85] IMD World Competitiveness Yearbook 2015 (Workforce productivity).

[86] KPMG (2016), *Study the Site Selection for Life Sciences Companies in Europe*

[87] See:"https://www.akamai.com/uk/en/multimedia/documents/state-of-the-internet/akamai-state-of-the-internet-q2-2016-connectivity-infographic.pdf

[88] IMD World Competitiveness Yearbook 2015 (Foreign high-skilled people)

[89] HollandBIO life sciences 2030 report

[90] Klein, N., et al. (2015), The State of UK Healthcare and Life Sciences Sectors, produced by Biotech & Money. p. 15

Despite pressures on public resources, the share of spending on R&D has risen slowly but consistently, from 1.9 per cent of GDP in 2011 to 2 per cent in 2015.[91]

Further developments in the LSH sector include:

- The Netherlands Enterprise Agency (RVA) runs a Life Sciences & Health for Development Fund (LS&H4D) to support public-private partnerships in the sector.[92] So-called subsidies for Top Consortiums for Knowledge and Innovation have been increased from EUR 4 million in 2013 to EUR 28 million in 2015.[93]
- An instrument called Health Deal 94 was launched by the Dutch Ministry of Health and Ministry of Economic Affairs to ensure swifter entry on the market of innovation in the sector.[95]
- The Ministry of Health further supports research and development with numerous forms of direct support.[96]
- The Ministries of Health, Economic Affairs and Education, together with the Dutch Cancer Society, seek to set up a virtual institute in oncology.[97]

A3.3 Regulatory and supporting environment

The Netherlands and EU benefit from a highly-sophisticated regulatory system (including the regulation of medicines and devices). A summary of CBG-MEB is provided in the box below.

The regulatory agency for medicines (CBG-MEB)

Budget: income 2015/16 was EUR 25.4 million.[98]

- **Staff:** An average of 317 staff, 228 permanent full-time equivalent staff during the year 2015/2016[99]
- **Key activities (2015)** :
  - Part of the Dutch Ministry of Health, Wellbeing and Sports as a quasi-autonomous non-governmental organisation
  - Scientific Advice Co-ordinator in 86 cases
  - Designated drug orphan status in 8 cases
  - Rapporteur Paediatric Investigation Plan in 46 cases
  - (Co-)Rapporteur Committee for Human Medicinal Products in 22 cases
  - (Co-)rapporteur CHMP Referrals in 9 cases
  - (Co-)Rapporteur Committee PRAC procedures (including referrals) in 18 cases
  - Reference Member State in 44 per cent of decentralised procedures involving the UK

[91] Ministerie van Binnenlandse Zaken (2016), *Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016:* https://www.topsectoren.nl/binaries/topsectoren/documenten/publicaties/rapport-grondstoffenefficientie-lei-wur/oktober-2016/5-oktober-2016/vooruitgang-door-vernieuwing---rapportage-bedrijvenbeleid-2016/Rapportage+bedrijvenbeleid+2016.pdf

[92] See: http://www.rvo.nl/subsidies-regelingen/programma-publieke-private-samenwerking/lsh4d

[93] Ministerie van Binnenlandse Zaken (2016), *Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016:* https://www.topsectoren.nl/binaries/topsectoren/documenten/publicaties/rapport-grondstoffenefficientie-lei-wur/oktober-2016/5-oktober-2016/vooruitgang-door-vernieuwing---rapportage-bedrijvenbeleid-2016/Rapportage+bedrijvenbeleid+2016.pdf

[94] Additional details: http://www.rvo.nl/onderwerpen/innovatief-ondernemen/research-development/health-deals

[95] Ministerie van Binnenlandse Zaken (2016), *Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016:* https://www.topsectoren.nl/binaries/topsectoren/documenten/publicaties/rapport-grondstoffenefficientie-lei-wur/oktober-2016/5-oktober-2016/vooruitgang-door-vernieuwing---rapportage-bedrijvenbeleid-2016/Rapportage+bedrijvenbeleid+2016.pdf

[96] Ministerie van Binnenlandse Zaken (2016), *Vooruitgang door vernieuwing Rapportage bedrijvenbeleid 2016:* https://www.topsectoren.nl/binaries/topsectoren/documenten/publicaties/rapport-grondstoffenefficientie-lei-wur/oktober-2016/5-oktober-2016/vooruitgang-door-vernieuwing---rapportage-bedrijvenbeleid-2016/Rapportage+bedrijvenbeleid+2016.pdf

[97] https://www.oncologieenpraktijk.nl/nieuws/virtuele-samenwerking-rd-snel-resultaat/

[98] CBG-MEB Annual report and Accounts 2015/16, p.85: https://www.cbg-meb.nl/binaries/college-ter-beoordeling-van-geneesmiddelen/documenten/jaarverslagen/2015/01/01/jaarverslag-2015/cbg-jaarverslag-2015.pdf

[99] CBG-MEB Annual report and Accounts 2015/16, p.84: https://www.cbg-meb.nl/binaries/college-ter-beoordeling-van-geneesmiddelen/documenten/jaarverslagen/2015/01/01/jaarverslag-2015/cbg-jaarverslag-2015.pdf

A3.4 Competitiveness

With expenditure on R&D in the LSH sector at EUR 731 million in 2014, or 9.8 per cent of R&D expenditure in the Netherlands in 2014, 381 products in developments the life sciences sector (without health) alone in 2015[100], the most R&D intensive sector in the Netherlands, LSH has strong foundations and well-placed to continue growing. According to a Dutch report[101], when measured by the number of companies per million capita the size of sector was third in Europe, after Switzerland and Denmark, and fifth in the total number of companies, after Germany, the United Kingdom, France and Switzerland.

Private investment totalled EUR 4.3 billion in 2015, from a total of 27 investors.[102] The largest investment was recorded by AcertaPharma at EUR 2.64 billion (60 per cent of total investment), followed by Galapagos with. EUR 947 million, Dezima with EUR 268 million, and uniQure with EUR 215 million.

The LSH sector works closely together with medtech and biotech companies, university hospitals, health insurers, health facilities, pharmaceutical companies, patient associations and IT companies. Recent developments are the cooperation agreement between Hubrecht Institute (a part of the Royal Dutch Academy of Sciences) and the designated TopSector Life Sciences and Health to further research in the area of developmental biology and stem cell research.[103] Also across other regions in the Netherlands, further initiatives have been undertaken, including the launch of SMB, which supports, facilitates and stimulates start-ups and entrepreneurial researchers in the LSH sector in the Nijmegen/Oss region (east of the Netherlands[104] and of the so-called Health Valley[105], and further growth in the sector in Rotterdam.[106]

[100] See: https://www.hollandbio.nl/uploads/themacategorien/160624_sectorplan_lifesciences2030_leesversie.pdf

[101] See: https://www.hollandbio.nl/uploads/themacategorien/160624_sectorplan_lifesciences2030_leesversie.pdf

[102] See: https://www.hollandbio.nl/uploads/themacategorien/160624_sectorplan_lifesciences2030_leesversie.pdf

[103] See: https://www.knaw.nl/nl/actueel/nieuws/hubrecht-instituut-gaat-samenwerking-met-topsector-life-sciences-health-aan

[104] See: http://www.smb-lifesciences.nl/over-smb/strategische-partners/

[105] See: http://www.health-valley.nl/

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Annex 5 Topic guide for interviews with stakeholders

Background for interviewer

The role of this Study is to provide the Dutch Government with insights into the likely impacts of hosting the European Medicines Agency (EMA). The aim of the interviews is to gather views and evidence on the current impacts of the EMA and the potential costs, benefits and structural advantages to the Netherlands of hosting the EMA to answer the following core research question: "What would be the economic effects of relocation of the EMA to the Netherlands in terms of costs and benefits and what might be the impact of relocation on companies, professional networks, research, regulators and civil society organisations in the Life Sciences and Health Sector related to medicinal products for human and/or veterinary use?"

These interviews will cover the following stakeholders (with clear markers used throughout the topic guide to denote who the questions are intended for):

- Small companies - Small life sciences and health companies.
- Large companies - Large life sciences and health companies.
- Advisors - Consultants and contract research organisations (CROs).
- Investors - Government investment bodies.
- Regulators - Life sciences and health regulatory bodies.
- EMA - Life sciences and health regulatory bodies.
- Others - Regional cluster network bodies, industry representative bodies, bio-incubators and others.

Please note that the topic of this Study is sensitive and should be treated in confidence. It has been agreed with the Dutch Government that the Study will be described to stakeholders as set out in the Introduction text below. Please stick to this text when describing what this study is about.

Please tailor the topic guide depending on who you will be interviewing. If you are sending these questions to interviewees in advance of an interview, please delete this background text and any text below in red italics before sending it. During interviews, please try not to lead the interviewee and instead wait for them to provide their own answer before using the prompts (as necessary) to ask them more specific follow-up questions.

Introduction

ICF Consulting Services Limited, a leading policy and management consultancy, has been commissioned to undertake research into the European Medicines Agency (EMA) to explore the links between the location of the EMA and wider impacts, including investment and operational strategies, in the sector in which it operates.

We are seeking to explore the impacts of the EMA's location on the wider life sciences and health sector, including how these impacts may differ if the EMA was hosted by another Member State in the EU.

As part of this research, we are conducting a small number of interviews with organisations that have an interest in the work of the EMA. We would welcome an opportunity to speak with you about your views on how the EMA's location impacts the wider life sciences and health sector, including corporate investment and operations.

Your participation in the interview and the information you provide will be treated in confidence. Our synthesis of the research evidence will not attribute information to specific individuals or organisations.

Your participation in an interview is entirely voluntary. If you decide not to participate or withdraw from the study, there will be no adverse consequences. By participating in an interview, you consent to participating in the study and to us using the information you provide as set out in this note.

We are conducting these interviews over the next few weeks. We hope you will be willing to join other organisations in providing advice to inform this analysis and we will follow-up by phone shortly to confirm whether and when you would be willing to speak with us as part of this research.

We thank you in advance for your participation in this research and if you have any further questions, please do not hesitate to contact the Project Director for this study, Mr Joe Sunderland (joe.sunderland@icf.com) on +44(0) 20 3096 4851.

Interviewee details

Interviewee details	
Name of interviewee	
Organisation	
Role within organisation	
Length of time in current role	
Contact details	
Date and time of interview	
Interviewer	

Role/responsibilities and interactions with the EMA

1. Small companies Large companies Advisors Investors Regulators EMA Others Could you please say a little about your role?

   Prompt: for all stakeholders other than the EMA, ask them about the nature/extent of their interactions with the EMA.

2. Small companies Large companies Advisors Investors Regulators EMA Others Could you please describe the broad mandate/role/activities of your organisation in relation to the wider life sciences and health sector related to medicinal products for human and/or veterinary use (hereafter referred to as the 'life sciences and health sector')?

3. Small companies Large companies Do you have an in-house team with responsibility for liaising with the EMA and, if so, how large is the team and where are they located (and has their location been influenced by the location of the EMA)?

4. Small companies Large companies To what extent to do you rely on external advisers and specialist consultants who have better links with – and an understanding of – the EMA and how it works? Where are they located?

5. Small companies Large companies What would be the impact on your operations, (particularly in terms of the location of your regulation team and your choice of external advisers) if the EMA moves to another country? How many people might be affected by this?

6. Advisors Others – networks & incubators To what extent do your clients liaise directly with the EMA, or via advisers/ consultants. Where are they located now? If the EMA relocates, what impact will this have on your operations and the choice of advisers?

7. Others – ABPI Who in ABPI liaises most actively with the EMA? How will this change for you and the support you provide to your members if the EMA moves to another country? What changes might you have to make if the EMA does relocate – in terms of your costs and the time and location of your key staff?

Current situation: EMA in the UK

Costs and benefits for the UK – overview

8. Small companies Large companies Advisors Investors Regulators EMA Others I'd like to begin by discussing some of the perceived/actual costs and benefits of the EMA for the UK life sciences and health sector. By way of introduction, could you describe the main benefits that you think the EMA helps to generate for the life sciences and health sector generally and any particular benefits you think accrue to the UK specifically?

9. EMA Broadly speaking, how has the mandate of the EMA evolved since 1995 in terms of its activities, role and responsibilities?

   Note: Prior to 2004, EMA was known as the European Agency for the Evaluation of Medicinal Products (EMEA).

10. Small companies Large companies Advisors Investors Regulators EMA Others Can you recall any significant changes/improvements/innovations in the life sciences and health sector in the years following the establishment of the EMA in 1995 that you feel could be at least partly attributed to the EMA's establishment?

Costs and benefits for the UK – strategic advantages

11. Small companies Large companies Advisors Investors Regulators EMA Others In your opinion, does the EMA being located in the UK provide strategic advantages specifically to your organisation and/or to UK companies/regulators more generally (i.e. through informal and regular contact made possible by its proximity to these UK stakeholders, collaborative approaches in new tech solutions, etc.). What makes you say so? Could you provide any examples?

12. Small companies Large companies Advisors Investors Regulators EMA Others Are there first-mover/learner advantages for the UK life sciences and health sector (including regulators, companies and the research community) specifically because they are closer to the decision-making process, with a greater potential to influence the EMA's decisions (i.e. on approaches to regulating innovative medicines)?

13. Investors Regulators EMA Others Do regulators/governments in the UK gain influence in negotiating legislation/regulation from the presence of the EMA and the associated strength of the industrial and research base in the UK?

Costs and benefits for the UK – knowledge sharing

14. Small companies Large companies Advisors Investors Regulators EMA Others To what extent do you think that the EMA improves knowledge sharing in the UK life sciences and health sector specifically through:

    a. The recruitment of staff in/out of the EMA into industry/national regulators?
    b. Informal contacts/networks between EMA staff and wider industry (i.e. conferences, social connections)?
    c. Supporting clustering of academic institutions and industry close to the EMA?
    d. The proximity of UK stakeholders to EMA networking and events, as they might be more likely to attend and build trusting relationships with EMA staff?

Costs and benefits for the UK – pull factor

15. Small companies Large companies Advisors Investors Others Do you believe that the location of the EMA is a pull factor for:

    a. Life science and health related companies considering locating in the UK?
    b. Joint and collaborative research in the UK?
    c. The research community, with advantageous access/position to conduct trials, innovative projects that are commissioned by the EMA?
    d. A growth in the number and quality of life science-related regulation advisers and legal specialists?

    Has it triggered other, related spin-off economic activity of companies, professional networks and research in the life sciences and health sector in the UK?

    Prompt: other European/international institutions, industry bodies and associations, research networks, NGO's ?

Costs and benefits for the UK – regulatory processes and supply chain

16. Small companies Large companies Advisors Others Regulators EMA Is the regulatory approval process/guidance on R&D somehow streamlined or easier for UK pharma companies due to the presence of the EMA and joint/informal cooperation of UK regulators?

17. Small companies Large companies Advisors Others Regulators EMA To what extent does the regulatory supply chain in the UK (including lawyers, scientists and regulators who offer advice and other services to the EMA and industry) benefit from the presence of the EMA?

    Prompt: easier to have regular interaction with/at EMA, potential to invite EMA staff at meetings/conferences/research labs, be in the know early on about upcoming EMA activities?

Costs and benefits for the UK – other

18. Small companies Large companies Advisors Investors Others How important is the capacity and capability of national competent authorities (NCAs) and other institutions in the UK to benefit from the EMA? Is the EMA dependent on having these resources in close proximity? Further, to what extent has the capacity and competence of NCAs and other institutions in the UK benefitted from the EMA being in the UK?

    Prompt: NCAs are the Member State authorities responsible for the authorisation of medicines.

19. Small companies Large companies Advisors Investors Regulators EMA Others In your opinion, does the EMA strengthen the UK's international position in research, technology and development? And to what extent would the UK's international position be weakened (and in what ways) if the EMA moves to a new location in Europe?

Possible relocation of the EMA

Possible relocation scenarios

20. Small companies Large companies Advisors Investors Regulators EMA Others In considering the possible relocation of the EMA as a result of the UK's exit from the EU, we might think of two alternative, simple scenarios associated with Brexit and the approval of new medicines:

a. Scenario 1: Following Brexit, EU and UK regulators continue to collaborate closely and take similar approaches. As such, there are minor cost implications only for new medicines launched both in the EU and the UK.

b. Scenario 2: Following Brexit, EU and UK regulators do not collaborate closely and instead tend to diverge in their approaches. As such, the costs of launching new medicines in both the EU and the UK market increases significantly.

Do you feel that one of these simplified scenarios is more likely than the other (or that an alternative scenario is more likely to result)?

Push and pull factors for new hosting Member States

21. Small companies Large companies Advisors Investors Others What would you anticipate to be the main costs and benefits of relocation for a new hosting country and the UK?

22. Small companies Large companies Advisors Investors Others Regulators EMA What do you see the main regulatory obstacles (if any) for relocation of the EMA?

23. Small companies Large companies Advisors Investors Others If the EMA relocates to another Member State, what conditions would need to be in place within that Member State for it to experience the same sort of impacts that the UK's life sciences and health sector has experienced from hosting the EMA?

24. Small companies Large companies Advisors Investors Others What factors may *hinder* the full transfer of benefits to another Member State through relocation (i.e. strong industrial base in the UK, comparative advantages in recruitment, finance etc., historical presence, universities, etc.)?

25. Small companies Large companies Advisors Investors Others What are the key *fiscal and economic levers/tools* that would need to work in tandem with the relocation of the EMA to a new hosting country to maximise the 'pull factor' associated with its relocation? Are there other factors (e.g. social, cultural) that are also instrumental in maximising the pull factor of the EMA?

26. Small companies Large companies Advisors Investors Others To what extent do you think that the presence of the EMA could act as a push factor for companies and institutions from *third, non-EU countries* to relocate as well?

Impacts of a potential relocation to a new Member State

27. Small companies Large companies Advisors Investors Regulators EMA Others Of the countries for which there is currently public speculation that they might have an interest in hosting the EMA (i.e. Denmark, Sweden, the Netherlands, Spain, Italy, Ireland and Germany), do you think there is a preferred candidate and, if so, why?

28. Small companies Large companies Advisors Investors Others Do you think the EMA's relocation would impact on the number of clinical trials in the UK and the new hosting country?

Prompt: there are suggestions that 40 per cent of the clinical trials performed in the UK are due to the location of the EMA.

29. Advisors Investors Regulators EMA Others What do you consider to be the main types of costs both to the UK and to the new hosting country of the EMA's relocation?

30. Advisors Investors Regulators EMA Others What do you think would be the impacts on the employment of EMA staff in the event of its relocation?

Prompts: Recruitment of staff in/out of the EMA into industry/national regulator

Impacts on other related authorities and industries

31. Advisors Regulators EMA Others What would be the impact of the EMA relocating for other related European authorities, such as the pharmaceuticals division of the Unitary Patent Court?

32. Small companies Large companies Advisors Investors Others What would be the impact of the EMA relocating for the likelihood of companies in the life sciences and health sector moving at least some of their existing functions to the new hosting country? Which functions would most likely be affected/relocated?

33. Small companies Large companies Advisors Investors Others What would be the impact of the EMA relocating for its wider "clientele" of informal contacts and the wider industry (social connections, conferences) and relevant academic institutions?

Closing remarks

34. Small companies Large companies Advisors Investors Regulators EMA Others Do you have any additional views/ information you would like to share with us?

35. Small companies Large companies Advisors Investors Regulators EMA Others Do you agree to be re-contacted by us for quality control purposes?

Annex 6 Multipliers used for the economic impact assessment

The analysis undertaken for this study identified some significant differences in the published economic multipliers for the UK and the Netherlands. These differences were found to have a significant influence on the estimates of indirect and induced effects and the overall economic impacts associated with the EMA in each country.

In order to ensure consistency in the impact estimates and comparisons between the UK and the Netherlands, the study has calculated its own simplified multipliers for individual sectors in each country. These multipliers have been calculated using the latest published data in the UK and Netherlands (2014 for UK and 2015 for NL) relating to:

- Output, GVA and employment by sector;
- Intermediate consumption between sectors; and
- Household final consumption expenditure by sector.

The methodology used to produce the type I (indirect) multipliers involved the following steps:

1. Collecting the latest available data for output, GVA and employment by sector from the national accounts and data for intermediate consumption between sectors from the relevant supply and use tables;
2. Aggregating some sub-sectors to ensure consistency across the different variables and data sources;
3. Calculating ratios for output to GVA and output to employment for each sector;
4. Using these ratios to estimate the additional GVA and employment supported by intermediate consumption between sectors;
5. Summing all additional GVA and employment supported by the intermediate consumption of each sector;
6. Removing the impacts of expenditures within the same sector to avoid double counting these impacts; and
7. Calculating Type I (indirect) multipliers for each sector (i.e. the extent to which the intermediate consumption expenditures of a particular sector indirectly support additional GVA and employment in other sectors, over and above the GVA and employment directly supported within the sector itself).

The methodology used to produce the type II (indirect and induced) multipliers involved the following steps:

8. Collecting the latest available data for household consumption expenditure in the UK and Netherlands and calculating the percentage distribution of household expenditures by sector;
9. Estimating the propensity for households to consume domestic goods and services (estimated as overall consumer expenditures on domestic goods and services as a proportion of overall incomes);
10. Calculating the extent to which incomes earned in each sector are re-spent by households (estimated by multiplying total incomes (GVA) in each sector by the overall propensity to consume);
11. Disaggregating these household expenditures by sector using the percentage distribution of household expenditures;
12. Using the previous ratios of output to GVA and output to employment to estimate that additional GVA and employment supported by these household expenditures in each respective sector;
13. Summing all additional GVA and employment supported by the household expenditures in each sector;
14. Removing the impacts of expenditures within the same sector to avoid double counting these impacts;
15. Calculating induced multipliers for each sector (i.e. the extent to which the household expenditures resulting from incomes earned in each sector support additional GVA and employment in other

sectors, over and above the GVA and employment directly and indirectly supported by the sector); and

16. Calculating Type II (indirect and induced) multipliers for each sector (i.e. the extent to which supplier and employee expenditures support additional GVA and employment in other sectors, over and above the GVA and employment directly supported within the sector itself).

Multipliers were calculated for all sectors in the UK and the Netherlands. The economic impact assessment presented in Section 3 uses these multipliers to estimate the indirect and induced impacts of EMA expenditures in relevant sectors. The GVA and employment multipliers for these sectors (and for the total UK and NL economies), are presented in Table A6.1 and Table A6.2 below.

Table A6.1 GVA multipliers used for the economic impact assessment

Sector		UK		NL	
		Type I multiplier	Type II multiplier	Type I multiplier	Type II multiplier
Manufacture of pharmaceuticals	21	1.17	1.57	1.84	2.12
Retail	47	1.35	1.81	1.30	1.55
Post & courier	53	1.54	2.07	1.27	1.50
Hospitality sector	55, 56, 79	1.36	1.81	1.39	1.64
Computer services	62	1.26	1.70	1.25	1.48
Information services	63	1.31	1.76	1.25	1.48
Financial services	64-66	1.52	2.04	1.18	1.39
R&D	72	1.25	1.69	1.25	1.49
Other professional services	74	1.34	1.81	1.25	1.49
Property management	81	1.29	1.74	1.18	1.39
Public sector	84	1.41	1.90	1.27	1.51
Total economy		**1.35**	**1.79**	**1.34**	**1.58**

Source: ICF calculations based on analysis of the latest industry data published by the statistical authorities in the UK and NL.

Table A6.2 Employment multipliers used for the economic impact assessment

Sector		UK		NL	
		Type I multiplier	Type II multiplier	Type I multiplier	Type II multiplier
Manufacture of pharmaceuticals	21	1.97	3.81	1.83	2.18
Retail	47	1.18	1.38	1.27	1.50
Post & courier	53	1.39	1.71	1.37	1.66
Hospitality sector	55, 56, 79	1.15	1.29	1.18	1.30
Computer services	62	1.43	1.82	1.36	1.68
Information services	63	1.59	2.13	1.36	1.68
Financial services	64-66	2.29	3.12	1.49	2.04
R&D	72	1.46	1.90	1.36	1.67
Other professional services	74	1.49	1.83	1.36	1.67
Property management	81	1.08	1.17	1.10	1.21
Public sector	84	1.45	1.86	1.36	1.64
Total economy		**1.34**	**1.69**	**1.32**	**1.57**

Source: ICF calculations based on analysis of the latest industry data published by the statistical authorities in the UK and NL.