The impact of Brexit on London's Economy – 2023 report

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Contents

Executive summary

Since the June 2016 Referendum on the United Kingdom's membership of the European Union, there have been many studies and assessments of that decision's impacts on the UK and its various economic sectors and regions, including London. Broadly speaking, the literature concurs that Brexit has been exerting pressures on the London and UK economies, to the detriment of long-term growth and prosperity.

For example, after the EU Referendum, the depreciation of sterling led to higher import prices, and fed into diminished expectations of future income for consumers. Other factors also adversely affected economic activity; uncertainty around the form Brexit would take undermined business sentiment and contributed to lower investment. There was a noticeable decline in business dynamism. Moreover, the number of EU nationals – key contributors to vital London sectors such as hospitality, retail and professional services - started falling directly after the Referendum. There was, though, a boon for some exporters who took advantage of the lower value of sterling, though that effect was relatively limited in magnitude.

After the UK signed the Withdrawal Agreement with the EU, there was a further rise in prices as a result of increased trade barriers on imports. It has been over three years since this Agreement was signed and became effective. With that in mind, it is important to ascertain to what extent this current arrangement between the two parties affects London's economic prospects.

To answer this question, GLA Economics used a synthetic control methodology to measure the impact of Brexit-related effects on London's economy. The control scenario features a composite combination of cities. The donor pool compares London with 19 global cities across the world, including major European capitals. The process of selection compares sector growth rates across cities as this captures a major attribute of London: its export-oriented service sector economy.

The analysis finds that London's Gross Value Added (GVA) was 6.2% (or £32 billion) lower in 2019 than it would have been had the UK voted to remain in the EU back in 2016. This is nearly £9,500 of foregone income for every household in London. We specifically highlight the impact estimate for 2019 as this would not include the effect of other events (notably the COVID-19 pandemic), making Brexit a significant contributor to this result. This would also suggest that despite still technically being in the Customs Union and Single Market during the transition period (from 2016 to 2020), Brexit already caused political and economic uncertainty that significantly undermined investment into London. It also led to lower migration. As a result, London's productivity and output growth were harmed from the onset.

The analysis also finds that in 2021, London's GVA was 7.8% (or £41 billion, that is £11,500 for every household) smaller than it otherwise would have been, although that is likely to also capture the effect of COVID-19 and other events during that period.

These results seem consistent with the findings of other studies that Brexit has damaged the London and UK economies – the estimates fall within the range found by the International Monetary Fund (IMF) in a review of studies. Both economies are smaller than they would otherwise have been had the UK not voted to leave the EU.

It is important to note that Brexit has been a complex, drawn out, and uncertain process, and it remains incomplete. Thus, the impact will change over time. Some drivers of ongoing change will increase its economic impact, and others will mitigate it. Finally, it is worth emphasising that there will continue to be uncertainty around UK-EU relations depending on the political evolutions of both entities; such developments could yet affect London's and the UK's economic growth.

1 Introduction

Brexit has been a transformative event for the London and UK economies. It signalled a break with the rest of Europe after 50 years of an ever-closer relationship. The economic effects have been deep and wide ranging.

GLA Economics previously commissioned external reports on the impact of Brexit[1, 2], and has kept a watching brief from the time of the EU Referendum to the present. It has published two previous reports on the subject[3, 4]. The 15 editions of London's Economic Outlook (LEO)[5] from Autumn 2016 to Autumn 2023 have provided updates on the process of the UK leaving the EU and assessments of the impact on the London economy. This part of the report summarises the previous analysis.

This report incorporates the results of modelling by GLA Economics of a Brexit counterfactual for London – that is, an estimate of how much smaller London's economy was than it would have been if Brexit had not happened.

The paper has chapters on:

- Evolution of the economy since the EU Referendum

- Reviewing Brexit's economic impacts so far

- Overview of existing estimates of Brexit's impacts and their methodologies

- The GLA Economics counterfactual modelling

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[1] Cambridge Econometrics (2018), Preparing for Brexit, GLA
[2] CEBR (2021). 'Trade and Cooperation Agreement – London impact', January 2021
[3] Christie E and Douglass G (2017), London and Europe: facts and figures, GLA Economics
[4] Hope M (2019), The Economic Impact of Brexit on London, GLA Economics
[5] GLA Economics (2016, 2017a, 2017b, 2018a, 2018b, 2019a, 2019b, 2020a, 2020b, 2021a, 2021b, 2022a, 2022b, 2023). 'London's Economic Outlook: Autumn 2016 The GLA's medium-term planning projections': editions from Autumn 2016, Spring 2017, Autumn 2017, Spring 2018, Autumn 2018, Spring 2019, Autumn 2019, Spring 2020, Autumn 2020, Spring 2021, Autumn 2021, Spring 2022, Autumn 2022, Spring 2023, Autumn 2023

2 Developments since the EU Referendum

2.1 Summary

This chapter considers political and economic developments since the EU Referendum, and how different political developments have played out in the economy. Brexit has been a complex, drawn out, and uncertain process that remains incomplete. The economic consequences began after the EU Referendum, and prior to the UK effectively leaving the EU; they are likely to continue for years to come.

There have been adverse economic effects throughout this period. After the EU Referendum, the depreciation of sterling made consumers and producers worse off through higher prices for imports, which fed into diminished purchasing power. Uncertainty around what form Brexit would take (between 2016 and 2020) took away management time and led to lower business investment, while the number of EU migrants started falling.

After the UK left the Single Market, there was a rise in prices from the introduction of trade barriers on imports. Theoretically, the introduction of trade barriers should be detrimental for trade and growth. In practice, however, UK trade has recovered after the pandemic, except for goods exports, so the overall impact on trends is unclear. The post-Brexit migration regime is also rebalancing jobs held by foreign nationals towards the higher-skilled. It is unlikely that other potential benefits (e.g., greater flexibility to determine regulations and trade agreements) would have more than a marginal impact on growth.

Over the longer term, the consequences of a loss of business dynamism and investment will continue to play out. In this context, perhaps surprisingly, London and the UK have remained attractive to foreign investors. Further, the introduction of trade barriers makes it more costly to export to the EU. This will be to the detriment of small firms and may be a disincentive to firm creation. In time, there will be fewer large exporters than there would have been, and thus fewer exporters of all sizes to realise the gains from trade. Firms will also be less productive, impacting on long-term growth and prosperity.

2.2 What is Brexit?

Brexit is a process that describes UK-EU relations following the June 2016 Referendum. This process is very complex and constantly evolving. By its nature there will be multiple impacts on London, affecting different sectors in different ways, and over different timeframes. The considerable uncertainty around the process will itself impact on economic outcomes.

2.2.1 The UK-EU Trade and Cooperation Agreement

The UK voted to leave the EU in the Referendum vote on 23 June 2016, and originally this decision was expected to take effect on 29 March 2019. This was extended to 31 December 2019 with a transition period to the end of the following year. There was an ongoing political stalemate in the UK Parliament, which was resolved following the election of another Conservative government in December 2019 – this time with an explicit mandate to 'get Brexit done'. In parallel, there were divergences between the negotiating goals and strategies of the UK and the EU[6].

It was only around the end of the transition period (on 24 December 2020) that the UK and the EU reached an agreement on their future relationship, the Trade and Cooperation Agreement (TCA). This was signed on 30 December 2020, applied provisionally from 1 January 2021, and entered into force on 1 May 2021.

The key economic features of the TCA include the following:

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[6] GLA Economics (2020), London's Economic Outlook: Spring 2020, 15 June

Trade: There will be no tariffs or quotas on trade in goods provided that rules of origin, defined below, are met. There are increased non-tariff barriers, but also measures on customs and trade facilitation to alleviate their effect on trade in goods.

Governance: The Agreement is overseen by a UK-EU Partnership Council supported by other committees. There are binding enforcement and dispute settlement mechanisms covering most of the economic partnership, involving an independent arbitration tribunal.

Level playing field provisions: Both parties have the right to take countermeasures including the imposition of tariffs, subject to arbitration, where they believe divergences are distorting trade. There is also a review mechanism were this to occur frequently.

Subsidies/state aid: Both parties are required to have an effective system of subsidy control with independent oversight. Either party can impose remedial measures if a dispute is not resolved by consultation.

There are also provisions around fisheries, security, participation in EU programmes, and for review and termination of the agreement. Crucially, there were no provisions for services. This was particularly detrimental to London as an export-orientated service sector economy.

The TCA meant that service-sector exporters now face a range of non-tariff barriers (NTBs), including but not limited to:

- **Loss of equivalence-based access for the Finance sector**. Equivalence refers to "a process by which EU bodies assess whether a third country's regulatory regime for a particular financial-services product type meets EU standards and, therefore, whether the latter can be permitted to be sold to EU buyers"[7]. If the EU does not provide the UK with passporting rights, UK financial intermediaries would not be able to handle swap trades or sell financial products to EU-based customers. This is due to end in 2025 and will require the transfer of activity from London to the EU.

- **Loss of EU 'data adequacy' status as a result of the UK leaving the EU's General Data Protection Regulation (GDPR) protocol**, meaning that the UK's data protection rules are not recognised as comparable to those in the EU. This may have meant that companies will not be able to freely pass personal information between the jurisdictions, especially if the UK continues to diverge from EU standards on this issue[8].

- Difficulties for individuals to travel between the two jurisdictions for the purpose of providing a service;

- Non-recognition of UK-awarded qualifications by the EU requiring recognition by Member States.

There will also be NTBs on traded goods despite zero tariffs, such as:

- **Introduction of rules of origin criteria –** these criteria require that a certain proportion of an exported good's value must be produced in the UK or EU to be eligible for tariff-free export. This is relevant, for example, to the production of batteries of electric vehicles, which are being imported from outside the EU[9];

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[7] Tarrant A et al (2019), Equivalence, mutual recognition in financial services and the UK negotiating position, UK Trade Policy Observatory, Briefing Paper 27

[8] GLA Economics (2021), London's Economic Outlook: Autumn 2021, 13 December

[9] Bailey D (2023), Another Brexit 'cliff-edge' for the auto industry?, UK in a Changing Europe, 21 August

- **New costs to fill out customs declarations**, and gain licences to export;

- **Implementation of regulatory barriers, registration and product standards**[10].

Sectors will face different regulatory barriers. GLA Economics[11], the Scottish Government[12], the Bank of England (BoE)[13], and the Confederation of Business Industry (CBI)[14] have all scrutinised this issue in previous publications.

The UK has implemented all elements of the TCA for EU imports (with the exception of customs declarations and controls). Since January 2022, imports from the EU have had to be accompanied with relevant customs declarations and upfront payments of necessary tariffs. The remaining controls are now expected to be introduced in 2024; these include:

- Health certification and sanitary and phytosanitary (SPS) certification

- Physical SPS-checks on imports at designated Border Control Posts

- Safety and security declarations, which provide a summary of the goods contained in a consignment to reduce the risk of terrorism and trade in illicit goods[15]

By leaving both the Single Market and Customs Union as a result of the TCA, the UK opted for a 'hard form' of Brexit. In February 2020 the Government also announced details of a new migration regime which would apply to future EU and non-EU migrants. It would no longer be possible for low-skilled migrants from the EEA to come and work in the UK. For existing EEA citizens resident in the UK, the UK Government introduced the EU Settlement Scheme (EUSS). This enabled EEA and Swiss citizens resident in the UK by the end of the transition period and their family members to retain residency rights in the UK. 5.6 million people had obtained a grant of status by 30 June 2023 (with 2.1 million people holding pre-settled status)[16].

2.2.2 Developments after signature of the Trade and Cooperation Agreement

2.2.2.1 Northern Ireland Protocol
The implementation of the TCA did not go smoothly. The principal area of disagreement was the Northern Ireland Protocol, which attempted to reconcile Northern Ireland's political status as part of the United Kingdom with the commitments enshrined in the Good Friday Agreement to avoid the erection of customs checkpoints between Northern Ireland (NI) and the Republic of Ireland (the latter being a part of the European Union and hence part of the Customs Union and the Single Market). The Protocol would permit NI to remain part of the Single Market to ensure no trade friction with the Republic of Ireland, while minimising any friction in trade between Great Britain and NI across the Irish Sea.

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[10] This includes sanitary and phytosanitary rules (e.g. restrictions for substances, hygienic requirements, measures for preventing dissemination of disease and related to food safety), technical barriers to trade (e.g. labelling and certification), non-technical measures such as measures to protect intellectual property and rules on public procurement, and other measures aimed at creating a level playing field between imports and domestically-produced goods and services. Description comes from BoE (2018), [EU withdrawal scenarios and monetary and financial stability, a response to the House of Commons Treasury Committee](#)
[11] Hope M (2019), [The economic impact of Brexit on London](#), GLA Economics, 29 October
[12] Scottish Government (2019), [Brexit and businesses: sectoral impact analysis](#)
[13] BoE (2018), [EU withdrawal scenarios and monetary and financial stability, a response to the House of Commons Treasury Committee](#)
[14] Confederation of British Industry (2019), [What comes next? The business analysis of no deal](#)
[15] Jurkovic P (2023), [The UK's border with the EU](#), UK in a Changing Europe, 7 September
[16] Home Office (2023), [EU Settlement Scheme quarterly statistics, June 2023](#), 24 August

Implementation of the Protocol was an arduous process, with the UK threatening to withdraw on multiple occasions and businesses suffering from the ongoing uncertainty. The UK wanted to eliminate most checks on goods going from Great Britain to Northern Ireland, while the EU has made proposals which could end as much as 80% of current checks. The UK rejected the proposals as not going far enough, and not meeting its demand for an end to the role of the European Court of Justice in oversight of the Protocol.

However, the appointment of Rishi Sunak as Prime Minister in October 2022 heralded a new engagement between the UK and the EU. Notable has been the announcement of the Windsor Framework on 27 February 2023 to change the way the Northern Ireland protocol works[17]. Amongst its components, there is a new and less intrusive system of checks on goods moving from Great Britain to Northern Ireland. The risk of a deleterious trade war between the UK and EU largely subsided.

2.2.2.2 Other regulatory developments

Leaving the EU has given the UK Government the ability to diverge in regulatory terms from the EU. Such divergence was not expected to be economically significant. Prior to leaving the EU, HM Government estimated that it might add 0.1% to GDP in the long run based on the assumption of improved regulatory efficiency[18]. The government analysis would not indicate that more extensive deregulation would change the order of magnitude of this effect.

A consequence of the Windsor Agreement is that the Government watered down the Brexit Freedoms Bill. Ambiguity around the Bill's impact generated even more uncertainty for business. The government also postponed regulatory divergence from the EU where it saw a threat to business interests. For example, there have been delays to the mandatory use of the UKCA mark on goods, the introduction of new veterinary certification requirements for meat exports, and the registration of chemicals on a new UK database. The government is also taking longer to regulate on safety and cyber resilience, and single-use plastics. In contrast, the new UK subsidy regime could become a point of tension with the EU, as it is more permissive than the EU system.

There have also been developments on financial and insurance services. There is an ongoing transfer of financial activity to the EU, even while equivalence is still in place. As the Withdrawal Agreement expired, UK-based banks moved trading in Euro-dominated assets to the EU, and as part of the establishment of EU-based entities transferred assets to the EU to meet capital adequacy requirements for trading. More recently, the European Central Bank has started to crack down on the 'back-to-back' model, where EU-based entities continue to manage risk from the UK. EU regulators have also started to look critically at practices such as 'chaperoning' – when EU-based workers sit in on calls between customers and UK-based traders, so an EU-based firm can claim it is undertaking the regulated activity[19].

As a sign of improved relations following the Windsor Agreement, the EU and the UK signed a deal to boost cooperation on the regulation of financial services. This would include the establishment of a joint UK-EU Financial Regulatory Forum. Once signed off by EU member-states, it would improve coordination between the UK and the EU and replicate arrangements the EU already has with other major jurisdictions including the US[20].

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[17] House of Commons Library (2023), Northern Ireland Protocol: the Windsor Framework
[18] Department for Exiting the European Union (2018), Exiting the European Union: Publications: Publications - Technical Reference Paper
[19] GLA Economics (2021), London's Economic Outlook: Autumn 2021, 13 December
[20] Bounds A and Fleming S (2023), Brussels agrees to sign regulatory co-operation deal with the UK, Financial Times, 17 May

One other area of likely regulatory divergence is in the EU's Solvency II rules for the insurance sector to loosen capital requirements. The EU is reviewing these rules[21], while, the BoE has already introduced a tighter version of global banking capital rules than that being pursued by the EU[22].

An area of development where Brexit may further adversely affect British industry and trade activity is in the promotion of green technologies. Both the US, through its Inflation Reduction Act, and the EU, through its draft Net-Zero Industry Act, are adopting protectionist measures to promote their industries[23]. This will limit the access of UK companies to these markets.

Trade in goods between the EU and the UK will be further disrupted if the EU introduces its carbon-border adjustment mechanism (CBAM). This will see EU imports of certain products (currently iron, steel, aluminium, cement, fertiliser and electricity) subject to additional bureaucracy[24].

Finally, there will be a review of the TCA due in 2026. The scope of this review is not yet clear, but it may well reshape the trajectory of UK-EU economic relations.

2.2.2.3 UK Trade agreements post Trade and Cooperation Agreement

On 16 July 2023, the UK Government signed an agreement to join the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) as its 12th member[25, 26]. This is an important milestone in establishing new trade partnerships after leaving the EU but is unlikely to be significant in economic terms. The UK already had trade agreements with nine of the Partnership members. The Government initially estimated the long run increase in GDP from joining CPTPP at 0.08%, but the OBR recently revised this figure downward to 0.04%[27]. This compares with a loss in output of 4%[28] from leaving the European Union and makes clear the importance of the EU as a large economic union and neighbour to UK trade.

Of the 71 other trade deals the UK has signed since leaving the EU[29], 68 are rollover deals identical to the deals it had with those countries when it was in the EU. They have allowed the UK to continue relations as they were with key trade partners across the globe.

One new agreement that did not represent a roll-over from the pre-Brexit era was the UK-Japan Comprehensive Economic Partnership Agreement (CEPA), which came into effect in December 2020 (Japan is also a member of the CPTPP). The deal is nearly identical with the one that the UK had with Japan while part of the EU, apart from a chapter on digital trade.

Two other new deals with Australia and New Zealand came into force on 31 May 2023[30, 31]. The deal with Australia is estimated to increase UK GDP by 0.08% by 2035[32], and that with New Zealand might increase UK GDP by 0.03% by 2025[33].

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[21] European Commission (2021), Reviewing EU insurance rules: encouraging insurers to invest in Europe's future, Press release, 22 September
[22] Parker G et al (2022), City set for boost as Hunt loosens financial services rule book, Financial Times, 8 December
[23] Rankin J (2023), EU targets 40% of clean tech to be made within the bloc by 2030, The Guardian, 7 March
[24] Notionally, there is also a charge proportionate to the amount of CO_2 embedded in the product. This is not relevant to the UK as the UK sets a high carbon price, and monies owed to the EU by importers can reflect charges paid in the country of origin.
[25] Arasasingham A et al (2023), The UK is joining the CPTPP. What comes next?, the Center for Strategic and International Studies
[26] Schneider-Petsinger M (2023), Real value for the UK in joining CPTPP is strategic, Chatham House
[27] OBR (2023), Economic and Fiscal Outlook – November 2023
[28] OBR (2023), Economic and Fiscal Outlook – March 2023
[29] Hunsaker S and Howe T (2023), Trade tracker: UK trade deals, UK in a Changing Europe
[30] House of Commons Library (2023), UK – Australia Free Trade Agreement
[31] House of Commons Library (2023), UK – New Zealand Free Trade Agreement
[32] Department for Business and Trade and Department for International Trade (2021), UK-Australia FTA: impact assessment
[33] Department for Business and Trade and Department for International Trade (2021), UK-New Zealand FTA: impact assessment

3 Examining Brexit's economic implications

3.1 Theoretical link between trade openness and growth

HM Government summarised the beneficial effects of trade agreements in general[34]. "In the long run, theory and evidence suggest that international trade increases output and raises living standards through four key channels:

a) Domestic specialisation allows each country to put more resources into what it does best, leading to higher productivity and real wages
b) Greater variety of inputs and products for businesses and consumers, with increased competition and lower prices leading to:
    i.   More efficient production for businesses

    ii.   Increased consumer choice

c) Access to new markets allows firms to scale up their production, leading to efficiency gains where there are increasing returns to scale

d) Exposure to competition leads demand to shift away from the least competitive firms while the most competitive (and productive) firms gain opportunities to expand into new markets."

The BoE identifies several complementary effects[35]:

- "Barriers that result in economies becoming less open result in lower trade and foreign direct investment

- Reductions in trade and foreign direct investment tend to reduce productivity

- Less open and less productive economies tend to have lower real exchange rates

- Depreciations in the exchange rate tend to have large and protracted pass-through to consumer prices in the UK …

- Slowdowns in the economy are often associated with tighter financial conditions and an increase in uncertainty. In turn, these weigh on demand

- Weaker demand tends to increase the rate of unemployment and significant structural adjustment can increase the natural rate of unemployment

- Weaker economic conditions tend to reduce net inward migration."

That is, Brexit will have both demand and supply-side effects on the London and UK economies.

3.2 Output

Over the 25 years to 2023, London's economy has generally grown faster than the UK's, although it has also suffered larger troughs. There was a decline in the average London growth rate after the 2008 financial crisis, and a slight pick up after the EU Referendum and prior to the pandemic[36], (Figure 3.1). This reflects

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[34] Department for Exiting the European Union (2018), [Exiting the European Union: Publications: Publications - Technical Reference Paper](#)
[35] BoE (2018), [EU withdrawal scenarios and monetary and financial stability, a response to the House of Commons Treasury Committee](#)
[36] More strictly correct comparisons would make comparisons across economic cycles

the benefits of continuing to be in the Single Market after the exchange rate depreciation. There is a similar effect for the UK.

Figure 3.1: Annual output growth rate, London and UK, 1999 Q1 – 2023 Q1, and average London growth specific periods
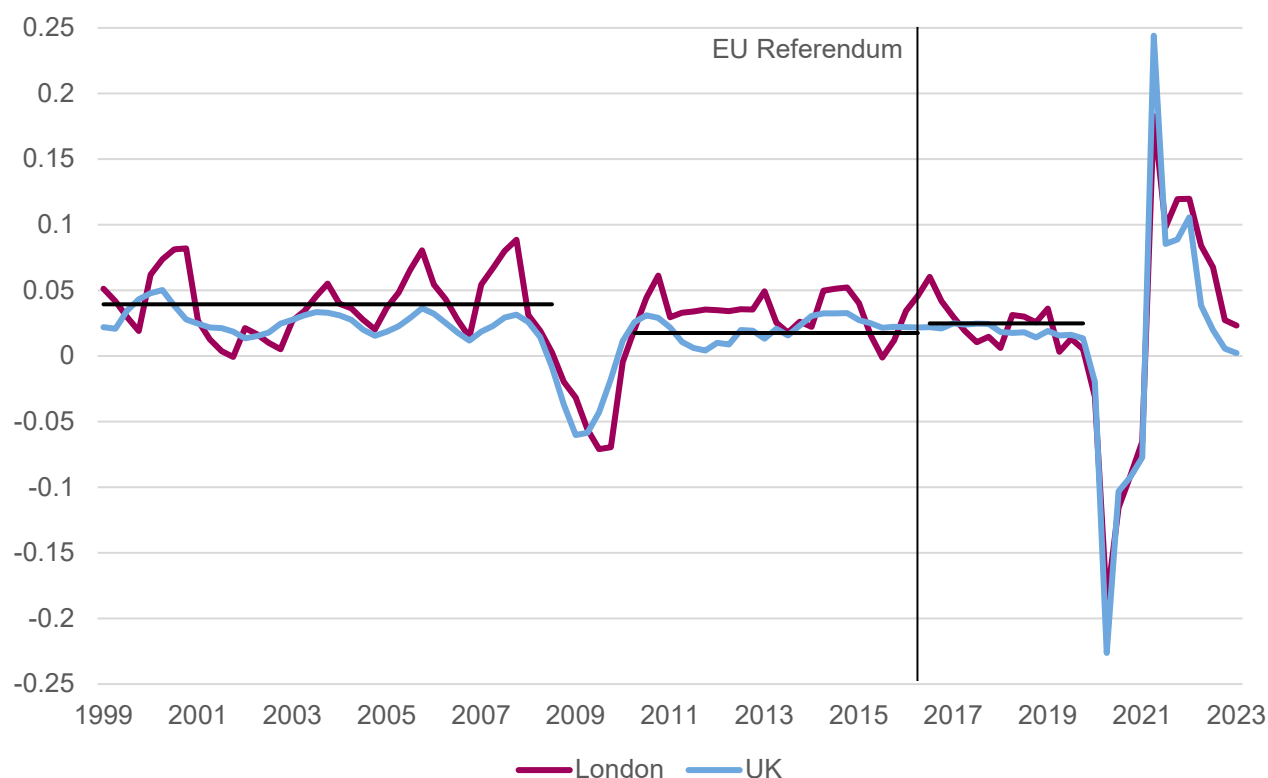
Source: ONS quarterly UK GDP estimate, and GLA estimates using regional ONS annual GVA data, and quarter GDP statistics

Note: UK GDP figures consistent with latest published regional figures, and so do not take account of the Blue Book 2023 revisions. GDP, rather than GVA, figures used for UK, as they incorporate a broader range of data than GVA estimates, and so are more robust

3.3 Investment

Business investment ceased growing after the EU Referendum[37], perhaps reflecting the uncertainty around the form Brexit would take, and a shift in management effort towards Brexit preparations. There was also an increase in investment to the EU, see later. Post-pandemic investment growth has recovered to previous levels[38].

3.4 Foreign Direct Investment (FDI)

FDI flows can be volatile, so it is not simple to ascertain patterns since the EU Referendum, especially as the pandemic is a complicating factor. What is clear is that in 2021, net FDI flows into London and the UK were negative from the disposal of UK companies' share and loan capital, and from a net increase in amounts due to foreign parent companies on the inter-company account[39]. This suggests a retrenchment of asset positions in the UK.

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[37] Hope M (2019), The Economic Impact of Brexit on London, GLA Economics
[38] Source: ONS
[39] ONS (2023), Foreign direct investment involving UK companies by UK country and region, (directional): inward

Greenfield site developments have been more stable. The proportion of global projects in London and the UK has slipped back a little from the late 2010s, (Figure 3.2).

Figure 3.2: Shares of global FDI projects, London, UK and Western Europe, 2011-2022
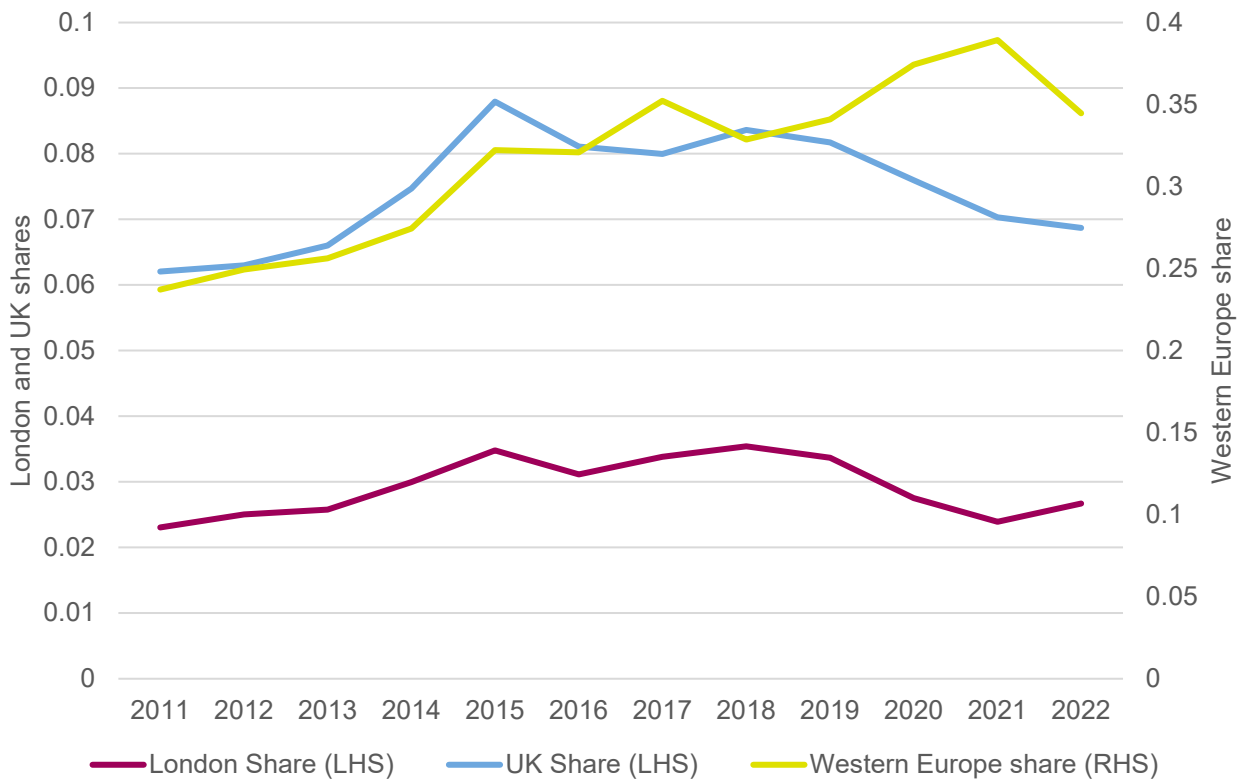
Source: fDi Markets

The share of projects in London from the EU has remained reasonably stable over the last ten years at around a third.

3.5 Productivity

London is by far the most productive place in the UK. Nevertheless, since 2011, productivity growth[40] has been below its historic trend both for London and the UK, and it continued to stall after the EU Referendum, (Figure 3.3).

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[40] Measured by output per workforce job

Figure 3.3: Productivity growth, output per job, London and the UK, 1998-2021
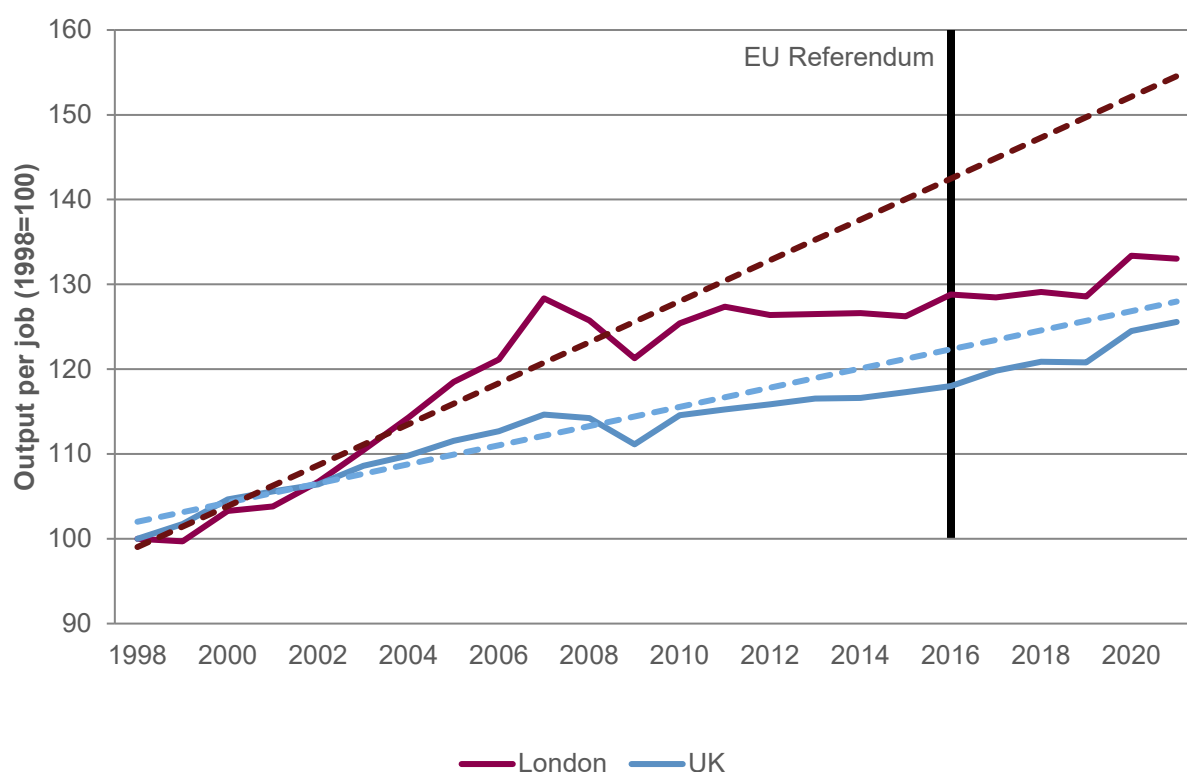
Source: ONS Workforce jobs, and annual regional GVA
Note: Trendlines project forward from the financial crisis

The expectation is that Brexit will diminish the UK's productivity compared with what it would otherwise have been. The labour market is likely to adjust, as in a flexible labour market the number of jobs is largely determined by supply. So, a decline in output from reduced trading opportunities feeds through into productivity.

The productivity of British businesses which traded in goods was around 70% higher on average than for businesses which did not in 2016. After controlling for their size, industry and foreign ownership status, goods exporters have a productivity premium relative to non-traders of 21%, and for importers it is 20%. These premia are notably lower for trade with the EU: this seems consistent with lower barriers to EU goods trade enabling relatively less productive businesses to access these markets[41].

3.6 Business dynamism

Lower productivity is partially attributable to intra-firm effects, that is the shifting of activity, and jobs, from more productive to less productive firms. Firms which were more productive prior to the EU Referendum have experienced greater levels of Brexit uncertainty and have gone through greater reductions in size. Thus, even before the UK effectively left the EU, the decision is likely to have led to a re-allocation of activity away from more productive global businesses towards less productive domestic firms[42].

Some of the intra-firm effects prior to leaving the EU may have been because of increased management time on the implications of Brexit negotiations[43]. Furthermore, uncertainty over future EU market access

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[41] Wales P et al (2018), UK trade in goods and productivity: new findings, ESCoE discussion paper 2018-09
[42] Thwaites G et al (2019), The impact of Brexit on UK firms, VOX, CEPR Policy Portal
[43] Thwaites G et al (2019), The impact of Brexit on UK firms, VOX, CEPR Policy Portal

deterred British firms from introducing products into the EU[44]. More generally, trade agreements have dynamic trade-promoting effects. They establish stable tariff rates for the future and reduce one source of risk for firms that would like to expand internationally[45].

There has also been a significant contraction in the variety of goods being exported to the EU due to the TCA. Analysis over the period 2019 to 2022 Q1 indicates that there has been an estimated loss of 20-42% of product varieties in the 15 months after withdrawal from the EU. There has also been an increased concentration of export values to fewer products. As a comparison, the varieties of UK imports also reduced but on a much smaller scale[46].

London's business environment is dynamic and competitive, with a high number of business births and closures – but its dynamism and its openness make it more vulnerable to external factors such as increased trade friction with the EU. Business start-ups have driven the growth in business numbers: research by TBR for GLA Economics showed that between 2004 and 2013 only 0.2-1.2% of London's firm population came from business in-migration from elsewhere in the UK, compared to 10-12% from business start-ups[47].

Since the EU Referendum, there has been a pronounced fall in the net start-up rate in London, from 6.4% in 2016 to 1.8% in 2017, before partially recovering to 3.6% in 2018, and falling again during the pandemic, (Figure 3.4). Uncertainty related to the UK's future relationship with the EU, subdued economic growth and the depreciation of sterling have been cited as explanatory factors[48].

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[44] There has been a similar deterrence effect for trade between the UK and Portugal. Fernandes, A and A Winters (2021), Exporters and shocks: The impact of the Brexit vote shock on bilateral exports to the UK, Journal of International Economics, volume 131, 103489

[45] Crowley M et al (2020), The Looming Threat of Tariff Hikes: entry into exporting under trade agreement renegotiation, American Economic Association papers, vol 110, pp 547-551

[46] Du J (2023), How did Brexit affect UK trade?, Contemporary Social Sciences, volume 18, issue 2, pp266-283

[47] Trends Business Research Ltd (2016) The changing spatial nature of business and employment in London. Working Paper 73. London: GLA Economics.

[48] ONS (2018), Business demography, UK: 2017.

Figure 3.4: Annual business net start-up rate, London and the UK, 2012-2020
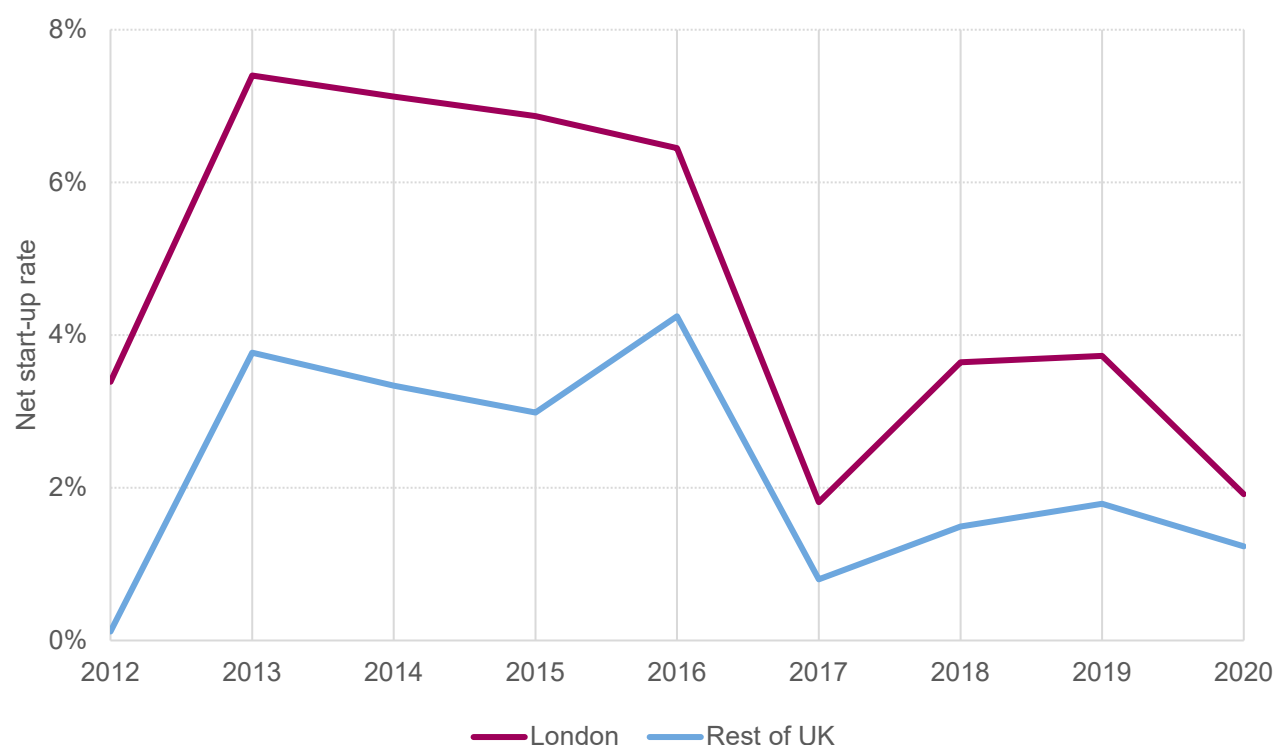
Source: GLA Economics Calculations drawn from ONS Business Demography
Note: There has been a methodological change in the most recent publication. 2021 data has not been included in this figure as it is not available on a consistent basis

## 3.7 Trade barriers and small and medium-sized enterprises

The introduction of trade barriers is likely to have disproportionately harmed small and medium-sized enterprises (SMEs), those firms with up to 250 employees. A GLA survey[49] in early 2021 found wide ranging impacts by size and sector extending beyond firms which trade directly with the EU. For example:

- Brexit is the top challenge for London businesses who have traded with the EU in the last three years;

- A third (34%) of SMEs have traded with the EU in the past year, rising to a half of small (10-49 employees) (49%) and medium (50-249 employees) (55%) sized businesses;

- Of those SMEs that have traded with the EU in the past year, over half (53%) say they expect trade with the EU to decrease over the next 12 months;

- 6 in 10 SMEs who have traded with the EU in the last three years say their business will see business growth, revenue and sales negatively impacted;

The barriers to trade from leaving the EU Single Market are prevalent across businesses which trade with the EU. Across a range of barriers, there was a potential impact for over a half of firms. The largest barriers were from understanding of customs regulations (affecting 59% of firms), and from ease of business travel (affecting 55% of firms), (Figure 3.5).

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[49] A survey conducted by YouGov between 5 and 19 March of 1,012 London businesses (owners or senior decision makers only).

Figure 3.5: Barriers to EU market facing London SMEs, those which have traded with the EU in the last three years
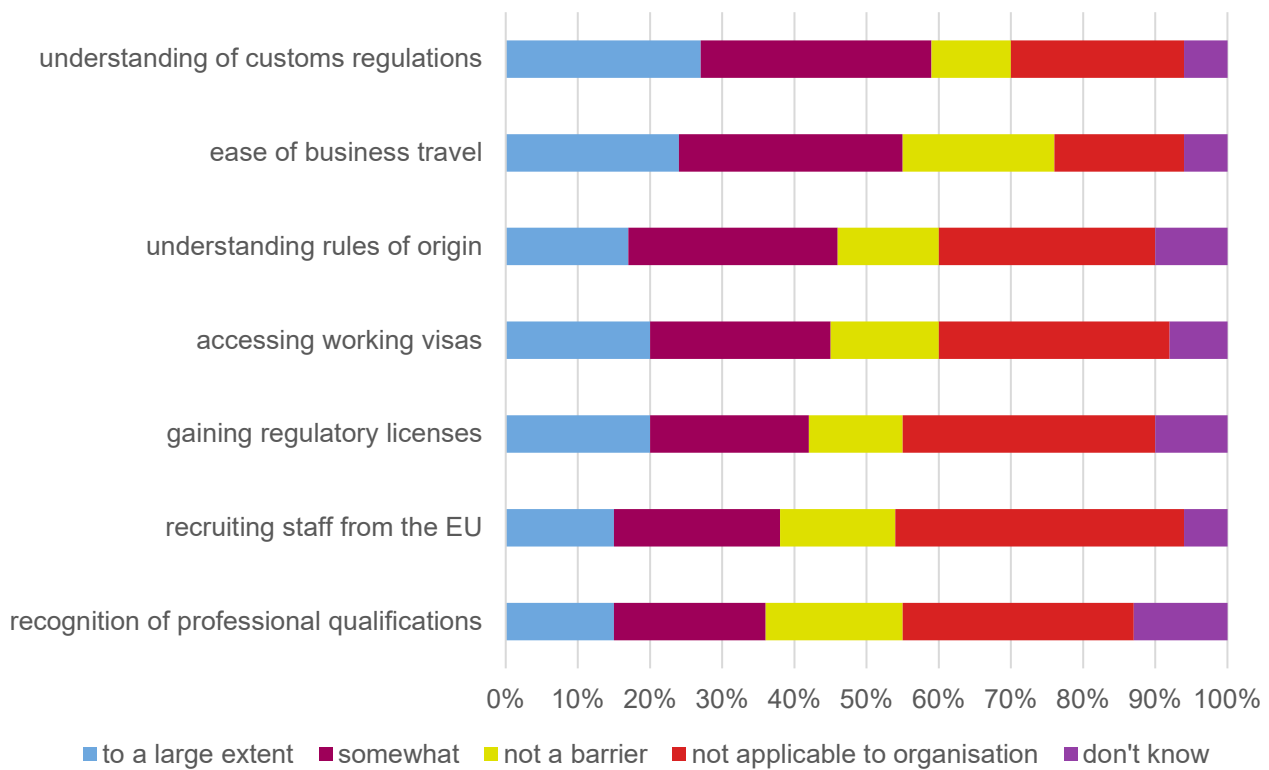
Source: YouGov survey for the GLA of Brexit impact on SMEs

London's businesses have a concentration in export-oriented sectors that tend to trade extensively with the EU. These businesses overwhelmingly have fewer than five employees, (Table 3.1):

- Professional and technical activities, and Information and communication account for nearly two fifths (37%) of businesses in London

- These sectors in London each account for over a quarter of UK businesses (32% in the case of Information and communication

- 90% of businesses in these sectors have fewer than 5 employees, compared with 80% for all London and UK businesses

Table 3.1: London and UK businesses with a VAT or PAYE record, by sector and employee numbers (including sole proprietors), 2019

Sector	0-4	5-9	10-19	20-49	50-99	100-249	250+	London Total	UK Total	London share of UK	Within London share	Within UK share
Primary & utilities	2405	495	300	100	25	20	25	**3370**	164165	2%	1%	6%
Manufacturing	10580	1620	1000	510	180	100	55	**14045**	137380	10%	3%	5%
Construction	50225	3385	1340	410	135	65	50	**55610**	343725	16%	11%	13%
Wholesale	19700	3400	1770	875	260	130	60	**26195**	180350	15%	5%	7%
Retail	30465	5185	1840	740	200	115	130	**38675**	208750	19%	7%	8%
Transportation and Storage	11330	980	515	260	105	85	80	**13355**	111375	12%	3%	4%
Accommodation and food service activities	12450	5200	3225	1815	535	250	205	**23680**	157040	15%	5%	6%
Information and Communication	64705	3300	2020	1200	520	235	185	**72165**	226205	32%	14%	8%
Financial and insurance activities	11865	1520	850	570	265	230	180	**15480**	60630	26%	3%	2%
Real estate	19685	3130	1475	305	80	65	55	**24795**	100345	25%	5%	4%
Professional, scientific and technical activities	105940	7480	4005	2100	730	415	255	**120925**	471695	26%	23%	17%
Administrative and support service activities	42210	4230	2445	1255	580	335	275	**51330**	228750	22%	10%	8%
Public administration and defence	5	5	5	10	10	5	50	**90**	7510	1%	0%	0%
Education	5180	1025	745	620	465	365	215	**8615**	44490	19%	2%	2%
Health	10885	2815	2290	1315	480	215	205	**18205**	101995	18%	3%	4%
Arts, entertainment and recreation	14855	1255	745	330	135	65	75	**17460**	67525	26%	3%	2%
Other services	13765	2600	1100	490	160	85	45	**18245**	106495	17%	3%	4%
London Total	**426250**	**47625**	**25670**	**12905**	**4865**	**2780**	**2145**	522240	2718430	19%	100%	100%
UK Total	2125515	306475	152985	80975	26940	15060	10480	**2718430**				
London share of UK	20%	16%	17%	16%	18%	18%	20%	**19%**				

Source: GLA Economics calculations using ONS UK business: activity, size and location

3.8 Inflation

The introduction of trade barriers is associated with a worsening of the terms of trade, and so a fall in the exchange rate. This happened immediately after the EU Referendum. It led to higher import prices, and so higher inflation. The consequence is that Londoners' and Britons' purchasing power dropped.

Sterling fell by 11% against the euro after the UK voted to leave the EU in June 2016, (Figure 3.6). As a no-deal Brexit became more likely by July 2019, sterling depreciated by a further 4%. There was little movement in the exchange rate when the TCA was agreed. It did, though, appreciate by 6% over the first quarter of 2021, in part because of greater certainty around UK–EU relations.

Figure 3.6: Sterling-euro exchange rate and Consumer Price Inflation, 1999-2023
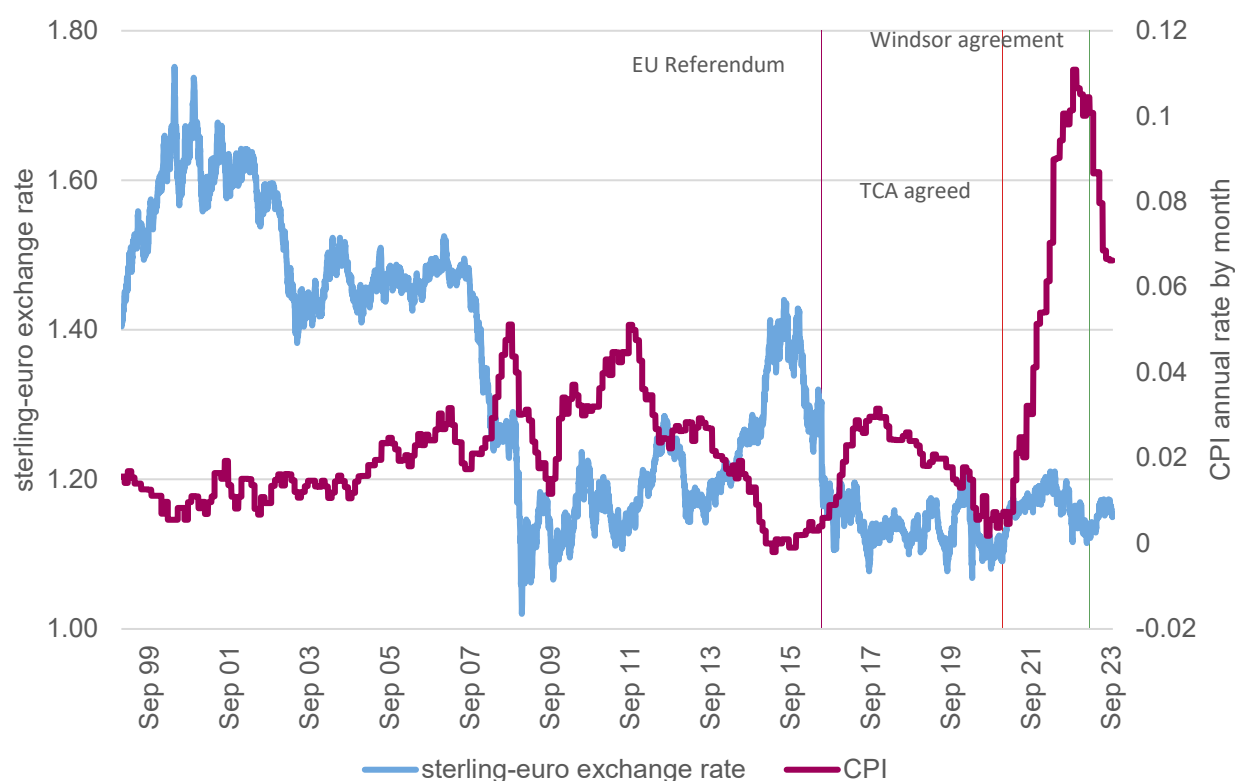
Source: BoE and ONS

The effect of sterling's depreciation immediately after the EU Referendum was to favour production and output of tradeable sectors, while reducing the output of non-tradeable sectors. This has been observed for the UK[50] and is likely to also apply for London, although regional-level data on this is not available.

In the two years following the referendum, consumer price inflation rose disproportionately for products with higher import shares. Producer price inflation rose more for products where imported inputs accounted for a larger share of import costs. Depreciation increased consumer prices by 2.9%, and this led to a comparable decline in real wage growth. Compared to other regions of the UK, however, London showed more resilience[51].

Workers in the sectors most exposed to trade fluctuations also lost out permanently in terms of real wages. This was mostly in the services sector, and so is likely to have affected London disproportionately. There was also a cost shock from higher intermediate import price increases[52].

The introduction of trade barriers also increased inflation[53]. Higher non-tariff barriers (NTBs) due to Brexit, such as increased paperwork and the application of phytosanitary standards, are affecting food price inflation and UK households' purchasing power. For example:

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[50] Drechsel, T. (2020). '[Economic growth and the Brexit vote'.](#)

[51] Breinlich H et al (2022), [The Brexit Vote, Inflation and UK Living Standards](#), International Economic Review, volume 63, no 1, February

[52] Costa R et al (2022), [New dawn fades: trade, labour and the Brexit exchange rate depreciation](#), LSE Centre for Economic Performance, discussion paper 1890

[53] Bakker J et al (2023), [Brexit and consumer food prices: May 2023 update](#), London School of Economics Centre for Economic Performance

- 30% of the increase in food prices between December 2019 and March 2023 could be attributed to the effects of Brexit

- Between January 2022 and March 2023, the price of food products that were more exposed to Brexit (due to their reliance on imports from the EU before the referendum) increased by approximately 3.5 percentage points more than those that were not

- These changes were entirely driven by products with high NTBs. Food products which fall into this category, such as meat and cheese, have seen price increases in the region of 10 percentage points more since January 2021 relative to similar products not as reliant on Brexit-related trade changes.

The introduction of trade barriers may also reduce competition in markets, which would also drive inflation upward[54].

3.9 UK trade

After the EU Referendum in June 2016, UK total exports and imports increased. The exchange rate depreciation made exports more competitive, while the UK's integration in international supply chains may have increased demand for imports. After the onset of the pandemic, trade collapsed to below 2016 levels. This continued after the Trade and Cooperation Agreement (TCA) came into effect in the first quarter of 2021. There was some stockpiling of goods by businesses at the end of 2020 because of uncertainty about whether there would be a trade agreement.

There have been differing experiences of recovery after the pandemic for goods and services. Notably, goods exports have not returned to former levels. Exports of both goods and services dipped once the TCA came into effect. Initially goods exports picked up first, but service exports have had a stronger, and more sustained recovery. The volume of service exports is now 9% above its pre-pandemic peak, while goods exports remain 12% below their previous peak. UK imports of services fell after the introduction of the TCA but are now 11% above their pre-pandemic peak. Meanwhile, goods imports have broadly risen since the TCA, before falling off again in the last year – they remain below their pre-pandemic peak, (Figure 3.7).

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[54] Crowley M et al (2022), The price impacts of trade agreements, in The Economics of Brexit: what have we learned?

Figure 3.7: UK goods and services trade after inflation, annual moving average, January 2015 – August 2023, index numbers 2020 Q4 = 100.0
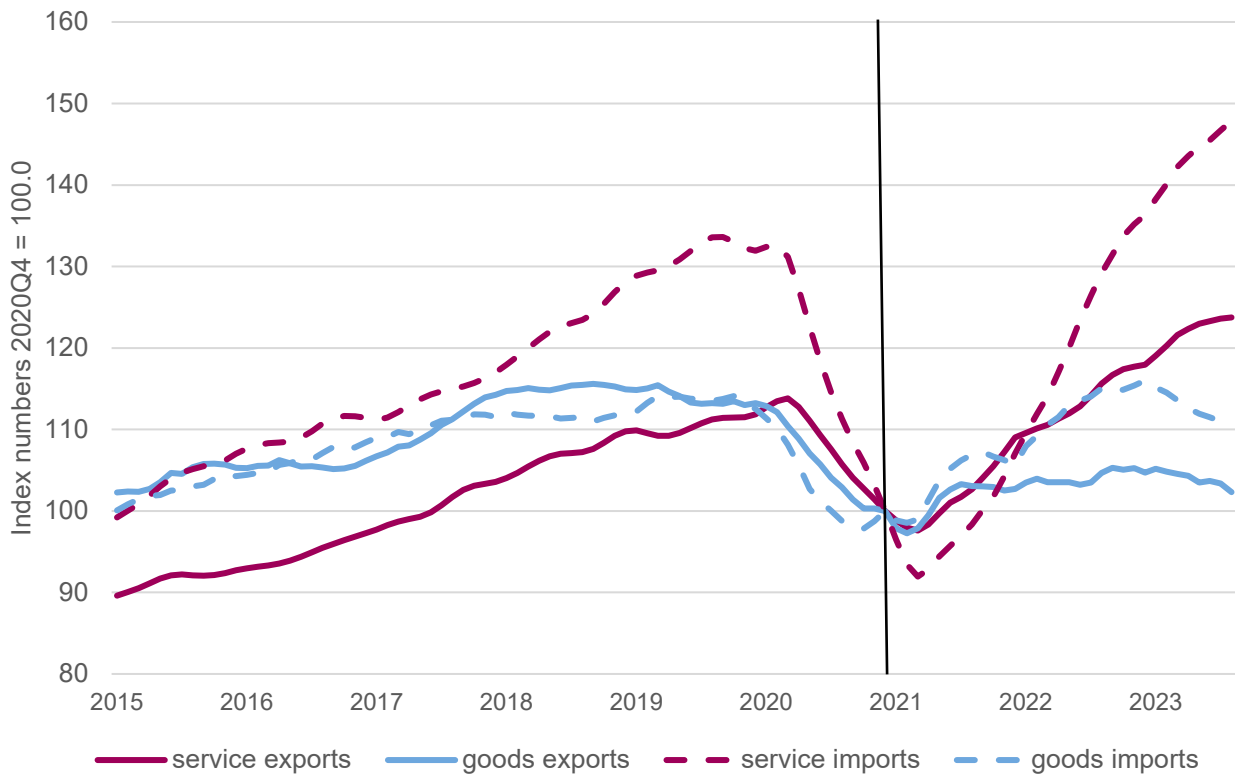

Source: ONS monthly trade statistics
Note: Inflation has been estimated for individual series by the ONS, and goods figures exclude precious metals

UK services trade, both with the EU and beyond, fell dramatically during the pandemic. Exports have since reached pre-pandemic levels: for example, exports to the EU are 13% higher, and exports to the rest of the world are 16% higher. Despite this, the speed of the recovery has been greater for imports, and for trade with the rest of the world. This may indicate that post-Brexit trade barriers have begun to exert their influence, (Figure 3.8).

Figure 3.8: Trend in UK services trade, after inflation, to the EU and the rest of the world, annual moving average, 2016 Q4 to 2023 Q2, index numbers 2020 Q4 = 100.0
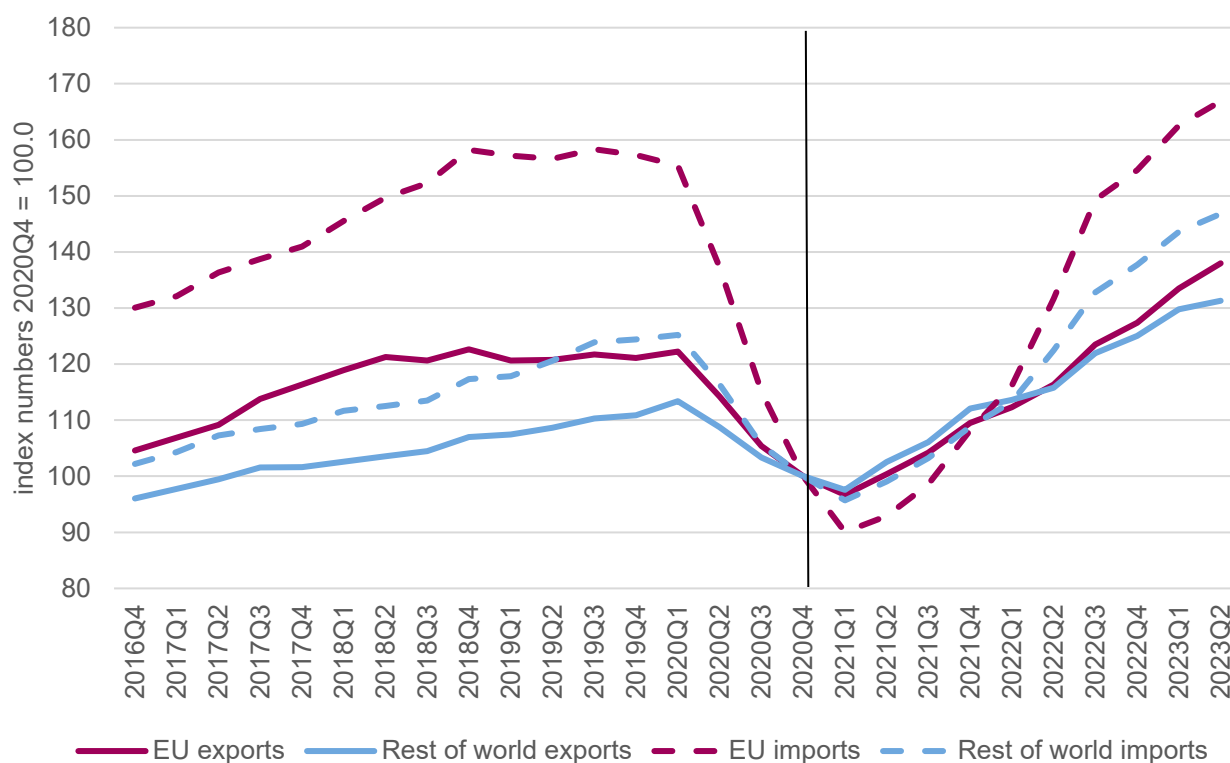
Source: ONS UK trade in services: service type by partner country;
Note: Inflation measure used is the GDP deflator.

It has been observed that the expected aggregate boost to UK exports from the depreciation of sterling in 2016 did not occur to the degree expected. Three reasons have been given for this[55]:

- The UK's relatively heavy involvement in international value chains is consistent with the significant increase in UK prices and with the attenuated export responses,

- The elasticity of demand for UK exports is rather low,

- Some part of the failure could be due to the dramatic increase in trade-policy uncertainty that the Brexit result heralded.

There is also evidence that exporters have adapted their delivery models both before and after trade barriers came into effect. There are four types of mode of supply, (Table 3.2).

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[55] Ayele, Y. and Winters, L. A. (2020). 'Should the Brexit sterling depreciation have boosted exports? How exchange rates affect trade and prices'.

Table 3.2: ONS modes of supply of service exports

Mode 1	A supplier in one country sells a service to a customer in another, but without the movement of people. An example is UK legal or financial advice services being supplied by a UK business to overseas customers remotely, by email or an online platform.
Mode 2	A consumer travels to another country and buys a service. For example, a tourist from another country travels to the UK and pays for a London landmark tour.
Mode 3	A company sets up a subsidiary in another country to supply services to foreign customers directly in that country. For example, a UK telecoms company may establish an affiliate or subsidiary in a foreign country to provide mobile phone services overseas.
Mode 4	Personnel travel abroad to provide a service. For example, a UK consultancy firm sends a business analyst to an overseas customer's office to give expertise or to oversee a project.

Source: ONS Exports of services by country, by modes of supply

Prior to the pandemic, over 60% of UK service exports (excluding mode 3) to the EU and the rest of the world did not involve the movement of people (mode 1). This will have protected service exports from restrictions on travel during the pandemic, although not from downturns in other economies.

The modes of supply did change across trade categories such as construction and travel. The relative ability of conducting trade without the movement of people (mode 1) provides a mitigation against the introduction of trade barriers, and the ability to change the form of delivery of services may also alleviate the effects of Brexit, (Figure 3.9).

Figure 3.9: Distribution of mode of supply of UK exports to the EU and the rest of the world, 2019 to 2021
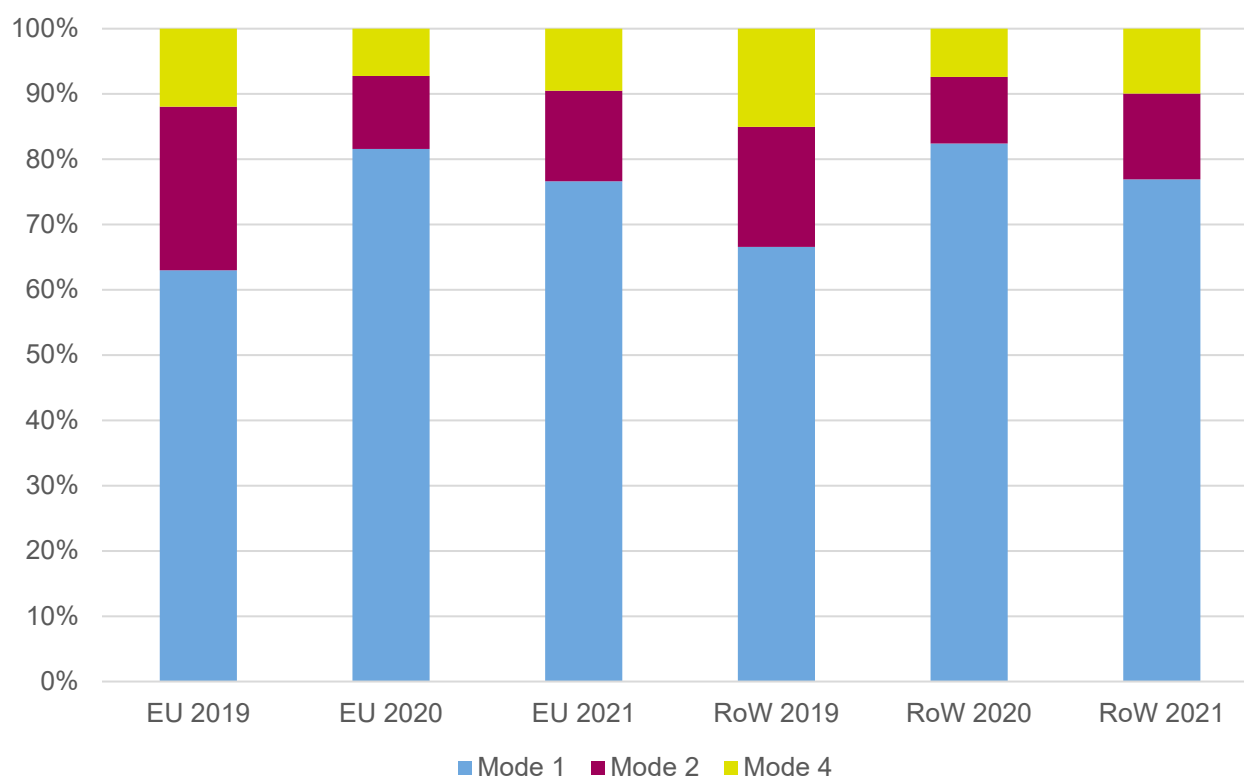
Source: ONS Exports of services by country, by modes of supply

The establishment of an overseas subsidiary may also reduce the effects of trade barriers, which have in part led to a 17% increase (to a value of £21.2 billion) in outward investment transactions to the EU 27 by UK firms. In 2020, 31% of service exports to the EU were provided by subsidiaries, compared with 67% for the rest of the world, suggesting there may be more scope for this form of provision to the EU. The use of EU-based intermediaries and adjustment to existing supply changes to make greater use of intermediate products serve as other potential measures to mitigate the adverse impacts of trade barriers[56].

3.10 London trade

London ran a trade surplus with both the EU and the rest of the world, while the rest of the UK did not. Nonetheless, the ratio of exports to GVA was around a third for both London and the UK in 2017[57].

In 2021, London's total exports were worth £190bn, and 80% of them were in services. 35% of its goods exports and 38% of service exports went to the EU. By comparison, 47% of UK goods exports and 36% of its service exports went to the EU[58].

London's trade has followed a similar pattern to the rest of the UK. The post-pandemic trade rebound, though, has been stronger for London, despite exports to the EU declining in 2021, (Figures 3.10 and 3.11). This suggests that London has been effective in finding ways to mitigate Brexit-related trade barriers.

Figure 3.10: London's exports with the EU and rest of the world, 2016–21
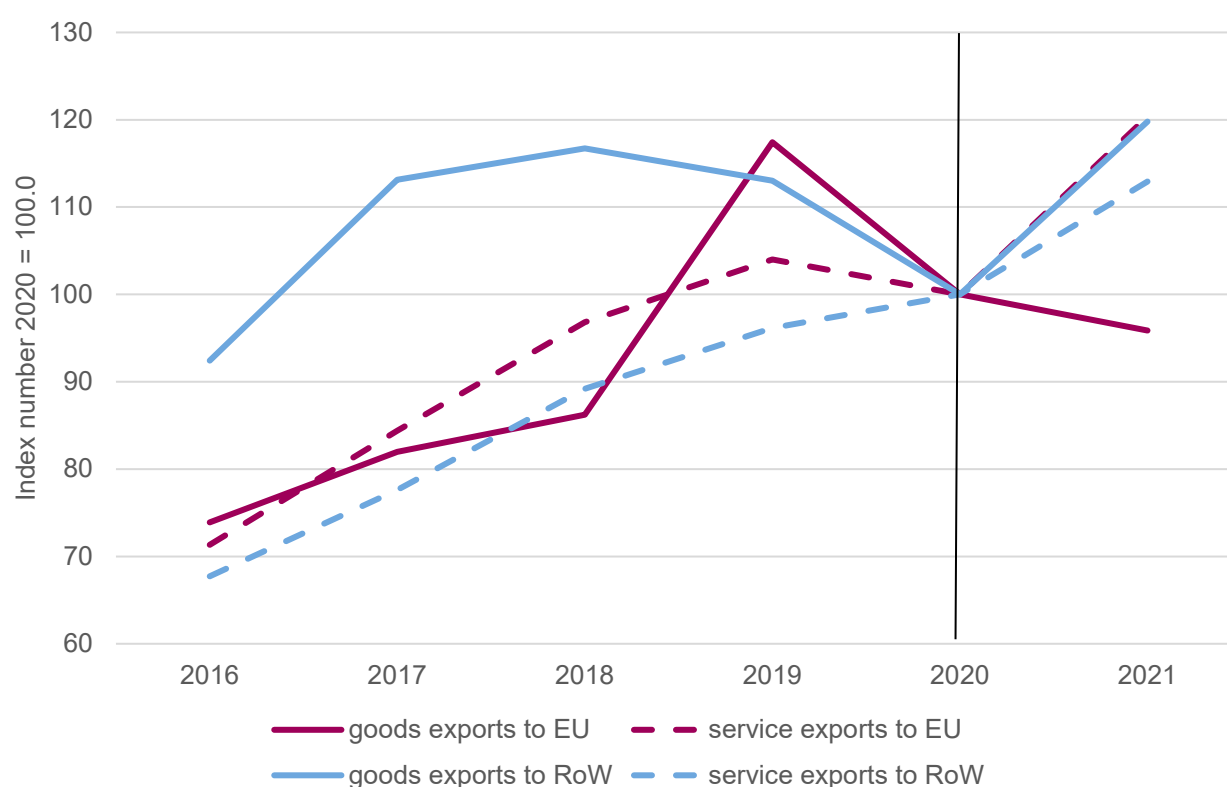
Source: ONS International trade in UK nations, regions and cities

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[56] David J (2022), Post-Brexit imports, supply chains, and the effect on consumer prices, UK in a Changing Europe

[57] Hope M (2020), An update on London's trade, supplement to London's Economy Today, August

[58] Hope M (2020), An update on London's trade, in London's Economy Today, August 2020 with some additional material from the same statistical sources

Figure 3.11: London's imports with the EU and rest of the world, 2016-21
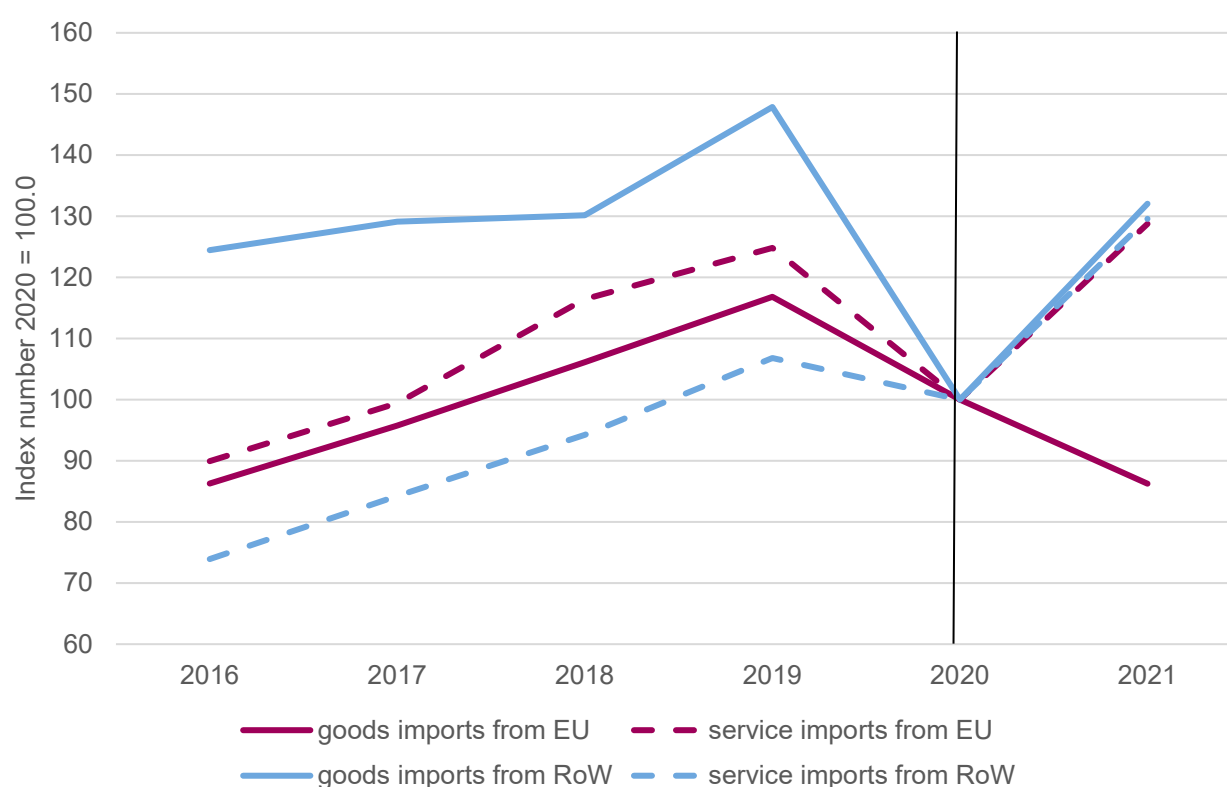
Source: ONS International trade in UK nations, regions and cities

3.11 Financial services sector

Finance is one of London's key sectors. It is heavily regulated and will be subject to significant regulatory change after Brexit. There is, though, some anecdotal evidence of the nature of impacts on financial services so far. For example, on the first trading day of 2021, nearly €6bn of EU share dealing shifted away from the City of London[59].

Also, in January 2021, Amsterdam surpassed London as Europe's largest share trading centre. Trading in Euro-denominated swaps in London dropped from nearly 40% of the market in July 2020 to 10% in January as business moved to New York, Amsterdam and Paris. Furthermore, International Exchange Inc. plans to move its €1bn daily market for European carbon emissions contracts to the Netherlands from London.

Additionally, as the EU and the UK are now distinct jurisdictions, EU regulators have withdrawn registration of six UK-based credit rating agencies and four trade repositories – data warehouses that provide authorities with information on derivatives and securities financing trades. EU companies and investors will have to use EU-based entities.

3.12 Migration

Brexit has undoubtedly affected the flow of EU and non-EU citizens to and out of the UK. Net migration has risen sharply from 321,000 in the year to June 2016 to 672,000 in the year to June 2023. Over the same period net migration of EU citizens has been falling from a net inflow of 322,000 to a new outflow of 86,000, (Figure 3.12). London appears to have gained less than the UK from the inflow of non-EU workers

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[59] This section is drawn from the January and February 2021 London's Economy Today.

and lost relatively more EU workers. There has been a marked decline in students, both children and adults, from the EU visiting or studying in the UK[60].

Figure 3.12: Non-EU, EU, and British nationals net migration to the UK between year ending June 2012 and year ending June 2023
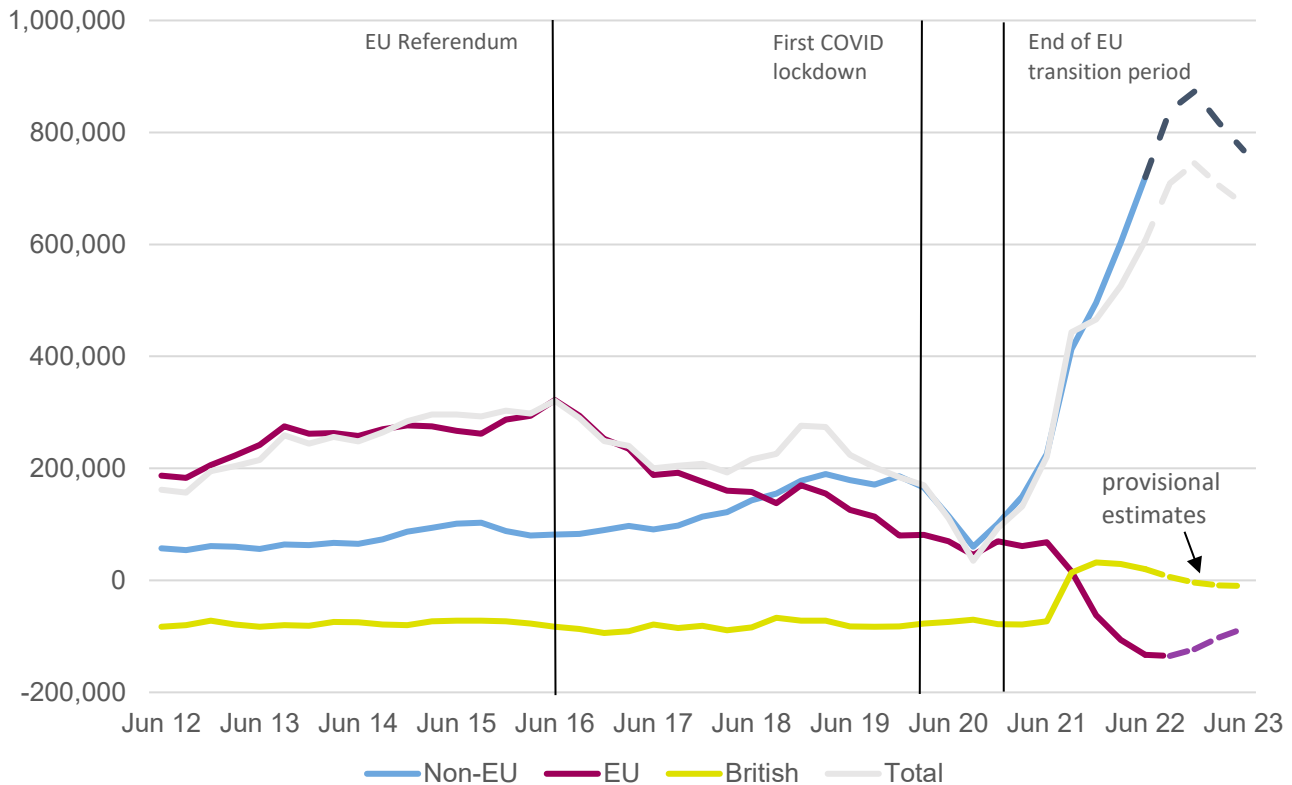
Source: Office for National Statistics

The loss of free movement in low-skilled sectors of the economy is contributing to labour shortages. The new immigration system has, though, alleviated some workforce pressures through the introduction of entry visas, including for low paid work, in the NHS and social care sectors, and for seasonal agricultural workers. The latest evidence does suggest that a new immigration regime that encourages high-skilled migrants and deters low-skilled migrants from the EU is likely to be beneficial for productivity[61].

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[60] GLA Economics (2023), London's Economic Outlook: Spring 2023, 19 June
[61] Portes J (2023), UK migration and productivity, UK in a Changing Europe

4 Overview of existing estimates of Brexit's impacts

4.1 Summary
There have been several studies conducted to measure the economic impact of Brexit. Output estimates either use a synthetic control, which is a composite combination of geographic areas, or forecast models.

There is a consistent finding that Brexit has damaged the London and UK economies. Both economies are smaller than they would otherwise have been. The effects began immediately after the EU Referendum and have continued since.

4.2 Methodological approaches

4.2.1 Approaches to forecast future or long-term impacts
Generally, there have been two approaches to forecasting the impact of Brexit over the long term. The first is by using Computable General Equilibrium (CGE) models. These build on Input-Output (IO) tables[62], which measure in a single framework the distribution of economic activity by production, income, and expenditure. They allow estimation of the size of the interlinkages between the sectors of an economy in the supply and use of resources. A CGE model adds the general equilibrium consequences of constraints and price effects – that is, they include a behavioural response to the shock. This is important in the context of Brexit because it is a macroeconomic development with widespread ramifications.

The second approach is a macroeconomic forecast model that adapts input assumptions to represent different scenarios. This is what Cambridge Econometrics (CE) has done for London for the GLA[63], and the Centre for Economic Business Research[64] (CEBR) post-Brexit.

4.2.2 Approaches that evaluate impacts so far
Impact analyses are an approach to estimate what would have happened without an intervention (e.g., Brexit) from the moment the intervention begins until the present moment (or thereabouts). They require a control group as well as a treatment group.

For analysis of the effect on outputs, academic researchers have adopted a synthetic control, or synthetic 'doppelganger' approach. This provides an estimate of impacts so far, rather than long-term impacts. It derives a weighting of a combination of countries to mimic the path of the UK economy prior to Brexit. The later path of the synthetic control indicates how the UK economy might have developed after the event. This can be compared with the path of the treated area, London in this case. Identification of an effect requires that Brexit is a natural experiment, that is, was not designed by researchers. This is the case because the outcome of the vote was unanticipated, and unrelated both to macroeconomic performance and expectations of how the economy would evolve. Abadie (2021)[65] explains what the methodology behind the calculations is.

Trade analyses can use actual data for a control because it is possible to specify comparator geographic areas. A range of variables, as well as headline GDP, can be used to match the actual and candidate 'doppelganger' economies, such as:

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[62] Wingham M and Hope M (2018), The London input-output tables, GLA Economics, working paper 97

[63] Cambridge Econometrics (2018), Preparing for Brexit, GLA

[64] CEBR (2021). 'Trade and Cooperation Agreement – London impact', January 2021

[65] Abadie (2021), Using Synthetic Controls: feasibility, data requirements, and methodological aspects, Journal of Economic Literature, volume 59, no 2, pp391-425

- Consumption/GDP
- Investment/GDP
- Exports/GDP
- Imports/GDP
- Labour productivity growth
- Employment share of output[66]
- Inflation rate
- Industrial production/GDP
- Average years of schooling[67]

The impact estimate is then derived using a difference-in-difference calculation. That is, the difference in average outcome between the treatment group and control group before the event less the difference in average outcome between the treatment group and control group after the event.

An alternative to synthetic control is an approach based on regression. This minimises the sum of the squares between control estimates and treatment estimates for the pre-treatment period. Abadie (2021)[68] provides several reasons why this is an inferior approach to synthetic control. For example, while the weights of the synthetic control are all between 0 and 1, for a regression analysis they might be outside this range, including negative values, and so are difficult to interpret. Traditional regression analysis techniques require large samples and many observed instances of the event, such as Brexit, or intervention of interest, and, as a result, they are often ill-suited to estimate the effects of infrequent events.

Analysis of the impact of Brexit on trade has been conducted using difference-in-difference methodologies. This requires a careful specification of the control group, which comes with its own considerations, see below.

4.3 Impact estimates prior to Brexit

There were a range of studies done on the long-run impacts of Brexit. An IMF review found negative effects on UK output of between 3% and 10%[69]. Previous GLA Economics research provided an overview of UK Government studies[70]. What was unexpected at the time was that the Government would introduce a more liberal migration regime, which may be beneficial to output[71]. These studies also glossed over the short-run effects of uncertainty picked up in post-Brexit studies, which used actual data on what has happened.

The HM Government study[72] also provided regional estimates. It found that the losses London faced would be less than that of the other countries and regions of the UK. This depended critically on the effects of the introduction of NTBs. HM Government reports[73] that most other studies find that goods sectors tended to be more harmed than service sectors, and so areas in northern England and the Midlands were typically expected to fare worse. That said, there is a study[74] that instead placed relatively more weight on the

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[66] Born B et al (2019), The Costs of Economic Nationalism: evidence from the Brexit experiment, Economic Journal, volume 129, pp2722-2744
[67] Springford (2022), What can we know about the cost of Brexit so far?, Centre for European Reform, 9 June
[68] Abadie (2021), Using Synthetic Controls: feasibility, data requirements, and methodological aspects, Journal of Economic Literature, volume 59, no 2, pp391-425
[69] IMF (2019), World Economic Outlook, April 2019: Growth Slowdown, Precarious Recovery
[70] Hope M (2019), The economic impact of Brexit on London, GLA Economics, 29 October
[71] This depends on the numbers of high-skilled migrants who now enter compared with low-skill migrants who would have entered, and their relative productivity levels
[72] Department for Exiting the European Union (2018), Exiting the European Union: Publications: Publications - Technical Reference Paper
[73] Department for Exiting the European Union (2018), Exiting the European Union: Publications: Publications - Technical Reference Paper
[74] Dhingra S et al (2017), Local economic effects of Brexit, National Institute Economic Review, volume 242 (1), pp R24-R36

introduction of NTBs. The BoE also finds that NTBs are a more important barrier to trade with the EU than tariffs[75], although it does not consider their relative importance in trade with the UK.

There is one other regional impact study[76], which raises the important point that there would also be consequences for the EU as a result of Brexit. Germany risked a GDP loss in the order of 4.5%-6.4%, and France of 1.8%-2.7%. In broad terms, the nearer an EU region is to the UK, the greater the risk, (Map 3.1). This study used an IO framework, and so did not capture the behavioural response to Brexit.

Map 4.1: Regional GDP risk for EU regions
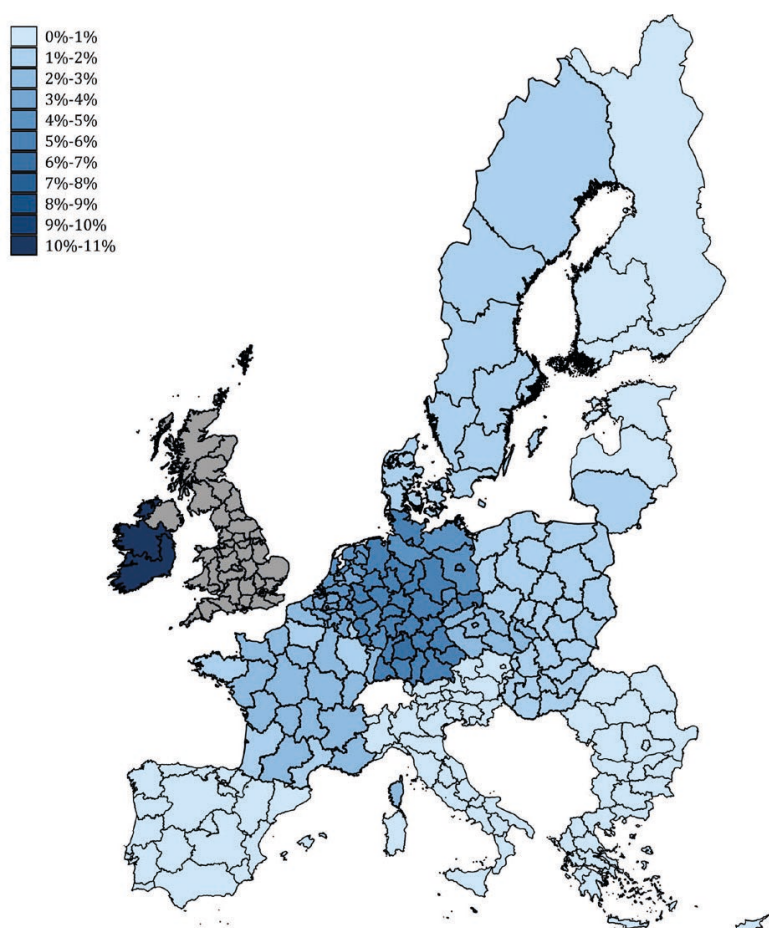
Source: Chen W et al (2017)

4.4 Impact estimates after Brexit (UK's Economy)

Most Brexit studies of impacts on output have been at a national level. They have adopted a synthetic control methodology. The findings indicate there was an output gap prior to the UK leaving the EU, and that this has become larger since.

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[75] BoE (2018), EU withdrawal scenarios and monetary and financial stability, a response to the House of Commons Treasury Committee

[76] Chen W et al (2017), The continental divide? Economic exposure to Brexit in regions and countries on both sides of the Channel, Regional Science, volume 97, issue 1, pp25-54

Born et al (2019)[77] estimated that the UK economy was 2.4% smaller than it would otherwise have been by the end of 2018. Springford estimated that the UK economy was 5.2% smaller by December 2021[78], and 5.5% smaller by June 2022[79].

Gudgin and Lu (2023)[80] have criticised this work. Springford (2023)[81] has defended the specifics of his methodology, and Portes (2023)[82] has also rebutted the challenge. Portes has noted that Gudgin and Lu estimate an output gap almost identical with Springford by Q1 2023, and with an inferior regression-based methodology.

More recently, the National Institute of Economic and Social Research (NIESR) published a report on Brexit's economic effects. It suggested that three years after the end of the transition period, the UK's real GDP is 2%-3% lower than it would have been had Brexit not happened, with that impact increasing to 6% by 2035. The key reasons for this impact, according to the report, were "a trade decline with the European Union and an associated reduction in the UK terms of trade, a reduction in productivity, and a permanent reduction in the willingness to invest in the United Kingdom"[83].

The Office for Budget Responsibility (OBR) holds the view that productivity will be 4% lower in the long run than if the UK had remained in the EU[84].

There have also been some studies of the impact on trade flows specifically. For example:

- Using a CGE model, Fusacchia et al (2022)[85] estimate that the long-term impact of the TCA will be to reduce total exports by around 7%, and imports by around 14%

- Freeman et al (2022)[86] find no evidence that uncertainty and anticipation effects led to a significant decline in relative UK goods trade with the EU before implementation of the TCA. The TCA trade relationship, though, led to a sudden and persistent 25% fall in imports from the EU.

- Kren et al (2022)[87] estimate that goods trade between July 2016 and 2021 reduced by 20% in both directions.

- Using synthetic control methodology, Du and Shepotylo (2022)[88] estimate that the UK has experienced an average shortfall of service exports of £18.5 billion a year between 2016 and 2019, and that they are 5.7% lower by 2019.

- Springford also used a synthetic control method to produce a series of estimates of trade impacts. For many months in 2021, the impact on total goods trade was between 11% and 16%[89]. By June 2022,

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[77] Born B et al (2019), The Costs of Economic Nationalism: evidence from the Brexit experiment, Economic Journal, volume 129, pp2722-2744

[78] Springford J (2022), What can we know about the cost of Brexit so far?, Centre for European Reform, 9 June

[79] Springford J (2022), The Cost of Brexit to June 2022, Centre for European Reform, 21 December

[80] Gudgin G and Lu S (2023), The CER doppelganger index does not provide a credible measure of the impact of Brexit, UK in a Changing Europe

[81] Springford J (2023), Are the Costs of Brexit big or small?, Centre for European Reform

[82] Portes J (2023), How much has Brexit cost the UK economy?, UK in a Changing Europe

[83] Kaya A et al (2023), Revisiting the Effect of Brexit, NIESR

[84] OBR (2023), Economic and Fiscal Outlook – March 2023

[85] Fusacchia I et al (2022), The consequences of the Trade and Cooperation Agreement for the UK's international trade, Oxford Review of Economic Policy, volume 38, no 1, pp27-49

[86] Freeman R et al (2022), UK trade in the wake of Brexit, LSE Centre for Economic Performance discussion paper no 1847

[87] Kren J and Lawless M (2022), How has Brexit changed EU-UK trade flows?, ESRI Working Paper no 735

[88] Du J and Shepotylo O (2022), Brexit and UK services trade, Chapter 6 in The Economics of Brexit: what have we learned?

[89] Springford J (2022), The Cost of Brexit: December 2021, 10 March

this had fallen to 7%[90]. Services trade was estimated to be about the same as it would otherwise have been, although this may reflect that tourism is less important for the UK than the 'doppelganger' countries.

Kren et al (2022) and Freeman et al (2022), while both looking at the impact of Brexit on goods trade, compare UK-EU data using different data sources and use different control groups – that is, they have not used synthetic controls. There are two reasons to be cautious in using the results of Freeman et al (2022). Freeman et al (2022) use UK trade with the RoW as a comparator group, while Kren et al prefer EU trade with the rest of the world. Kren et al argue against the use of UK trade with the RoW because there are likely to have been spillover effects from Brexit[91]. For example, imports from the EU might feed into exports to other parts of the world.

The second reason for divergence between these two studies is because of data sources. The UK's exit from the EU Single Market resulted in data collection changes, which caused a noticeable discrepancy in values that EU and UK statistical agencies reported for the same trade flows. There was a smaller change in UK-reported data[92].

In summary, the weight of the evidence is that Brexit has had an adverse effect on UK-EU trade flows.

4.5 Impact estimates after Brexit (London's Economy)
There have been at least two studies of the impact of Brexit on the London economy.

CEBR conducted a short piece of analysis[93] for the GLA (published soon after the TCA was agreed). It estimated that London may lose £9.5bn a year in economic output because of Brexit. This is more than 2% of London's output. The CEBR notes that there remains a considerable amount of uncertainty on the impacts of the UK leaving the EU. Even the TCA did not conclusively resolve all issues between the UK and the EU (such as financial services equivalence).

The other is a regional study by Fetzer and Wang (2020)[94], using a synthetic control methodology. They find that all countries and regions of the UK have reduced economic activity after the EU Referendum and prior to the UK leaving the EU. Across the UK, losses add up to £50 billion, or 2.3%-2.5% of GDP in 2019. The absolute loss was highest in London at £17 billion in 2018, or 3.8% of GDP, falling to £7 billion, or 1.6% in 2019.

4.6 Forecast comparisons
Another, less formal, way to assess the impact of Brexit is to compare forecasts over time.

In 2018 and 2019, the impact of the ongoing uncertainty around future UK-EU relations (as well as the effects of a slowing global economy and rising global trade tensions) was reflected in deteriorating BoE forecasts for the UK economy, (Figure 4.1).

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[90] Springford J (2022), The Cost of Brexit to June 2022, 21 December
[91] Kren J and Lawless M (2022), How has Brexit changed EU-UK trade flows?, ESRI Working Paper no 735
[92] Kren J and Lawless M (2022), How has Brexit changed EU-UK trade flows?, ESRI Working Paper no 735
[93] CEBR (2021). 'Trade and Cooperation Agreement – London impact', January 2021.
[94] Fetzer T and Wang S (2020), Measuring the Regional Economic Cost of Brexit: evidence up to 2019, CAGE working paper no 486

Figure 4.1: Quarterly UK GDP growth rate estimates by vintage of BoE quarterly forecast, November 2018–November 2019
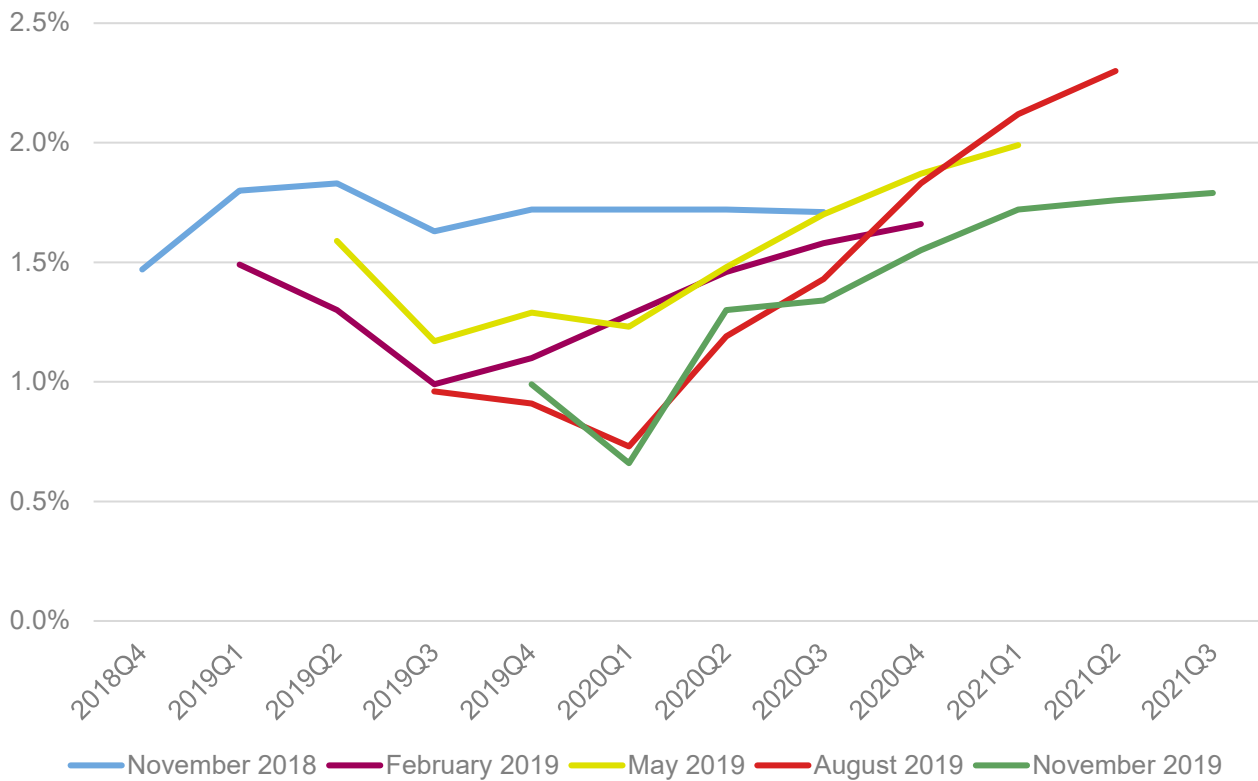
Source: BoE inflation reports November 2018-August 2019, and Monetary Policy Report, November 2019

A comparison of London economy forecasts both before and after the EU Referendum was consistent with the view that growth in the London economy would be slower following Brexit, but that it will be higher than for the UK as a whole in the next couple of years, (Table 4.1).

Table 4.1: Summary of London economy forecasts: Pre/post referendum, 2016 to 2018

Spring 2016

Forecaster	2016	2017	2018
Consensus (LEO 28)	2.6	2.6	2.6
GLA Economics (LEO 28)	2.9	3.4	3.3

Autumn 2016

Forecaster	2016	2017	2018
Consensus (LEO 29)	2.8	2.0	2.3
GLA Economics (LEO 29)	2.4	1.4	1.9

Autumn 2017

Forecaster	2017	2018	2019
Consensus (LEO 31)	2.1	1.8	2.6
GLA Economics (LEO 31)	1.5	1.4	1.5

Autumn 2018

Forecaster	2018	2019	2020
Consensus (LEO 33)	1.6	1.8	2.0
GLA Economics (LEO 33)	1.9	1.6	1.9

Source: London's Economic Outlook (LEO), various editions
Note: Consensus of independent forecasts provided by HM Treasury[95]

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[95] HM Treasury (2023), Forecasts for the UK Economy

5 The GLA Economics Brexit counterfactual

5.1 Summary

This chapter sets out GLAE's estimate for the impact of Brexit on London's GVA, alongside the methodology and robustness checks. The final section is an interpretation of the results.

GLA Economics estimates that London's economy was 6.2% (or £32 billion, or £9,500 for every household) smaller than it would have been in 2019, with Brexit being a key reason. The extent of the damage has been increasing over time, which is consistent with the findings of previous chapters.

The modelling passes several robustness checks and uses data for a relatively long period (1990-2021). Other cuts of the data for the shorter period of 2001-2021 also passed the robustness checks.

The approach is a synthetic control methodology comparing London with a donor pool of 19 other global cities or major European capitals to select for the control. It compares sector growth rates across cities in order to capture London's strength as an export-oriented service sector economy. The cities in the synthetic control are major European capitals.

5.2 Methodology

The main data source is S&P Global Market Intelligence data from their Regional Explorer[96] proprietary service, complemented by Bureau of Economic Affairs (BEA) data for US cities. There are various advantages to this approach.

First, it captures that London is a global and European city – studies comparing London to other countries and regions of the UK do not reflect that London is distinct from the rest of the UK. It is urbanised everywhere and has no rural areas[97]. It has a relatively small manufacturing sector, and specialises in certain service-based sectors, (Figure 5.1).

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[96] S&P Global Market Intelligence (2023), Regional Explorer: Economics, risk, and data analytics
[97] Hope M (2020), Transport expenditure in London 2020, GLA Economics

Figure 5.1: London's sectors 2019, jobs specialisation and output
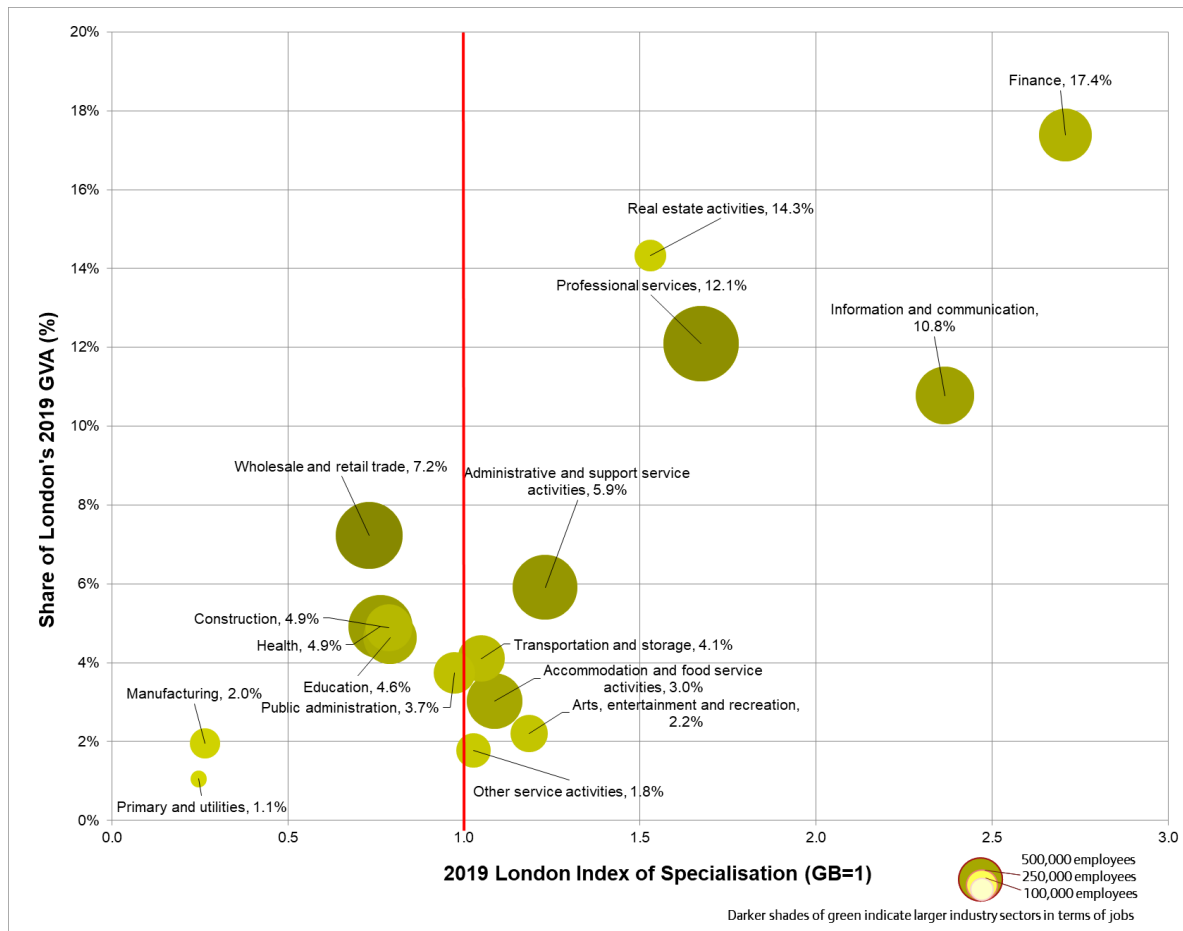
Source: GLA Economics estimates of ONS Regional GVA, Workforce jobs, BRES and APS

Comparison of the evolution of sectors across cities seems a sensible way to match London with similar cities.

S&P Global Market Intelligence collates data from national statistical agencies across the world for a selection of countries. Sub-national data, and specifically cities, is provided where it is available. This limits the choice of cities that can be used in the study. For the USA, S&P Global Market Intelligence uses a sector split which does not map easily onto data for other countries. Consequently, the data of the US national statistical agency has been used, namely the BEA. Restricting the comparator pool to cities that have a population of over 5 million or are a major European capital (i.e., having similar demographic weight to London) gives 20 cities across the world for the study, (Table 5.1). It includes the European capitals of Berlin, Madrid, and Paris. The USA is represented by Chicago, Los Angeles, New York, and Philadelphia. For China, there is Beijing, Chongqing, Shanghai, and Tianjin.

Table 5.1: Cities used in GLAE counterfactual study

City	Country	Population (m)	Year of estimate
Bangkok	Thailand	8.3	2010
Beijing	China	19.6	2010
Berlin	Germany	3.6	2019
Bogotá	Colombia	7.2	2018
Chicago	United States	8.3	2000
Chongqing	China	9.7	2000
Istanbul	Turkey	15.2	2021
London	**United Kingdom**	**8.1**	**2011**
Los Angeles	United States	11.8	2000
Madrid	Spain	3.3	2020
New York	United States	8.5	2021
Paris	France	2.2	2015
Philadelphia	United States	5.1	2000
Rio de Janeiro	Brazil	6.3	2010
Riyadh	Saudi Arabia	5.2	2010
Santiago	Chile	5.6	2017
Seoul	Korea	9.6	2020
Shanghai	China	23.0	2010
São Paulo	Brazil	11.2	2010
Tianjin	China	7.5	2000

Source: United Nations and Statista (for Turkey)

One challenge is reconciling the definitions of a city used by a national statistical area. For London, the ONS provides data by the administrative boundary of the city. There are two Travel-to-Work-Areas[98] which subsume the administrative definition, and the OECD definition of London's Functional Urban Area (FUA)[99] also goes beyond the administrative definition[100]. FUAs were not used because they do not provide a long time series of data for cities. The BEA provides data by county and Metropolitan Statistical Area (MSA)[101].

The selection of sectors reflects the classification of the available data. Non-US data uses the International Standard Industrial Classification (ISIC)[102]. US data uses North American Industry Classification System (NAICS)[103]. A high-level mapping between the two classifications has been done, (Table 5.2)

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[98] In concept, these are self-contained labour markets where people both live and work
[99] OECD (2013), Definition of Functional Urban Areas (FUAs) for the OECD metropolitan database
[100] Hope M (2020), Transport expenditure in London 2020, GLA Economics
[101] Office of Management and Budget (2020), Revised Delineations of Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Combined Statistical Areas, and Guidance on Uses of the Delineations of These Areas, Executive Office of the President
[102] United Nations (2008), International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4
[103] Office of Management and Budget (2022), North American Industry Classification System, Executive Office of the President

Table 5.2: Sector mappings for GLA Economics Brexit counterfactual study

GLA Economics Brexit counterfactual analysis	S&P Global Market Intelligence	BEA
Agriculture	Agriculture	Agriculture, forestry, fishing and hunting
Mining	Mining	Mining, quarrying, and oil and gas extraction
Utilities	Electricity, Gas, Steam and AC	Utilities
Construction	Construction	Construction
Manufacturing	Manufacturing	Manufacturing
Wholesale and retail trade	Wholesale and Retail Trade	Wholesale trade Retail trade
Transportation and storage	Transportation and Storage	Transportation and warehousing
Information and communication	Information and Communication	Information
Finance and insurance	Finance and Insurance	Finance and insurance
Real estate	Real Estate	Real estate and rental and leasing
Professional, scientific and technical	Professional, Scientific and Technical	Professional, scientific, and technical services Management of companies and enterprises
Administrative and waste management services	Administrative and Support Services Water Supply, Sewerage, Waste Management	Administrative and support and waste management and remediation services
Education	Education	Educational services
Health	Health and Social Work	Health care and social assistance
Arts, entertainment and recreation	Arts, Entertainment and Recreation	Arts, entertainment, and recreation
Accommodation and food services	Accommodation and Food Service	Accommodation and food services
Public administration and other services	Public Administration and Other Services	Government and government enterprises Other services (except government and government enterprises)

Source: GLA Economics analysis

Finally, the data required some vetting. S&P Global Market Intelligence backcast data to 1990 to provide a complete dataset. Outside the US, it takes nominal, or cash, data from national statistical agencies, and applies a consistent methodology across countries to adjust for inflation. As a result, the S&P Global Market Intelligence real GVA data for London is different from the ONS, (Figure 5.2). Using S&P Global Market Intelligence data, however, ensures data consistency across countries.

Figure 5.2: London output trends, S&P Global Market Intelligence and ONS, 2001-2021
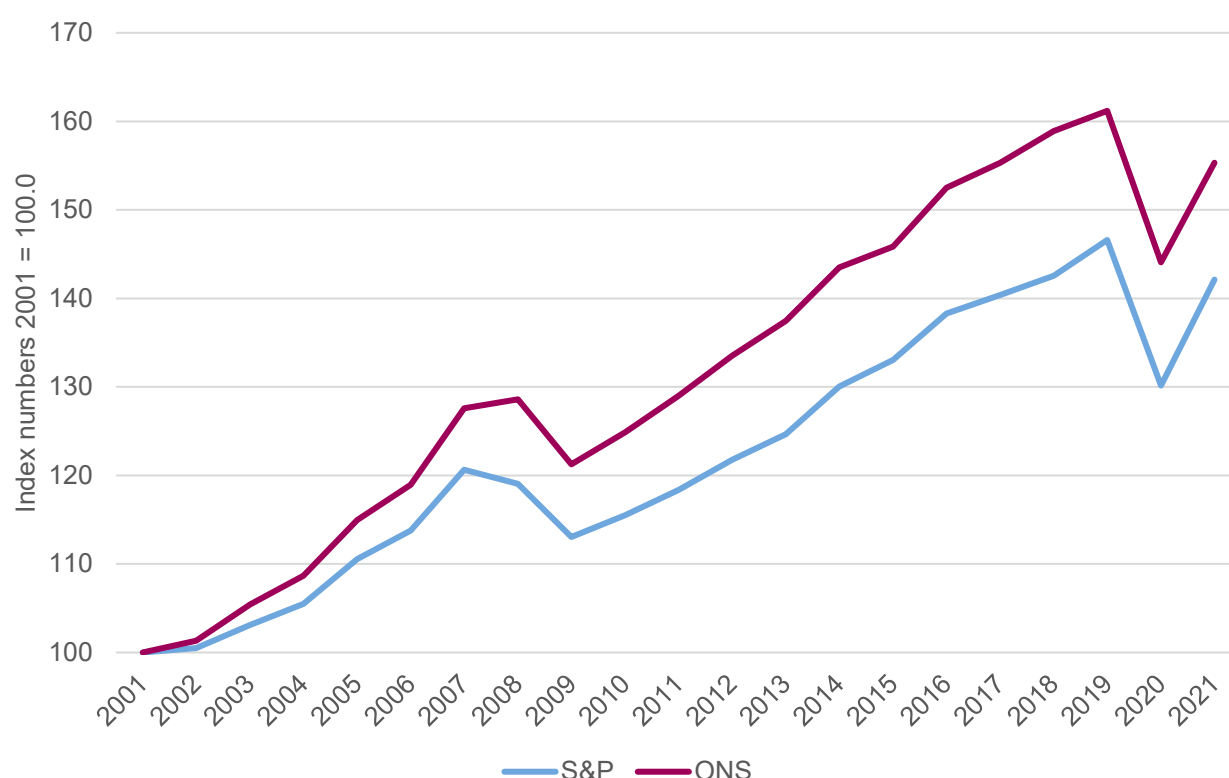
Source: S&P Global Market Intelligence and ONS

There has also been a need to impute and backcast US data. GLA Economics has developed methods to do this, explained in Appendix A.

There are a range of datasets that could be used to run the analysis:

- OPTION 1: All cities, 1990-2021: includes backcasting of US cities
- OPTION 2: Non-US cities, 1990-2021
- OPTION 3: All cities, 2001-2021: avoids GLA Economics backcasting

Synthetic control analysis typically seeks to minimise the Root Mean Square Percentage Error (RMSPE) between the control series and the treated series. An alternative variable to look at would be the Mean Absolute Percentage Error (MAPE). For completeness, the respective formulae are also provided in Appendix A, as well as the robustness checks performed to ascertain the reliability of the results.

5.3 The estimate

The preferred estimate is based on the option that maximises the number of datapoints available in the pre-Brexit period, and so OPTION 1 in Section 5.2 is used (which covers the years 1990-2021). Figure 5.3 compares London's actual output trajectory to the synthetic control.

Figure 5.3: Comparison of London output, £ billions
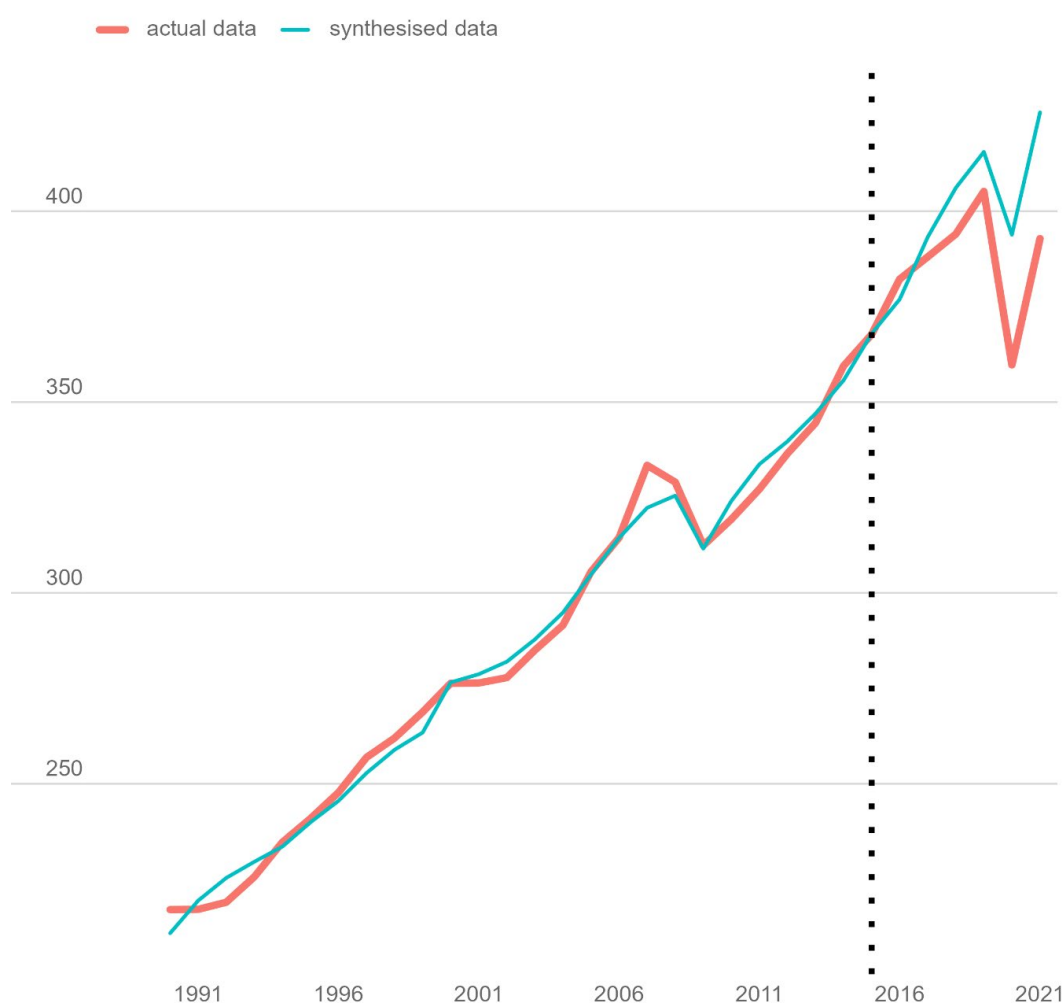
Source: GLA Economics analysis of S&P Global Market Intelligence and BEA data

The counterfactual is estimated using a difference-in-difference calculation. London's GVA was 6.2% (or £32 billion) lower in 2019 than it would have been had the UK voted to remain in the EU. This is equivalent to £9,500 of potential foregone income for every household in London. We specifically highlight the impact in 2019 as this would exclude the impact of other substantial events (e.g., the COVID-19 pandemic) from the estimate, making Brexit a significant contributor to the result. In 2021, the analysis finds that London's GVA is 7.8% (or £41 billion[104], or £11,500 for every household[105]) smaller than it would otherwise have been, as Table 5.3 and Figure 5.4 show, although that is likely to also capture the effect of COVID-19 and other events during that period, and so cannot be entirely attributed to Brexit.

Table 5.3: GLA Economics estimates for the Brexit counterfactual

2016	2017	2018	2019	2020	2021
-4.0%	-4.8%	-5.5%	-6.2%	-8.5%	-7.8%

Source: S&P Global Market Intelligence (for London) and BEA

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[104] GLA Economics calculations of ONS current price GVA data
[105] Using ONS Labour Force Survey estimates of the number of households

Figure 5.4: GLA Economics estimates for the Brexit counterfactual
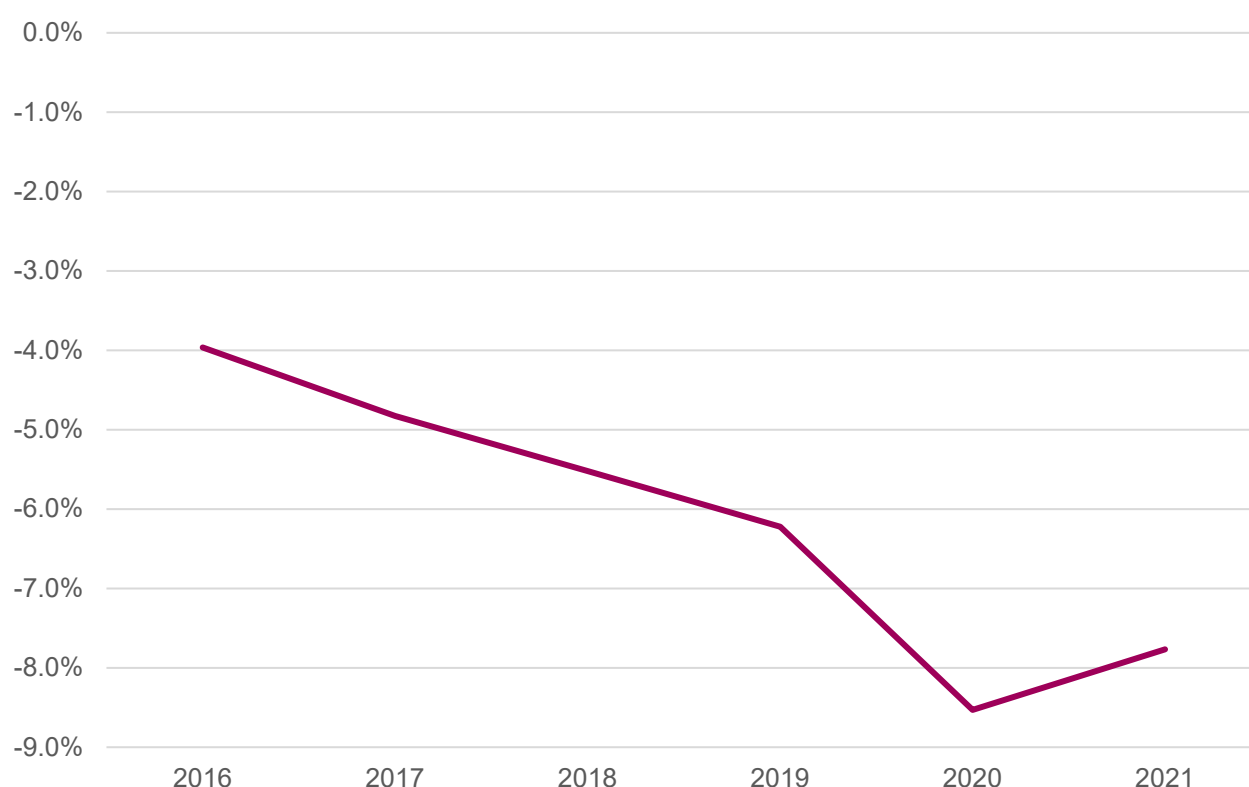
Source: S&P Global Market Intelligence (for London) and BEA

Ultimately, this is a substantial loss of income for Londoners and the rest of the UK (who will now receive a smaller net contribution to the Exchequer[106]), leading to less money being available to support necessary public services across the whole country.

5.4 Interpretation of the results

What the analysis intended to do is compare London's GVA trajectory to that of other similar cities across the world to establish the extent of any divergence since the Brexit referendum. Over time, however, there were other important shocks, including obviously the pandemic, which are likely to have exerted an effect since 2020.

The fact that London's economy is shown to be at least 6% smaller than it would have been in 2019 had Brexit not happened would suggest that even though the UK was technically still in transition during that year (i.e., it still had not exited the Customs Union and Single Market), the significant uncertainty alluded to earlier in this report has played a significant part in undermining business activity, foreign investment, and even domestic actors from investing the resources needed in London's economy. The effect of this uncertainty is aggravated by the impact Brexit has had on London's SMEs and the number of EU workers in the city's labour force.

With regards to uncertainty and investment, it is important to highlight that as businesses tend to plan for the medium-to-long term, they are acutely averse to risk and uncertainty. As a result, they are likely to have reduced their investment in London after the Referendum result. This view was recently echoed by Dave Ramsden, a Deputy Governor of the Bank of England, who told the Commons Treasury Committee that

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[106] Douglass G et al (2023), London's Economy Today, GLA Economics, 29 June

Brexit "chilled business investment", and that one "can see a break in the trend for UK business investment in 2016", with it flattening since then due to the lack of fiscal certainty[107].

London (like the UK) has been suffering from chronic business underinvestment that has gotten worse since 2016[108] - an indication that Brexit-related uncertainty exacerbated the situation. Economic theory is unequivocal that investment plays a significant part in boosting total factor productivity, and hence output growth. This mechanism certainly played out in London, with the modelling revealing its sizeable contribution to undermining potential output growth.

There are also the impediments Brexit has imposed on London's SMEs, which are vital components of London's output and labour force. With over 1 million SMEs, London hosts about 20% of the national SME population, and these employ over half the city's labour force. These SMEs tend to be concentrated in sectors such as professional services, transport, construction, hospitality, and retail - sectors that collectively comprise at least two-thirds of the city's GVA.

With that in mind, Brexit-related trade barriers were always likely to disproportionately harm SMEs, with London suffering more as a consequence. For example, a recent survey by the British Chamber of Commerce (BCC) found that "more than three quarters of British companies have reported that the trade agreement between the European Union and Britain has made it difficult for them to increase sales and grow their business"[109]. More than 90% of the businesses surveyed by the BCC were SMEs. Complicating factors for SMEs include compliance with trade and regulatory changes as well as the costs of recruitment to address labour shortages (resulting in part from exiting the Single Market). Many studies have highlighted SMEs' plight[110,111], and London's output potential was always going to be substantially curtailed as a result of this.

Furthermore, there was an outflow of EU citizens from London (and the UK) even during the transition period, which has contributed to some of the labour-market shortages witnessed in some of London's key economic sectors (e.g., retail and hospitality). Here again, London's services-dependent economy was always likely to suffer disproportionately from this outflow. Last but not least, trade-related effects (i.e., barriers) are likely to have stymied London's productivity, and as outlined in Chapter 3, this would also undermine the city's economic output.

In light of these factors, it is possible to understand why London's output growth performed worse than comparator cities in the period after the referendum. The magnitude of the effect (per the analysis) is a testament to the fact that Brexit has left a footprint on London's economy via multiple channels (e.g., migration, investment, and trade) that collectively compounded the extent to which the capital's GVA growth has been curtailed relative to its potential had Brexit not happened.

The introduction of trade barriers is likely to continue affecting enterprises across multiple economic sectors within London and the UK. Meanwhile, any restrictions on migrant inflows could impact labour supply for some of London's most important sectors (e.g., tourism), with implications for output, growth, and long-term prosperity. Over the medium term, a more liberal regime for high-skilled labour may well help productivity growth.

The trajectory of UK-EU relations could further shape the consequences of Brexit for London. Concretely, the loss of equivalence in trade in financial assets, due in 2025, could lead to a further adverse shock for

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[107] Partington R (2023), Brexit has 'chilled' business investment, says Bank of England deputy governor, The Guardian, 21 November
[108] ONS (2021), Regional gross fixed capital formation, ITL1 and ITL2, 2000 to 2019
[109] Reuters (2022), Brexit deal a 'nightmare' for small businesses - survey
[110] British Beauty Council (2023), Value of Beauty 2023
[111] European Movement UK, Brexit and Business: in their own words

London, with more financial services activity being transferred to the EU to circumvent the lack of passporting rights.

It should be noted that it is difficult to isolate the impact of the pandemic from that of Brexit (for the years 2020 onwards). There is evidence that the UK performed poorly relative to other countries due to higher labour market inactivity since 2020[112]. The data available at the time of this study also does not account for the recent ONS revision to GDP statistics that put the UK's performance more in line with other G7 economies[113]. As the regional output data has not yet been updated, this revision could not be incorporated in this study. In addition, the comparator cities in the synthetic control are European capitals, and their output has also been adversely affected by Brexit.

5.5 Conclusion

GLA Economics has estimated the impact of Brexit on London's economy. This synthetic control analysis uses city-level data and focuses on London's key characteristic as an export-oriented service sector economy to perform the analysis. The estimate is derived using a difference-in-difference approach. It finds that London's economy is smaller than it would have been had the UK opted to remain in the European Union back in June 2016: by 6.2%, (or £32 billion, or £9,500 for every household) by 2019. This rules out any role for the COVID-19 pandemic, the War in Ukraine, and other shocks since 2020, and renders Brexit a major contributor to this impact. As Brexit continues to evolve as a process, these effects (whether on London or the rest of the UK) will also change in response to further developments.

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[112] Burn-Murdoch J (2022), Chronic illness makes UK workforce the sickest in the developed world, Financial Times, 21 July
[113] McLaren C (2023), GDP – Bringing the big picture up-to-date, ONS, 29 September

Appendix A: Methodological details for GLA Economics Brexit counterfactual

This Appendix provides additional material regarding the analysis performed.

A.1: Imputation and backcasting of US BEA data

The BEA provides data for Metropolitan Statistical Areas and counties for 2001–2021 in 2012 prices, and for 2017-2022 in 2017 prices, which also has revisions to the series. It has not been possible to splice the datasets because of missing data, and so the analysis used is for 2001-2021. Some data is missing, so as not to disclose respondents. It has been backcast to 1990 to provide a longer series for analysis to align with the time period for the S&P Global Market Intelligence data.

The following imputation process has been adopted for missing Metropolitan Statistical Area data for Chicago, New York and Philadelphia (there is no missing data for Los Angeles):

- Calculate straight line estimates where one or two data points are missing

- Set 2021 values at 2019 levels to allow for the pandemic in 2020

- Use USA growth rates for Agriculture, Construction, Utilities, and Wholesale

- Use growth rates from S&P Global Market Intelligence imputed data for Information, Manufacturing, and Transportation & Warehousing

- For the elements of Professional & business services, that is Professional services, Management, and Administrative & support services:
  - Apply sector growth rates to impute series of missing values
  - For sector with longest series of missing value estimate as difference of Professional & business services and two other sub-sectors (ignore non-additivity of sectors as of little effect)[114]

- Chicago has missing values for each of Education and Health:
  - To impute first years apply S&P Global Market Intelligence growth rates for Education and Health combined
  - For later years derive a linear trend of shares across years with missing values where there is BEA data for each of Education and Health, and the sectors combined (again ignore problem of non-additivity)

- Chicago has missing values for each of the Arts and Accommodation & food services:
  - For years where there is BEA data for the sectors combined and individually estimate an average share for each sector (the shares appear relatively stable, and again ignore problem of non-additivity)
  - Apply the share for individual years where there is combined BEA data, but not data for individual sectors

- Use S&P Global Market Intelligence estimates for other services for Chicago

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[114] Formally, chained currency, or real, values are not additive because the relative weights for a given period differ from those of the reference year

County level data is more complete. It has been used for the cities of interest, and to create estimates for New York City. Its five counties are more familiar by their borough names, (Table A.1).

Table A.1: New York City counties and boroughs

county	borough
Bronx	Bronx
King's	Brooklyn
New York	Manhattan
Queen's	Queen's
Richmond	Staten Island

Where there was missing county data the rules above were adopted as appropriate. Additionally for some New York City counties missing items were imputed from the relative proportions of entire county and state economies.

Backcasting of economy-wide and sector series has been conducted using the auto-arima function in R. This maintains the stationarity of the series.

A.2 Robustness checks
There have been three checks done of the robustness of the analysis:

- Training and validation periods
- Loss analysis
- Descriptive analysis check

A.2.1 Training and validation periods
The synthetic control is a good estimator of a change if it matches the treatment series prior to the intervention and diverges thereafter. This can be tested at the point of change. A second way to test it is to have a validation period prior to the intervention. The check is to see if the control series continues to follow the treatment series (London) until the intervention.

The main analysis for the calculation of the impact of Brexit is to use data up to 2015. Additional analyses used training periods up to 2012, 2013, and 2014 to leave validation periods of the remaining years. The control series are in parallel up to 2015, and diverge from the treatment series in 2016, (Figure A.1). The test is passed in the sense that the analysis is likely to be picking up a Brexit effect.

Figure A.1: Comparison of London output, £ billions
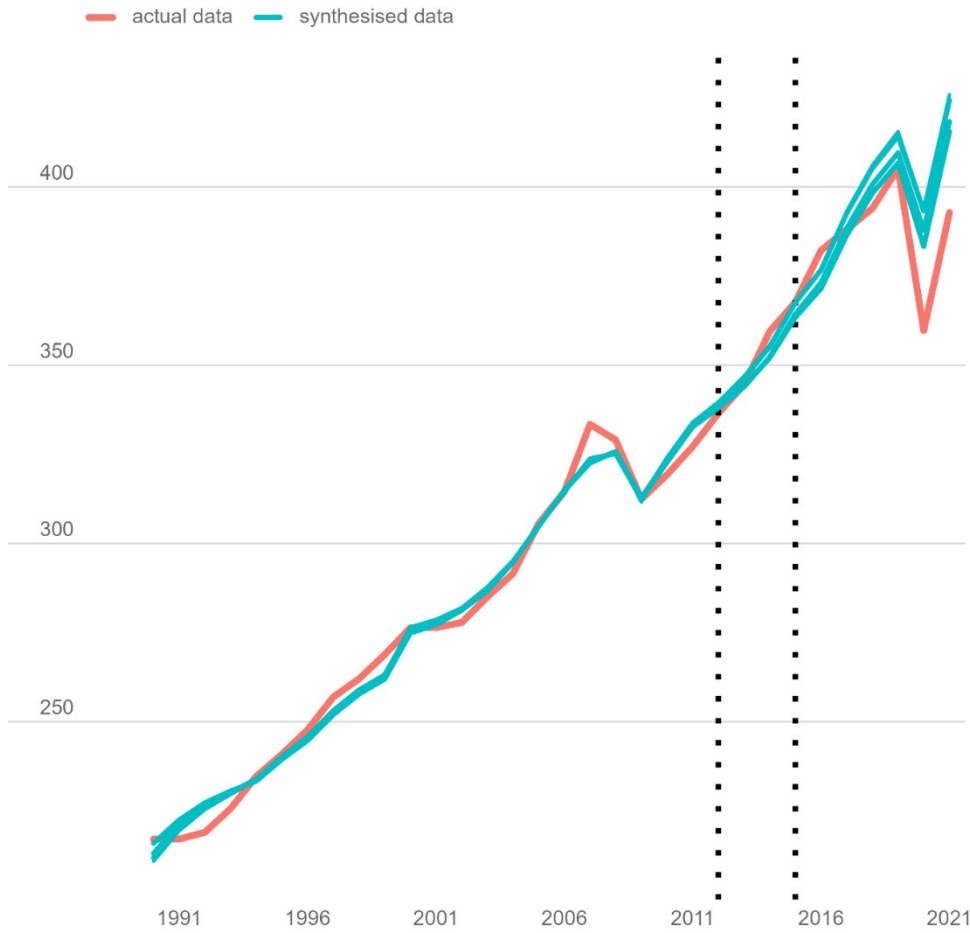
Source: GLA Economics analysis of S&P Global Market Intelligence and BEA data

A.2.2 Loss analysis

RMSPE and MAPE are measures of loss, that is a measure of the distance of the control series from the treatment series. The metric is the ratio of the loss estimates pre- and post-treatment periods. The respective formulae are:

$$RMSPE = \sqrt{\frac{1}{n} \sum_{k=0}^{n} \left(\frac{\hat{y}_k}{y_k} - 1 \right)^2}$$

$$MAPE = \frac{1}{n} \sum_{k=0}^{n} \left(1 - \frac{\hat{y}_k}{y_k} \right)$$

Where y_k are the values of the treatment series and $\hat{y}_k$ are the values of the control series.

The test is to re-estimate these metrics for the donor pool of cities excluding London, and repeat the analysis with each city which contributes to the synthetic control as the treatment city. If either of the metrics is higher for another city then this suggests there is not a Brexit effect specific to London and the test is failed.

The preferred specification, discussed later, is all cities for 1990-2021, and US MSAs. The weights of cities in the synthetic control are, Table A.2:

Table A.2: Weights for preferred specification for synthetic control

city	weight
Berlin	53%
Istanbul	8%
Los Angeles	<0.5%
Madrid	3%
Paris	36%

Source: GLA Economics analysis of S&P Global Market Intelligence and BEA data

The modelling identifies major European capitals as the cities most like London in terms of their sector composition and development. This is in contrast with Springford, who finds the UK as more like the USA than other countries; however, he does look at the UK as opposed to London, and the two economies are quite disparate in structure and features.

Modelling of the non-US cities 1990-2021 dataset (OPTION 2 in section 4.2) produced corner solutions, and these were rejected as being uninformative.

The loss metrics for the preferred solution are reported in Table A.3. Losses are higher for London than other cities in the synthetic control, indicating an effect specific to London. The test is passed.

Table A.3: Comparison of loss for London and cities in the synthetic control by preferred specification

City	RMSPE	MAPE
London	**3.7**	**1039.2**
Los Angeles	1.2	-5.1
Berlin	0.9	0.9
Istanbul	1.2	-29.4
Madrid	2.0	15.5
Paris	2.4	134.7

Source: GLA Economics analysis of S&P Global Market Intelligence and BEA data

The modelling of a number of datasets failed this test. In many cases, Paris had a higher loss. This may, in part, be because Paris has also been affected by Brexit through trade links with the UK, as discussed earlier.

This leaves robust modelling solutions for:

- MSAs for both 1990-2021 and 2001-2021 datasets
- New York city and New York county for the 2001-2021 dataset

A.3.3 Descriptive analysis check

It is apparent that the synthetic control mimics the treatment series relatively well, except during the 2008 Financial Crisis. It might be expected that New York would mimic London most closely over this period as it is also a global financial centre. So, it is a surprise that New York is not part of the synthetic control.

First, there are a number of geographies that can be used for New York – the state, the MSA, county and city, (Map A.1).

Map A.1: New York geographies
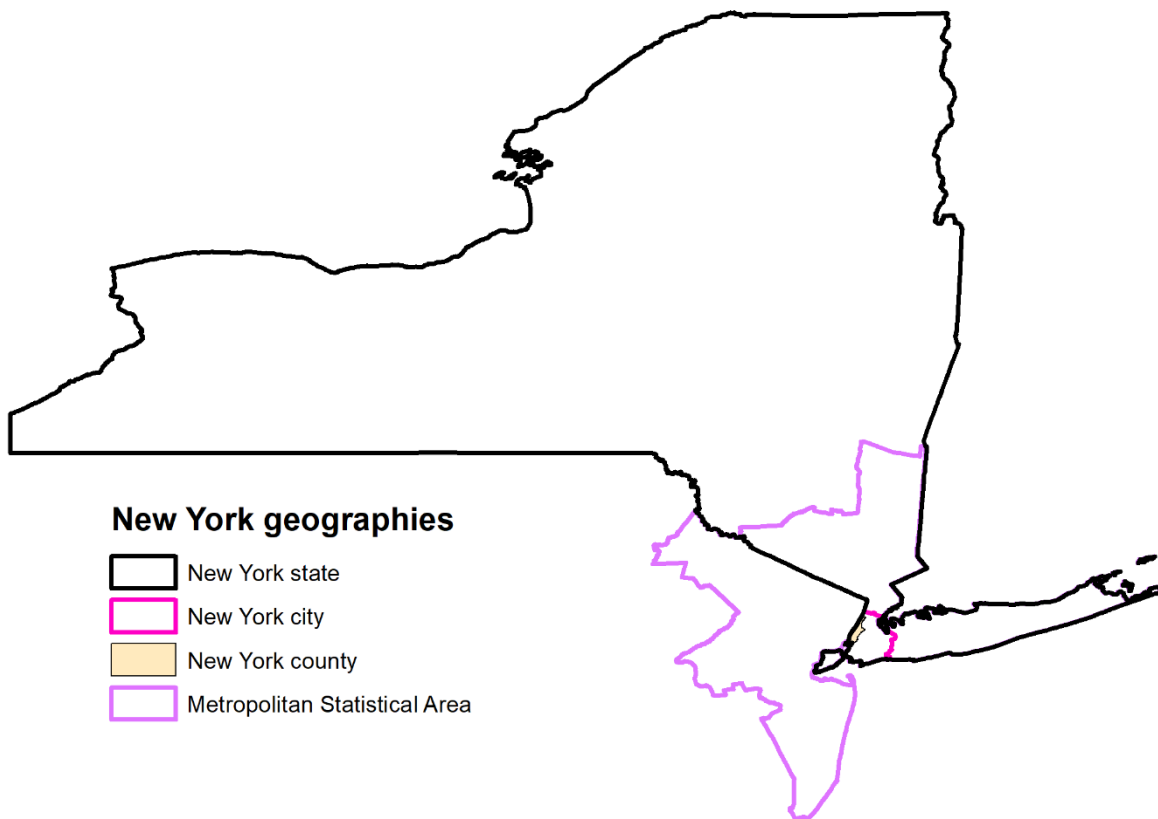
Source: United States Census Bureau

Of the cities in this study, New York[115] is the most similar to London in terms of its key sectors, in which it specialises, (Figure A.2). This supports the view that London is like New York.

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[115] Geography for US cities is MSA

Figure A.2: Share of output of London's key sectors in cities for GLA Economics Brexit counterfactual analysis
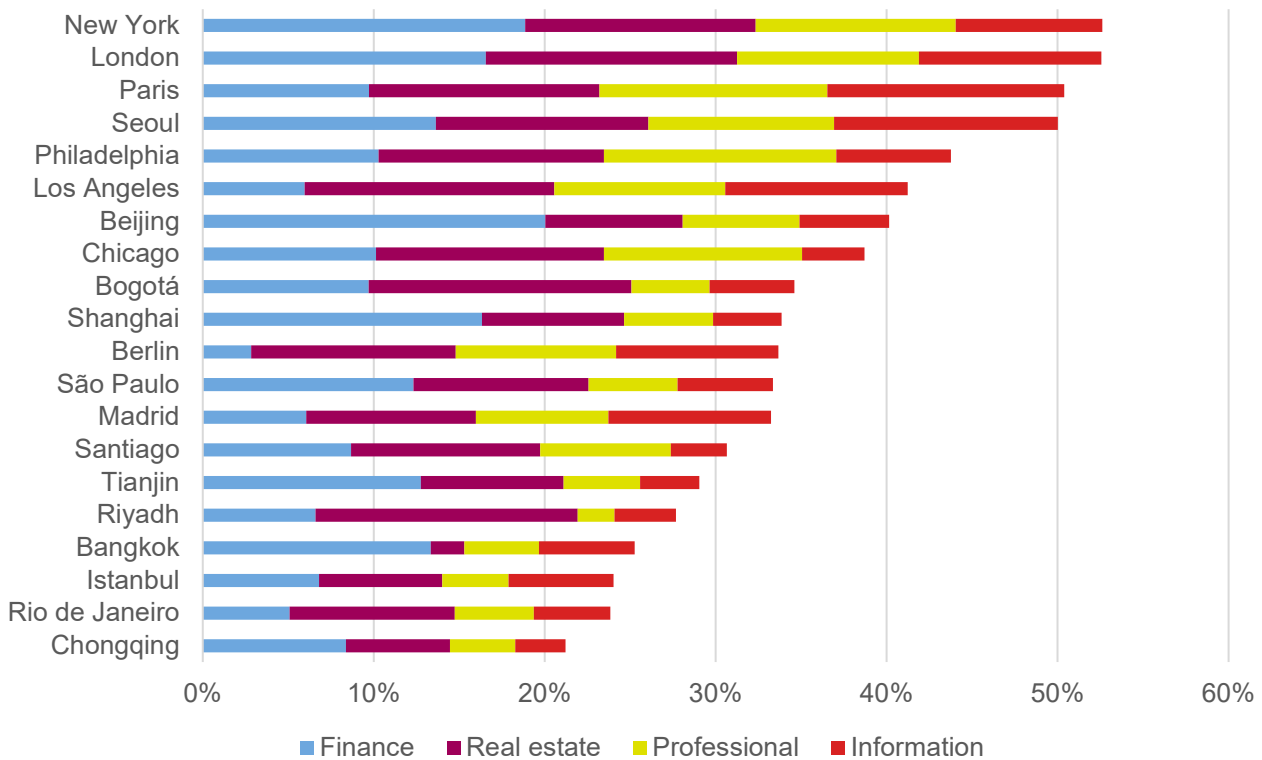
Source: S&P Global Market Intelligence and BEA

In terms of the path of output for New York, that for the state and MSA is similar, as is the case for the county and the city. These trends, though, differ. Further, neither of the trends follows the trend for London over the period of analysis closely. During the Financial Crisis, the timings were not in sync, with New York starting earlier and ending earlier than London, (Figure A.3).

Figure A.3: London and New York output trends, 2001-2021
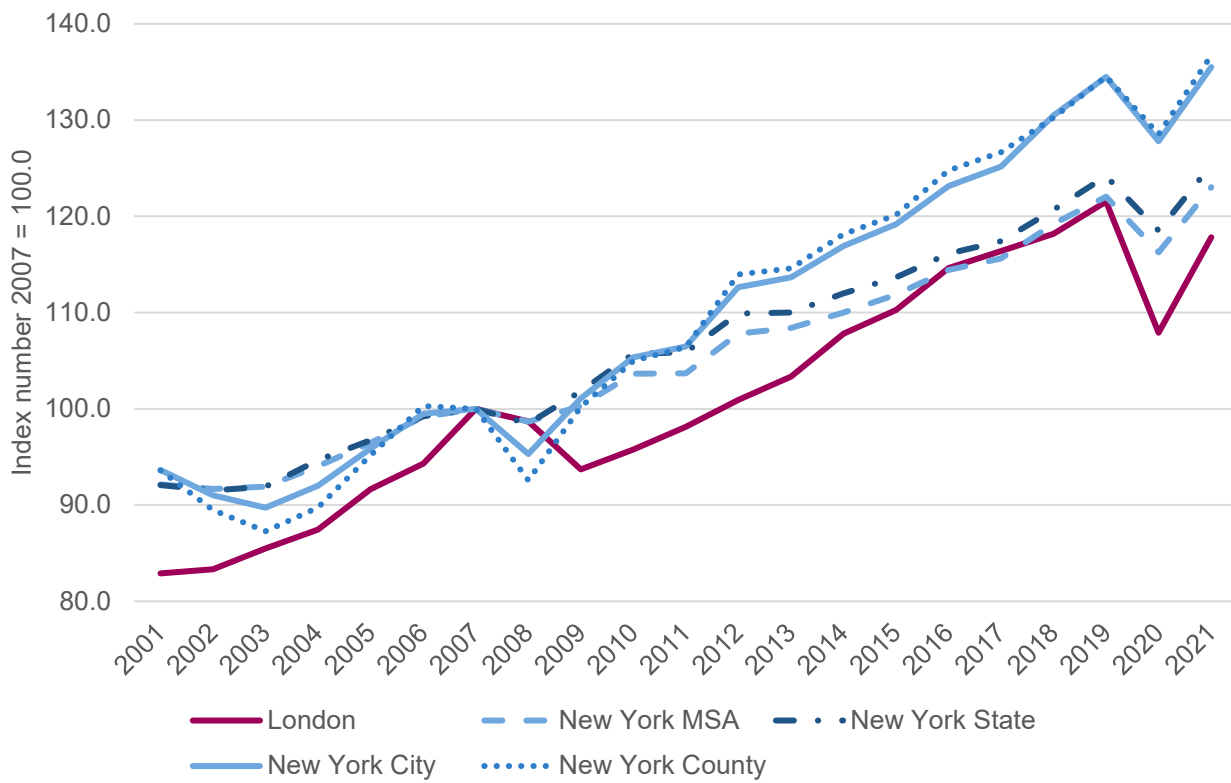
Source: S&P Global Market Intelligence (for London) and BEA

This explains why New York is not part of the synthetic control for the Brexit counterfactual.

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