What would the UK gain from closer ties with the EU?

Trade, productivity and investment gains from deeper UK–EU integration

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Abstract

In September 2026 the Prime Minister said that all options for the UK's relationship with the EU are on the table, from the current Trade and Cooperation Agreement (TCA) to full membership. We provide comparable estimates of what each option would be worth to the UK relative to the TCA, combining a meta-analysis of 37 gravity studies, a general equilibrium model of world trade, and evidence on productivity and on business investment lost since the referendum. Through lower trade costs in goods and services, re-joining the EU would raise UK real income by 1.6%, and by 1.8% with productivity effects. If membership also brought back the lost investment, the long-run gain would be 3.7%, or 2.9% if that shortfall would have narrowed anyway; about three-quarters of it would arrive within 15 years of accession. An EEA/Swiss-type agreement, a deep free trade agreement or a customs union would be worth 1.3–1.8%. How much lost investment an agreement brings back depends on its legal permanence: how hard it would be to undo. In goods trade a customs union and an EEA/Swiss-type agreement deliver similar gains, but a customs union would oblige the UK to apply the EU's external tariff, including any tariff on imports from China, and once services and investment are counted the EEA/Swiss-type agreement is ahead. The estimates do not settle which option to choose, but they show which features of an agreement would raise its value.

Keywords: Brexit; EU membership; customs union; single market; structural gravity; meta-analysis; productivity; investment

JEL classification: F13, F14, F15, F17

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AI use and reproducibility: During the preparation of this work the authors used Claude (Anthropic), accessed through the Claude Code assistant, as a research and programming aid. It was used to (i) write, debug and document the R and Stata code for data processing, gravity estimation, the general-equilibrium simulations and the sensitivity analyses; (ii) assist with literature searches and draft the coding of estimates from published studies for the meta-analyses, which the authors and a research assistant then checked against the original papers; and (iii) draft and edit text, tables and figure notes. The research questions, modelling framework, parameter choices, scenario design, interpretation of results and policy conclusions are the authors' own. The authors reviewed and verified all AI-assisted output and take full responsibility for the content of this publication. The coding of the gravity studies was checked by hand against the original papers for a sample of 686 estimates, and the errors found were corrected (Appendix A). We thank Linh Chi Do for checking the coded estimates and for research assistance. The replication package will be made available on request.

Executive summary

Ten years after the Brexit referendum, the UK's relationship with the EU has returned to the centre of UK politics. The Prime Minister has said that the options range from the current arrangement to re-joining, and, in his statement to the House of Commons on 12 October 2026, that after the UK–EU summit in Brussels on 20 November the two sides should "set up a serious dialogue about the different options for our relationship in the long term" (Prime Minister's Office, 2026). This paper provides comparable estimates of what each option would be worth to the UK relative to the Trade and Cooperation Agreement (TCA). It also shows how the answer depends on the 2025 US tariffs and on EU trade policy towards China.

The bottom line. Membership gives the largest gain under every assumption we consider. That gain is 1.08% of real income from lower trade costs in goods, 1.59% with services, and 3.67% in the long run (about £112 billion a year) once modelled productivity and investment effects are added. The partial options are close to one another. Their order depends on how much services access they give, how legally permanent they are, meaning how hard they would be to undo, and how broadly the EU taxes imports from China. The trade-cost results are the best-measured part; the productivity and investment estimates rest on judgements and are best read as ranges.

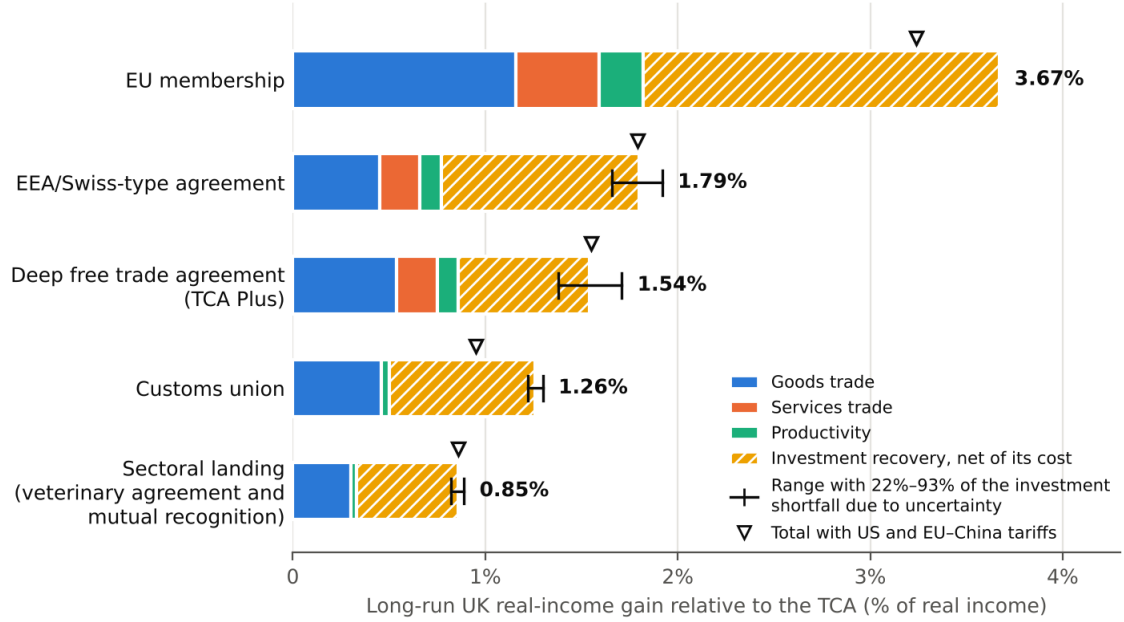
Table 1: UK gain relative to the TCA, by type of agreement (% of long-run real income)

Agreement	Lower trade costs, goods only	Lower trade costs, goods and services	With productivity and investment, long run	Same, with US and EU–China tariffs
EU membership	+1.08%	+1.59%	+3.67% (£112bn)	+3.24%
EEA/Swiss-type agreement	+0.42%	+0.66%	+1.79% (£54bn)	+1.79%
Deep free trade agreement (TCA Plus)	+0.50%	+0.74%	+1.54% (£47bn)	+1.55%
Customs union	+0.42%	+0.46%	+1.26% (£38bn)	+0.95%
Sectoral landing (veterinary agreement and mutual recognition)	+0.28%	+0.30%	+0.85% (£26bn)	+0.86%

Agreement	Lower trade costs, goods only	Lower trade costs, goods and services	With productivity and investment, long run	Same, with US and EU–China tariffs
TCA (the current arrangement)				
No deal (WTO terms)	−0.70%			

Notes: 2022 tariff baseline unless stated; supply elasticity ψ = 1.99; £bn a year at 2025 GDP. Goods only: the model of Section 6, with services not traded. Goods and services: a baseline in which services are traded, with the services access assumed for each agreement (Section 3.5). Including productivity and investment: central case, in which 58% of the investment shortfall is due to uncertainty. With shares of 22% and 93% the gains are 1.4–1.7% for a deep free trade agreement, 1.7–1.9% for an EEA/Swiss-type agreement, 1.2–1.3% for a customs union and 0.8–0.9% for a sectoral landing. Membership recovers the whole shortfall by construction, so its gain is 3.67% under both shares, but 2.92% if the shortfall narrowed under the TCA (Section 4, Table 6). China column: the EU taxes all imports from China at the US rate (34.7%). The customs-union figures exclude the cost of unwinding the UK's own trade agreements with countries outside the EU, which would lower its goods-only gain to 0.39% if those partners withdrew their preferences (Section 5). The breakdown of the TCA has a goods-only estimate only.

Figure 1: Where the gains come from: long-run UK real-income gain relative to the TCA, by layer (2022 tariff baseline, ψ = 1.99)



Notes: Bars show goods trade, services trade, productivity and the recovery of investment net of its cost (Table 5); layers may not add exactly to the totals because they interact. Brackets show the range when 22% to 93% of the investment shortfall is due to uncertainty; membership recovers the whole shortfall in every case. Triangles show the total with the US tariffs and an EU tariff on all imports from China (Table 6). Membership recovers the whole investment shortfall by construction; if the shortfall narrowed on its own under the TCA, its gain would be 2.92%.

Key findings

Lower trade costs alone would raise UK incomes, most of all under membership, which would raise UK goods exports to the EU by about 40%. Productivity and investment could about double the gains, but they rest on a number of key assumptions. For membership, productivity adds 0.23 points and the recovery of business investment 1.85 points net of its cost (Figure 1). This assumes that the 13.6% shortfall in business investment since the

referendum persists under the TCA; if it narrowed on its own, membership would be worth 2.92%. Without any investment recovery, membership is worth 1.82% and the other options 0.33–0.86%.

Legal permanence matters as well as depth, because agreements that are harder to undo bring back more of the investment held back by uncertainty. This is why the EEA/Swiss-type agreement, which is more permanent than a customs union and also opens services trade, comes out ahead once investment is counted. Its value depends on services access: an EEA-type agreement with full access would be worth 2.34%, a Swiss-type agreement without it 1.25%. A deep free trade agreement has the largest trade effect of the partial options but less permanence, so it comes first only if little of the investment shortfall was due to uncertainty. Of the 5,751 combinations of assumptions we tested, the EEA/Swiss-type agreement ranks first among the partial options in 85% and the deep free trade agreement in the rest; this is a share of the combinations tested, not a probability.

In goods trade a customs union and an EEA/Swiss-type agreement are broadly level. A customs union would fall slightly behind (0.39% against 0.42%) if partners in the UK's own trade agreements outside the EU withdrew their preferences and the UK reverted to its pre-agreement tariffs. A customs union also obliges the UK to apply the EU's external tariff. Leaving that aside, if the EU taxed half of its imports from China at the US rate, the customs union would fall about 0.16 percentage points behind, and 0.29 points if it taxed all of them, provided the UK kept its own China policy under the EEA/Swiss route.

The gains take time, and the 2025 US tariffs change little. If the UK re-joined in 2035, output would be 1.5% higher at accession and 2.8% higher by 2040. Net of the cost of the extra investment, which comes first, the gain would be 1.1% by 2040 and about three-quarters of its long-run value by 2050. The government estimates that a veterinary agreement would raise GDP by up to 0.14% in the long run and linking the emissions trading schemes by 0.1%, close to £9 billion together when scaled to projected GDP in 2040 (Department for Business and Trade, 2025; HM Treasury, 2025). Our sectoral landing is worth 0.28% from lower trade costs, but the packages differ, and the emissions-trading gain is a lower cost of meeting climate targets rather than more trade. Our full gain from membership is of the same order as the Office for Budget Responsibility's assumption that leaving the EU lowers productivity by 4%, and lies at the lower end of synthetic-control estimates of the cost of Brexit (3.0–6.7% of GDP).

What this means for each option

The estimates do not settle which option to choose, which also depends on political judgements the model does not price, but they show what each option is worth and what would make it worth more.

- **Membership** gives the largest gains under every assumption. It also brings a vote on EU rules, budget contributions and free movement, which the estimates do not price.
- **An EEA/Swiss-type agreement** keeps UK trade policy independent. Its value rises with services access, and an EEA-type agreement is the stronger form.
- **A customs union** is a conditional option. Its value depends on EU trade policy towards third countries, over which the UK would have no vote, and unwinding

the UK's own trade agreements with countries outside the EU could lower it further. It should be assessed together with the EU's likely external trade policy.

- **A deeper TCA** is strong on trade and leaves trade policy independent. Unless it is anchored in more permanent institutions, it brings back less of the lost investment. The near-term reset agenda is worth banking while the longer-term choice is made: the veterinary agreement, emissions-trading linkage and mutual recognition of conformity assessment.
- **A "Swiss Plus" package** combines Swiss-type single-market access with a UK-wide customs union, and is not estimated here. A customs union (0.42%) and membership (1.08%) are reference points rather than bounds. Like a customs union, it would tie UK tariffs to EU decisions. A companion paper will compare it directly with membership.
- **Across all options**, the government should compare the choices on the same basis, measured against the TCA, and report the gains from lower trade costs separately from the larger but less certain gains from productivity and investment.

1. Introduction

The UK left the EU single market and customs union on 1 January 2021. Since then its trade with its largest partner has been governed by the Trade and Cooperation Agreement (TCA), a free trade agreement with zero tariffs and quotas but little regulatory cooperation. Customs formalities, rules of origin and regulatory checks returned, and ex post studies find that they reduced UK–EU trade substantially (Freeman et al., 2022; Du, Satoglu and Shepotylo, 2023). The Office for Budget Responsibility assumes that leaving the EU will reduce UK trade intensity by 15% and long-run productivity by 4% (OBR, 2025), and Bloom et al. (2025) estimate that by 2025 Brexit had lowered UK GDP per capita by 6–8%.

The policy debate has moved quickly since the UK–EU summit of May 2025, which agreed to negotiate a sanitary and phytosanitary (SPS) agreement, to link the two emissions trading systems (ETS) and to explore a youth experience scheme. The five-year review of the TCA, due in 2026, offers a further opportunity to revisit the relationship (House of Commons Library, 2026). At the Labour Party conference on 29 September 2026, and in an interview with the BBC the following day, the new Prime Minister, Andy Burnham, said that all options are on the table, from the current arrangement, through a customs union or the single market, to re-joining the EU.[1]

The global trading environment has changed at the same time. In 2025 the United States raised tariffs on almost all of its partners, and the EU is under pressure to protect its market from Chinese industrial competitiveness. An arrangement that ties the UK to the EU's external trade policy also brings with it the EU's tariffs on third countries and the tariffs that third countries apply to EU goods.

We ask four questions. How large are the gains from each option relative to the TCA once productivity and investment are counted? How much of each gain comes from lower trade costs, the part that trade models measure best? How does the choice between an EEA/Swiss-type agreement and a customs union depend on the external trading environment? And how quickly would the gains arrive?

Building on our earlier work on the gains from EU membership (Shepotylo, 2010) and on UK trade after Brexit (Jackson and Shepotylo, 2018), the analysis proceeds in four steps. The trade effect of each type of agreement comes from a meta-analysis of 37 gravity studies, modelled on Campos et al. (2025). These effects are solved in a model of universal gravity (Allen, Arkolakis and Takahashi, 2020), in which production responds through input–output linkages, under three external trading environments. We then add services trade, using our own gravity estimate of the effect of Brexit on UK–EU services trade, the productivity effects of trade liberalisation, net of what the model already captures, and the recovery of investment, based on the firm-level evidence of Bloom et al. (2025).

In the long run the gains range from 0.85% of real income for a sectoral landing to 3.67% (£112 billion a year) for membership. For membership, lower trade costs contribute 1.59 points, productivity 0.23 and the recovery of investment 1.85, net of its cost. The partial

[1] Reported in Irish Times (2026) and Euronews (2026); see also Rutter (2026). A YouGov survey cited by Euronews (2026) found that 56% of UK voters would support re-joining.

agreements are close to one another, and their order turns on their legal permanence (Section 3.6), their access to services and the breadth of any EU tariff on Chinese imports. Like the analyses published before the TCA, we rank an EEA-type arrangement above a free trade agreement. Our contribution is to place a customs union, a deep free trade agreement and a sectoral landing on the same scale, measured from the TCA rather than from membership.

The paper estimates the economic stakes of each option; it does not recommend one. The choice also turns on sovereignty, net budget contributions, free movement of people and influence over EU rules, which our estimates do not price, and on what the EU would be willing to agree. Our aim is to give comparable estimates of the economic gains, and to show which features of an agreement raise its value whichever route is chosen.

Section 2 describes the options and Section 3 the evidence and the model. Sections 4 to 8 present the results: the full gains, the role of EU trade policy towards China, the gains from lower trade costs in goods, their timing and the contribution of services. Section 9 compares our estimates with others, and Sections 10 to 12 discuss the implications, limitations and conclusions. Appendix F collects further detail and robustness checks.

2. The options on the table

The public debate has converged on a small number of alternatives to the status quo. Table 2 summarises what each involves and what it would require of the UK. A breakdown of the TCA ("no deal"), in which trade reverts to World Trade Organization terms and the UK and the EU apply most-favoured-nation tariffs to each other, is included as a downside benchmark.

Table 2: Options for the UK–EU relationship and what each would require

Option	What it involves	External tariff	Alignment with EU rules	Free movement and budget	Say in EU rules
TCA (status quo)	Zero tariffs and quotas on goods meeting rules of origin; customs and regulatory checks	Own	None	No	None
TCA Plus	The TCA with sector agreements (veterinary agreement, mutual recognition of conformity assessment) or deeper regulatory cooperation, as in the reset agenda of May 2025	Own	Some sectors	No	None
No deal (WTO terms)	Most-favoured-nation tariffs and full border checks; downside benchmark	Own	None	No	None
EEA/Swiss-type agreement	Single-market access for goods (EEA) or sector by sector (Switzerland), including SPS and conformity assessment, without a customs union; as for Norway and Switzerland, and as the Liberal Democrats propose for the single market	Own	Dynamic, in covered areas	Yes	Shaping, no vote
Customs union	Common external tariff and no rules of origin on UK–EU trade; regulatory checks remain; as for Turkey, and as proposed by George Osborne	EU	Limited	No	None
EU membership	Customs union and single market	EU	Full	Yes	Vote

Notes: Under an EEA/Swiss-type agreement the EU may expect the UK to coordinate trade defence measures (Section 5).

The trade evidence cannot separate the EEA from the Swiss model, because both are represented by few country pairs and studies often pool them. We therefore treat them as one option, an EEA/Swiss-type agreement, which provides access to the single market for goods without a customs union. The agreements under negotiation on SPS standards and emissions trading, together with mutual recognition of conformity assessment (Du, Shepotylo and Zhang, 2025), would be steps in this direction. On their own they would amount to a deepened TCA, or "TCA Plus", which we evaluate both as a sectoral landing and as a deep free trade agreement (Sections 4 and 6.2).

The debate also includes packages that combine elements of these options. The British Chambers of Commerce has proposed a "Swiss Plus" arrangement, in which Swiss-type access to the single market is combined with a UK-wide customs union and possibly a common VAT zone (British Chambers of Commerce, 2026). The historical evidence does not identify such combinations, so we do not estimate Swiss Plus here. Section 10.2 describes the package and what our estimates imply for it, and a companion paper will compare it directly with membership.

Each option is evaluated in three external environments. In the baseline, tariffs are as in 2022, so that only UK–EU trade costs change. In the second, the additional US tariffs in force in October 2025 apply, by exporting country, to all imports into the United States, without retaliation: the UK faces an additional 10.4%, EU members 14.3% and China 34.7%. In the third, the EU also imposes a tariff on imports from China equal to the US rate. Under membership the UK inherits the EU's external position: it faces the US tariff on EU goods and, in the third environment, applies the EU's tariff on China. Under a customs union the UK applies the EU's tariff on China but continues to face its own US tariff, as Turkey does.

We also run the third environment under two alternative assumptions (Section 5). In the first, the EU's tariff applies only to the products already under EU trade defence (battery electric vehicles, steel and clean technologies), which make up 7.5% of EU imports from China and 4.8% of UK imports from China. In the second, the UK also applies the EU's China duties under an EEA/Swiss-type agreement, as the EU may require of such partners.

3. Evidence and methodology

3.1 The trade effects of deeper integration

A large empirical literature uses the gravity equation to estimate how much trade between two countries rises when they enter an agreement of a given depth (Head and Mayer, 2014; Yotov et al., 2016). Published estimates vary widely with the data, the period and the method. Instead of selecting one, we pool them in a meta-analysis that follows the design of Campos et al. (2025), extended to a ladder of integration depths.

The sample consists of 37 primary gravity studies published between 2003 and 2025, from which we code 3,554 coefficients. Every reported specification is coded, not only the authors' preferred one, together with its standard error and the features of its research design. Each coefficient is classified by the depth of the agreement it measures: a shallow

preferential agreement, a free trade agreement (FTA), a deep FTA, a customs union, an EEA/EFTA/Swiss arrangement, EU membership, or the additional effect of the euro.

We regress the estimates on the integration types and on study-design characteristics, weighting by precision and clustering standard errors by study. The design characteristics include the estimator, the treatment of multilateral resistance, pair fixed effects, the use of domestic trade flows, controls for globalisation, the lag structure, the sample period, publication status and the standard error itself, which captures publication bias (Stanley and Doucouliagos, 2014). The effect of each integration type is then predicted at best econometric practice: a Poisson pseudo-maximum-likelihood (PPML) estimator with exporter-time, importer-time and pair fixed effects, domestic trade flows, controls for globalisation and cumulative effects. Appendix A gives the details and alternative estimators.

Table 3: Trade effects of integration and implied changes in UK–EU trade costs relative to the TCA

Type of integration	Best-practice effect (log points)	Standard error	Change relative to TCA	Trade-cost equivalent
Free trade agreement (TCA)	0.148	0.039	–	–
EEA/Swiss-type agreement	0.282	0.075	+0.135	−2.6%
Customs union	0.284	0.075	+0.136	−2.6%
EU membership	0.463	0.075	+0.316	−6.0%
EU membership, optimistic (1973 cohort)	0.930	0.120	+0.782	−14.1%

Notes: The last row is the optimistic scenario. It uses the average post-accession EU effect for the UK's own 1973 accession cohort estimated by Nagengast, Rios-Avila and Yotov (2025), not a best-practice prediction from the meta-analysis.

An FTA such as the TCA raises trade between its members by 0.15 log points, about 16%, and EU membership by 0.46 log points, about 59% (Table 3). Moving from the TCA to membership is therefore equivalent to reducing UK–EU trade costs by 6.0%, and a breakdown of the TCA to raising them by 2.9%. Because tariffs are already zero under the TCA, these changes reflect non-tariff barriers such as customs procedures, rules of origin and regulatory checks.

The gap between membership and EEA/Swiss-type agreements is well determined, at 0.18 log points with a standard error of 0.05. The customs-union and EEA/Swiss rungs, by contrast, are almost level (a difference of 0.002 log points, with a standard error of 0.11), and the EEA/Swiss rung rests largely on one study, Mayer, Vicard and Zignago (2019). The customs-union effect lies 0.18 log points below membership, a difference that is not statistically significant (Appendix A.4). Much of the evidence on customs unions comes from the EU–Turkey customs union, for which studies report larger effects (Baier, Yotov and Zylkin, 2019; Head and Mayer, 2021; Larch, Schmeißer and Wanner, 2021); Larch, Schmeißer and Wanner (2021) attribute part of the difference to Turkey's alignment with EU regulation rather than to the customs union itself. We exclude Cheong, Kwak and Tang (2018), whose customs-union measure includes the EU enlargements of 2004 and 2007; including it would roughly double the customs-union gain (Appendix A.6).

3.2 Why the TCA is treated as a shallow free trade agreement

Every option is measured from the TCA, so where the TCA sits on the ladder is the central modelling choice. Its wide coverage could place it on the deep-FTA rung, but in goods trade it works as a shallow agreement: it removes tariffs and quotas on goods that meet the rules of origin, but provides no regulatory alignment, no mutual recognition of conformity assessment and no veterinary agreement. We therefore place it on the FTA rung. The ex post evidence is consistent with this but does not settle it: the falls in UK–EU trade found after the TCA (Freeman et al., 2022; Kren and Lawless, 2024) lie between what the two codings imply and measure different comparisons. The choice matters. On the deep-FTA rung, membership would lower UK–EU trade costs by about half as much as in our central case, and the EEA/Swiss-type and customs-union options would add little or nothing (Appendix F.2).

3.3 From trade effects to economy-wide outcomes

We translate the change in trade costs implied by each option into changes in incomes, prices and trade using a structural gravity model of world trade (Anderson and van Wincoop, 2003; Yotov et al., 2016), with the supply side modelled as in Allen, Arkolakis and Takahashi (2020). The model covers 81 economies and is calibrated to bilateral goods trade and gross output in 2022. When UK–EU trade costs fall, prices, incomes and trade with every partner adjust, including through the diversion of trade away from third countries.

Two parameters govern the size of the effects. The trade elasticity, $\theta = 5.14$, determines how strongly trade responds to trade costs and is close to the median structural estimate of about five reported by Head and Mayer (2014). The supply elasticity, ψ, determines how strongly production responds to the real price that producers receive. In our model it reflects input–output linkages: firms combine labour with intermediate inputs drawn from the same bundle of goods that consumers buy, so lower trade costs make inputs cheaper as well as final goods, and output expands (Campos, Reggio and Timini, 2025). ψ then equals the ratio of intermediate inputs to value added, $(1 - \zeta)/\zeta$, where ζ is the value-added share of gross output. Because the labour supply is fixed, the resulting gains in real income are gains in welfare (Costinot and Rodríguez-Clare, 2014). The options change trade costs for goods, so we calibrate ψ to goods-producing industries, for which the OECD input–output table for 2022 gives $\psi = 1.99$ for the world (Appendix B). As a robustness check we use the value for the UK economy as a whole, $\psi = 1.01$. Appendix B also reports results for $\psi = 0$, in which output cannot respond.

Each option changes trade costs between the UK and all 27 member states symmetrically, by the difference between its effect and that of an FTA (Table 3). No deal removes the FTA effect and, in addition, the UK and the EU apply their most-favoured-nation (MFN) tariffs to each other: 3.5% on UK goods entering the EU and 5.2% on EU goods entering the UK (trade-weighted averages, World Bank WITS, 2023). Appendix C reports alternative definitions of no deal. Tariff revenue goes to the importing country and is added to real income, and trade balances are held constant. Money values apply the percentage changes to UK nominal GDP in 2025 (£3,044.6 billion; ONS, 2026a), and changes in UK–EU trade are valued at 2025 flows: UK goods exports to the EU of £181.9 billion and imports of £320.8 billion (ONS, 2026b). Because labour supply is fixed in the model, a

percentage change in real income can be read as a change in real GDP of the same size, and all money values are in pounds a year at 2025 values.

3.4 Data

Bilateral goods trade comes from the International Monetary Fund's Direction of Trade Statistics for 2022 and gross output from the OECD Inter-Country Input-Output table for the same year, so that trade and production refer to the same year. Services are treated as non-traded in the core model and added in Section 8. Appendix F.1 gives the details and the baseline data.

3.5 From trade to productivity and investment

The model captures the gains from lower trade costs: cheaper imports and intermediate inputs, and the reallocation of trade. Two further effects lie outside it. Lower trade costs can raise productivity within firms, and a settled relationship can restore investment held back by uncertainty. We add both, together with services trade, for five types of agreement and in all three environments, and report the long-run result relative to the TCA (Section 4).

Services enter the baseline, and the services shock for membership is our own gravity estimate (Section 8). The other agreements receive a share of it: none for a customs union or a sectoral landing, which cover goods only, and half for a deep FTA and for an EEA/Swiss-type agreement, half being the midpoint between the EEA, which gives full access to the single market in services, and the Swiss agreements, which give little.

Productivity effects come from a review of 46 papers on trade liberalisation and productivity, which gives pooled effects for output tariffs, input tariffs and services reform (Appendix E). The central value is the median of the studies on a gross-output basis. We net the input and services channels of the saving on input costs that the model already captures, and measure the size of the services reform from the OECD Services Trade Restrictiveness Index for each UK–EU pair (0.44 standard deviations for the UK under membership).

For investment, Bloom et al. (2025) find business investment 13.6% lower in 2023, on average across their two firm-level estimates.[2] We assume that the shortfall would persist under the TCA. A new agreement brings back the part of it that is due to uncertainty in proportion to the agreement's legal permanence (Section 3.6), and the rest in proportion to the share of the trade-cost gap with membership that it closes. In the central case 58% of the shortfall is due to uncertainty, midway between a macroeconomic estimate of 22% and a firm-level estimate of 93%. Investment recovers between 2030 and 2035, and the capital stock then follows the assumptions of Bloom et al. (2025): investment at 6% of capital, depreciation of 4% and a GDP elasticity of 0.30. The net gains

[2] Bloom et al. (2025) report two firm-level estimates of the shortfall in private business investment in 2023: 12% from firms' exposure to the EU before the referendum (Table 2, column 3), which the authors prefer, and 15.2% from the Brexit uncertainty that firms reported (Table 3, column 2). We take their mean, 13.6%, because the investment we model is that held back by uncertainty, which the second estimate measures directly. The figure lies within the authors' range of 12–18% and close to the 11–13.7% found for total fixed investment by Springford (2022b). With 12%, the gain from membership would be about 3.4%; the other options would fall roughly in proportion.

deduct the extra investment, at the business investment share of GDP in 2025 (10.6%; ONS).

As an upper reading, we replace the literature-based productivity effect with the part of the productivity loss measured by Bloom et al. (2025) that arose before the TCA (2.5 of 2.8 percentage points). The part since the TCA is a trade-cost effect already in the model. For agreements short of membership, the uncertainty part of this loss is reversed in proportion to legal permanence.

3.6 Legal permanence of the options

The options differ not only in how much they lower trade costs but also in how hard they would be to undo, and this matters for investment. Much of the investment lost since the referendum reflects uncertainty about future barriers to trade (Bloom et al., 2025). The TCA is itself a settled agreement, so what a new agreement can add is legal permanence: commitments that a court enforces, rules that move with the EU's, a framework without a built-in exit, and a say in the rules. We score each option on these four features, 0, ½ or 1, and take the average (Table 4). The resulting index determines how much of the uncertainty part of the investment shortfall an agreement brings back.

Table 4: Legal permanence of each type of agreement (0 = TCA, 1 = EU membership)

Agreement	Supranational enforcement	Dynamic alignment	Permanent framework	Voice in EU rules	Index
EU membership	1.0	1.0	1.0	1.0	1.000
EEA-type	1.0	1.0	1.0	0.5	0.875
EEA/Swiss-type (pooled option)					0.625
Swiss-type	0.5	0.5	0.5	0.0	0.375
Customs union (EU–Turkey type)	0.0	0.5	1.0	0.0	0.375
Deep FTA (TCA Plus)	0.5	0.5	0.0	0.0	0.250
Sectoral landing (veterinary agreement and mutual recognition	0.5	0.5	0.0	0.0	0.250
TCA (status quo)	0.0	0.0	0.0	0.0	0.000

Notes: Each feature is scored 0, ½ or 1, and the index is their average.

A score of 1 for enforcement means a supranational court and surveillance authority, ½ a court role in some sectors and 0 state-to-state arbitration. For alignment, 1 means rules that move with EU law across the agreement, ½ in some sectors and 0 static commitments. A permanent framework scores 1 for an open-ended agreement with no scheduled review, ½ for linked agreements that are renegotiated and 0 for periodic review and termination on notice, as in the TCA. Voice scores 1 for a vote, ½ for decision-shaping and 0 for none. The EEA/Swiss-type option of the main results is the midpoint of the EEA and Swiss scores.

The scores are our judgement, and the index is a calibration rather than a measurement: the four features carry equal weight, and the index enters the recovery of the uncertainty part linearly, so membership recovers that part in full by construction (Appendix E.3). The EEA is the most permanent arrangement short of membership (0.875): the EFTA Court and Surveillance Authority enforce it, single-market law is incorporated as it changes, the agreement is open-ended, and the EFTA states help shape new rules, though

they do not vote on them. The Swiss agreements score 0.375, because dynamic alignment and a court role apply only under the newer package and the agreements are linked and periodically renegotiated. A customs union on the EU–Turkey model also scores 0.375: its framework is permanent and Turkey aligns with the common external tariff and part of the EU's goods legislation, but no court enforces it and Turkey has no vote.

Depth and permanence are different things. A deep FTA lowers trade costs more than any other partial agreement, because it covers many policy areas, but institutionally it remains a free trade agreement: disputes go to arbitration, each side can diverge from the other's rules, and it sits inside the TCA's framework of review and termination. We score it 0.25, the same as a sectoral landing, because a deep agreement would include sector agreements, such as the veterinary agreement, that bring dynamic alignment and a role for EU law in those sectors.

4. Main results: gains including productivity and investment

The long-run gain from each agreement is built up layer by layer in Table 5, under the 2022 tariff baseline. For brevity we call the total the full gain, although it is not complete: it leaves out net budget contributions and, for a customs union, the cost of unwinding the UK's own trade agreements (Section 5).

Table 5: Long-run UK real-income gain relative to the TCA, by layer: 2022 tariff baseline, ψ = 1.99 (% of real income unless stated)

Layer	EU membership	EEA/Swiss-type agreement	Deep free trade agreement (TCA Plus)	Customs union	Sectoral landing
Legal permanence	1.00	0.62	0.25	0.38	0.25
Goods trade	1.16	0.45	0.54	0.46	0.30
Services trade	0.43	0.21	0.21	0.00	0.00
Productivity	0.23	0.11	0.11	0.04	0.03
Investment recovery	3.52	1.93	1.28	1.43	0.98
Cost of the extra investment	−1.67	−0.90	−0.60	−0.67	−0.45
Net gain	**3.67**	**1.79**	**1.54**	**1.26**	**0.85**
Net gain, £bn a year	112	54	47	38	26
Present value 2027–2060, £bn	780	352	351	239	161

Notes: Each layer is a full general-equilibrium solution, reported as the increment over the previous one; small differences from adding across columns are interactions between layers. Productivity is literature-based. £bn a year at 2025 GDP; present values of the net gains over 2027–2060 on the path of Section 7, discounted at 3.5%.

In the long run, membership would raise UK real income by 3.67%, about £112 billion a year, net of the cost of the extra investment. Summed over 2027–2060 on the path of Section 7 and discounted at 3.5%, the net gains are worth about £780 billion. The other agreements are worth 0.85–1.79%. In the central case the EEA/Swiss-type agreement comes first (1.79%), followed by a deep free trade agreement (1.54%), a customs union

(1.26%) and a sectoral landing (0.85%). The three intermediate options lie within 0.53 points of one another.

The recovery of investment is the largest layer. Before its cost, it adds 3.52 points to membership and 0.98–1.93 points to the other agreements, and its size depends on legal permanence as well as on depth. A sectoral landing and a deep free trade agreement have the same permanence score (0.25), but the deep agreement closes more of the trade-cost gap with membership, so it brings back 36% of the investment shortfall against 27% for the sectoral landing.

Productivity adds less than the evidence on Brexit might suggest, 0.23 points for membership. Most of the productivity effect found in the literature works through cheaper inputs, which the trade model already captures, and the evidence comes mostly from tariff cuts in developing economies (Appendix E).

4.1 What the results depend on

The full gains rest on assumptions that the trade evidence does not pin down. Table 6 shows how much each of them matters.

Table 6: Full long-run UK real-income gain relative to the TCA under alternative assumptions (% of real income)

Assumption	EU membership	EEA/Swiss-type agreement	Deep free trade agreement (TCA Plus)	Customs union	Sectoral landing
Central	3.67	1.79	1.54	1.26	0.85
Uncertainty share 22%	3.67	1.66	1.71	1.30	0.89
Uncertainty share 93%	3.67	1.92	1.38	1.22	0.82
Shortfall narrows under the TCA	2.92	1.37	1.26	0.94	0.64
Any settled deal recovers the uncertainty part	3.67	2.17	2.33	1.91	1.64
Brexit-based productivity	5.91	3.10	2.14	2.14	1.44
$\psi = 1.01$	3.24	1.62	1.34	1.15	0.78
Trade and productivity only (no investment recovery)	1.82	0.76	0.86	0.50	0.33
With US and EU–China tariffs	3.24	1.79	1.55	0.95	0.86

Notes: 2022 tariff baseline and $\psi = 1.99$ unless stated. Central: 58% of the investment shortfall due to uncertainty, the shortfall persisting under the TCA, and recovery of the uncertainty part in proportion to legal permanence. Shortfall narrows under the TCA: it follows the path simulated with NiGEM by Kaya et al. (2025). Uncertainty shares: the NiGEM results of Kaya et al. (2025) and the firm-level decomposition of Bloom et al. (2025). Any settled deal: every agreement removes the uncertainty part in full, whatever its legal form. Brexit-based productivity: the pre-TCA part of the productivity loss measured by Bloom et al. (2025) is reversed instead of using the literature. Trade and productivity only: no investment recovery and no investment cost.

Three assumptions matter most. The first is how much of the investment shortfall reflects uncertainty. The result for membership does not depend on it, because membership closes the whole trade-cost gap and is fully permanent, so it recovers the whole shortfall by construction. The partial agreements do depend on it: with uncertainty shares

between 22% and 93% they are worth 0.82–1.92%. The share also changes their order. A deep free trade agreement comes first if little of the shortfall was due to uncertainty (1.71% against 1.66% for the EEA/Swiss-type agreement), and the EEA/Swiss-type agreement leads clearly if most of it was (1.92% against 1.38%). Of 5,751 combinations of the uncertainty share (22–93%) and half-step changes in each agreement's legal-permanence score, the EEA/Swiss-type agreement ranks first among the partial options in 85% and the deep free trade agreement in the remaining 15%; the customs union and the sectoral landing never rank first. These shares count the combinations tested; they are not probabilities. The EEA/Swiss-type agreement leads whenever more than 28% of the investment shortfall is due to uncertainty (18–64% across the score changes), so the deep free trade agreement comes first only towards the macroeconomic end of the evidence.[3]

The second is what would happen under the TCA. The central case assumes that the shortfall in business investment would persist. If it narrowed along the path simulated with the National Institute Global Econometric Model (NiGEM) by Kaya et al. (2025), there would be less to recover, and membership would be worth 2.92%. A simpler rule, in which any settled agreement removes the uncertainty part in full whatever its legal form, would raise the partial agreements to as much as 2.33%. That rule treats a sectoral landing like membership and ignores the fact that the TCA is itself a settled agreement, so we do not use it as the central case.

The third is the productivity evidence. Reversing the part of the productivity loss measured by Bloom et al. (2025) that arose before the TCA, instead of using the literature on trade liberalisation, raises the gain from membership to 5.91%. This is an upper reading. It assumes that the productivity lost to uncertainty and disruption returns in full under membership and in proportion to legal permanence under the other agreements; if half of it returned, membership would be worth 4.7%.

Two results do not depend on how lost investment responds to a new agreement. Without any investment recovery, membership is worth 1.82% and the other agreements 0.33–0.86%. And EU tariffs on China lower the full gain only for the options that take on the EU's external tariff, membership (to 3.24%) and a customs union (to 0.95%).

5. EU trade policy and the choice between an EEA/Swiss-type agreement and a customs union

The two intermediate options offer different things. A customs union removes rules of origin and customs duties on UK–EU goods trade, but it obliges the UK to apply the EU's external tariff and leaves regulatory checks in place. An EEA/Swiss-type agreement removes regulatory barriers to goods and, depending on its form, to services, while the UK keeps its own external trade policy. Table 7 compares the two across the scenarios of this paper.

[3] Every combination of the uncertainty share and the score changes is weighted equally. The shares do not include the cost to a customs union of unwinding the UK's own trade agreements (Section 5.2), which would only lower it further.

Table 7: UK gain relative to the TCA: EEA/Swiss-type agreement and customs union across scenarios (% of real income)

Reading	Scenario	EEA/Swiss-type	Customs union	Customs union minus EEA/Swiss-type	Ahead
Goods trade costs only	2022 tariffs	+0.42%	+0.42%	+0.01	about level
Goods trade costs only	With US tariffs	+0.42%	+0.43%	+0.01	about level
Goods trade costs only	With US tariffs and a broad EU tariff on China	+0.42%	+0.13%	−0.29	EEA/Swiss-type
Goods trade costs only	Same, tariff revenue not counted	+0.42%	−0.01%	−0.43	EEA/Swiss-type
Goods trade costs only	Same, EU tariff only on products under trade defence	+0.42%	+0.41%	−0.01	about level
Goods trade costs only	Same, EEA/Swiss-type UK also applies the EU's China duties	+0.12%	+0.13%	+0.01	about level
Goods trade costs only	2022 tariffs, random-effects trade effects	+0.75%	+0.56%	−0.19	EEA/Swiss-type
Goods trade costs only	2022 tariffs, ψ = 1.01	+0.29%	+0.29%	0.00	about level
Full gain, long run	2022 tariffs	+1.79%	+1.26%	−0.53	EEA/Swiss-type
Full gain, long run	With US tariffs and a broad EU tariff on China	+1.79%	+0.95%	−0.84	EEA/Swiss-type
Full gain, long run	EEA-type: full access in services	+2.34%	+1.26%	−1.08	EEA/Swiss-type
Full gain, long run	Swiss-type: no access in services	+1.25%	+1.26%	+0.01	about level
Full gain, long run	Uncertainty share 22%	+1.66%	+1.30%	−0.36	EEA/Swiss-type
Full gain, long run	Uncertainty share 93%	+1.92%	+1.22%	−0.69	EEA/Swiss-type
Full gain, long run	Any settled deal recovers the uncertainty part	+2.17%	+1.91%	−0.27	EEA/Swiss-type
Full gain, long run	Brexit-based productivity	+3.10%	+2.14%	−0.96	EEA/Swiss-type

Notes: Goods trade costs only: the model of Section 6, with services non-traded. Full gain: goods and services trade, literature-based productivity and investment recovery, net of the cost of investment (Section 4). "About level": the difference is below 0.05 points. ψ = 1.99 unless stated.

In goods trade the two are about level under the 2022 tariff baseline, at 0.42% each, and the same holds with the 2025 US tariffs and with the whole-economy supply elasticity. With the random-effects estimates the EEA/Swiss-type agreement is ahead (0.75% against 0.56%). This comparison is the least precise result in the paper (Section 3.1 and Appendix A.4).

Once services, productivity and investment are counted, the EEA/Swiss-type agreement is ahead (1.79% against 1.26%). It opens services trade, brings a larger productivity gain from services reform and, being legally more permanent (0.625 against 0.375), brings back more of the lost investment. Its lead depends on access to services: with the full access of the EEA it is worth 2.34%, and with the sectoral access of the Swiss agreements

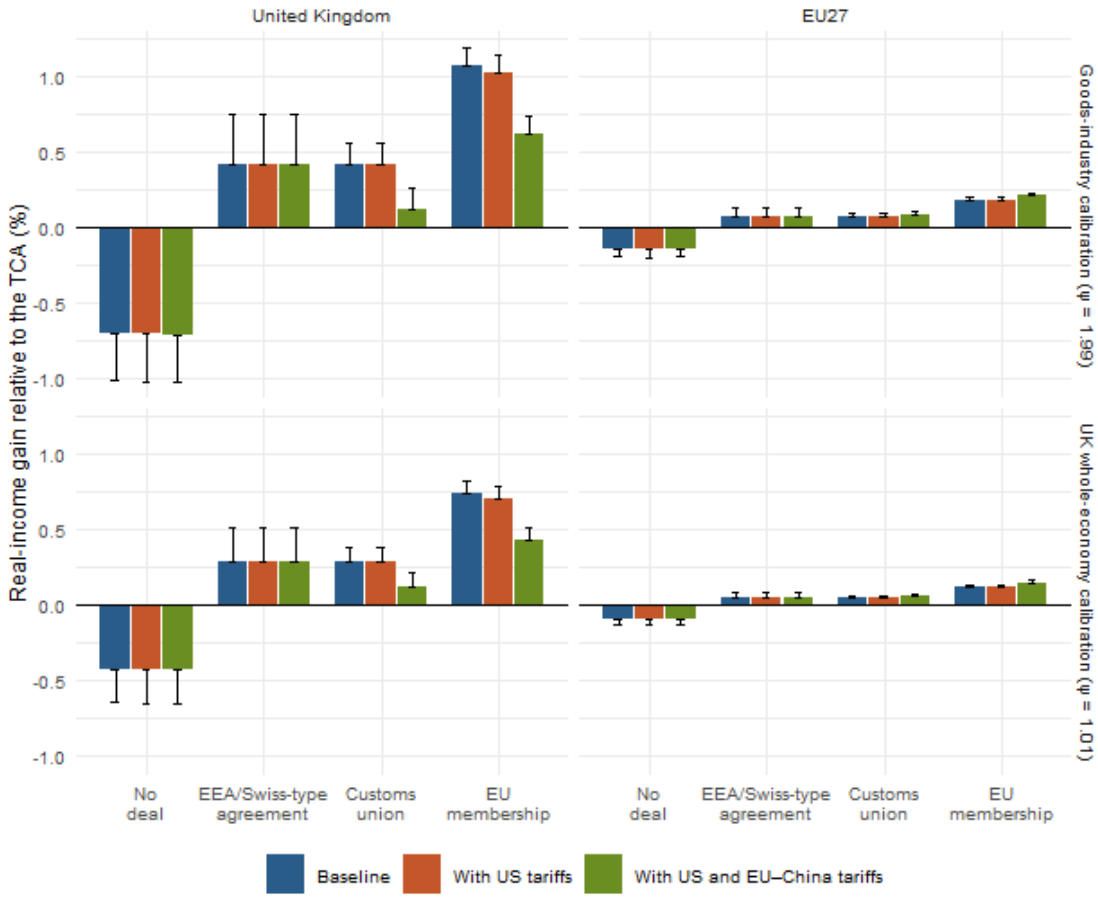
1.25%, about level with a customs union. The lead also widens with the share of lost investment due to uncertainty, from 1.66% against 1.30% at 22% to 1.92% against 1.22% at 93%.

5.1 The external trading environment

Table 8: UK real-income gain relative to the TCA in each trade environment (%; £bn a year at 2025 GDP in brackets)

Option	Baseline	With US tariffs	With US and EU–China tariffs
No deal (WTO terms)	−0.70% (−£21.4bn)	−0.70% (−£21.4bn)	−0.71% (−£21.5bn)
EEA/Swiss-type agreement	+0.42% (+£12.7bn)	+0.42% (+£12.8bn)	+0.42% (+£12.7bn)
Customs union	+0.42% (+£12.9bn)	+0.43% (+£13.0bn)	+0.13% (+£3.9bn)
EU membership	+1.08% (+£32.8bn)	+1.03% (+£31.3bn)	+0.63% (+£19.2bn)
EU membership, optimistic (1973 cohort)	+3.43% (+£104.3bn)	+3.38% (+£103.0bn)	+2.99% (+£90.9bn)
EU membership without adopting the EU's external tariffs	+1.08% (+£32.8bn)	+1.08% (+£32.9bn)	+1.08% (+£32.7bn)

Figure 2: UK and EU real-income gain relative to the TCA, by option and trade environment



Notes: Rows: central supply elasticity (ψ = 1.99) and UK whole-economy value (ψ = 1.01). Bars show the central estimates; whiskers extend to the alternative (multilevel random-effects) estimates.

The 2025 US tariffs leave the ranking unchanged (Table 8 and Figure 2). The TCA itself is barely affected (UK real income changes by −0.04% relative to the 2022 baseline), and only membership loses, by 0.05 percentage points, because the UK would then face the US tariff on EU goods (14.3%) rather than its own (10.4%).

An EU tariff on imports from China matters more. Membership loses 42% of its value and a customs union 70%, so that a customs union falls 0.29 percentage points below an EEA/Swiss-type agreement. The last row of Table 8 shows that most of the loss comes from the obligation to apply the EU's tariff on China, as imports from China fall and the prices of the goods affected rise. Options that leave UK external policy independent are unaffected. The figures include the revenue from the China tariff: under a customs union the UK would keep all of it, as Turkey does (0.14% of real income), and under membership 25% of it, the rest going to the EU budget.[4] Without the revenue a customs union would be worth −0.01% and membership 0.60%.

5.2 How broad would an EU tariff on China have to be?

Table 9 varies the share of imports from China covered by an EU tariff at the US rate (34.7%), from none to all.

Table 9: UK gain from lower goods trade costs relative to the TCA as the EU's tariff on China widens (%, ψ = 1.99)

Share of imports from China taxed	Customs union	Customs union, tariff revenue not counted	EEA/Swiss-type	EU membership
0%	+0.43%	+0.43%	+0.42%	+1.03%
10%	+0.39%	+0.35%	+0.42%	+0.96%
25%	+0.34%	+0.25%	+0.42%	+0.88%
50%	+0.26%	+0.13%	+0.42%	+0.77%
75%	+0.19%	+0.05%	+0.42%	+0.69%
100%	+0.13%	−0.01%	+0.42%	+0.63%

Notes: The third environment of Section 2 (US tariffs and an EU tariff on China), with the EU (and the UK under a customs union or membership) applying 34.7% to the stated share of imports from China, entered as an average tariff on all imports from China. The EEA/Swiss-type UK keeps its own China policy. A tariff on the products under EU trade defence covers about 7.5% of EU imports from China.

Without any cost of unwinding the UK's own trade agreements, the two options are level without a China tariff, and a customs union falls behind once the EU's tariff covers about 2% of imports from China (5% with ψ = 1.01). If that cost arose, it would be behind at every level of coverage. This threshold marks the point at which two near-equal estimates cross, and it depends on the 34.7% rate and on how coverage is converted into an average tariff. The gap becomes material only with wide coverage: 0.16 percentage points when half of imports from China are taxed and 0.29 points when all are. A tariff confined to the products already under EU trade defence would cost a customs union almost nothing

[4] The 25% retention rate applies to the 2021–2027 multiannual financial framework (European Commission, "Customs duties", *https://commission.europa.eu/strategy-and-policy/eu-budget/long-term-eu-budget/2021-2027/revenue/own-resources/customs-duties_en*). The payment to the EU budget would lower every member state's GNI-based contribution a little, so a small part of it would come back to the UK; we ignore this and credit the 75% to the EU27 in proportion to GDP.

(0.41% against 0.42%). Membership remains the most valuable option at every level of the China tariff, because its trade-cost gain is more than twice that of a customs union.

An EEA/Swiss-type agreement may not leave UK trade policy fully independent. If the EU required the UK to follow its trade defence against China, the EEA/Swiss-type agreement would lose most of its gain under a broad tariff (0.12%) and would be about level with a customs union (0.13%) (Appendix F.4). A customs union therefore falls clearly behind only if the EU taxes imports from China broadly and the UK keeps its own China policy under the EEA/Swiss route. Keeping that policy may not be costless: a Franco-German proposal would make the UK's place in the EU's "Made in Europe" preferences depend on aligning with EU tariffs on Chinese electric vehicles (Du, 2026). That would link this choice to the exposure discussed in Section 6.3, a link we do not model.

A customs union would also require the UK to apply the EU's external tariff to partners with which it has its own trade agreement but the EU has none in force: India (since 15 July 2026), Australia, and Malaysia and Brunei through the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). If these partners withdrew their preferences on UK goods and the UK applied its pre-agreement tariffs to their goods, the UK gain from a customs union would fall by 0.03 percentage points (about £0.9 billion a year), about three-quarters of it from India, to 0.39%. For India we use the Department for Business and Trade's estimate of India's tariff cuts at maturity rather than its most-favoured-nation rate. The cost ranges from 0.002 points, once the EU's concluded agreements with Australia and India are in force, to 0.05 points if the agreements' non-tariff effects are lost as well. If it arose, it would put a customs union slightly below an EEA/Swiss-type agreement in all three trade environments, although the goods estimates would remain broadly level. The full gains of Section 4 and the ranking shares of Section 4.1 do not include it, and it would only lower the customs union further. One further feature is not modelled: on the EU–Turkey model, the EU's trade partners would gain access to the UK market without the UK gaining reciprocal access to theirs. The customs-union figures in this paper are therefore best read as upper estimates.

6. Gains from lower trade costs in goods trade

This section reports the gains from lower trade costs alone, in the model in which services are not traded. They are the best-measured part of the full gains.

6.1 Effects on the UK, its trade and the EU

Table 10: Long-run effects on the UK economy relative to the TCA (baseline environment, % change)

Option	Real income	Real income, £bn a year	Real output	Consumer prices	Real exports	Real imports	Real income, $\psi = 1.01$
No deal (WTO terms)	−0.70%	−21.4	−0.61%	+1.04%	−16.4%	−11.6%	−0.42%
EEA/Swiss-type agreement	+0.42%	+12.7	+0.28%	−0.32%	+7.6%	+5.4%	+0.29%
Customs union	+0.42%	+12.9	+0.29%	−0.33%	+7.7%	+5.4%	+0.29%
EU membership	+1.08%	+32.8	+0.72%	−0.78%	+19.5%	+13.8%	+0.74%
EU membership, optimistic (1973 cohort)	+3.43%	+104.3	+2.30%	−2.10%	+61.6%	+43.8%	+2.35%

Each step towards deeper integration raises UK real income, and a breakdown of the TCA reduces it (Table 10). Membership raises real income by 1.08%, about £33 billion a year, as cheaper EU goods replace domestic and third-country supply and UK producers expand into the EU market. UK goods exports to the EU rise by 40%, about £72 billion a year, and imports from the EU by 32%, while trade diverted from third countries is small: UK imports from China fall by 3.4% (Appendix F.3). A customs union and an EEA/Swiss-type agreement each deliver about 39% of the gain from membership, and a breakdown of the TCA would cost 0.70% of real income (£21 billion a year).

With the average post-accession effect estimated for the UK's own 1973 accession cohort (Nagengast, Rios-Avila and Yotov, 2025), membership would be worth 3.43%. In 1973 the UK joined from tariffs rather than from a free trade agreement, so we treat this as an optimistic bound rather than a forecast (Appendix D). With the whole-economy supply elasticity the effects on real income are about 31% smaller, but the ranking does not change. It is also robust to the choice of estimator, although the comparison between the customs-union and EEA/Swiss rungs is sensitive to single studies and the customs-union estimate to how the EU–Turkey evidence is treated (Appendix F.5).

The EU also gains from every step of integration. Membership raises the real income of the EU27 by 0.19%, which, because the EU27 economy is about five times the size of the UK's, is of a similar order in absolute terms. Ireland's real income rises by 0.68%, about two-thirds of the UK's own gain.

6.2 A deepened TCA ("TCA Plus")

The reset agenda aims to deepen the TCA rather than replace it. We model this in two ways, neither of which changes the UK's external trade policy. The first is a sectoral landing priced with our own estimates: a veterinary (SPS) agreement, which would raise UK agri-food exports to the EU by 22.5% and imports by 5.6% (Du, Messenger and Shepotylo, 2024), and mutual recognition of conformity assessment, which would raise trade by 9.8% in Harmonised System chapters outside agri-food (Du, Shepotylo and Zhang, 2025). The second moves the TCA to the deep-FTA rung of the meta-analysis. That rung rests on only five studies, so we treat it as an upper reading.

The sectoral landing would raise UK real income by 0.28%, about £8.6 billion a year, and UK goods exports to the EU by 11.0%, about two-thirds of the gain from an EEA/Swiss-type agreement. Mutual recognition contributes much more than the veterinary agreement (0.25% against 0.04%), because it covers a larger share of trade. As a deep free trade agreement, TCA Plus would be worth 0.50%, more than a customs union or an EEA/Swiss-type agreement in goods trade, which reflects the thin evidence on these rungs rather than a firm ranking. Both gains are unchanged when the EU taxes China. Appendix F.6 reports the variants.

6.3 Exposure to "Made in Europe" rules

The European Commission proposed the Industrial Accelerator Act on 4 March 2026. It would set "Made in EU" and low-carbon requirements in public procurement and public support schemes, initially for steel, aluminium, cement, the automotive sector and net-zero technologies.

Table 11: UK goods exports to the EU27 in Industrial Accelerator Act sectors, 2025

Sector	£bn a year	Share of UK goods exports to the EU27 (%)	EU27 share of the sector's UK exports (%)
Steel (HS 72, 7301–7306)	3.0	1.7	49
Aluminium (HS 76)	1.8	1.0	53
Cement (HS 2523)	<0.1	<0.1	83
Motor vehicles and parts (HS 8701–8708)	14.3	7.9	44
of which battery electric cars (HS 870380)	1.0	0.6	76
Net-zero technologies (batteries, solar, wind, heat pumps, electrolysers, nuclear)	0.5	0.3	74
All Industrial Accelerator Act sectors	19.7	10.8	46

Notes: HS6 trade data reported by the UK (HMRC), calendar year 2025. Non-monetary gold (HS 7108) is excluded from all totals and shares. £ values apply each sector's share of UK goods exports to the EU27 to the ONS 2025 total. The EU27 takes 47% of all UK goods exports excluding gold in these data (41% including gold).

These sectors account for 11% of UK goods exports to the EU, about £20 billion a year, of which vehicles and parts make up £14 billion (Table 11). These values are upper bounds, because the requirements would bind only on demand linked to public procurement and public support. The exposure turns on whether UK origin counts rather than on Chinese content: Chinese value added makes up 2.5% of UK goods exports to the EU, less than in trade among EU members (3.1%), and in the sectors covered by the act it is similar to intra-EU trade (Appendix F.7).

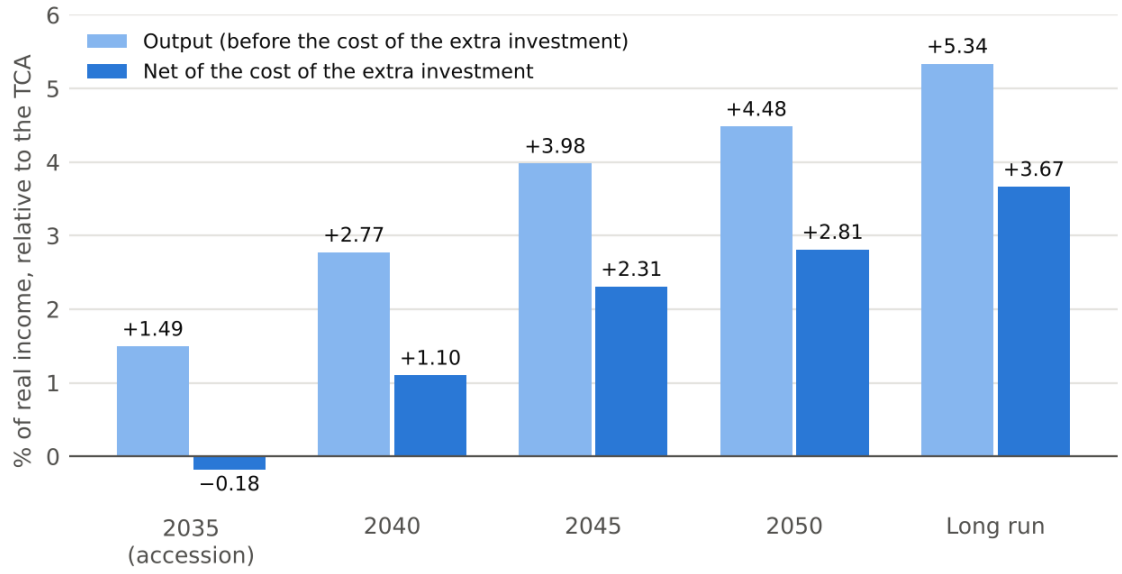
7. Re-joining over time

The results above compare long-run equilibria. Re-joining would not deliver them at once: accession takes several years, trade effects build up afterwards, and the capital stock rebuilds only gradually. We trace the full gain from membership year by year, combining lower trade costs, productivity and the recovery of investment on one timetable.[5]

We assume that the UK applies in 2030, after a general election due by 2029, and joins in 2035, close to the time Austria took in the 1995 enlargement. Trade-cost and productivity effects phase in along the average path of the 1995 and 2004 enlargements, which, like a UK re-joining from the TCA, joined from existing free trade or EEA agreements. Their year-by-year effects come from Nagengast, Rios-Avila and Yotov (2025), and they start two years before accession to capture anticipation. Investment responds earlier: the uncertainty part of the shortfall lifts once the decision is taken, so the extra investment builds up over 2031–2035, while the capital stock it adds grows only gradually.

[5] The path is a model scenario, not a forecast. Trade-cost and productivity effects reach about 40% of their long-run value at accession and 60% by 2040. The rise in investment builds up over 2031–2035 and then stays at its full level, while the capital stock catches up gradually (investment of 6% of the capital stock, depreciation of 4%). Each year is a comparative static on the 2022 economy with no trend growth, and the investment shortfall persists under the TCA. A breakdown of the path by layer is available for 2035, 2040 and the long run.

Figure 3: UK real-income gain from EU membership relative to the TCA over time, before and net of the cost of the extra investment (central case, 2022 tariff baseline, ψ = 1.99)



Notes: Long run: the value the path approaches by about 2060.

Table 12: UK real-income gain from EU membership relative to the TCA over time, central case

	2035	2040	2045	2050	Long run
Output (before the cost of the extra investment)	+1.49%	+2.77%	+3.98%	+4.48%	+5.34%
Cost of the extra investment	−1.67%	−1.67%	−1.67%	−1.67%	−1.67%
Net gain	**−0.18%**	**+1.10%**	**+2.31%**	**+2.81%**	**+3.67%**
Net gain, £bn a year at 2025 GDP	−5	34	70	86	112

Notes: 2022 tariff baseline, ψ = 1.99. Application in 2030, accession in 2035. Output includes lower trade costs in goods and services, productivity and the larger capital stock; the net gain deducts the cost of the extra investment, as in Table 5. Long run: the values reported in Section 4, which the path approaches by about 2060. Money values apply the percentage gains to 2025 GDP, without trend growth.

Output rises from the start (Figure 3 and Table 12). Under membership it is 1.5% higher than under the TCA at accession in 2035 and 2.8% higher by 2040. In 2035 about half of the output gain comes from lower trade costs and productivity (0.75 points) and half from the larger capital stock (0.74 points); by 2040 the contributions are 1.07 and 1.70 points. Net of the cost of the extra investment, the gain is slightly negative at accession (−0.18%). The extra investment, about 1.67% of GDP a year, is paid for in full from 2035, before the capital stock it builds has caught up and before most of the trade effect has arrived. This reflects the timing assumed for investment rather than a cost of membership itself. The net gain is 1.1% by 2040, 2.3% by 2045 and 2.8% by 2050, about three-quarters of its long-run value of 3.67%, which it approaches by about 2060.

The trade-cost part of the path on its own, and an optimistic path based on the UK's 1973 accession, are reported in Appendix D. The partial agreements are not shown here, because the timetable above, which they share in our runs, is unlikely to apply to them: a veterinary agreement or a deeper TCA could come into force well before 2035. Their

paths on the common timetable are in Appendix D.3 for illustration; estimating them with an earlier start is left for further work.

8. Services trade and re-joining the EU

The results of Section 6 lower barriers to goods trade only, yet services are as large a part of UK–EU trade as goods: in the OECD Inter-Country Input-Output table for 2022, UK sales of services to the EU27 are US$235 billion, against US$229 billion of goods exports. Studies of UK services trade since the referendum find losses of about 5–20% (Douch and Edwards, 2021; Ahmad et al., 2023; Bhalotia, Dhingra and Arnold, 2025; Du and Shepotylo, 2026), and gravity estimates of the long-run effect of the single market are larger (Mayer, Vicard and Zignago, 2019).

8.1 The size of the services shock

We estimate the effect of Brexit on UK–EU services trade directly, with a structural gravity equation for bilateral services trade among 56 economies in 2005–2023, estimated by PPML with exporter-year, importer-year and pair fixed effects (Appendix F.8). UK–EU services trade since 2021 has been 16% below its pre-referendum level, relative to the UK's and EU members' services trade with other partners (a coefficient of −0.175, with a standard error of 0.059). The gap opened in 2018 and has stayed between 16% and 17% since 2021, and UK exports to the EU fell more than EU exports to the UK. Reversing it implies a services shock of 0.175 log points from re-joining, an increase of 19%. This lies at the upper end of the ex post evidence and below the long-run single-market estimates. As a low case we use 0.101, which reverses the average effect of TCA barriers found by Bhalotia, Dhingra and Arnold (2025), and as a high case 0.285, the single-market effect of Mayer, Vicard and Zignago (2019).

8.2 Adding services to the model

We add services trade to the baseline and apply a services shock alongside the goods shock. Exports of services from economy *i* to *j* are the sales of services industries (ISIC G–T) in *i* to intermediate and final users in *j* in the OECD Inter-Country Input-Output table for 2022. They are added to goods trade and subtracted from internal trade, so gross output is unchanged, and UK exports rise from 9% to 19% of gross output. Because the model has a single sector, the two shocks are combined for each UK–EU pair using its 2022 trade mix,

$$\Delta\beta_{ij} = \ln\left(w_{ij}^{g}\, e^{\Delta\beta_g} + w_{ij}^{s}\, e^{\Delta\beta_s}\right),$$

where w_{ij}^{s} is the services share of the pair's trade, $\Delta\beta_g = 0.316$ is the goods shock for membership used throughout, and $\Delta\beta_s$ is the services shock. The same aggregation is used for the sectoral landing (Section 6.2). We run the scenario in the baseline environment only, because in a one-sector model the 2025 tariffs would also fall on services.

8.3 Results

Table 13: UK real-income gain from re-joining the EU relative to the TCA, with and without services liberalisation (baseline environment; £ billion a year at 2025 GDP in brackets)

Scenario	Services Δβ	ψ = 1.99	ψ = 1.01	ψ = 0
Goods only, services non-traded (Section 6)	—	+1.08% (£32.8bn)	+0.74% (£22.5bn)	+0.39% (£11.7bn)
Goods only, services traded in the baseline	0	+1.16% (£35.3bn)	+0.79% (£24.2bn)	+0.40% (£12.3bn)
Goods and services: central (own estimate)	0.175	+1.59% (£48.4bn)	+1.09% (£33.1bn)	+0.55% (£16.8bn)
Goods and services: by direction (own estimate)	0.234 / 0.103	+1.59% (£48.3bn)	+1.08% (£33.0bn)	+0.55% (£16.7bn)
Goods and services: low (ex post TCA barriers)	0.101	+1.40% (£42.6bn)	+0.96% (£29.2bn)	+0.49% (£14.8bn)
Goods and services: high (Single Market, long run)	0.285	+1.90% (£57.9bn)	+1.30% (£39.6bn)	+0.66% (£20.1bn)
Services only (central)	0.175	+0.43% (£13.1bn)	+0.29% (£8.9bn)	+0.15% (£4.5bn)

Notes: Services Δβ is the shock to UK–EU services trade costs (UK exports / UK imports where they differ). Every row except the services-only row also includes the goods shock for membership used throughout (Δβ = 0.316).

With services traded and liberalised, re-joining raises UK real income by 1.59% (£48 billion a year), against 1.16% with the goods shock alone (Table 13). Services liberalisation adds 0.43 percentage points (£13 billion), or about 37%, and 0.24–0.74 points across the low and high shocks. Treating services as traded changes little by itself: with the goods shock only, the gain is 1.16%, close to the 1.08% of Section 6. The two shocks are close to additive, since the services shock alone is worth 0.43%, and a shock that differs by direction (0.234 on UK exports, 0.103 on UK imports) gives almost the same result as the symmetric one. With ψ = 1.01 services add 0.29 points (£9 billion), and with ψ = 0, 0.15 points. The EU gains too: the EU27 gain rises from 0.19% to 0.27%, and Ireland's from 0.77% to 1.31%.

Four caveats apply. The services flows in the input–output table exceed the balance-of-payments figures, so the money values may be on the high side. The services shock rests on three years of data since the TCA, and services trade may adjust further, which the high case allows for. Activity relocated to EU affiliates shows up as lost exports, and not all of it would return. And the one-sector model spreads the services shock over all trade between each pair, so it cannot locate it in financial, professional or other business services.

9. How the results compare with other estimates

Earlier studies estimate the cost of leaving from membership, whereas we measure the gain from moving on from the TCA. To compare them, we express each of our options relative to membership, as the gain from membership minus the gain from the option.

9.1 Earlier estimates of the options

Table 14: Earlier estimates of the options and this paper's estimates, relative to EU membership (% of income)

Study	Approach	Measure, horizon	Effect by option	Ranking
HM Treasury (2016)	Gravity estimates of the trade and FDI effects of membership, with external estimates of the effect of trade on productivity	GDP, 15 years	EEA −3.8 (−3.4 to −4.3); negotiated bilateral agreement −6.2 (−4.6 to −7.8); WTO −7.5 (−5.4 to −9.5)	EEA > bilateral agreement > WTO
Dhingra et al. (2017)	Multi-sector quantitative trade model with trade in intermediates; counts lower budget contributions and exclusion from future integration within the EU	Welfare, long run	EEA (soft Brexit) −1.3; Swiss-type −1.4; WTO (hard Brexit) −2.7; with dynamic productivity effects (reduced form, EFTA) −6.3 to −9.4	EEA > Swiss-type > WTO
Sampson (2017)	Review of model-based and reduced-form estimates	Income per capita, long run	Plausible range −1 to −10 across options and methods; estimates with FDI and productivity effects 2–3 times those of trade models	Single Market > outside it
HM Government (2018)	Trade model with a link from openness to productivity; no change to migration arrangements	GDP, about 15 years	White Paper −0.6 (−1.3 to −0.1); EEA-type −1.4 (−2.4 to −0.9); average FTA −4.9 (−6.4 to −3.4); no deal −7.7 (−9.0 to −6.3)	White Paper > EEA-type > FTA > no deal
This paper: lower trade costs	Meta-analysis of gravity studies; universal gravity model; goods and services trade	Real income, long run	EEA-type −0.71; customs union −1.13; deep FTA −0.85; Swiss-type −1.14; FTA (TCA) −1.59; WTO terms −1.78 (goods only)	EEA-type > deep FTA > customs union ≈ Swiss-type > FTA (TCA) > WTO terms
This paper: full gain	As above, plus productivity and investment recovery, net of the cost of the extra investment	Real income, long run	EEA-type −1.32; customs union −2.40; deep FTA −2.12; Swiss-type −2.42; FTA (TCA) −3.67	EEA-type > deep FTA > customs union ≈ Swiss-type > FTA (TCA)

Notes: Negative values are losses relative to EU membership, in per cent. For this paper, they are the gain from membership minus the gain from the option, both relative to the TCA (2022 tariff baseline, $\psi = 1.99$). The TCA stands in for a standard free trade agreement. The EEA-type and Swiss-type agreements are the variants with full and with no access to the single market in services (Section 5). WTO terms are available for goods trade only. Ranges in brackets: HM Treasury (2016), executive summary; HM Government (2018), Table 4.10, Monte Carlo ranges. The Swiss-type and reduced-form estimates of Dhingra et al. (2017) are from the discussion-paper version. The earlier studies estimate the cost of leaving the EU, and this paper the gain from moving on from the TCA; horizons, income measures and the treatment of migration and budget contributions also differ.

Every earlier study ranks an EEA-type arrangement above a free trade agreement, and so do we (Table 14). In the full results an EEA-type agreement leaves UK real income 1.32%

below membership and the TCA 3.67% below. Both lie inside the ranges of HM Government (2018), 0.9–2.4% for an EEA-type agreement and 3.4–6.4% for an average free trade agreement, and both are smaller than the estimates of HM Treasury (2016), which combine gravity estimates of the trade effects with external evidence on the effect of trade on productivity. That reduced-form route gives larger costs than a trade model: Dhingra et al. (2017) find 6.3–9.4% this way, against 1.3–2.7% in their trade model. On lower trade costs alone our gap between membership and the TCA is 1.59%, between Dhingra et al.'s losses for soft and hard Brexit, which also count lower budget contributions and the UK's exclusion from future integration within the EU.

The new element is the middle of the ladder. None of the four earlier analyses estimated a customs union, and none distinguished a deep from a standard free trade agreement. HM Government (2018) ranked its White Paper scenario, which rested on a common rulebook for goods, above the EEA-type scenario, but that arrangement was not adopted. In Dhingra et al. (2017) a Swiss-type agreement costs only a little more than the EEA, because it raises barriers only in services and lowers budget contributions. In our estimates the Swiss-type agreement falls well behind the EEA-type agreement, because it gives no access in services and has less legal permanence, and so brings back less of the lost investment. On lower trade costs alone an EEA-type agreement is ahead of a deep free trade agreement, and a customs union is behind both. Once investment is counted, the EEA-type agreement moves further ahead, because it has the legal permanence that a free trade agreement lacks (Section 4).

9.2 Synthetic-control estimates and the OBR's assumption

Synthetic-control studies compare the UK with a weighted combination of other economies and put the total cost of Brexit so far at 1.7–2.5% of output by the end of 2018 (Born et al., 2019) and 3.0–6.7% at the end of 2021 (Springford, 2022a, 2022b, 2023). Our membership result, 3.67% net of the cost of the extra investment, lies at the lower end of this range and below the 6–8% fall in GDP per capita estimated by Bloom et al. (2025); with productivity calibrated to the Brexit evidence it is 5.91% (Appendix F.9). The comparison suggests that our central result is not too large, but it should not be pushed far: the ex post estimates attribute any shock specific to the UK since 2016 to Brexit, depend on the choice of donor economies, and measure the cost of leaving rather than the gain from returning.

The trade effects are close to the assumption of the Office for Budget Responsibility (OBR), which takes UK exports and imports to be 15% lower in the long run than if the UK had remained in the EU (OBR, 2025); in our membership scenario UK international trade is 16% higher. What differs is how trade maps into income. In the trade model alone the gain is 1.08%, or 1.59% with services, against the OBR's 4% of productivity, a gap typical of quantitative trade models (Arkolakis, Costinot and Rodríguez-Clare, 2012); empirical estimates of the effect of trade on income are larger (Feyrer, 2019). With productivity and investment the full gain from membership, 3.7% net of the cost of investment, is of the same order as the OBR's assumption.

Two further points limit the comparison. The literature on trade liberalisation explains about a third of the 2.8% fall in productivity measured by Bloom et al. (2025); about 90% of that fall arose before or in the year the TCA began, when trade costs had barely changed. And not all of the cost would be reversed: some losses are sunk, and the effects of exit and re-entry need not be symmetric.

10. Discussion and policy implications

The gains from lower trade costs are the best-measured part of our results: about £48 billion a year for membership, including services, and £8.6 billion a year for a sectoral landing built on the veterinary agreement and mutual recognition. The government estimates that an SPS agreement would raise UK GDP by up to 0.14% in the long run and linking the emissions trading schemes by 0.1%: together about 0.24%, or close to £9 billion when scaled to projected GDP in 2040 (Department for Business and Trade, 2025; HM Treasury, 2025). Both are long-run comparative statics without a transition path. Most of the SPS gain comes from lower costs on imports from the EU, and the emissions-trading gain reflects a lower cost of meeting emissions targets rather than more trade. Our estimates are not directly comparable. For the veterinary agreement alone we find 0.04% of real income (about £1.1 billion a year), about a quarter of the government's estimate, because our shock comes from ex post gravity evidence while the government's rests on a larger cut in the cost of imports. Our sectoral landing includes mutual recognition, which the government's package does not, and our model has no emissions-trading component.

10.1 What the findings imply for policy

As the Introduction notes, the estimates do not settle which option the UK should choose, which rests on political judgements and on what the EU would agree. They do, however, bear on how any option is designed and pursued.

First, much of the gain from any agreement short of membership comes from the return of investment, and that depends on how hard the agreement would be to undo. Enforcement by a court, rules that move with EU law and the absence of a built-in exit raise the value of whatever is negotiated; without them, even a deep free trade agreement brings back little of the lost investment. Second, for any route through the single market, coverage of services matters as much as coverage of goods: an agreement with the services access of the EEA is worth almost twice one with the sectoral access of the Swiss agreements. Third, a customs union is the most conditional option. Its value depends on EU trade policy towards China and on whether the UK's own trade agreements would have to be unwound, and it should be assessed with both in view. Fourth, the near-term reset agenda is worth securing in its own right, and the dynamic alignment it involves in the veterinary and conformity-assessment agreements is a building block for any deeper arrangement rather than a step that closes options off. Finally, comparisons between options should be made on a common basis against the TCA, with the better-measured gains from lower trade costs reported separately from the larger but less certain gains from investment. Membership offers the largest gains under every assumption we consider, but they take time to arrive, and both the UK and the EU would gain from closer integration, which is relevant to the negotiations ahead.

10.2 Swiss Plus

The concept note of the British Chambers of Commerce combines three elements. The first is Swiss-type access to the single market, in the form that Switzerland is to have under its 2026 package with the EU. The package updates Switzerland's existing single-market agreements, including those on free movement of persons, land and air transport, mutual recognition of conformity assessment and agriculture, and adds agreements on

food safety and electricity. In these areas Switzerland would apply EU law dynamically, with a common mechanism for settling disputes, but most services remain outside: there is no agreement on financial services, and core professional services have no privileged access. The second is a UK-wide customs union, modelled on the customs union in the 2018 "backstop" text of the Withdrawal Agreement but also covering fisheries. It would create a single customs territory with no tariffs or quotas between the UK and the EU, and the UK would apply the EU's common external tariff and trade remedies. The UK would not take part in EU trade negotiations or benefit from EU trade agreements, so it would negotiate its own arrangements with other partners within the EU's tariff. The third, possibly, is a common VAT zone, in which sales between the UK and the EU would be treated as internal, removing import VAT formalities.

The Chambers describe the combined effect as near-frictionless movement of goods and free movement of persons, perhaps with an emergency brake, with access for services and capital close to that under the TCA. Compared with membership, Swiss Plus would leave out most services and capital, a UK vote on EU rules and on the external tariff, and the EU's trade agreements with third countries. Compared with a customs union alone, it would add regulatory alignment in the goods sectors covered and free movement of persons.

Our estimates give reference points for Swiss Plus, not bounds. In goods trade a customs union is worth 0.42% and membership 1.08%. Swiss Plus would add regulatory alignment, fisheries and possibly a common VAT zone to a customs union, and leave out most services and the EU's trade agreements, so its value need not lie between the two. The customs-union and EEA/Swiss-type effects cannot simply be added, because some of the customs-union evidence comes from the EU–Turkey customs union, which also involves regulatory alignment (Section 3.1). And because Swiss Plus would apply the EU's external tariff, its value would depend on EU tariff policy towards China in the same way as a customs union's.

Where Swiss Plus lies relative to these reference points depends on which customs, regulatory and services frictions it removes. Our next paper will estimate each element from the closest real cases, including the EU–Turkey customs union, Northern Ireland under the Windsor Framework and the Swiss agreements, and combine them in a multi-sector model to measure the gap between Swiss Plus and full membership. It will also examine how exposed UK sectors are to the EU's "Made in Europe" rules, and on what terms UK-made goods would qualify under each arrangement.

10.3 Beyond the estimates

Our results suggest that the value of an option depends on its components, such as services access, legal permanence and the external tariff, as much as on its label, which points to a less binary framing than in or out. The terms of market access also extend beyond the provisions we model. For a vehicle manufacturer, an agreement could simplify customs procedures and conformity assessment while leaving separate questions about the approval of driving software and the use of vehicle data (Du, 2026). Such provisions affect which products firms can sell and which services they can supply alongside them, and the UK's relationship with the EU extends in the same way to research, data and digital services. A sector-level assessment of the options would need to examine these requirements alongside tariffs and border procedures; that is a question for further work, not a finding of this paper.

11. Limitations and further research

The investment results rest on judgements. The share of the investment shortfall due to uncertainty is imprecisely estimated: the firm-level value of 93% has a 90% interval that reaches down to 31–46%, and the macroeconomic value is 22%. The legal-permanence scores are our own judgement, and the central case assumes that the shortfall would persist under the TCA. Table 6 shows how much these choices matter.

We show uncertainty as ranges rather than confidence intervals. The trade effects are imprecise, especially for a customs union and EEA/Swiss-type arrangements (Appendix A.4), and the productivity evidence rests on four to six studies per channel. We report alternative estimates and leave-one-study-out ranges, but do not yet carry the sampling uncertainty through to the welfare results, so differences of a few hundredths of a point should not be read as rankings.

The options are stylised. The EEA and Swiss arrangements are pooled in the trade evidence. The cost to a customs union of unwinding the UK's own trade agreements is estimated for goods trade only and is not included in the full gains, and the asymmetry of the EU–Turkey model is not modelled; both would lower its value. Intermediate packages such as Swiss Plus are not estimated, and a companion paper will estimate Swiss Plus directly against membership. Nor do the estimates price net budget contributions, free movement of people or influence over EU rules (Section 1). They also leave out effects outside trade, investment and productivity as modelled here, including research and science collaboration, data and AI services, the movement of skilled people, and foreign direct investment in both directions. The productivity layer draws on evidence from tariff and services liberalisation, and does not capture effects working through the range of products exported or the entry of new exporters. The time paths in Section 7 give every option the same timetable, so we report them for membership only; paths with an earlier start for the partial agreements, and a breakdown of the path by layer at every date, are left for further work.

The model has one aggregate sector, and input–output linkages enter only through a single aggregate intermediate input (Appendix B). The meta-analysis suggests that the EU effect is about three times larger for agri-food than for manufacturing. A multi-sector model (Caliendo and Parro, 2015) would place the sectoral agreements and a targeted EU tariff on China in the sectors they affect. Tariff revenue is added to real income after the model is solved; under membership the UK keeps 25% and pays 75% into the EU budget, and we ignore the small part that would return to the UK through lower contributions.

Finally, the coding of the gravity meta-analysis has been checked against eight replication packages and, for a sample of 686 estimates, by hand against the papers, and the errors found have been corrected. For the productivity review, the output measure behind each main estimate has been checked against the papers, but not every row of either dataset has been verified.

12. Conclusions

This paper estimates, on a common basis, what each option for the UK's relationship with the EU would mean for UK incomes relative to the TCA. Lower trade costs, the best-

measured part of the gains, would raise real income by 1.59% under membership and by 0.30–0.74% under the other agreements. Counting productivity and the recovery of investment, the long-run gains rise to about 3.7% and 0.9–1.8%. How much of the lost investment returns depends on how hard the new arrangement would be to undo, and the value of a customs union depends on EU trade policy towards third countries. Our next paper compares Swiss Plus directly with full membership.

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Appendix A. Meta-analysis of the trade effects of integration

A.1 Sample and coding

The sample comprises the 37 primary gravity studies in our literature database, published between 2003 and 2025, which report 3,554 coefficients on integration variables. Each coefficient is one observation, recorded with its standard error (reported, or derived from t-statistics, p-values or confidence intervals) and the design features of its regression. These features are the estimator, the fixed effects, the use of domestic trade flows, controls for globalisation, the lag structure, the sample period, the sector and the data source. Effects of nested variables, such as EU membership on top of a regional agreement, are converted into total effects, and lagged effects are summed into cumulative effects. Third-country effects, effects on individual margins and anticipation effects are excluded from the core sample, and pair-specific and sector-specific estimates are analysed separately. The analysis sample contains 1106 aggregate estimates with standard errors from 35 studies. Where replication materials were available, the coded estimates were verified against them for eight studies.

A.2 Pooled effects and publication bias

Table 15: Partial trade effects by depth of integration (log points)

Integration type	Estimates	Studies	Study-weighted mean	Multilevel random effects	PET-PEESE	WAAP	Best practice	SE
Shallow preferential agreement	74	10	0.182	0.172	0.136	0.142	0.129	0.052
Regional agreement (unspecified)	410	28	0.304	0.273	0.231	0.238	0.164	0.035
Free trade agreement	148	15	0.292	0.299	0.161	0.161	0.148	0.039
Deep free trade agreement	68	5	0.424	0.471	0.207	0.298	0.306	0.047
Customs union	79	15	0.517	0.476	0.424	0.431	0.284	0.075
EEA/EFTA/Swiss arrangement	48	4	0.376	0.529	0.519	0.427	0.282	0.075
EU membership	133	13	0.499	0.643	0.477	0.499	0.463	0.075
Euro (incremental to EU membership)	131	5	0.234	0.234	−0.048	0.108	0.066	0.077
Individual provisions (e.g. mutual recognition)	15	2	0.098	0.161	–	–	0.163	0.072

Figure 4: Funnel plots: estimates against their precision, by depth of integration

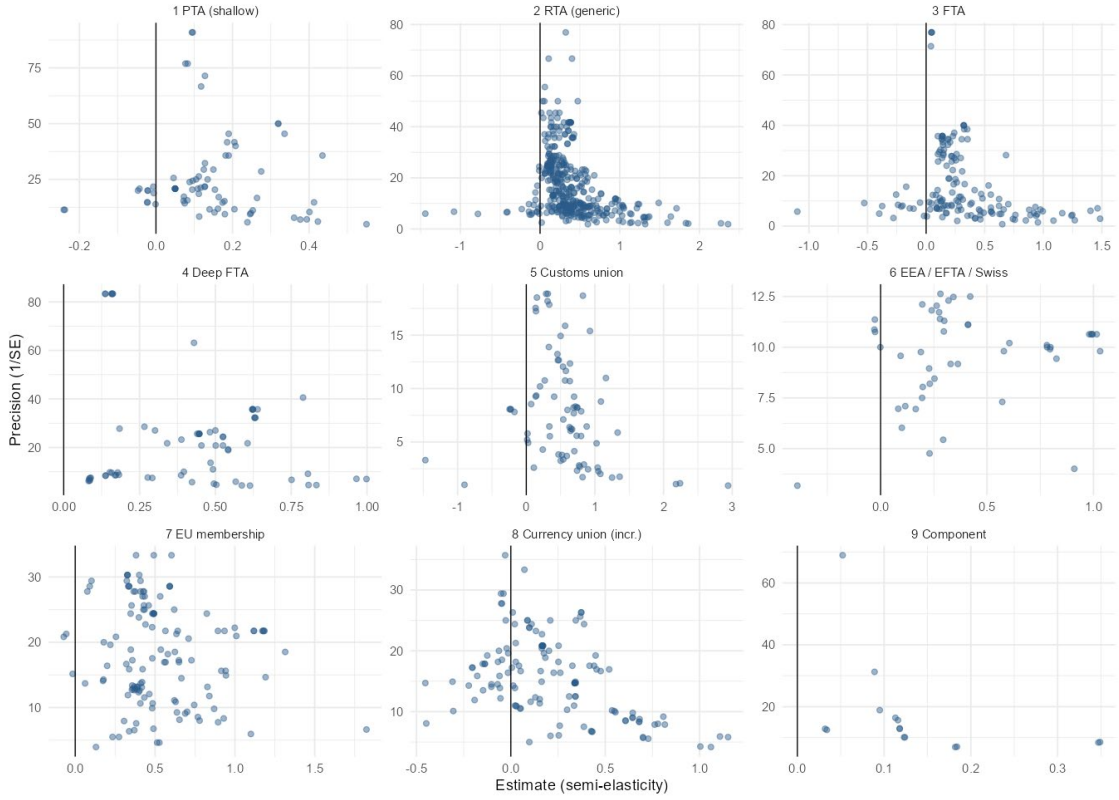


Table 15 reports pooled estimates from alternative estimators. The funnel plots (*Figure 4*) and the precision-weighted meta-regression indicate moderate publication bias: the coefficient on the standard error is 1.54 (standard error 0.26). Estimates corrected for publication bias by the PET-PEESE (Stanley and Doucouliagos, 2014) and WAAP procedures remain positive and significant for regional agreements, FTAs, customs unions, EEA/Swiss arrangements and EU membership. The incremental effect of the euro is not robust to the correction.

A.3 Sources of heterogeneity

Table 16: Meta-regression: effects of study design (precision-weighted, standard errors clustered by study)

Characteristic	Coefficient	Standard error	p-value
Standard error (publication bias)	1.536	0.256	0.000
OLS rather than PPML	0.157	0.047	0.002
No exporter-time and importer-time effects	0.000	0.032	0.997
No pair fixed effects	−0.039	0.047	0.416
No domestic trade flows	−0.251	0.075	0.002
No controls for globalisation	0.138	0.072	0.065
Contemporaneous effect only	−0.084	0.033	0.017
Heterogeneity-robust difference-in-differences	−0.156	0.071	0.036
Cross-section	−0.118	0.087	0.183
Sample midpoint (years after 2000)	−0.006	0.001	0.000
Published	−0.036	0.033	0.276

Table 16 shows that research design matters. Omitting domestic trade flows lowers the estimated effects by about 0.25 log points. Omitting controls for globalisation raises them by about 0.14, because agreements then absorb the general decline in international trade costs. These patterns match those reported by Campos et al. (2025) and justify predicting effects at best practice rather than using raw averages.

A.4 Precision of the differences between integration types

Table 17: Differences between best-practice effects (standard errors clustered by study) and leave-one-study-out ranges of the change relative to an FTA

Difference	Estimate	Standard error	p-value	Leave-one-study-out range
EU membership − customs union	0.179	0.104	0.094	
Customs union − EEA/Swiss	0.002	0.109	0.987	
EU membership − EEA/Swiss	0.181	0.046	0.000	
Customs union − FTA	0.136	0.065	0.045	0.116 to 0.188
EEA/Swiss − FTA	0.135	0.058	0.026	0.020 to 0.195
EU membership − FTA	0.316	0.055	0.000	0.258 to 0.364
Test of equal spacing	0.177	0.208	0.399	

Because the study-design characteristics are common to all integration types, the difference between two best-practice effects equals the difference between their coefficients in the meta-regression. *Table 17* shows that the difference between EU membership and EEA/Swiss arrangements is precisely estimated, whereas the position of customs unions relative to both is not. Re-estimating the meta-regression without each of the 35 studies in turn yields the ranges of the change relative to an FTA reported in the last column; the corresponding welfare effects are shown in *Table 32*. Correcting the coding errors found in the hand check raised the EEA/Swiss-type trade effect to about the level of a customs union; that rung rests largely on one study, Mayer, Vicard and Zignago (2019).

A.5 Sector-level evidence

Table 18: Sector-specific trade effects (log points, precision-weighted)

Integration type	Sector	Estimates	Effect
Deep FTA	Agriculture	5	0.17
Deep FTA	Manufacturing	16	0.40
Deep FTA	Mining	2	0.39
Deep FTA	Services	13	0.37
Customs union	Manufacturing	8	0.77
EU membership	Agriculture	65	1.12
EU membership	Manufacturing	301	0.35
EU membership	Mining	16	0.35
EU membership	Services	92	0.72

The effects of EU membership are largest for agri-food and services and smaller for manufacturing (*Table 18*). These sector-level estimates are not used in the one-sector model, but they indicate where the gains from deeper integration are likely to be concentrated.

A.6 Sensitivity of the customs-union effect to one study

The customs-union effect rests on few studies, and when the meta-analysis was extended one of them came to dominate it. Cheong, Kwak and Tang (2018) estimate the effects of partial-scope agreements, FTAs and customs unions on product-level (HS2) imports for 1996–2010. We exclude the study from the core sample, for two reasons.

- **What its customs-union indicator measures.** The indicator follows the WTO database of regional trade agreements, which classifies the EU and its enlargements as a customs union. All twelve countries that joined the EU in 2004 and 2007 are in the sample, so the estimate largely measures EU accession rather than an EU–Turkey-type customs union.
- **Its weight in the meta-regression.** With 4.5 million product-level observations, its standard errors are small: the median is 0.052, against 0.110 for the median of the other studies. It also contributes 13 closely related specifications. Together, these gave it 53% of the precision weight of all customs-union estimates and 25% of that of FTA estimates.

Including the study raises the customs-union effect over an FTA from 0.136 to 0.307 log points. It does so through both rungs: the customs-union rung rises and the FTA rung falls. The UK gain from a customs union then roughly doubles, from +0.42% to +1.04% in the baseline environment (*Table 19*). Reclassifying its customs-union estimates as EU membership removes almost all of the difference.

Table 19: The customs-union effect under alternative treatments of the evidence: best-practice effects (log points) and the UK real-income gain from a customs union relative to the TCA (ψ = 1.99, %)

Variant	FTA	Customs union	Customs union − FTA	UK gain, baseline	UK gain, with US and EU–China tariffs
Central: Cheong, Kwak and Tang (2018) excluded	0.148	0.284	0.136 (0.065)	+0.42%	+0.13%
Including Cheong, Kwak and Tang (2018)	0.116	0.423	0.307 (0.100)	+1.04%	+0.75%
Including it, only its estimates without a tariff control	0.143	0.379	0.236 (0.089)	+0.77%	+0.48%
Including it, its customs-union estimates treated as EU membership	0.108	0.264	0.155 (0.073)	+0.49%	+0.19%
Excluded; pooled CU/CM/EU estimates of Esteve-Pérez et al. (2020) treated as EU membership	0.145	0.268	0.123 (0.067)	+0.38%	+0.08%
Excluded; equal weight for each study	0.193	0.385	0.192 (0.088)	+0.62%	+0.32%
Excluded; standard errors floored at 0.05	0.128	0.266	0.138 (0.067)	+0.43%	+0.13%
Earlier sample of 30 studies	0.179	0.329	0.149 (0.128)	+0.47%	+0.17%

Notes: Best-practice predictions from the precision-weighted meta-regression of Appendix A.3. Standard errors are clustered by study. The customs-union shock in the model is the difference between the customs-union and FTA effects. For comparison, the central gains are +0.42% for an EEA/Swiss-type agreement and +1.08% for membership in the baseline environment, and +0.42% and +0.63% with US and EU–China tariffs.

The central estimate is nevertheless conservative. Some studies estimate customs unions and FTAs in the same regression. Those with best-practice designs (PPML with domestic trade flows) find average customs-union premia of 0.31 to 0.49 log points: Campos, Timini and Vidal (2021); Baier, Yotov and Zylkin (2019); Bergstrand, Clance and Santos Silva (2025); Franco-Bedoya and Frohm (2022). Their customs-union indicators exclude the EU, which is coded as a deeper agreement. These premia are larger than the central 0.14, which also draws on comparisons across studies. A customs-union effect of this size would put the UK gain at or above the value in the second row of *Table 19*. The table therefore brackets the plausible range, with the central case at its lower end.

Appendix B. The supply elasticity

B.1 Calibration

The supply elasticity ψ governs how strongly output responds to the real price that producers receive. In the model solved by ge_gravity2 it has a structural interpretation (Campos, Reggio and Timini, 2025). Producers combine primary inputs with intermediate inputs, which are the same bundle of goods as final consumption ("roundabout" production): $Q_i = (A_i L_i)^{\zeta} M_i^{1-\zeta}$. A higher real output price p_i/P_i lowers the relative cost of intermediates and raises output with elasticity

$$\psi = \frac{1-\zeta}{\zeta},$$

where ζ is the share of primary inputs (value added) in gross output. On this reading ψ captures input–output linkages, not additional labour supply. The real-income gains with ψ > 0 are then welfare gains: with ψ = 0 the welfare formula is that of Arkolakis, Costinot and Rodríguez-Clare (2012), and with ψ > 0 it becomes the formula with intermediate inputs, $\widehat{W}_i = \hat{\lambda}_{ii}^{-1/(\theta\zeta)}$ (Costinot and Rodríguez-Clare, 2014), since $1/\zeta = 1 + \psi$.

We calibrate ζ as the ratio of value added to gross output in the OECD Inter-Country Input-Output (ICIO) table for 2022, which covers 80 economies and the rest of the world in 50 industries (OECD, ICIO tables). Costs in each industry are intermediate inputs, net taxes on intermediate products and value added, so 1 − ζ includes the net taxes. The table reports China and Mexico in two parts each (processing and other activities), which we add up. We report the UK, the 38 OECD members and the world, as output-weighted aggregates and as simple averages across countries, for all industries and for the goods-producing industries (agriculture, mining and manufacturing).

Table 20: Supply elasticity implied by the input–output structure (OECD ICIO, 2022)

Economy	Aggregation	ζ, all industries	ψ, all industries	ζ, goods industries	ψ, goods industries
United Kingdom	–	0.498	1.01	0.343	1.92
OECD (38)	output-weighted	0.501	1.00	0.345	1.90
OECD (38)	simple mean	0.463	1.16	0.323	2.10
World (incl. rest of world)	output-weighted	0.470	1.13	0.335	1.99
World (80 economies)	simple mean	0.487	1.06	0.371	1.69

Table 20 reports the results.

For the economy as a whole the calibrated values are close to one: ψ = 1.01 for the UK, 1.00 for the OECD and 1.13 for the world (output-weighted; 1.16 and 1.06 as simple averages). Goods-producing industries use intermediates more intensively, so they imply values about twice as large, 1.92 for the UK and 1.99 for the world.

We use the goods-industry value for the world, ψ = 1.99, in all central results. The options change trade costs for goods, and the model's traded good is goods, so the input–output structure of goods production is the relevant one; the world value fits a model in which all countries share one supply elasticity. As a robustness check we use the value for the UK economy as a whole, ψ = 1.01. It treats services, which are largely non-traded in the model, as part of the same production structure, and it reduces the gains by about 31% without changing their ranking.

B.2 Results without input–output amplification (ψ = 0)

With ψ = 0 output cannot respond to prices, and the model is the Armington (1969) structural gravity model solved by ge_gravity (Baier, Yotov and Zylkin, 2019). Lower trade costs then raise real income only through cheaper imports and better terms of trade, without the amplification through cheaper intermediate inputs. Since the input–

output data imply $\psi > 0$, these results are a lower bound. *Table 21* reports the main results for this case.

Table 21: UK real-income gain relative to the TCA with $\psi = 0$ (%)

Option	Real income, baseline	£bn a year	With US tariffs	With US and EU–China tariffs	Real exports
No deal (WTO terms)	−0.13%	−3.8	−0.12%	−0.13%	−16.0%
EEA/Swiss-type agreement	+0.15%	+4.6	+0.15%	+0.15%	+7.4%
Customs union	+0.15%	+4.6	+0.15%	+0.11%	+7.5%
EU membership	+0.39%	+11.7	+0.37%	+0.22%	+18.9%
EU membership, optimistic (1973 cohort)	+1.21%	+37.0	+1.21%	+1.06%	+58.9%

The ranking of the options is the same as with $\psi = 1.99$, and the trade effects are similar (UK real exports rise by 18.9% under membership, against 19.5%), but the real-income gains are about 36% of those in the central case. On the central trade-cost path of Appendix D.1, the gain reaches +0.29% by 2045 and +0.34% in the long run.

Appendix C. Alternative definitions of no deal

The central no-deal scenario removes the FTA effect ($-\beta_{FTA} = -0.15$) and adds the MFN tariffs that the UK and the EU would apply to each other. The tariffs are trade-weighted MFN averages for 2023 from the World Bank's World Integrated Trade Solution (WITS): 3.52% for the EU's common external tariff on UK goods, and between 1.0% and 19.0% for the UK Global Tariff on goods from individual member states, 5.22% on average when weighted by EU exports to the UK. WITS reports no UK rate for Romania, which is set to that average. The importing country collects the tariff revenue, which is added to its real income.

This definition may count the tariff part of the FTA effect twice. The gravity studies behind β_{FTA} do not control for tariffs, so the FTA effect already includes the removal of tariffs between the partners. At $\theta = 5.14$ the MFN tariffs alone are worth 0.18 log points on UK exports to the EU and 0.26 on UK imports from the EU, close to β_{FTA} itself. The table therefore also reports two definitions that count the tariff part only once: removing the FTA effect without MFN tariffs, and imposing MFN tariffs while keeping the rest of the FTA effect.

Table 22: UK effects of no deal relative to the TCA under alternative definitions (baseline environment, $\psi = 1.99$)

Definition	Real income	of which tariff revenue	£bn a year	UK exports to EU	UK imports from EU	Real income, $\psi = 1.01$
FTA effect removed + MFN tariffs (central)	−0.70%	+0.21	−21.4	−30.6%	−29.3%	−0.42%
Same, with the multilevel random-effects FTA effect	−1.01%	+0.18	−30.8	−40.9%	−38.3%	−0.65%
FTA effect removed, no MFN tariffs	−0.40%	0.00	−12.2	−14.6%	−12.2%	−0.28%
MFN tariffs only, FTA effect kept	−0.35%	+0.24	−10.7	−18.9%	−19.2%	−0.17%

Table 22 reports the results.

The central definition costs the UK 0.70% of real income. Without MFN tariffs the loss is 0.40%, and with MFN tariffs alone 0.35%. Trade with the EU falls by about a third in the central case and by 12–19% under the single-count definitions. The revenue from the MFN tariffs offsets 0.21 percentage points of the central loss. The central case is therefore best read as an upper estimate of the cost of no deal, and the two single-count definitions as a lower range.

Appendix D. Timing of the gains

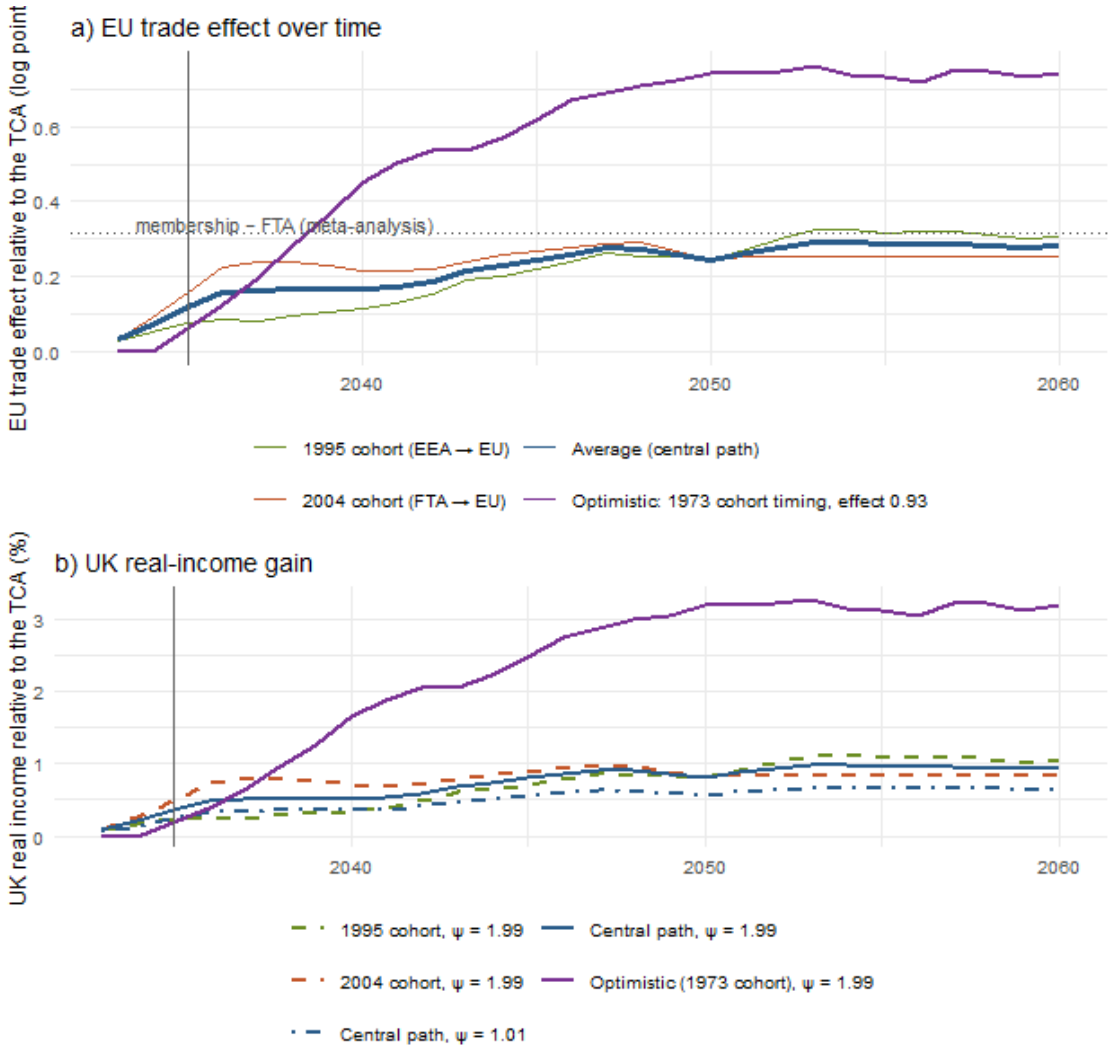
D.1 The trade-cost path

Section 7 phases in the effects of lower trade costs along the paths of earlier enlargements. This section reports that part of the path on its own, for lower trade costs in goods only, so it is smaller than the full gain in Section 7.

The closest precedents for a UK that re-joins from a free trade agreement are the 1995 and 2004 enlargements. Austria, Finland and Sweden joined in 1995 from the European Economic Area, and most members of the 2004 enlargement joined from Europe Agreements, which were free trade agreements with the EU. Because these agreements were in place before accession, the estimated cohort effects measure the gain from membership on top of them. Averaged over the last ten years for which each cohort is observed, the long-run effects are 0.30 log points for the 1995 cohort and 0.26 for the 2004 cohort. Their average, 0.28, is close to the gap of 0.32 between membership and a free trade agreement in the meta-analysis (Table 3), and we use the average of the two paths as the central case. The UK's own 1973 accession is a poor precedent, because the UK then joined from most-favoured-nation terms and its effect bundles the removal of tariffs, the common agricultural policy, the end of Commonwealth preference and the later single market. Appendix D reports it as an illustration.

Re-joining would follow a general election, due by 2029. We assume that the UK applies in 2030 and joins in 2035, five years later, which is close to the time Austria took in the 1995 enlargement. Following Nagengast, Rios-Avila and Yotov (2025), the effect starts two years before accession, in 2033, to capture anticipation. Each year's shock is the cohort effect for that year, smoothed with a centred three-year moving average and held at its long-run level after the last observed year, and each year is solved as a long-run equilibrium of the 2022 world economy. Money values are in 2025 prices, without economic growth.

Figure 5: Re-joining on the path of the 1995 and 2004 enlargements (application in 2030, accession in 2035), and the optimistic scenario based on the 1973 accession cohort



Notes: Panel a: EU trade effect relative to the TCA (log points, smoothed) by cohort, their average (the central path) and the optimistic path; the dotted line is the gap between membership and a free trade agreement in the meta-analysis. Panel b: UK real-income gain relative to the TCA.

Table 23: UK gains from re-joining relative to the TCA, on the path of the 1995 and 2004 enlargements and in the optimistic scenario

Measure	Central path	Central path, ψ = 1.01	1995 cohort	2004 cohort	Optimistic (1973 cohort)
Real-income gain in 2035 (accession)	+0.36%	+0.25%	+0.23%	+0.49%	+0.19%
Real-income gain in 2040	+0.52%	+0.36%	+0.35%	+0.70%	+1.65%
Real-income gain in 2045	+0.80%	+0.55%	+0.72%	+0.89%	+2.48%
Real-income gain in 2050	+0.81%	+0.55%	+0.81%	+0.81%	+3.19%
Long-run real-income gain	+0.94%	+0.64%	+1.03%	+0.84%	+3.43%
Long-run gain, £bn a year	+29	+20	+31	+26	+104
UK exports to the EU, 2060	+35%	+34%	+38%	+31%	+119%
Years from accession to 90% of the long-run gain	11	11	17	2	15

Notes: Each year is a long-run equilibrium of the 2022 world economy, solved at that year's smoothed cohort effect. The long-run gain is solved at the cohort's long-run effect. Money values are in 2025 prices, without economic growth.

On the central path the gains are small at first and build up over the following decade (Figure 5 and Table 23). The gain is 0.36% of real income at accession in 2035, 0.52% in 2040 and 0.80% in 2045, and reaches 0.94% in the long run, about £29 billion a year, somewhat below the long-run gain from membership in goods trade (1.08%). About 90% of the long-run gain is reached 11 years after accession. The 2004 path rises faster, because its effect jumps at accession, while the 1995 path builds up more slowly to a higher level. The optimistic path follows the timing of the 1973 cohort, rescaled so that its long-run level equals the cohort's average post-accession effect of 0.93 log points. It starts more slowly, because it first has to pass the free trade agreement already in place, but reaches 2.48% by 2045 and 3.43% in the long run. The cohort effects come from heterogeneity-robust designs, which in our meta-analysis yield estimates 0.16 log points lower than other designs ($p = 0.04$), so these paths are, if anything, cautious relative to the static estimate.

D.2 The 1973 accession path

The UK's own accession in 1973, together with Denmark and Ireland, was among the most trade-creating in the EU's history. Nagengast, Rios-Avila and Yotov (2025) estimate an effect that starts two years before accession and levels off at 1.10 log points, the average of the last ten years they observe (200% more trade). This is 2.4 times the best-practice effect of EU membership in the meta-analysis. Net of the FTA effect already in place, it implies a long-run shock of 0.95 log points and a long-run UK real-income gain of +4.59%. We use this single long-run level throughout; the year-by-year path is smoothed in the same way as in Section 7.

The optimistic scenario in Section 6 and Appendix D.1 uses the cohort's average post-accession effect, 0.93 log points, which is below this long-run level. We do not use the 1973 experience as a central case, for four reasons.

- **What it measures.** In 1973 the UK joined from most-favoured-nation terms with the European Economic Community. Its accession effect bundles the removal of tariffs on trade with the original members, the common agricultural policy, the unwinding of Commonwealth preference and, later, the single market. Netting off a modern FTA coefficient removes only part of the tariff component.
- **Design.** The estimate comes from a heterogeneity-robust difference-in-differences design. In our meta-analysis such designs yield estimates 0.16 log points lower than other designs, so comparing it with the PPML best practice mixes designs.
- **Anticipation.** The path includes the two years before accession, which the core sample of the meta-analysis excludes.
- **Noise.** Single-year coefficients late in the path move by up to 0.16 log points from one year to the next, which is why we smooth the path and use a ten-year average for its long-run level.

Table 24: UK gains on the 1973 accession path relative to the TCA, with the timing of Appendix D.1

Measure	ψ = 1.99	ψ = 1.01
Real-income gain in 2035 (accession)	+0.31%	+0.21%
Real-income gain in 2045	+3.28%	+2.25%
Long-run real-income gain	+4.59%	+3.14%
Long-run gain, £bn a year	+140	+96

On the same timing as Appendix D.1, the 1973 path would raise UK real income by +3.28% by 2045 and +4.59% in the long run, 4.9 times the central path. In 2060 the 95% confidence interval of the path gives 2.5–6.5%, reflecting only the sampling uncertainty of the cohort estimates. The comparison shows how much larger the effects of the first enlargements were. It does not show what re-joining from the TCA would deliver.

D.3 Full-gain paths for the partial agreements (illustrative)

Table 25 reports the full-gain paths of all five options on the timetable assumed for membership, with an application in 2030 and entry into force in 2035. This timetable is unlikely to apply to the partial agreements: a veterinary agreement or a deeper TCA could come into force well before 2035, which would bring their gains forward, so the figures for nearer dates are illustrative. On this common timetable the partial agreements follow the same profile as membership at a smaller scale. At nearer dates the deep free trade agreement is narrowly ahead of the EEA/Swiss-type agreement (0.52% against 0.46% in 2040), because more of its gain comes from lower trade costs and less from investment, which builds up slowly; the EEA/Swiss-type agreement moves ahead in the early 2040s. Estimating the paths with an earlier start for the partial agreements is left for further work.

Table 25: UK real-income gain relative to the TCA over time, net of the cost of the extra investment and before it (output), central case, all options on the membership timetable (illustrative)

Option	Measure	2035	2040	2045	2050	Long run
EU membership	Net	−0.18%	+1.10%	+2.31%	+2.81%	+3.67%
	Output	+1.49%	+2.77%	+3.98%	+4.48%	+5.34%
EEA/Swiss-type agreement	Net	−0.19%	+0.46%	+1.06%	+1.34%	+1.79%
	Output	+0.71%	+1.37%	+1.97%	+2.25%	+2.69%
Deep free trade agreement (TCA Plus)	Net	+0.02%	+0.52%	+1.01%	+1.20%	+1.54%
	Output	+0.62%	+1.11%	+1.61%	+1.80%	+2.14%
Customs union	Net	−0.17%	+0.30%	+0.73%	+0.94%	+1.26%
	Output	+0.50%	+0.97%	+1.40%	+1.60%	+1.93%
Sectoral landing	Net	−0.12%	+0.20%	+0.49%	+0.63%	+0.85%
	Output	+0.34%	+0.66%	+0.94%	+1.09%	+1.31%

Notes: 2022 tariff baseline, ψ = 1.99. Application in 2030 and accession or entry into force in 2035 for every option. Net: real income net of the cost of the extra investment, as in Table 5. Output: before that cost. Long run: the values reported in Section 4, which the paths approach by about 2060. The partial agreements could come into force well before 2035, which would bring their gains forward.

Appendix E. Productivity and investment

E.1 Productivity effects of trade liberalisation

Table 26: Effect of liberalisation on productivity: pooled estimates on a gross-output basis (positive = gain from liberalisation)

Channel	Studies	Central: median of studies	Low: corrected for publication bias	High: random-effects mean
Output tariffs, % per 10-point cut	4	0.6	−0.4	0.6
Input tariffs, % per 10-point cut	6	4.9	4.7	4.9
Services reform, downstream manufacturing, % per 1 SD	5	3.9	3.9	5.5

The review covers 46 papers collected for this project. Estimates of value added or labour productivity are converted to a gross-output basis with the ratio of value added to gross output in UK manufacturing (0.33). The same rule applies to every channel: the median of the studies' main estimates as the central value, the estimate corrected for publication bias (Stanley and Doucouliagos, 2014) as the low case and the random-effects mean as the high case. Where prices can be observed, the gain in physical efficiency is about 0.25–0.35 of the measured gain (De Loecker, 2011; Arnold, Javorcik and Mattoo, 2011); we use 0.30. The input and services channels are netted of the input-cost saving that the model itself produces, which gives almost the same result as a fixed allowance of 1.4% per 10 points (Halpern, Koren and Szeidl, 2015). The services reform is measured from the OECD Services Trade Restrictiveness Index for third countries and for EEA members in 2025, in standard deviations of the composite index of Beverelli, Fiorini and Hoekman (2017): 0.44 for the UK and 0.01–0.18 for EU members. All of the input- and output-tariff studies in the central pool come from low- and middle-income economies; the high-income evidence (Trefler, 2004) measures industry labour productivity and is used only as a robustness check.

E.2 Investment recovery

Table 27: Investment recovery by type of agreement (central case)

Agreement	Share of the EU goods trade-cost gap closed	Legal permanence	Services depth	Investment shortfall recovered	Capital stock, long run	Productivity loss recovered (Brexit-based)
EU membership	100%	1.000	100%	100%	+12.1%	100%
Deep free trade agreement (TCA Plus)	50%	0.250	50%	36%	+4.5%	30%
EEA/Swiss-type agreement	43%	0.625	50%	54%	+6.7%	59%
Customs union	43%	0.375	0%	40%	+5.0%	39%
Sectoral landing (veterinary agreement and mutual recognition)	30%	0.250	0%	27%	+3.4%	26%

The shortfall and its path. The investment shortfall is 13.6% in 2023, the mean of the two firm-level estimates of Bloom et al. (2025): 12% from firms' exposure to the EU before the referendum (their Table 2, column 3), which the authors prefer, and 15.2% from the Brexit uncertainty firms reported (their Table 3, column 2). With 12%, the gain from membership would be about 3.4% rather than 3.67%, and the other options would fall roughly in proportion. The central case assumes that it persists under the TCA. If it narrowed along the NiGEM path of Kaya et al. (2025, Table 2), from 12.4% in 2023 to 7.5% in 2030 and 7.6% in 2035, scaled to our starting level (about 8.3% from the 2030s), membership would be worth 2.92% rather than 3.67%.

The share due to uncertainty. The firm-level decomposition of Bloom et al. (2025) attributes 93% of the shortfall to uncertainty, but its uncertainty coefficient is significant only at the 10% level: with the delta method the 90% interval runs from 63% to 100%, and by simulation from 31–46% to 100%, depending on the unreported correlation between its two coefficients. Kaya et al. (2025) attribute 22% of the long-run fall to uncertainty. The central case uses the midpoint, 58%.

Legal permanence. The uncertainty part of the shortfall is recovered in proportion to the legal-permanence index of *Table 4* (Section 3.6), and the rest in proportion to the share of the EU trade-cost gap the agreement closes. The same rule applies to the uncertainty part of the productivity loss (82%) in the Brexit-based reading. Appendix E.3 discusses the scores.

E.3 Legal permanence of the options

Why legal permanence matters. Business investment is 13.6% below its no-Brexit level, and much of the shortfall reflects uncertainty about future barriers to trade with the EU (Bloom et al., 2025). An agreement reduces that uncertainty to the extent that its commitments are hard to reverse or to erode. The TCA is itself a settled agreement, so the index measures legal permanence beyond the TCA, which scores 0, up to membership, which scores 1. Depth and permanence are distinct. Depth is how much an agreement lowers trade costs, which comes from the meta-analysis. Permanence is how securely those lower costs are locked in.

The four features.

- **Supranational enforcement.**
  - 1: a court and a surveillance authority whose rulings bind, as with the Court of Justice under membership and the EFTA Court and Surveillance Authority in the EEA.
  - ½: a court role in part of the agreement, for example where an arbitration panel must refer questions of EU law to the Court of Justice in particular sectors.
  - 0: state-to-state arbitration only, as in the TCA.
- **Dynamic alignment.**
  - 1: the rules covered by the agreement move with EU law as it changes, as with the incorporation of single-market law into the EEA.
  - ½: rules move with EU law in some sectors only.
  - 0: static commitments, under which either side may diverge and the other may respond with rebalancing measures.

- **Permanent framework.**
  - 1: an open-ended agreement with standing institutions and no scheduled review.
  - ½: a set of linked agreements that are periodically renegotiated.
  - 0: a framework with a built-in review and termination on notice, as in the TCA, which provides for a joint review five years after its entry into force and can be terminated on twelve months' notice.
- **Voice in EU rules.**
  - 1: a vote in the Council and the European Parliament.
  - ½: participation in shaping rules without a vote, as for the EFTA states in the EEA.
  - 0: none.

How each option is scored.

- **EU membership (1).** The Court of Justice enforces the full acquis. Exit is possible only under Article 50. The UK would vote in the Council and the Parliament.

- **EEA-type (0.875):**

  - enforcement 1: the EFTA Surveillance Authority and the EFTA Court mirror the Commission and the Court of Justice;
  - alignment 1: the EEA Joint Committee incorporates new single-market law;
  - permanence 1: the EEA Agreement is open-ended;
  - voice ½: decision-shaping without a vote.
- The permanence score is the softest of the four, because the EEA Agreement can also be left on twelve months' notice. It rests on the absence of a scheduled review and on the standing multilateral institutions.

- **Swiss-type (0.375):**

  - enforcement ½, alignment ½: the agreements include dynamic alignment and arbitration with reference to the Court of Justice only under the newer package negotiated with the EU in 2024, and only for the single-market agreements;
  - permanence ½: the agreements are linked, so that ending one ends others, and are periodically renegotiated;
  - voice 0.
- **EEA/Swiss-type option (0.625).** It is the midpoint of the two, as for services depth, because the trade evidence pools them.

- **Customs union on the EU–Turkey model (0.375):**

  - enforcement 0: disputes go to the Association Council, with no court;
  - alignment ½: Turkey applies the common external tariff and aligns with EU legislation for the industrial goods covered;
  - permanence 1: the customs-union decision of 1995 has no end date;

  - voice 0.
- **Deep FTA, or "TCA Plus" (0.25):**
  - enforcement ½, alignment ½: a deep agreement would include sector agreements, such as the veterinary agreement, with dynamic alignment and a role for EU law in those sectors;
  - permanence 0: it remains inside the TCA's framework of review and termination;
  - voice 0.
- **Sectoral landing (0.25):**
  - enforcement ½, alignment ½: the veterinary agreement brings dynamic alignment, with the Court of Justice as the arbiter of EU law in that sector, and mutual recognition of conformity assessment is added;
  - permanence 0: both sit inside the TCA's framework;
  - voice 0.
- **TCA (0).** This is the reference point: arbitration, no dynamic alignment, review and termination on notice, no voice.

How the index enters the results. An agreement brings back a share $R = c \cdot u + (1 - u) \cdot d$ of the investment shortfall. Here c is its index, u is the share of the shortfall due to uncertainty (58% in the central case) and d is the share of the EU trade-cost gap it closes. Membership has c = d = 1 and brings back the whole shortfall. In the Brexit-based reading, the same rule applies to the part of the productivity loss due to uncertainty.

Limits of the index.

- **Equal weights, coarse scale.** The four features have equal weights, and the three-point scale is coarse.
- **Judgements.** The scores are judgements about the legal texts, not estimates.
- **Legal is not political.** Legal permanence is not the same as political durability: the EEA can be left, and the Swiss package still has to pass Swiss ratification.
- **Linearity.** The index enters recovery linearly, so a half-step on one feature (0.125) moves the recovered share by 7 percentage points for every agreement.

Table 28: Long-run net UK gain relative to the TCA when one agreement's legal-permanence index moves by a half-step on one feature (2022 tariff baseline, $\psi = 1.99$, %)

Agreement	Index	Index − 0.125	Central	Index + 0.125	Any settled deal (index 1)
Deep FTA (TCA Plus)	0.250	1.41	1.54	1.68	2.33
EEA/Swiss-type	0.625	1.66	1.79	1.92	2.17
Customs union	0.375	1.13	1.26	1.39	1.91
Sectoral landing (SPS + MRCA)	0.250	0.72	0.85	0.99	1.64

Table 28 moves each agreement's index by a half-step on one feature and reruns the full scenarios, holding the other scores at their central values.

- **Half-steps do not change the order.** A half-step on one feature moves an agreement's net gain by about 0.13 points, and no such move on any one agreement changes their order: the EEA/Swiss-type option, the deep FTA, the customs union and the sectoral landing. Taken together, across 5,751

combinations of the uncertainty share and half-step changes in the scores, the EEA/Swiss-type agreement ranks first among the partial options in 85% of the combinations tested and the deep FTA in the rest (Section 4.1).

- **"Any settled deal" changes it.** If every agreement removed the uncertainty part in full, the deep FTA would come first among them, because it has the largest trade effect.

Appendix F. Further results and detail

F.1 Data and measurement

Trade flows. Bilateral trade in goods comes from the International Monetary Fund's Direction of Trade Statistics (DOTS) for 2022, in current US dollars, as in Jackson and Shepotylo (2024). The data cover 193 economies and US$23.7 trillion of trade. We use 2022 so that trade and production refer to the same year.

Internal trade. Structural gravity needs each economy's sales to itself, X_{ii}. In theory these are gross output less exports, measured on the same basis as the trade flows (Yotov et al., 2016):

$$X_{ii} = Y_i - \sum_{j \neq i} X_{ij},$$

where Y_i is gross output and X_{ij} are exports to economy j. We take gross output of all industries from the OECD Inter-Country Input-Output (ICIO) table for 2022 and subtract goods exports from DOTS. Gross output, not GDP, puts internal and international flows on the same gross basis, since trade flows include the value of intermediate inputs. Services are treated as non-traded: the model ignores trade in services, and services output is counted entirely as domestic sales. The model's scale is therefore the whole economy, which makes it consistent to apply its percentage changes in real income to GDP. For the UK, gross output is US$5.61 trillion, goods exports US$0.51 trillion and internal trade US$5.10 trillion; goods imports are 13% of UK expenditure (*Table 29*). Hong Kong's DOTS exports include re-exports, so its internal trade is small, 6% of its gross output.

Sample. The model has 81 economies: the 80 economies of the ICIO table, all of which report in DOTS, and a rest of the world that aggregates the other 113 DOTS economies. The ICIO table splits China and Mexico into processing and other activities, which we add up. Trade among the 80 accounts for 91.8% of world trade in DOTS, and trade between them and the rest of the world for 7.8%. Trade within the rest of the world, 0.4%, becomes part of its internal trade. Gross output of the rest of the world is the ICIO rest-of-world aggregate. Its 2025 US tariff is the average of its members' tariffs, weighted by their exports to the United States (18.9%).

Valuation. The model is calibrated in 2022 US dollars, and its results are percentage changes. Money values apply them to 2025 data from the Office for National Statistics: real-income changes to UK nominal GDP in 2025 (£3,044.6 billion), and changes in UK–EU trade to UK goods exports to the EU (£181.9 billion) and imports from the EU (£320.8 billion) in 2025, on a balance-of-payments basis. No exchange rate is needed. In the baseline the EU takes 45% of UK goods exports and supplies 46% of UK goods imports.

Table 29 summarises the baseline for the UK and its main partners; EU27 figures include trade among member states.

Table 29: Baseline data, 2022 (US$ billion unless stated)

Economy	GDP	Gross output	Goods exports	Goods imports	Internal trade	Domestic share of expenditure (%)
United Kingdom	3,087	5,606	507	747	5,099	87
EU27	16,745	33,428	7,046	7,339	26,382	78
United States	25,775	45,300	2,060	3,150	43,240	93
China	17,954	45,095	3,602	2,151	41,493	95
All 81 economies	100,815	199,691	23,658	23,658	176,032	88

F.2 Placing the TCA on the ladder

Every option is measured from the TCA, so where the TCA sits on the ladder is the central modelling choice. The TCA has wide coverage: besides goods, it includes services, investment, level-playing-field commitments and cooperation in other areas, and a coding by the number of provisions could place it on the deep-FTA rung (0.31 log points). The EEA/Swiss-type and customs-union options would then add nothing, or even reduce trade, and membership would add only 0.16 log points.

In goods trade, however, the TCA works as a shallow agreement. It removes tariffs and quotas on goods that meet the rules of origin, but it provides no regulatory alignment, no mutual recognition of conformity assessment and no veterinary agreement, so customs formalities, sanitary and phytosanitary checks and certification requirements all apply at the border. Freeman et al. (2022) describe it as an agreement that "allows for UK–EU trade to be tariff and quota free, but does little to engender deeper integration".

The ex post evidence is broadly consistent with this. Freeman et al. (2022) find that the TCA caused a sudden and persistent fall of about 25% in UK imports from the EU relative to imports from the rest of the world. Relative exports fell by less and only temporarily, but the number of product–country varieties exported to the EU fell by around 30%. Du, Satoglu and Shepotylo (2023), using synthetic difference-in-differences, find a large and persistent negative effect of the TCA on UK exports and a narrower range of goods exported to the EU. Kren and Lawless (2024) estimate that in 2021–2022 UK goods exports to the EU were about 16% lower, and imports about 20% lower, than they would have been without Brexit.

These magnitudes do not discriminate cleanly between the two codings. If the TCA were a deep FTA, moving from membership to the TCA would have raised UK–EU trade costs by 0.16 log points, a partial fall in trade of about 15%. Coded as an FTA, the same move is worth 0.32 log points, a partial fall of about 27%, and in general equilibrium the model implies falls of about 28% in UK goods exports to the EU and 24% in imports from the EU. The ex post estimates of 16–25% lie between the two, and they are not like-for-like: Freeman et al. (2022) compare imports from the EU with imports from the rest of the world, Kren and Lawless (2024) compare trade with a no-Brexit counterfactual, and both cover only the first one or two years of the TCA, before trade had fully adjusted. Our central coding therefore rests on the institutional content of the TCA in goods trade described above, with the ex post evidence consistent with it. The choice matters for the

results. On the deep-FTA rung, membership would add only 0.16 log points to UK–EU trade, about half the central shock, and the EEA/Swiss-type and customs-union options would add nothing or even reduce trade, so the gains from all the options would be much smaller.

F.3 Effects on trade

Table 30: Change in UK–EU goods trade relative to the TCA (nominal; £bn a year at 2025 trade values in brackets)

Option	UK exports to EU	UK imports from EU	UK exports to US	UK imports from China
No deal (WTO terms)	−30.6% (−£56bn)	−29.3% (−£94bn)	−3.5%	+5.4%
EEA/Swiss-type agreement	+15.4% (+£28bn)	+12.5% (+£40bn)	+0.8%	−1.5%
Customs union	+15.6% (+£28bn)	+12.7% (+£41bn)	+0.8%	−1.5%
EU membership	+39.7% (+£72bn)	+31.8% (+£102bn)	+1.9%	−3.4%
EU membership, optimistic (1973 cohort)	+127.5% (+£232bn)	+97.8% (+£314bn)	+4.2%	−8.5%

Table 30 reports the effects on UK goods trade. Under membership UK goods exports to the EU rise by 40%, about £72 billion a year, and imports from the EU by 32%, while a breakdown of the TCA would reduce exports to the EU by 31%. Deeper integration diverts some trade away from third countries, but not much: under membership UK imports from China fall by 3.4% and exports to the United States rise by 1.9%.

F.4 Alternative EU tariffs on China

Table 31: UK real-income gain relative to the TCA with US and EU–China tariffs, under alternative EU tariffs on China (%, $\psi = 1.99$)

Option	Broad tariff (central)	Broad tariff, EEA/Swiss-type aligned	Targeted tariff	Targeted tariff, EEA/Swiss-type aligned
No deal (WTO terms)	−0.71%	−0.71%	−0.70%	−0.70%
EEA/Swiss-type agreement	+0.42%	+0.12%	+0.42%	+0.40%
Customs union	+0.13%	+0.13%	+0.41%	+0.41%
EU membership	+0.63%	+0.63%	+0.99%	+0.99%

Notes: Broad: the EU taxes all imports from China at 34.7%. Targeted: the same rate on electric vehicles, steel and clean technologies only, entered as an average tariff of 2.6% on EU and 1.7% on UK imports from China. Aligned: the UK also applies the EU's China duties under the EEA/Swiss-type option. The customs union and membership apply the EU tariff in all columns.

The reversal depends on two assumptions (Table 31). The first is how broadly the EU taxes China. If the EU taxed only the products already under its trade defence, the average tariff would be small and the environment would look much like the baseline: a customs union would be worth 0.41% and membership 0.99%, and the customs union and an EEA/Swiss-type agreement would stay about level. Most of the UK's exposure would then come from electric vehicles, 3.2% of its imports from China. The second is whether a UK in an EEA/Swiss-type agreement keeps its own China policy. The EU may expect such partners to coordinate trade remedies. If the UK had to apply a broad China tariff under an EEA/Swiss-type agreement, that option's gain would fall to 0.12%, about level with a

customs union (0.13%) and well below membership (0.63%). A customs union therefore falls clearly behind an EEA/Swiss-type agreement only if the EU taxes imports from China broadly and the UK keeps its own China policy under the EEA/Swiss route. The targeted case is an approximation, because the one-sector model spreads a tariff on a few products across all imports from China.

F.5 Robustness

Table 32: UK real-income gain relative to the TCA under alternative assumptions (baseline environment, %)

Variant	No deal	EEA/Swiss-type	Customs union	EU membership	EU membership, optimistic
Central estimates	−0.70%	+0.42%	+0.42%	+1.08%	+3.43%
Multilevel random-effects estimates	−1.01%	+0.75%	+0.56%	+1.19%	+2.55%
UK whole-economy supply elasticity (ψ = 1.01)	−0.42%	+0.29%	+0.29%	+0.74%	+2.35%
Leave one study out, lowest		+0.06%	+0.36%	+0.85%	
Leave one study out, highest		+0.63%	+0.60%	+1.27%	
1995 and 2004 accession cohort effects (average)				+0.94%	

The ranking is robust in most respects (Table 32). With the central estimates, in the baseline and with US tariffs, a breakdown of the TCA lies below an EEA/Swiss-type agreement and a customs union, which are about level with each other and well below membership, under both values of the supply elasticity. With the random-effects estimates the EEA/Swiss-type agreement moves ahead (0.75% against 0.56%).

The comparison between the two intermediate rungs is sensitive to single studies. Without Mayer, Vicard and Zignago (2019), an EEA/Swiss-type agreement is worth almost nothing over the TCA, and a customs union is clearly ahead of it and within 0.07 log points of membership. Dropping any other single study leaves the two rungs within a few hundredths of a log point of each other, in either order. No single study reverses the ordering of membership above a customs union.

The customs-union estimate also depends on how the evidence is treated. Including Cheong, Kwak and Tang (2018), whose customs-union measure includes the EU enlargements of 2004 and 2007, raises the customs-union gain to 1.04%, and the alternatives in Appendix A.6 range from 0.38% to 1.04%. Its value is best read as lying between an EEA/Swiss-type agreement and membership rather than as a precise figure. Finally, the supply elasticity matters more than the choice of estimator: moving from the goods-industry to the whole-economy value of ψ changes the size of the gains more than any choice among the pooled estimates. Results for ψ = 0 are in Appendix B.

F.6 A deepened TCA: method and variants

The reset agenda aims to deepen the TCA rather than replace it. We model this in two ways, both measured against the TCA and neither changing the UK's external trade policy.

The first is a sectoral landing priced with our own estimates. A veterinary (SPS) agreement would raise UK agri-food exports to the EU by 22.5% and imports from the EU by 5.6% (Du, Messenger and Shepotylo, 2024). Mutual recognition of conformity

assessment would raise trade by 9.8% in every Harmonised System (HS) chapter outside agri-food. This is the average effect across all 98 chapters in Du, Shepotylo and Zhang (2025), so we apply it to all chapters, not only to those where the effect is significant; a variant applies the chapter-specific estimates to the 25 chapters with a significant positive effect and nothing elsewhere. Agri-food chapters receive the SPS effect only. Weighting the sector effects by 2022 UK–EU trade shares (agri-food is 8% of UK goods exports to the EU and 16% of imports from it) gives a trade-cost shock of 0.102 on UK exports to the EU and 0.087 on imports. The second treats TCA Plus as a deep free trade agreement, moving the TCA to the deep-FTA rung of the meta-analysis, a shock of 0.159 log points. That rung rests on only five studies and on agreements that are deep across many policy areas, so we treat it as an upper reading.

Table 33: UK real-income gain and UK–EU goods trade relative to the TCA under a deepened TCA (baseline environment, $\psi = 1.99$)

Scenario	Real income	UK exports to the EU	UK imports from the EU
Deep free trade agreement	+0.50% (+£15.2bn)	+18.4% (+£33bn)	+14.9% (+£48bn)
Deep free trade agreement, random-effects estimates	+0.55% (+£16.6bn)	+20.1% (+£37bn)	+16.3% (+£52bn)
Sectoral landing	+0.28% (+£8.6bn)	+11.0% (+£20bn)	+8.3% (+£27bn)
Sectoral landing, SPS +22.5% in both directions	+0.33% (+£10.1bn)	+11.8% (+£21bn)	+10.1% (+£32bn)
Sectoral landing, chapter-specific mutual-recognition effects	+0.18% (+£5.5bn)	+7.0% (+£13bn)	+5.3% (+£17bn)
Sectoral landing, SPS only	+0.04% (+£1.1bn)	+1.6% (+£3bn)	+1.0% (+£3bn)
Sectoral landing, mutual recognition only	+0.25% (+£7.6bn)	+9.4% (+£17bn)	+7.4% (+£24bn)

Notes: Money values in brackets: real income at 2025 GDP; trade changes applied to ONS 2025 UK–EU goods trade.

The sectoral landing would raise UK real income by 0.28%, about £8.6 billion a year, and UK goods exports to the EU by 11.0% (Table 33), about two-thirds of the gain from an EEA/Swiss-type agreement (0.42%). Mutual recognition contributes much more than the veterinary agreement (0.25% against 0.04%), because it covers a larger share of trade. Applying the chapter-specific estimates of mutual recognition only to the 25 chapters with a significant positive effect gives 0.18%: those chapters have large effects but account for only 28% of UK exports to the EU.

As a deep free trade agreement, TCA Plus would be worth 0.50%, more than a customs union or an EEA/Swiss-type agreement in goods trade. This reflects the thin evidence on these rungs rather than a firm ranking. Because neither scenario touches the UK's external tariff, both gains are unchanged when the EU taxes China. The one-sector model spreads the sectoral gains across all goods, whereas a multi-sector model would locate them in agri-food and in the sectors covered by mutual recognition.

F.7 Chinese value added in exports to the EU

Table 34 uses the OECD Inter-Country Input-Output table for 2022 to measure the Chinese value added embodied in exports to the EU, directly and through inputs bought from other countries.

Table 34: Chinese value added in gross exports to the EU27, by exporting industry, 2022 (%)

Industry	UK exports to the EU27, US$bn	UK → EU27	Intra-EU27	Germany → rest of EU
Motor vehicles †	15.1	4.2	4.2	3.3
Electrical equipment (incl. batteries) †	4.5	4.4	6.0	5.4
Iron and steel †	4.0	2.7	2.3	2.1
Non-ferrous metals (incl. aluminium) †	2.7	1.8	2.5	2.4
Non-metallic minerals (incl. cement) †	1.5	2.2	2.3	2.1
Chemicals	12.0	3.0	2.8	3.5
Pharmaceuticals	9.8	1.1	1.2	1.8
Machinery	9.4	3.5	3.7	3.4
Computers and electronics	4.1	3.4	7.0	7.1
Other transport (incl. aerospace)	10.9	2.8	3.9	3.2
Food, drink and tobacco	10.9	1.8	1.7	1.8
IAA-related industries	27.7	3.7	4.0	3.6
All goods industries	146.2	2.5	3.1	3.3
All industries	381.6	1.5	2.3	2.5

Notes: OECD ICIO 2022, with China's processing and non-processing activities combined. † Industries covered by the Industrial Accelerator Act.

Chinese value added makes up 2.5% of UK goods exports to the EU, less than in trade among EU members (3.1%) or in German exports to the rest of the EU (3.3%). In the industries covered by the Industrial Accelerator Act the share is higher, 3.7%, but similar to that in intra-EU trade (4.0%), and in motor vehicles it is 4.2%, the same as among EU members. UK exports to the EU are therefore no more dependent on Chinese inputs than the EU's own trade, and their exposure to "Made in Europe" rules turns on whether UK origin counts rather than on Chinese content.

F.8 The effect of Brexit on UK–EU services trade

Studies of UK services trade since the referendum find losses of about 5–20%. Douch and Edwards (2021) use synthetic control and find UK services exports about 7% below their counterfactual after the referendum, with the fall concentrated in other commercial services. Du and Shepotylo (2026) apply synthetic difference-in-differences to OECD–WTO data for 2016–2019 and find UK services exports 5.65% (US$23.7 billion a year) lower than they would have been had the UK remained in the EU, and bilateral exports to the EU 6.2% lower. Ahmad, Limão, Oliver and Shikher (2023) find that the higher probability of Brexit lowered UK services exports by at least 20 log points. Bhalotia, Dhingra and Arnold (2025) measure the barriers introduced by the TCA by service and member state: UK services exports to the EU fell by 9.6% at the average barrier and by 15.8% in services where member states took reservations, and total UK services exports are 4–5% lower.

Gravity estimates of the EU effect on services are larger, because they measure the long-run effect of the single market rather than the first years after exit. Mayer, Vicard and Zignago (2019) estimate an EU coefficient of 0.17 for services trade with pair fixed effects; in their simulations the single market raises services trade among members by 58%, or by 33% when estimated by PPML (in 't Veld, 2019), about half the corresponding effects for goods. HM Treasury (2016) estimates that membership raised UK services trade with the EU by about 25%, against 115% for goods. Mulabdic, Osnago and Ruta (2017) find that the deepest trade agreements raise services trade by 20% on average, that EU membership more than doubled UK services trade, and that an EEA-type agreement would lower UK–EU services trade by 16%. The sector-level studies in our meta-analysis (Felbermayr, Gröschl and Heiland, 2022; Fontagné and Yotov, 2024) give a precision-weighted EU effect on services of 0.72 log points, against a mean of 0.23 for free trade agreements (Appendix A.5).

We estimate the effect of Brexit on UK–EU services trade directly, with a structural gravity equation for bilateral services trade estimated by PPML:

$$X_{ijt} = \exp\big(\beta_1 EU_{ijt} + \beta_2 RTA_{ijt} + \beta_3\, UKEU_{ij} \cdot 1[2016 \le t \le 2020] + \beta_4\, UKEU_{ij} \cdot 1[t \ge 2021] + \pi_{it} + \chi_{jt} + \mu_{ij}\big)\varepsilon_{ijt}$$

The data are exports of total services reported by 56 economies to their partners in 2005–2023, from the OECD–WTO Balanced Trade in Services (BaTIS) dataset (Liberatore and Wettstein, 2021). EU_{ijt} marks pairs of EU members (Bulgaria and Romania from 2007, Croatia from 2013), excluding UK–EU pairs; RTA_{ijt} marks other trade agreements, from the database of Egger and Larch (2008) updated to 2025; and $UKEU_{ij}$ marks UK–EU pairs in both directions. Exporter-year (π_{it}) and importer-year (χ_{jt}) effects absorb each country's overall services trade in each year, including the COVID-19 shock and exchange-rate movements, and pair effects (μ_{ij}) absorb the average level of each pair. Standard errors are clustered by pair. The coefficient β_4 measures UK–EU services trade since the TCA relative to before the referendum, against the UK's and EU members' services trade with other partners, and its reversal is the services shock from re-joining.

Table 35: PPML gravity estimates of the effect of Brexit on UK–EU services trade (total services; exporter-year, importer-year and pair fixed effects; standard errors clustered by pair)

Effect	Coefficient (s.e.)	UK–EU services trade	Implied effect of re-joining
UK–EU, from 2021 (central)	−0.175 (0.059)	−16.0%	+19.1%
UK–EU, 2016–2020 (referendum and transition)	−0.056 (0.040)	−5.5%	+5.8%
UK exports to the EU, from 2021	−0.234 (0.071)	−20.8%	+26.3%
EU exports to the UK, from 2021	−0.103 (0.085)	−9.8%	+10.9%
UK–EU, from 2021, importer-reported flows	−0.139 (0.058)	−13.0%	+14.9%
UK–EU, from 2021, 2010–2022 sample	−0.179 (0.063)	−16.4%	+19.6%

Effect	Coefficient (s.e.)	UK–EU services trade	Implied effect of re-joining
EU membership minus other trade agreements (all pairs)	+0.148	—	+16.0%

Notes: The implied effect of re-joining reverses the estimated change. The last row is the coefficient on EU membership minus that on other trade agreements, estimated on all pairs with the UK–EU pairs counted as EU members until 2020 and as an FTA from 2021.

UK–EU services trade since 2021 has been 16% below its pre-referendum level (β_4 = −0.175; Table 35). Reversing this implies a services shock of $\Delta\beta_s = 0.175$, an increase of 19%. In an event study with UK–EU pair-year effects (base 2015) there is no gap before the referendum and little up to 2017 (−0.4%); the gap opens in 2018 (−4.1%) and 2019 (−8.4%) and has stayed between −16% and −17% since 2021. UK exports to the EU fell more (−21%) than EU exports to the UK (−10%, not statistically significant). Importer-reported flows give −13% and the 2010–2022 sample −16%, and pooling all EU pairs, membership adds 0.148 log points to services trade relative to other trade agreements.

Our estimate lies at the upper end of the ex post evidence, close to the effect that Bhalotia, Dhingra and Arnold (2025) find for services affected by TCA reservations, and below the long-run single-market estimates. We use it as the central services shock. The low case, 0.101, reverses their average TCA barrier effect, and the high case, 0.285, is the 33% single-market effect of Mayer, Vicard and Zignago (2019). The sector-level studies in the meta-analysis would imply a larger step still (about 0.49 log points), but they are few. The central services step is about 55% of the goods step for membership (0.316), close to the ratio found by Mayer, Vicard and Zignago (2019).

F.9 Ex post estimates of the cost of Brexit

Table 36: Ex post estimates of the cost of Brexit and this paper's result for membership (%)

Study	Method	Date	Output	Investment	Goods trade
Born et al. (2019)	Synthetic control	End of 2018	1.7–2.5	–	–
Springford (2022a)	Synthetic control ("doppelgänger UK")	2021 Q4	5.2	13.7	13.6
Springford (2022b)	Synthetic control ("doppelgänger UK")	2022 Q2	5.5	11	7
Springford (2023)	Synthetic control, 5th–95th percentile across random donor pools	2021 Q4	3.0–6.7	–	–
Bloom et al. (2025)	Firm surveys; comparison with other advanced economies	2023–2025	6–8 (GDP per capita)	12–15.2 (2023, firm level)	–
OBR (2025)	Assumption based on the literature	Long run	4 (productivity)	–	15 (trade intensity)
This paper: membership relative to the TCA	Meta-analysis, general equilibrium model, productivity and investment	Long run	3.67 net; 5.34 gross; 5.91 net with Brexit-based productivity	13.6 (assumed shortfall)	13.9

Notes: Shortfalls relative to the counterfactual at the date shown. Investment is gross fixed capital formation for Springford and business investment for Bloom et al. and this paper. Springford (2023) reports the range for his estimate to the end of 2021, obtained by repeatedly dropping countries at random from the donor pool. For this paper, the table shows three things. The first is the gain in real income from

membership relative to the TCA in the long run (2022 tariff baseline, ψ = 1.99), net and gross of the cost of the extra investment. The second is the firm-level shortfall in business investment that membership would recover. The third is the shortfall of UK international goods trade under the TCA relative to membership in the trade model. Springford (2022b) finds services trade about the same as in the doppelgänger.

The synthetic-control studies measure the total cost of Brexit so far (Table 36). Born et al. (2019) find an output loss of 1.7–2.5% by the end of 2018, before any change in trading rules, and an expectations-augmented vector autoregression attributes much of it to a downward revision of growth expectations. Springford's "doppelgänger" estimates for the Centre for European Reform put the loss at 5.2% of GDP at the end of 2021 and 5.5% in mid-2022, with fixed investment 11–14% and goods trade 7–14% lower (Springford, 2022a, 2022b). Across randomly drawn donor pools, the loss at the end of 2021 ranges from 3.0% to 6.7% (Springford, 2023). None of these estimates is broken down by option, so they benchmark only our result for membership.

Our result for membership lies at the lower end of this range. Net of the cost of the extra investment, re-joining would raise UK real income by 3.67% in the long run, inside the 3.0–6.7% range of the doppelgänger estimates but below their central values of 5.2–5.5% and below the 6–8% of Bloom et al. (2025). Before the cost of investment the gain is 5.34%, and with productivity calibrated to the Brexit evidence it is 5.91% net. The components are consistent with the ex post evidence. The shortfall in business investment that membership would recover, 13.6%, is close to the Centre for European Reform's 11–13.7% for total fixed investment, and our model puts UK goods trade under the TCA 13.9% below membership, at the top of its range of 7–13.6%. The comparison suggests that our central result is not too large, but it should not be pushed far. The ex post estimates attribute any shock specific to the UK since 2016 to Brexit, they depend on the choice of donor economies, and they measure the cost of leaving rather than the gain from returning.