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Midlands Engine – Brexit Analysis

Introduction and context

Brexit has dominated the political discourse in the UK since the referendum in June 2016. The nature of the UK's relationship with the EU after its departure will have a substantial effect on the law, regions and people within the nation. Therefore, it is necessary that analysis is conducted so that policy makers can plan for the future. This analysis provides an insight into how areas within the Midlands Engine will be affected by the potential tariffs, NTBs, reduced migration and investment-FDI arising from the UK leaving the EU.

The general consensus within literature and amongst businesses is that the Midlands and particularly the West Midlands, will be especially vulnerable to Brexit (CBI, 2019; Chen et al, 2018; KPMG, 2018). The precise magnitude of the effect of Brexit on the Midlands differs depending on which report you read and what modelling approach they use. However, the why is consistent throughout, the Midlands has a relative (to the UK) specialisation in industries that are particularly susceptible to the likely outcomes of Brexit. These include higher tariffs and NTBs on certain goods which are exported to the EU, which are particularly high on transport equipment, an area in which the West Midlands has specialised.

As part of this project we are using a top down approach, relying on CE's E3ME model and other local area data, to analyse whether the Midlands Engine truly is more exposed to Brexit relative to the UK (Cambridge Econometrics, 2018). An analysis of the results, arising from E3ME and UALAD follows, along with comparison to similar studies that have previously been conducted (Chen et al, 2018; Dhingra et al, 2017).

Modelling

This study uses the global-sectoral E3ME model. The key features that distinguish the E3ME model are:

- its global geographical coverage, with 61 regions including all Europe's Member States and candidate countries, the world's largest economies and all other economies in groups
- its detailed sectoral disaggregation, with 69 economic sectors in Europe and 43 sectors for the rest of the world
- its econometric specification that provides a strong empirical grounding and means the model is not reliant on many of the rigid assumptions common to other (CGE) modelling approaches, for example Dhingra et al (2017)[1].

[1] A CGE model is a large-scale numerical model that simulates the core economic interactions in the economy. It uses data on the structure of the economy along with a set of equations based on economic theory to estimate the effects of policies on the economy. For more information: https://www.gov.scot/publications/cge-modelling-introduction/

E3ME relies on the national accounting framework, similar to CGE models. However, E3ME has the key advantage of relaxing some of the rigid and increasingly questioned assumptions of CGE models. In a typical CGE framework, optimal behaviour is assumed, output is determined by supply-side constraints and prices adjust fully so that all the available capacity is used. Whereas, in E3ME:

- the determination of output comes from a post-Keynesian framework, and it is possible to have unused labour and capital resources that can be utilised under the right policy conditions.
- the model is demand driven.
- it allows for economies and diseconomies of scale in both production and consumption.
- technological progress is modelled to allow both product and process innovation
- and it is not assumed that prices always adjust to market clearing levels.

The differences have important practical implications, as they mean that in E3ME regulation and other policy may lead to increases in output if they are able to draw upon spare economic capacity. The econometric specification of E3ME also gives the model a strong empirical grounding. E3ME uses a system of error correction, allowing short-term dynamic (or transition) outcomes, moving towards a long-term trend. The dynamic specification is important when considering short and medium-term analysis.

Further information about E3ME can be found in the model manual, available at www.e3me.com.

The following table summarises the key modelling differences described above that need to be borne in mind when comparing results.

Model features, assumptions and scenarios	E3ME Model
Model features	
Sector coverage	69 sectors (EU) and 43 sectors (Rest of the world)
Country coverage	61 regions
Data sources	Eurostat, OECD, World Bank, ADB, National sources
Treatment of trade	Bilateral through two-tier econometric equations (see model manual for details)
Model assumptions	
Firm competition	Variable, econometrically estimated
Equation parameters	Econometrically estimated (see model manual for details)
Long-run equilibrium	Moves towards equilibrium following dynamic path. Equilibrium determined by long-run model equations.

Scenarios

E3ME model was run based on three standard Brexit narratives which are explained in more detail below, the results are the percentage differences from base (life without Brexit) in each of the scenarios for employment and GVA by 2030.

Remaining in the single market but exiting the customs union (e.g. Norway)

There would be no tariffs on goods traded between the UK and the EU countries, and the financial sector would retain passporting rights that allow services to be provided in the other

countries in the EEA. Non-tariff barriers between the UK and the EU would remain low and there would be no new barriers to trade in services with the EU.

As the UK is no longer part of the Customs Union, it will be able to set its own external tariff and negotiate its own trade deals with non-EU countries. However, there would be some new non-tariff barriers on trade between the UK and EU, as UK exporters would have to satisfy 'rules of origin' requirements when trading with the EU, increasing trading costs, particularly in industries that have large global supply chains, such as the textiles and automotive industries.

The UK will not be able to restrict migration between the UK and the EU, but migration will be lower than in Scenario 1 as the UK becomes a less attractive place for migrants to settle, and the government tries to achieve its tens of thousands migration target.

Remaining in the Customs Union but exiting the Single Market (e.g. Turkey)

As a result, there would be no tariffs on goods traded between the UK and EU, and the UK would not be able to set its own tariffs or negotiate its own free trade agreements (FTAs) with non-EU countries. The UK could face barriers to trade in services with the EU, and as a result, non-tariff barriers are likely to increase.

As the UK is no longer part of the EEA, it will be able to have control over migration between the UK and the EU, and get closer to achieving the government's tens of thousands migration target. At the same time, countries that are part of the EEA will be able to restrict migration from the UK.

Complete exit of the EU (e.g. most third countries which operate under WTO rules, e.g. India)

The UK will have greater political power and will be able to set economic policy and regulatory standards without taking account of the preferences of other EU members.

The UK's trade with most of the rest of the world would be under the WTO rules, resulting in the largest increase in trade costs between the UK and EU across all scenarios. The UK would face the Most Favoured Nation treatment from all WTO members, and would charge the same tariffs to all other WTO members, raising the cost of trade between the UK and the EU. Non-tariff barriers between the UK and EU would also increase, due to divergence in regulation between the UK and the EU. Trade in UK services will also be governed by WTO and so UK service producers would face reduced access to the EEA.

There would be no free movement of people under the WTO rules, enabling the government to meet its tens of thousands migration target, as there would no longer be free labour mobility between the UK and the EU. This would most likely result in a sharp decline in migration.

Implementation

When modelled in E3ME, the three scenarios contain effects from trade (increased tariffs and NTBs, reduced migration and investment-FDI). The precise assumptions are described in the Preparing for Brexit report produced by Cambridge Econometrics (2018).

The scenario results are presented as % differences from the baseline in 2030, i.e. level of employment or output in Scenario X in 2030 / level of employment or output in Baseline Scenario in 2030. The scenarios are produced at the UK-sector level, and therefore analyse how each of the sectors are expected to perform at the national level. A key (and fairly strong) assumption is therefore that the sectors in different regions react the same way to the effects of Brexit.

The 2017 shares for output and employment for each area are multiplied by the various Brexit scenario effects to create an effective total Brexit impact for an area in the Midlands. Therefore, it is the differences between the sector shares that drive the differences in the Brexit impact between areas and not the inherent competitiveness of a sector within an area.

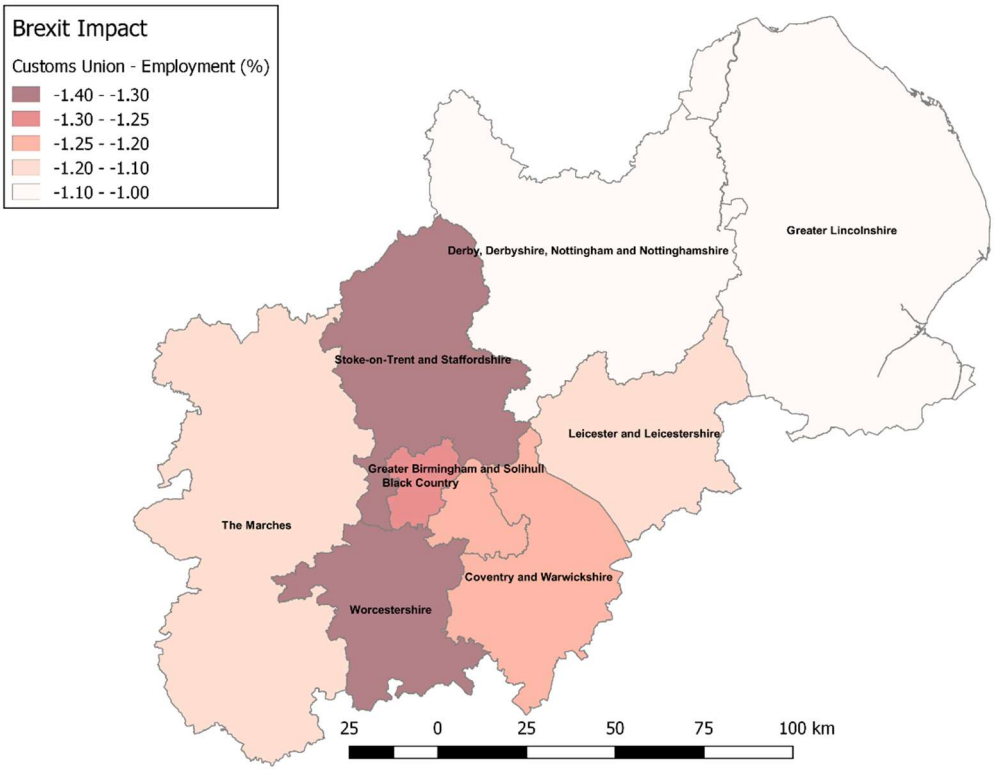
Results

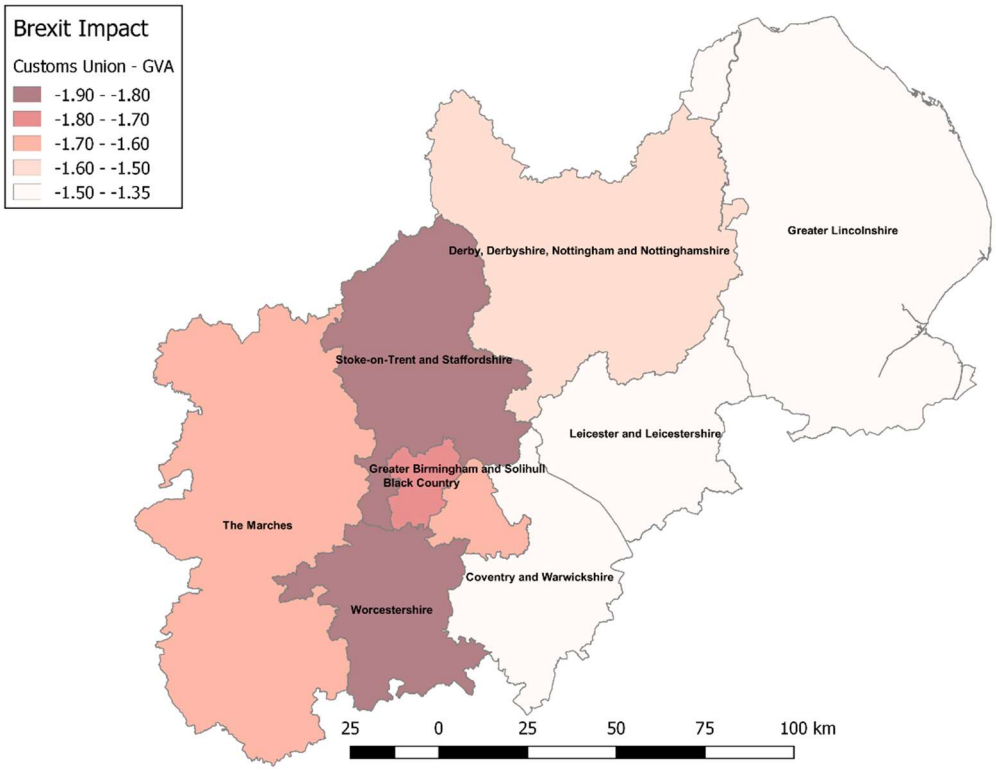
The results of the analysis show a relatively uniform outcome across the individual LEPs within the Midlands for both GVA and employment, with GVA being more heavily impacted than employment. The estimated effects of Brexit have a greater impact on the Midlands Engine than the UK to its sectoral structure, for both GVA and employment. The West Midlands is more affected by Brexit than the East Midlands, as suggested in previous literature.

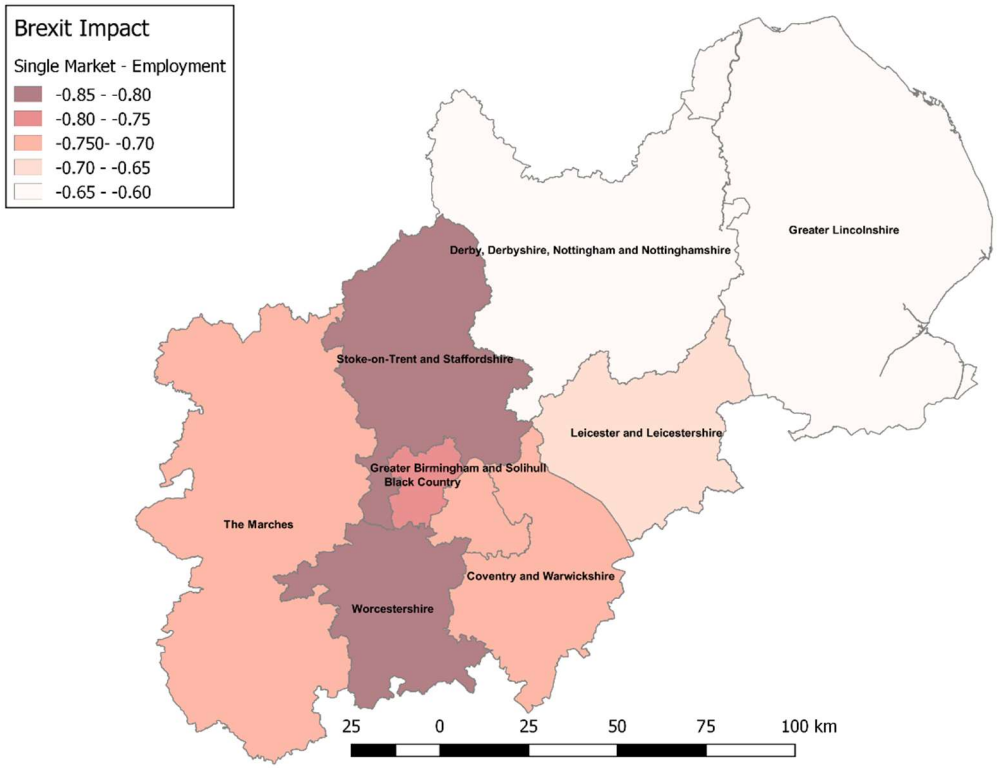
There is very little difference between the effects on the individual LEPs within each of the areas, however some interesting insights can be inferred. Different outcomes are exhibited under the different Brexit scenarios, these are broken down below:

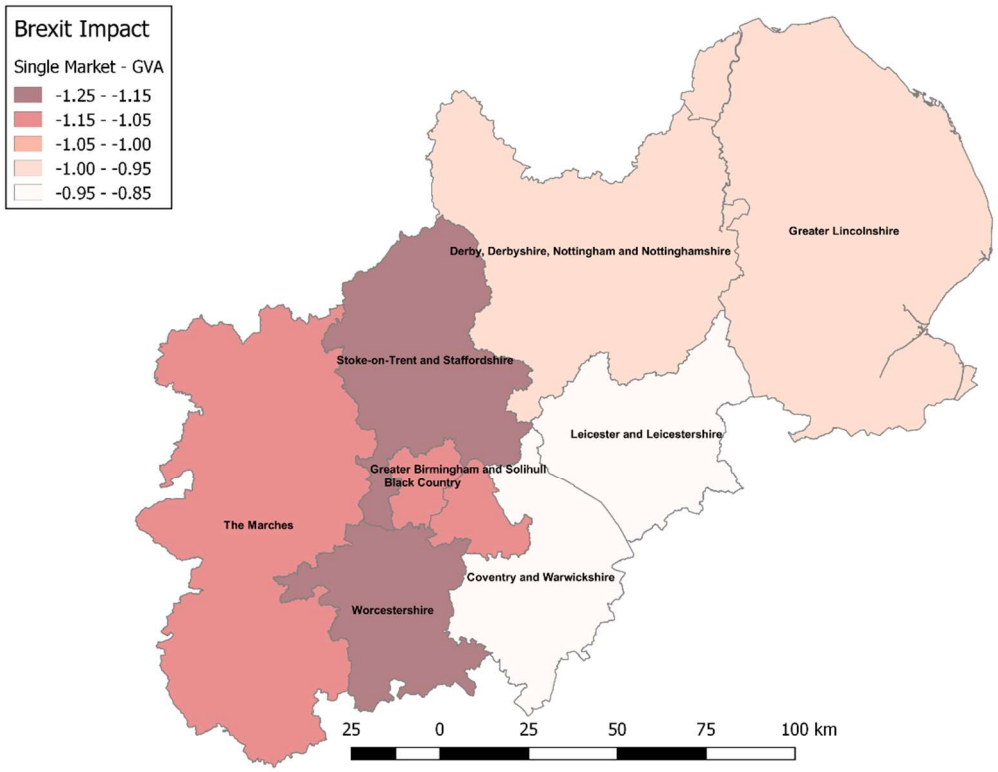
Single Market & Customs Union

In the East Midlands, in employment terms, the most affected area is Leicester and Leicestershire, but when the areas are ranked by GVA impact Leicester and Leicestershire has the smallest impact. The least affected area in the East midlands, in employment terms in Greater Lincolnshire, whereas the most affected area in GVA terms is D2N2. For the West Midlands, Stoke-on-Trent and Staffordshire is the most affected area in both GVA and employment terms. Whereas, the least affected area is Coventry and Warwickshire in GVA terms and The Marches in employment terms. The results for employment and GVA are presented as heat maps below, the darker the red the greater the percentage difference between the baseline scenario and the Brexit scenario results in 2030.


Brexit Impact
Customs Union - Employment (%)
-1.40 - -1.30
-1.30 - -1.25
-1.25 - -1.20
-1.20 - -1.10
-1.10 - -1.00
Derby, Derbyshire, Nottingham and Nottinghamshire
Greater Lincolnshire
Stoke-on-Trent and Staffordshire
Leicester and Leicestershire
Greater Birmingham and Solihull
Black Country
The Marches
Coventry and Warwickshire
Worcestershire
25 0 25 50 75 100 km

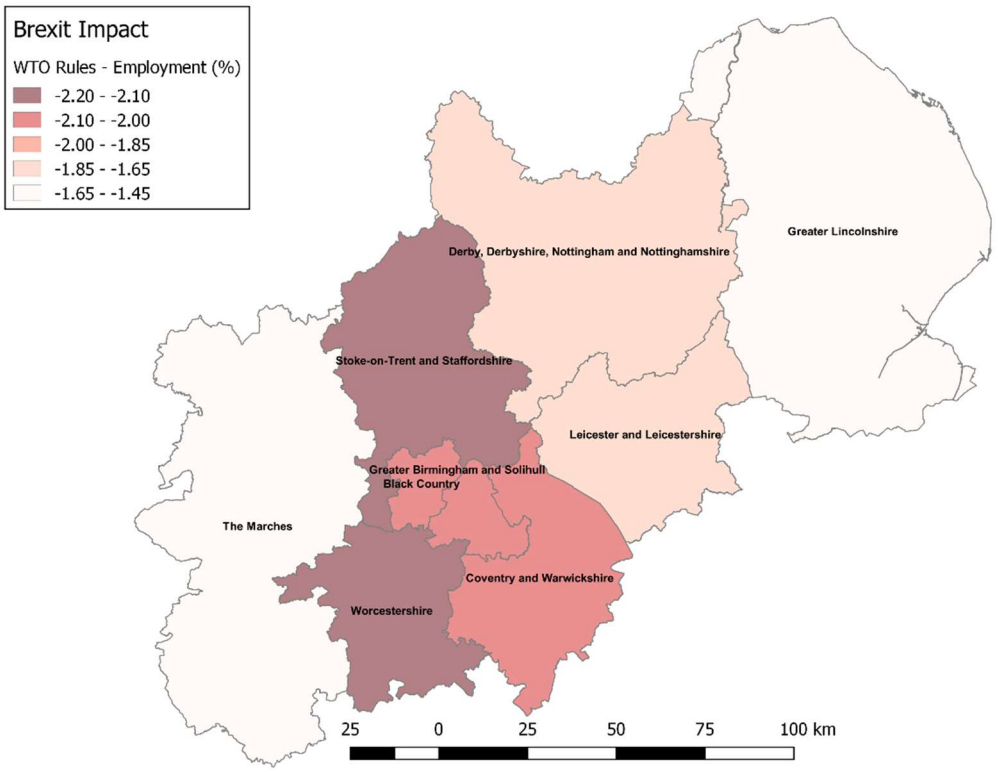

Brexit Impact
Customs Union - GVA
-1.90 - -1.80
-1.80 - -1.70
-1.70 - -1.60
-1.60 - -1.50
-1.50 - -1.35
Derby, Derbyshire, Nottingham and Nottinghamshire
Greater Lincolnshire
Stoke-on-Trent and Staffordshire
Leicester and Leicestershire
Greater Birmingham and Solihull
Black Country
The Marches
Coventry and Warwickshire
Worcestershire
25 0 25 50 75 100 km


Brexit Impact
Single Market - Employment
-0.85 - -0.80
-0.80 - -0.75
-0.750- -0.70
-0.70 - -0.65
-0.65 - -0.60
Greater Lincolnshire
Derby, Derbyshire, Nottingham and Nottinghamshire
Stoke-on-Trent and Staffordshire
Leicester and Leicestershire
Greater Birmingham and Solihull
Black Country
The Marches
Coventry and Warwickshire
Worcestershire
25 0 25 50 75 100 km


Brexit Impact
Single Market - GVA
-1.25 - -1.15
-1.15 - -1.05
-1.05 - -1.00
-1.00 - -0.95
-0.95 - -0.85
Greater Lincolnshire
Derby, Derbyshire, Nottingham and Nottinghamshire
Stoke-on-Trent and Staffordshire
Leicester and Leicestershire
Greater Birmingham and Solihull
Black Country
The Marches
Coventry and Warwickshire
Worcestershire
25 0 25 50 75 100 km

WTO Rules

In employment terms, the rankings of the individual LEPs by magnitude of Brexit effect is the same, however it changes slightly when GVA is considered. The least affected areas in the East and West Midlands remain Coventry and Warwickshire and Leicester and Leicestershire respectively. However, the most affected areas are Greater Lincolnshire and The Marches which were previously Stoke-on Trent and Staffordshire and D2N2 respectively. This is driven by the dramatic change in the fortunes of the agriculture sector under WTO rules, diminishing from -2.3% below baseline under a customs union scenario to -33.1% in a WTO scenario. This is because the sector particularly benefits from the protectionist measures that the EU currently impose on the products of agriculture. As Greater Lincolnshire and The Marches are rural areas and have a higher share of agriculture as a percentage of GVA, they are hit a lot harder by the WTO Brexit outcome.



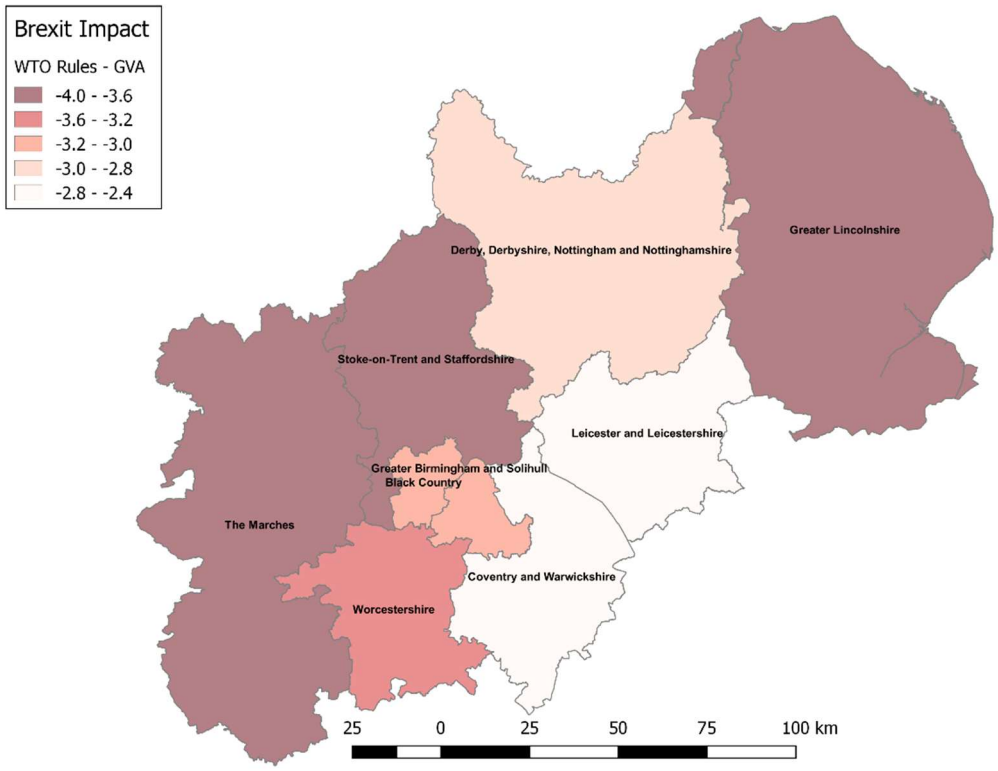


Table 1: Employment Brexit impact

	CE % Differences from Baseline in 2030		
	All effects (trade, migration, investment)		
	Single Market	Customs Union	WTO Rules
UK	**-0.6**	**-1.0**	**-1.6**
Midlands Engine	**-0.7**	**-1.2**	**-1.9**
West Midlands	**-0.8**	**-1.2**	**-2.0**
Black Country	-0.8	-1.3	-2.0
Coventry and Warwickshire	-0.7	-1.2	-2.0
Greater Birmingham and Solihull	-0.7	-1.2	-2.0
Stoke-on-Trent and Staffordshire	-0.8	-1.4	-2.2
The Marches	-0.7	-1.2	-1.6
Worcestershire	-0.8	-1.3	-2.1
East Midlands	**-0.6**	**-1.1**	**-1.7**
D2N2	-0.6	-1.0	-1.7
Greater Lincolnshire	-0.6	-1.0	-1.5
Leicester and Leicestershire	-0.7	-1.1	-1.8

Table 2: GVA Brexit impact

	CE % Differences from Baseline in 2030		
	All effects (trade, migration, investment)		
	Single Market	Customs Union	WTO Rules
UK	**-0.9**	**-1.4**	**-2.7**
Midlands Engine	**-1.0**	**-1.6**	**-3.1**
West Midlands	**-1.1**	**-1.6**	**-3.1**
Black Country	-1.1	-1.8	-3.1
Coventry and Warwickshire	-0.9	-1.4	-2.5
Greater Birmingham and Solihull	-1.1	-1.7	-3.0
Stoke-on-Trent and Staffordshire	-1.2	-1.9	-3.6
The Marches	-1.1	-1.7	-4.0
Worcestershire	-1.2	-1.8	-3.5
East Midlands	**-1.0**	**-1.5**	**-3.0**
D2N2	-1.0	-1.5	-2.9
Greater Lincolnshire	-1.0	-1.5	-3.6
Leicester and Leicestershire	-0.9	-1.5	-2.8

Comparison

Chen et al

Chen et al (2018) released a paper that examined the percentage of GDP and worker income that was exposed to the effects of Brexit in a NUTS2 area. Whilst NUTS2 areas do not directly map to LEP areas, these results can be manipulated in order for a comparison at the Midlands Engine and regional spatial levels[2]. The results for GDP can be used to validate and compare results against as this measure is broadly comparable to CEs GVA estimate. Another important thing to note is that these two variables are trying to capture different things, Chen et al are trying to look at the % of GDP that is exposed to Brexit whereas CE are estimating the actual down shift in GVA forecast up to 2030. Therefore, making a quantitative comparison would be incorrect; it is more appropriate to look at the ranking of the areas, in terms of Brexit effect.

Chen et al find that the Midlands Engine is more susceptible to the effects of Brexit than the UK as a whole, which is in agreement with the findings of CE's analysis. An interesting difference is the effect on the West Midlands and the East Midlands. The Chen et al analysis finds that the East Midlands is more exposed to the effects of Brexit than the West Midlands, whereas CE finds the opposite. Whilst this comparison raises questions, it's important to

[2] NUTS1 results produced using a weighted average of NUTS2 areas within a given area. The weights are produced using the GVA estimates for 2017 from CE's UALAD data. Midlands Engine is produced in a similar manner, by weighting the NUTS1 results.

consider the margin of the differences, CE finds that the West Midlands is slightly more affected whilst Chen et al find that the East Midlands is slightly more affected.

Table 0.1: Percentage of GVA exposed to Brexit Chen et al

	Total Economy
UK	**12.20%**
Midlands Engine	**13.22%**
West Midlands (NUTS1)	**13.15%**
Herefordshire, Worcestershire and Warwickshire	14.30%
Shropshire and Staffordshire	13.90%
West Midlands (NUTS2)	12.20%
East Midlands	**13.32%**
Derbyshire and Nottinghamshire	11.40%
Leicestershire, Rutland and Northamptonshire	15.40%
Lincolnshire	13.10%

Dhingra et al (2017)

Dhingra et al (2017) looks at how the trade-related impacts could manifest themselves across local area districts (LADs) and (through a simple aggregation process) the Primary Urban Areas (PUAs) as defined by the Centre for Cities[3]. The method by which localisation occurs is relatively straightforward, with national-sector level output (GVA) results weighted according to the LAD sector employment shares in the 2015 Business Register and Employment Survey (BRES). This provides an overall (weighted) impact for each LAD and PUA aggregate. For more information on the modelling approach see the Appendix.

Two scenarios are analysed:

- **Soft Brexit** - assume tariffs remain at zero and non-tariff barriers increase. Tariffs remaining at zero would happen if the UK joins a free trade area, such as EFTA, with the EU. Non-tariff barriers are the costs arising from customs checks, border controls, differences in product market regulations, legal barriers and other transactions costs that make cross-border business more difficult.
- **Hard Brexit** - the UK and the EU are not part of a free trade agreement (at least immediately) and so they must charge each other the tariffs that they charge to other members of the World Trade Organization. This means that goods crossing the UK-EU border are faced with WTO Most-Favoured-Nation tariffs.

PUAs have been used to analyse the different effects in the East and West Midlands as these are more easily digestible (there are many Local Authority Districts in the Midlands Engine). The analysis shows that the West Midlands performs roughly in line with the UK, whilst the East Midlands is hit slightly harder by the effects of Brexit. This is contrary to the findings from Chen et al and CE's analysis, which finds that both areas are hit harder than the UK average. These results are reasonably surprising, considering that Coventry,

[3] See http://www.centreforcities.org/puas/.

Birmingham and Leicester have large manufacturing sectors relative to the UK, although it is in these sub-areas that underperformance is observed relative to the UK. The West Midlands appears to be less effected than the East Midlands, which is in line with the findings from Chen et al but not CE. However, it is unwise to attach too much meaning to these results as it ignores rural areas. Rural areas are much more effected by the impacts of a Hard Brexit scenario due to their agriculture concentration as shown in previous analysis. All of this is shown in Table 0.2.

Table 0.2: GVA impact Dhingra et al

	Soft Brexit (%)	Hard Brexit (%)
UK	-1.14	-2.12
West Midlands		
Coventry	-1.20	-2.30
Birmingham	-1.10	-2.10
Stoke	-1.10	-2.00
Telford	-1.10	-2.00
East Midlands		
Nottingham	-1.20	-2.40
Leicester	-1.20	-2.20

References

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Appendix

Dhingra et al (2017)

Dhingra et al (ibid) refer to other papers (Dhingra et al, 2016a and 2016b) which further elaborate on the multi-sector global computable general equilibrium (CGE) model used to produce the necessary (long-run) sectoral GVA results from different assumptions on tariff and non-tariff barriers. Here, the model is described as having the following characteristics:

- a static trade model (this means that it only deals with long-run effects, and as acknowledged in the paper this means it does not account for the dynamic effects of trade on productivity);
- assumes perfect competition (price-taking behaviour) across firms, which it is acknowledge represents a lower bound on the welfare effects from changes to trade barriers;
- accounts for the interdependence across 31 sectors and 35 world regions through complex supply chains (it does this through identification of bi-lateral trade relationships using the COMTRADE database and the inter-sectoral linkages using the latest WIOD input-output tables);
- accounts for fiscal transfers that might occur between the UK and EU under different Brexit scenarios;
- models bilateral trade relationships using a gravity (relative) distance approach, using elasticities based on the literature (i.e. drawn from other studies and situations not necessarily based on the data being used – this includes an average elasticity for services trade based across studies);
- only deals with the trade effects (does not consider effects on investment and FDI, or on population, migration and skilled labour).