



Consulting

The impact of Brexit on the UK dairy sector

A report for Arla Foods UK

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This research was commissioned via LSE Consulting which was set up by the London School of Economics and Political Science to enable and facilitate the application of its academic expertise and intellectual resources.

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1. Executive summary

LSE Consulting was approached by Arla Foods UK (Arla) to analyse the potential impacts of Brexit on the UK dairy sector. Arla's Brexit Task Force has conducted extensive research into the implications of Brexit for the dairy sector, using CE Milk Model analysis, capacity mapping and EBIT analysis. Arla commissioned LSE Consulting for a review of this material and to conduct further analysis of the sectoral implications of Brexit. The aim of this project is to conduct a critical analysis of the "realistic" scenario for Brexit identified in Arla's own research and to consider the broader implications for product costs and availability in the dairy sector. The impact of Brexit on the UK dairy sector has been assessed in this report along three central dimensions: trade costs, labour markets, and the goods market.

Trade Costs

Previous analysis on the impact of Brexit on Arla and the dairy industry assumes that trade costs will increase by 2-2.5% due to Brexit. A more detailed analysis of different cost components related to customs checks suggests that this is probably an underestimate; the impact on **customs-related trade costs is likely to be much higher than 2-2.5%.**

- Outside of the Customs Union, **customs declarations** would be needed for all EU trade. Administration costs benchmarked against agent's prices can go beyond £25 per container. The UK's new Customs Declaration Service is designed to handle only 150 million declarations per year, post-Brexit there are likely to be over 250 million per year. This adds an additional cost of congestions that is likely to increase waiting times. It also generates uncertainty over the smooth functioning of the system and firms might have to move away from just-in-time production, incurring high fixed costs of setting up additional storing facilities. At present the impact of all these issues on costs is unknown but is likely to be substantial.
- For every extra seven minutes of **port check times** due to customs procedures, transportation times will increase by 10 hours, costing Arla a minimum of £111 extra per container just as a result of higher labour costs. By way of comparison, current non-EU trade check times can be up to 20 minutes. Other factors such as fuel costs, lorry maintenance, loss of perishable good life and increased wages of lorry drivers from labour market impacts mean the above figure is at the lower end of the likely range.
- **Rules of Origin**¹ costs are estimated to be 8% on average for all goods. Arla products should in general face much lower compliance costs than most, though any composite products such as flavoured yoghurts are more exposed.
- **Products of animal origin** (POAO) face greater scrutiny when imported to the EU. Unless the UK receives special third country treatment similar to Norway and Switzerland, Arla will face veterinary certificate requirements, veterinary control checks of £50.60 per 6 tonne consignment and organic certification of £45 per consignment. Moreover, a number of EU ports are currently not designated to handle POAO and thus transportation routes may be required to change, and as 100% of POAO consignments go through checks, waiting times may be further increased. Finally, around half of the UK's newly registered vets in 2016 are non-UK EU graduates, and the number of veterinary professionals immigrating from the EU is forecast to decrease, whilst UK goods requiring veterinary checks will increase by 325%. We estimate that the interaction of demand and supply forces will increase workload for

¹ **Rules of origin** are the criteria needed to determine the national source of a product.

veterinarians currently working at border checks by around 372% (note that this will only affect imports to the UK while the effects of exports from the UK depend on the labour market tightness and existing infrastructure of the importing EU countries). There can be no certainty that the system will continue to function adequately given these additional pressures.

- Though a free trade agreement (FTA) appears likely, there is no guarantee of its coverage or depth. Most FTAs signed by the EU to date do not involve **duty-free access** of dairy products. In addition, the EU is also constrained by the “Most Favoured Nation” clause in CETA. The EU will not be able to offer the UK a more favourable deal than that offered to Canada, unless the EU also offers the same access to Canada.
- In general, these trade costs are going to be symmetric across importing to and exporting from the UK, since the EU and the UK are likely to mirror each other’s concessions in a free trade agreement. However, there are some potential asymmetries as countries might differ in both existing and future infrastructure required to do customs checks.
- Table 1 presents a summary of the customs induced trade costs, which are measurable at the container level. However, a number of significant costs are unmeasurable. These include veterinary checks, which may be subject to queues and price increase due to the UK’s reliance on EU vets, import tariffs or quotas, increases in HGV driver wages and risks to the smooth running of the CDS. Finally, the waiting time costs are for an increase in check times of 7 minutes, this figure could easily increase as currently non-EU trade faces check times of up to 20 minutes.

Table 1: Customs costs per container (in % of shipping cost)

Trading Country	Shipping Cost	7 Minute Check Time Cost ²	Declaration Cost	POAO Checks Cost (weight dependent)	POAO Organic Certification
Finland	£3417	>3.2%	0.7%	1.5-11.3%	1.3%
Sweden	£2430	>4.6%	1%	2.1-15.9%	1.9%
Denmark	£2430	>4.6%	1%	2.1-15.9%	1.9%
Germany	£2430	>4.6%	1%	2.1-15.9%	1.9%
Netherlands	£1538	>7.2%	1.6%	3.3-25.1%	2.9%

Source: Arla, ONS, LFS, own calculations

- The importance of these costs will matter differently to different products. Higher value goods (e.g. Lurpak), where transportation costs make up a lower proportion of the overall cost of production, will face less of a production cost increase in comparison to goods with a lower value (e.g. yoghurts). An increase in check times to 20 minutes, the introduction of declarations and POAO checks will **increase the cost of goods sold across all categories, with high value products such as butter going up by a small amount in percentage terms, whilst the equivalent figure for other, lower value, goods will be significantly higher.**

² This is a lower bound as only considers labour cost, other factors to consider include fuel and HGV maintenance.

Labour Markets

Overall, **the labour market impact of Brexit for Arla is mixed**. Due to the availability of data our focus here is on Arla's own employees in its production facilities. However, Arla and the wider dairy sector will also be affected by what happens to staff on farm and in the haulage industry, as well as by the availability of veterinary staff (see above).

A number of reputable studies estimate that Brexit will cause a decrease in economic activity (Dhingra et al., 2016, HMT, 2016; OECD, 2016; NIESR, 2016). We estimate that on average the reduction in labour demand due to reduced economic activity will outweigh the effects of reduced labour supply from EU migration. Hence, in general wages are more likely to fall rather than rise. However, there are some occupations where Brexit will lead to labour shortages and put upward pressure on wages due to positive labour demand shocks from Brexit.

- The **UK labour market** will be affected by supply side changes due to falls in immigration from the EU, which may increase wages, and by demand side changes due to falls in economic activity due to Brexit, which may decrease wages. The impact on wages in the UK and on Arla's wage bill in its production facilities will depend on the net effect. On average the negative labour demand effects are likely to outweigh the negative supply effects such that **on the processing and production side there will be no reason for upward pressure on wages**.
- While the dairy industry relies heavily on **EU migrants** especially in processing and distribution, Arla employs fewer EU migrants than the industry average and its employment centres are in local labour markets with below average share of migration. Arla is only marginally exposed to the negative labour supply shock from a reduction in EU migration.
- Most of Arla's employment is located in **local labour markets** that face a decrease in overall labour demand due to a reduction in economic activity from Brexit. This will decrease labour market tightness and ought to put downward pressure on wages.
- As mentioned already, there will be an increased labour market tightness for **veterinary professionals**. This occupation will experience an increase in labour demand due to the increased need for border inspections and at the same time there will be a lower supply of EU workers.
- Arla has already reported facing an increase in labour market tightness for **lorry drivers**, since this occupation is facing a lower supply of EU workers and will see an increase in demand due to increased waiting time at customs checks. Wage increases in this labour market are underway now, **with both government data as well as industry insiders reporting a 10% increase in wages**. While the cause is not empirically identified, there is evidence to suggest that both sterling depreciation and falls in the UK's attractiveness to European labour have played a large role. This issue may well intensify as a result of Brexit.

Goods Markets

Overall, **Arla's goods are not likely to face any significant reductions in demand**, though there is heterogeneity across product categories.

- UK Households have already experienced a loss of £404 of **disposable income** on average as a result of the depreciation in sterling, and another £870 as a result of Brexit-related uncertainty, compared to the no-Brexit counterfactual.

- In the **longer run** households are estimated to lose £850 per year under a soft Brexit and £1700 per year under a hard Brexit due to changes in trade costs for ten years, and a further £200 annually due to migration changes.
- **Some Arla products stand to gain, as their demand is negatively related to income.**³ Various cheese products for example are estimated to have gained an increase in demand of 0.7% in the short run, and are estimated to experience demand increases of almost 1% per annum in the long run under a hard Brexit.
- Butter is the only product exposed to **negative demand impacts** due to falls in household income. These are estimated at approximately -0.8% and -1.1% per annum in the shorter and longer run, respectively.
- As this analysis has been at the product category level, it would not pick up any differences **within a given product category** which are considered luxury or non-necessary (e.g. organic goods). However, these are likely to also be highly sensitive to income changes and the negative impact on demand could be stronger.

Policy Recommendations

We believe that **staying in the Customs Union – or securing truly frictionless trade – is crucial for Arla and the wider dairy industry** since any barriers at the border will incur substantial costs. Due to Arla’s supply chain structure it may well be more exposed to these cost risks than its competitors.

Furthermore, we believe that **although continued free movement of labour or minimizing barriers to free movement is not at first glance a first-order concern for Arla, it is likely to be adversely affected by some specific labour market changes as a result of Brexit.** Within its production facilities Arla’s employment share of EU migrants is below industry average, and in addition at these sites Arla may well gain from a reduced wage bill due to a Brexit-induced slackening of the labour market. However, Arla, in common with the wider dairy industry, is likely to be sensitive to two particular labour markets: HGV drivers and vets. The dairy industry is also vulnerable to shortages of farm workers if their migration is restricted post-Brexit. It would therefore be in Arla’s interest to ensure these labour markets do not experience any significant supply side reductions, since these will inevitably increase costs.

Taking all of these changes together, it is clear that Brexit may well have a significant adverse impact on consumers of dairy products. At 16%, the UK has **second largest dairy trade deficit in the world**⁴, meaning it heavily relies on imports. The overwhelming majority (98%) of UK dairy imports are of EU origin⁵, so any friction at the border is likely to have a major, and predominantly negative, impact on the domestic market in the form of shortages of products and significantly higher prices. Restrictions in key labour markets will have a similar effect.

In the long run such issues may present opportunities for domestic dairy production, but in the short- to medium-term UK consumers will continue to depend on supplies from the EU. Agriculture depends on **far longer planning cycles** than the broader economy, particularly (for obvious reasons) when it comes to livestock rearing and dairy. Farmers cannot just ‘switch on’

³ This follows from the income elasticities of demand used in the Copenhagen Economics model.

⁴ <https://dairy.ahdb.org.uk/news/news-articles/february-2017/uk-is-largest-dairy-customer-for-eu-27/#.Wypfr6dKjcs>

⁵ <https://www.dairyfarmers.ca/content/download/5305/49186/version/1/file/DFC+AGM+Edmonton+Canada+July+2017.pdf>

milk production and produce billions more litres of milk. Efforts to make the UK more self-sufficient will require considerable time and investment in herds to produce the milk and in new production and processing facilities, as well as in training new staff. In the interim, if frictionless trade and access to labour are not protected consumers are likely to face problems of shortages and raised prices in the dairy sector.

2. The impact of Brexit on trade costs

Changes in trade costs are one of the major impacts of Brexit on the UK and the EU economies. However, there is significant uncertainty surrounding the size of the rise in trade cost due to Brexit. This section aims to provide some quantitative guidance on the expected magnitude and benchmarks it against the baseline assumption used in Arla's internal model of 2-2.5%.⁶ This appears to be based on a calculation of Arla's existing customs clearance costs for markets outside the EU.⁷

Considering a broader range of costs arising from a customs border between the UK and EU suggests that the baseline assumption is likely to be an underestimate. These costs are further outlined below. However, there is relatively large uncertainty surrounding the precise number of these cost estimates, so the below should only serve as a broad reference.

2.1. Non-tariff barriers and customs

2.1.1. Future customs arrangements

An assumption underlying this 2-2.5% estimate is that a "simplified/digital customs" process will be implemented. Two possible customs arrangements were proposed in the August white paper (HM Government, 2017a).

The first is a "Highly Streamlined Customs Arrangement" that would continue to waive customs declarations and implement a technology-based solution to ensure seamless movement through ports (for example, using vehicle recognition software). The second is a new Customs Partnership agreement, which would mirror the current EU customs arrangement for goods to be consumed in the EU.

Both are ambitious plans which would mitigate some of the costs of the loss of membership of the Customs Union (CU). The former would, however, still result in rules of origin costs⁸, require large infrastructure investment at both the UK and EU side and, according to HMRC estimates, cost firms £32.50 for each customs declaration, while the latter would require a costly enforcement mechanism to ensure compliance.

Both are highly experimental models and as it stands the EU has expressed large doubt as to whether either is plausible.

Furthermore, such large scale changes require both infrastructure and system changes. Such changes can often take years to implement as noted by Mark Corby, chair of the UK Trade Facilitation Expert Panel "You need three to five years, taking the transition up to 2025, to put in place the untried streamlined systems ultimately envisaged".

⁶ Slide 7 "Brexit Fast Track".

⁷ Slide 12 "Arla and the Economic Consequences of Brexit".

⁸ See section 2.1.4.

As it stands the transition agreement is likely to end on the 31st December 2020, thus leaving open the possibility of a customs “cliff-edge”.

2.1.2. Declarations

Currently as members of the EU, customs declarations are not required for intra-EU trade (except in very specific circumstances). Post-Brexit it is likely that all goods travelling between the UK and EU will require declarations.

Currently declarations are usually made through logistics providers serving as agents, or through the Customs Handling of Import and Export Freight (CHIEF) system. Agents’ fees can range between a few pounds to beyond £25 per sea container (Grainger, 2016). While such procedures can be done internally, this serves as a benchmark of expected administration costs.

Companies who previously have had little trade outside of the EU are unlikely to have the internal workforce to carry out declaration-related tasks, and thus will see an initial increase in administration costs, in particular for training and related software. Estimates from the Institute of Government suggest that import declarations alone could cost traders approximately £4 billion a year (Institute for Government, 2017).

Prior to the EU referendum the UK government had already decided to replace the dated CHIEF system with the new Customs Declaration Service (CDS). The old system is only able to handle approximately 50 million declarations a year while the new CDS is designed to handle 150 million. HMRC have estimated however that post-Brexit the system will be required to handle over 250 million declarations (National Audit Office, 2017). This poses obvious concerns, as an issue with the running of these systems could have serious knock-on effects for traders.

Since the Brexit vote, both specification and deadlines for the CDS implementation have changed. This has caused further concerns for some given the government’s issues with previous IT roll outs, such as with universal credit. Furthermore, the system is going to be used by an additional 130,000 new traders who, under the current set up, have never had to make declarations. Thus, even if the CDS system is rolled out in time, it will immediately be facing high pressure usage. The transition agreement however, is likely to give the rollout of the new system some extra breathing space.

Finally, it should be noted that HMRC is heavily understaffed for an exiting of the CU. They only employ around 5,000 customs staff which is dwarfed by similar size countries in the EU such as Germany who employ 35,000. David Davis has announced 5,000 new staff for HMRC to help with the Brexit related workload, though it is unclear whether this will be enough given the large structural change.

2.1.3. Check times and port traffic

As long as the UK is a member of the European Union goods can move seamlessly through UK ports going to or coming from the EU. Outside of the CU however this will no longer be the case. In particular, customs inspections will have to take place in the absence of a CU.

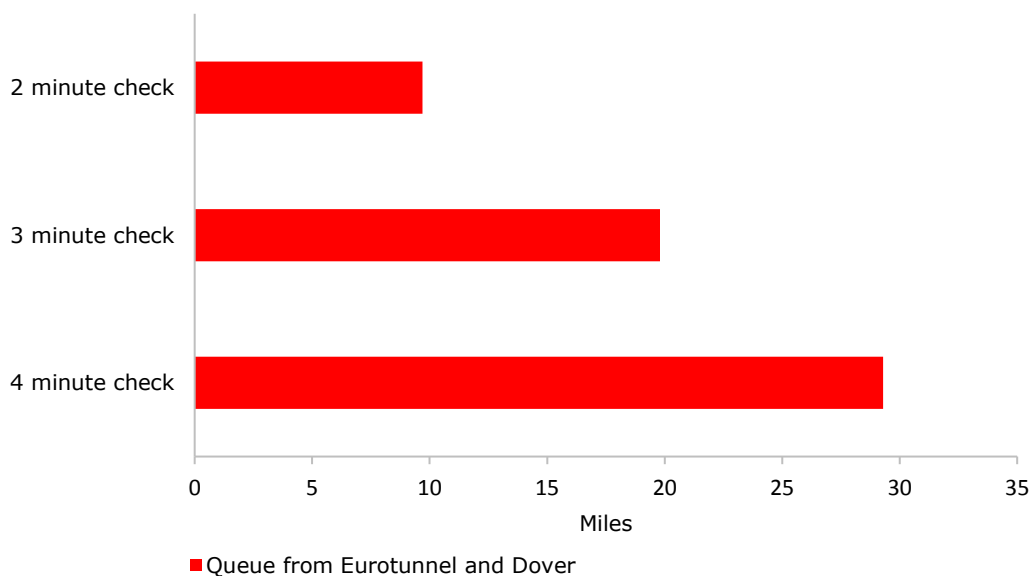
At the port of exit, having received an export declaration (which will now be required), port authorities perform a risk assessment based on the contained information and decide whether an inspection is necessary. A similar process exists at the port of entry. These checks can be related to several different areas including safety, security, consumer protection, environment, health and quotas. No such checks are required as members of the EU except under very specific circumstances (e.g. agricultural disease breakouts).

Ports which are primarily geared towards EU trade (e.g. Dover and Holyhead) are likely to experience a very large negative shock from such introductions which will increase travel times. 99% of Dover’s trade is with the EU, which in turn means they could experience up to a 100-fold increase in the number of inspections which need to be carried out. Importantly, it would mean all goods moving through the port would now be treated as those currently going to non-EU destinations.

As stated by Andrew Baxter, MD of Europa Worldwide Logistics at a House of Commons evidence session, a documentary check would delay a vehicle by an hour and a half and an inspection by five hours (Home Affairs Committee, 2017). While at the company level the risk to checks of Arla goods may not result in significant delays, when scaled up to the port level some important concerns have been raised about the ability to deal with such a large increase in checks.

Currently heavy goods vehicles (HGVs) travelling to the EU board within about two minutes. Research from Imperial College London has estimated that every extra minute required for checks per vehicle will add around an extra 10 miles of peak-time traffic queue (see figure 1), which translates to approximately 1.4 hours of waiting time (Han et al., 2017) at peak times.

Figure 1: Customs checks and traffic delays



Source: Imperial College London

According to data from the quarterly labour force survey (QLFS), the mean hourly wage for a large goods vehicle driver is £11.10, (see figure 2 for the wage distribution). Assuming Arla pays the mean wage, an extra seven minutes of check times per vehicle at Dover would imply a £111 per container increase in transportation labour costs. Currently the 1% of freight going through

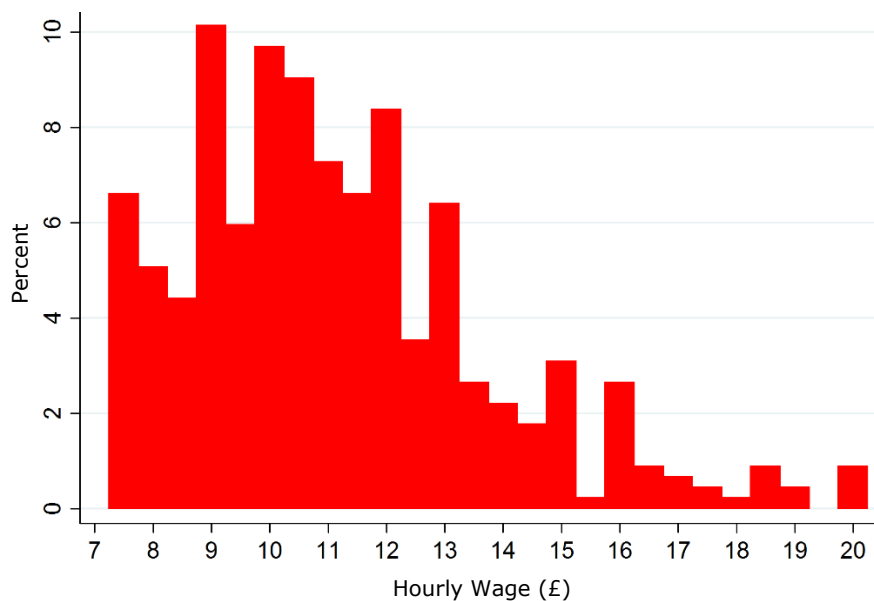
Dover destined for non-EU locations take approximately 20 minutes to clear customs (Dover, 2016)

Furthermore, existing regulation implies that drivers may not drive for longer than 9 hours per day (extendable to 10 hours twice a week). Such non-linearities may results in increases in this figure as a 10-hour delay may result in an entire extra day of HGV driver costs, depending on how their costing is structured.

Given that this is likely to be an economy-wide phenomenon for HGV drivers travelling between the EU and UK, general equilibrium effects may put upward pressure on demand for HGV drivers and thus their wages. This may in turn be exacerbated if labour supply shortages occur because of falling net migration to the UK. Non-UK EU nationals currently make up about 12% of the HGV driver labour force in the UK.

Other costs associated with such delays should also be factored in, such as increased fuel costs, capital depreciation (i.e. lorry maintenance) and loss of perishable good life. Therefore, the increased labour cost outlined above based on a seven minute delay should be seen as a lower bound of customs waiting costs.

Figure 2: Hourly wage distribution for HGV drivers



Source: Labour Force Survey, ONS, own calculations

One possible response to delay issues could be the introduction of buffer stocks, though any such process moving away from just-in-time production lines would incur, at the least, storage costs.

Ports set up for primarily EU trade do not have the current infrastructure to cope with such demands, and in some cases expansion is problematic. Dover port for example is severely space constrained due to its geographical location, and thus increasing spaces for stationary lorries requiring inspection is impossible, unless done away from the port.

Evidence from the June 2015 strikes at Calais, which resulted in a 30-mile-long tailback, demonstrate that impacts on delays may not only be caused by issues on the UK side, but rather that both sides of the border require adequate preparation to mitigate issues.

2.1.4. Rules of Origin

Outside of the CU arguably one of the costliest administrative processes is adhering to rules of origin (ROO) requirements. ROO procedures require goods to be certificated to have (partly) originated within the free trade agreement area, and therefore exporters would have to limit their use of input goods from outside the EU.

Estimates of the cost of compliance to these checks, when importing into the EU, are found to be in the range of 8% of the value of the underlying good (Carrere et al., 2011), with a significant portion of this cost (85%) being a result of extra paperwork. Thus, even those firms who already meet the necessary standards will have to bear additional compliance costs.

As the EU has one set of rules of origin which applies to both single market members outside the CU and to those with FTAs, the current situation of Norway provides a useful benchmark to assess the possible impact that the additional bureaucracy could have on trade.

A survey by the Swedish National Board of Trade (Kommerskollegium, 2011) of almost 1000 businesses, predominantly involved with foreign trade, found that Norway ranked top as both the country to improve trading relations with and the most problematic trading partner (along with Russia). Seven out of ten of those companies who stated trade with Norway was problematic pointed to "incredibly cumbersome" customs handling and rules.

For some industries ROO can be particularly burdensome where large numbers of input goods are required to produce a final product (e.g. automotives). For the dairy industry the ROO are very straightforward - all materials used must be wholly produced within the free trade area, and the weight of sugar used must not exceed 40% of the final weight. As a large number of Arla products have only one, or very few, inputs, for most Arla produce the administrative compliance costs should be well below the 8% average.

For any composite products Arla trades across the EU-UK border (e.g. strawberry flavoured yoghurt) the paperwork may become more burdensome, as proportion of product makeups would need to be documented. If any tariffs are still in place between the UK and EU, each main product component would be taxed at its individual rate. Furthermore, if any of its components come from outside the free trade area they may be subject to taxation.

This may result in problems for Arla's dynamism in the future. In particular, if in reacting to changes in world prices a change in procurement seems sensible for Arla's bottom line, the consequences of this would now need to be taken into consideration in terms of ROO and duty liability.

2.1.5. Animal and food-specific trade costs and regulations

Non-tariff barriers are one of the main impediments to frictionless trade. For Arla, some of these non-tariff barriers (NTBs) are likely to be exacerbated as their tradable produce would be

classified under “products of animal origin”. The extent of the barriers will hinge on the future trading agreement with the EU.

As noted in a recent House of Commons report (House of Commons, 2017), exporters of products of animal origin (POAO) need to go through the following steps:

1. Register with the EU as a third country company that is authorised to export animal products to the EU.
2. Apply for relevant import licences along with documentary proof of the product’s country of origin.
3. Apply and pay for veterinary certificates to show that the product meets EU public health standards.
4. Notify the relevant EU Border Inspection Post (BIP) in advance of the arrival of the goods.
5. Arrive at the first point of entry into the EU only at an approved EU Border Inspection Post.
6. Submit the goods for veterinary inspection before the consignment is permitted to freely move on to its destination within the EU.

The UK is likely to impose similar rules on exporters from the EU. These are likely to have a two-pronged impact on Arla, one directly at the company level and then indirectly through general equilibrium effects.

For example, the British Veterinary Association (BVA) has estimated that post-Brexit the volume of goods requiring veterinary checks will increase by 325% (BVA, 2017). Compounding this immense increase in demand is the potential negative labour supply shock that the UK veterinary labour market could face, which has been highly dependent on EU graduate vets. Indeed, in both 2015 and 2016 more EU graduated vets registered with the Royal College of veterinary surgeons than UK graduates (See figure 3). Both effects could result in a large excess of demand for veterinary services, either pushing up prices or waiting times, or both.

POAOs may only enter the EU through a designated border inspection post (BIP). As Calais and Boulogne have been designed for frictionless trade, neither are currently BIPs. Additionally, Ireland’s only BIP is at Dublin, and no BIP currently exists at the land border between Northern Ireland and Ireland. Even if a decision to develop a BIP at Calais was taken, it would unlikely be able to accommodate a fast procedure. Additionally, part of that process would be in the hands of the French port operators who would have to decide whether it was in their commercial interests to construct the necessary infrastructure.

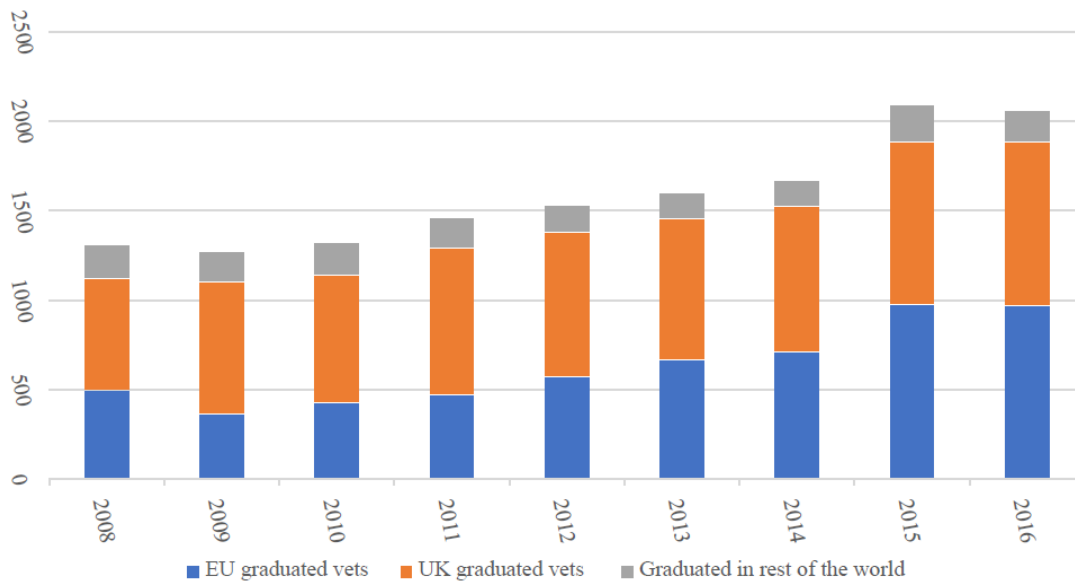
Harmonised charges exist for veterinary control checks at BIPs. For example, the BIP currently at Felixstowe charges £50.60 per consignment up to 6 tonnes and an additional £8.28 per tonne up to a maximum charge of £386.28 per consignment. Other port certifications exist which may be relevant to Arla such as organic certification which costs £45 per consignment.

These are carried out on 100% of consignments from third countries, and thus would also contribute to delays at ports.

Though “third countries”, EEA members (e.g. Norway) as well as Switzerland get treated as EU members with regards to such processes and therefore do manage to avoid some significant NTBs. Given the red lines drawn by UK government in its Brexit negotiations, the UK does not

appear likely to accept the four freedoms (goods, services, capital and persons). Thus, it is unclear whether the UK will be afforded all EEA benefits if a FTA is agreed. Hence there is a high risk of POAO NTBs being imposed in the future.

Figure 3: Annual registrations with RCVS by area of graduation



Source: RCVS

2.2. Free trade agreements (FTAs) and tariffs

The lead hypothesis of the Brexit scenario analysis focuses on a free trade agreement with zero or low tariffs on milk and dairy. While the government has made its intentions clear to pursue a deep trade deal (e.g. see HM Government, 2017b) there may be limitations on what is attainable. Free trade agreements (FTAs) vary significantly across a number of dimensions including the reductions of tariffs and non-tariff barriers. This is particularly true for the agricultural sector that is often highlighted as one of the most sensitive sectors in trade negotiations. The Agreement on the European Economic Area for example only contains provisions on various aspects of trade in agricultural and fish products.

Recent FTAs negotiated by the EU have been much deeper and have covered more products than previous FTAs. The South Korea-EU FTA, the most ambitious trade deal ever implemented by the EU, allows duty-free access to the EU market for 95% of all agricultural product lines. However, the impact of this tariff-free access to the EU market is only marginal for the EU agricultural sector since South Korea only accounts for 0.15% of total imports of agricultural goods into the EU. The relative unimportance of South Korea as a trade partner, especially in agricultural goods, makes it problematic as a role model for a future UK-EU FTA. Given the interconnectedness of the EU and the UK market, the priorities of both sides for the negotiations are likely going to be different compared to the EU-South Korea FTA.

Many commentators have pointed to the free trade agreement between Canada and the EU (CETA) as a guideline for the future UK-EU FTA. CETA, however, includes quotas and tariffs for a number of agricultural products, including dairy produce. In particular, cheddar cheese

exported from the EU to Canada faces a tariff rate quota of 3 cents per kilogram *within* the allowed quota, and a tariff of 245.5% *over* the allowed quota. The EU however did liberalise all its dairy tariffs lines, though was only willing to do this as it imports extremely low quantities of dairy produce from Canada. Therefore, it should not be taken for granted that EU trade negotiators are willing to do the same in a trade agreement with the UK.

When it comes to trade negotiations the starting point has been found to be very important (Sampson, 2016). Trade negotiations are a bargaining game and countries make concessions starting from the initial reference point. Therefore, the final outcome of trade negotiations depends on the starting point. Usually the starting point is the status quo, however, for the future EU-UK FTA it is unclear whether this initial point is the single market, with zero tariffs and full regulatory alignment, or the WTO MFN status. Average MFN tariffs on dairy for the EU stand at 35% (WTO, World Tariff Profiles 2016) and most FTAs signed by the EU do not involve duty-free access of dairy products.

There also exist constraints on what exactly the EU can offer the UK. CETA contains a “Most Favoured Nation” (MFN) clause, which means that neither signatory can treat the other less favourably than it treats third parties. When the UK and EU look to signing a new FTA, the UK would be a third party in the eyes of Canada. Thus, the EU will not be able to offer the UK a more favourable deal than that offered to Canada, unless the EU also offers the same access to Canada, and any other countries that have a similar clause in their FTA with the EU.

The UK as a whole has the second largest dairy trade deficit in the world (16%). Within that, Arla relies heavily on imports to the UK market from the EU both in absolute terms and relative to its main competitors. For Arla, and for the dairy sector more widely, it is therefore paramount to ensure zero-tariff access. To achieve this goal it seems vital that negotiators take the single market or at least the free movement of goods as the reference point in trade negotiations.

2.3. The overall impact of Brexit on trade costs for Arla

Brexit will affect trade costs between the UK and the EU in variety of ways. As discussed above the most important changes and regulations that will apply to Arla, if the UK leaves the customs union, are as follows: declaration costs, port check times, product of animal origin (POAO) checks and potentially organic certification, rules of origin (ROO), tariffs and quotas.

While there is high uncertainty surrounding the magnitude of these trade costs we provide some rough estimates how they will increase the cost of trading goods between the UK and the EU for some categories. Given that this trade accounts for 98% of total UK dairy imports, it is also notable that any increases in trade costs would likely have a major impact on the domestic dairy market in the form of shortages of products and significantly higher prices. In the long run such issues may present opportunities for domestic dairy production, but the nature of farming, and particularly farming involving livestock, means these would require considerable time and investment, meaning that in the short- to medium-term UK consumers will continue to depend on supplies from the EU.

Trade costs induced by Brexit can be broken down into 3 categories, those measurable at the container level, those measurable at the product level and those which are unmeasurable due to data limitations and uncertainty. Table 1 presents a summary of the customs induced trade

costs which are measurable at the container level. In addition to these, ROO costs at the product level should be considerably less than 8%, though may be closer to 8% for any composite products. Unfortunately, a number of significant costs remain which are unmeasurable. These include veterinary checks, which may be subject to queues and price increase due to the UK’s reliance on EU vets, import tariffs or quotas, increases in HGV driver wages and risks to the smooth running of the CDS. Finally, the waiting time costs are for an increase in check times of 7 minutes, this figure could easily increase as currently non-EU trade faces check times of up to 20 minutes.

Table 1: Customs costs per container (in % of shipping cost)

Trading Country	Shipping Cost	7 Minute Check Time Cost ⁹	Declaration Cost	POAO Checks Cost (weight dependent)	POAO Organic Certification
Finland	£3417	>3.2%	0.7%	1.5-11.3%	1.3%
Sweden	£2430	>4.6%	1%	2.1-15.9%	1.9%
Denmark	£2430	>4.6%	1%	2.1-15.9%	1.9%
Germany	£2430	>4.6%	1%	2.1-15.9%	1.9%
Netherlands	£1538	>7.2%	1.6%	3.3-25.1%	2.9%

Source: Arla, ONS, LFS, own calculations

⁹ This is a lower bound as only considers labour cost, other factors to consider include fuel and HGV maintenance.

3. The impact of Brexit on the labour market in the UK

The decision of the United Kingdom to leave the European Union has important implications for the food industry, from the milk farmer to the final consumer. In this section we will focus on the labour market implications of this decision, along the supply chain of dairy products and Arla's supply chain, focussing on Arla's employees in its production facilities due to data availability. We will discuss the implications of the decision to leave on labour supply and labour demand conditions separately.

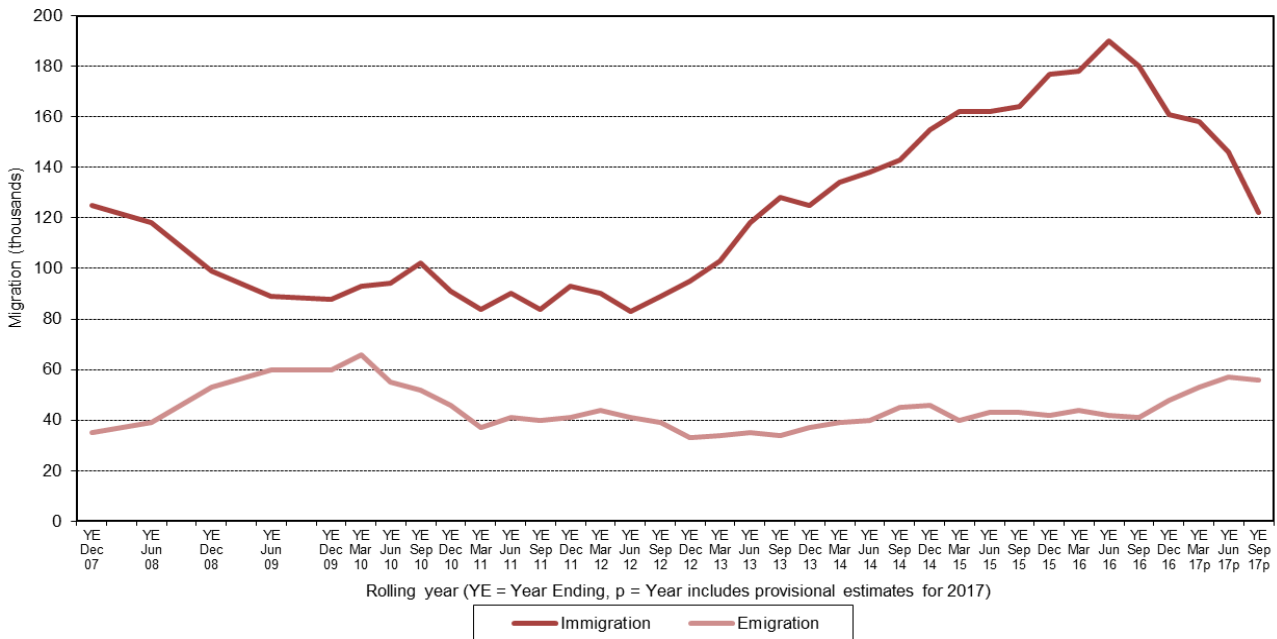
- Changes in labour supply are largely driven by changes in immigration from the EU.
- Changes in labour demand are due to a reduction in overall economic activity relative to a state of the world where the UK remained in the European Union.
- The referendum induces a negative labour supply shock and a negative labour demand shock such that the net effect is ex-ante unclear.

At the time of the decision to leave the European Union the labour market was very tight and it continues to be so. From November 2017 to January 2018 there were 816,000 job vacancies with only 1.45 million (4.3%) workers classified as unemployed, the lowest unemployment figure since 1975. In line with the economy as a whole, the drink industry faces difficult labour market conditions. Almost three quarter of respondents to a recent industry survey said they face challenges when recruiting permanent local staff (Food and Drink Federation 2017).

3.1. The impact of the referendum on aggregate labour supply

Since the referendum there has been a rapid decrease in net migration from the EU to the UK. Work-related net migration from the EU has almost halved relative to the year prior to the referendum, according to provisional data from the ONS (see figure 4). This decrease is particularly pronounced for migrants that come to the UK looking for work as opposed to those that migrate for a definite job. Net migration of job seekers has decreased from more than 60,000 per year to just around 10,000 (see figure 5).

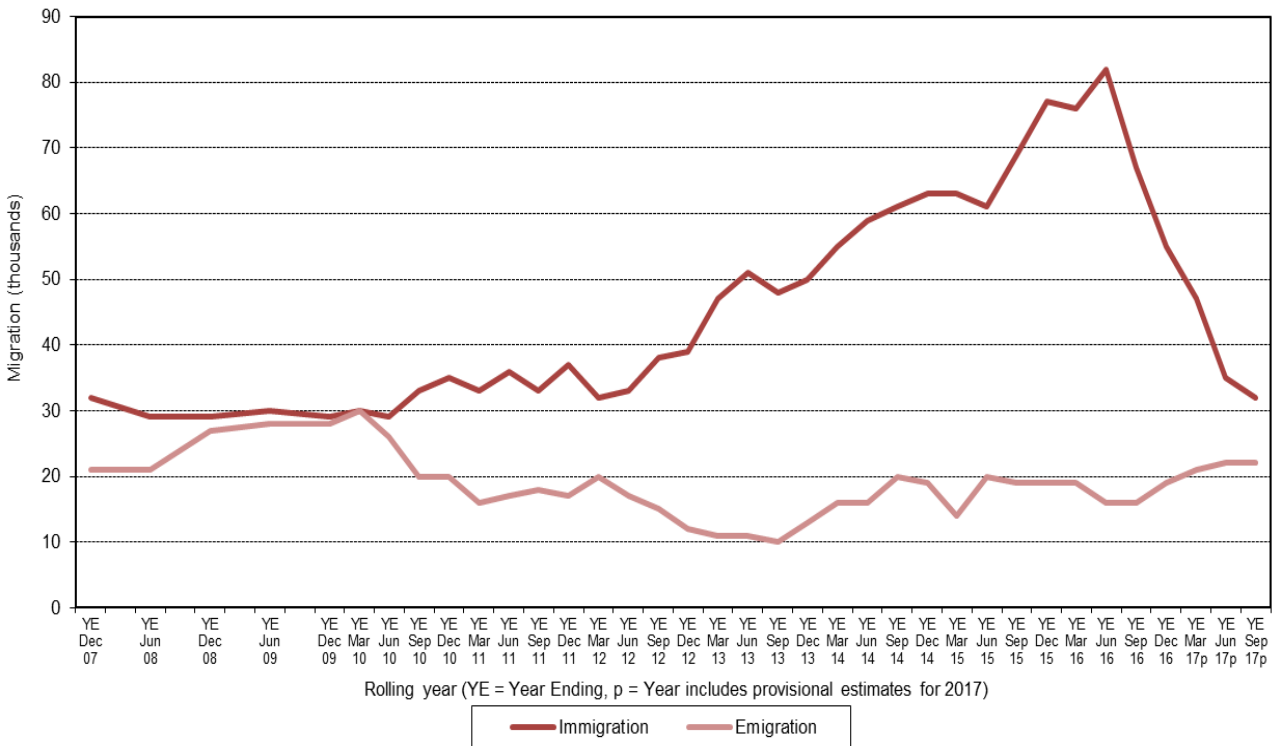
Figure 4: Work-related migration from the EU



Source: International Passenger Survey estimates, ONS

High-skilled workers are generally more likely to migrate for a definite job while low-skilled workers tend to migrate first and then look for a job locally. Therefore, the observed drop in migration is most likely driven by a drop-in net-migration of low-skilled workers.

Figure 5: Work-related migration from the EU: looking for a job



Source: International Passenger Survey estimates, ONS

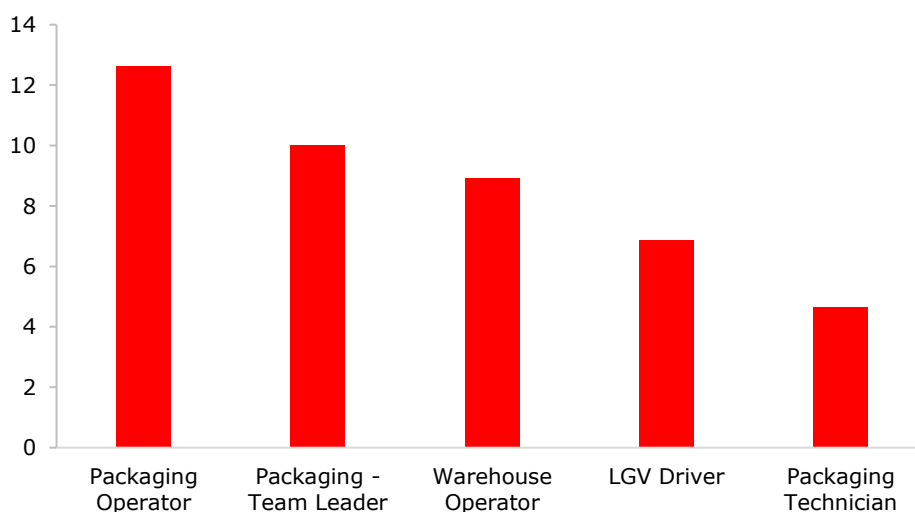
Since there has been no change in actual legislation, the observed drop in migration is likely to continue in the coming years. The observed migration response appears driven by the following set of factors (Portes 2016). First, the decrease in sterling decreases the effective real wage of migrants that send remittances to their origin countries or plan to spend their savings abroad. Second, the referendum has created uncertainty about their future status in the UK which decreases the benefits of migration. Third, the focus on migration during the campaigns, as manifested in the increase of hate crimes around the referendum (Home Office 2017), is a psychological factor reducing net migration. Some additional factors that might lead to a decrease in migration are a reduction in the unemployment rate across the EU and the end of high temporary migration from new member states after the end of restrictions on movement.

While the decrease in migration is likely to continue and intensify over the coming months and years there is high uncertainty around the future path of net migration from the EU to the UK. The key drivers of uncertainty are as follows. First, government policy towards migration from the EU has yet to be specified. Second, there is a lack of historical precedence for exiting the European Union which makes the shape of final policy arrangements more uncertain. Due to this uncertainty there are few credible estimates about long-term changes in migration from the EU to the UK. Portes and Forte (2017) predict that annual net migration from the EU will fall by 100,000, from a 180,000 peak, i.e. by more than 50%.

3.1.1. EU migration across industries and occupations

Overall Arla’s workforce consists of 8% of migrants from the EU (see table 2). In line with overall industry characteristics, Arla relies on migrant labour most heavily in low- and semi-skilled occupations in its food processing operations (see figure 6). The EU migrant share is highest amongst packaging and production operators (12%) and team leaders (10%), and warehouse operators (9%).

Figure 6: Share of EU migrants in Arla workforce by occupation



Source: Arla Foods Ltd, own calculations

While Arla’s reliance of migrants from the EU (8%) is above the economy-wide average of 6%, it is far below the industry average for both agriculture (9%) and especially food and drink manufacturing (30%). Similarly, Arla relies less on migrants from Non-EU countries compared to both the economy as a whole and the industry average (see table 2). Hence Arla appears relatively less exposed to changes in migration flows.

Table 2. Migrant share of employment

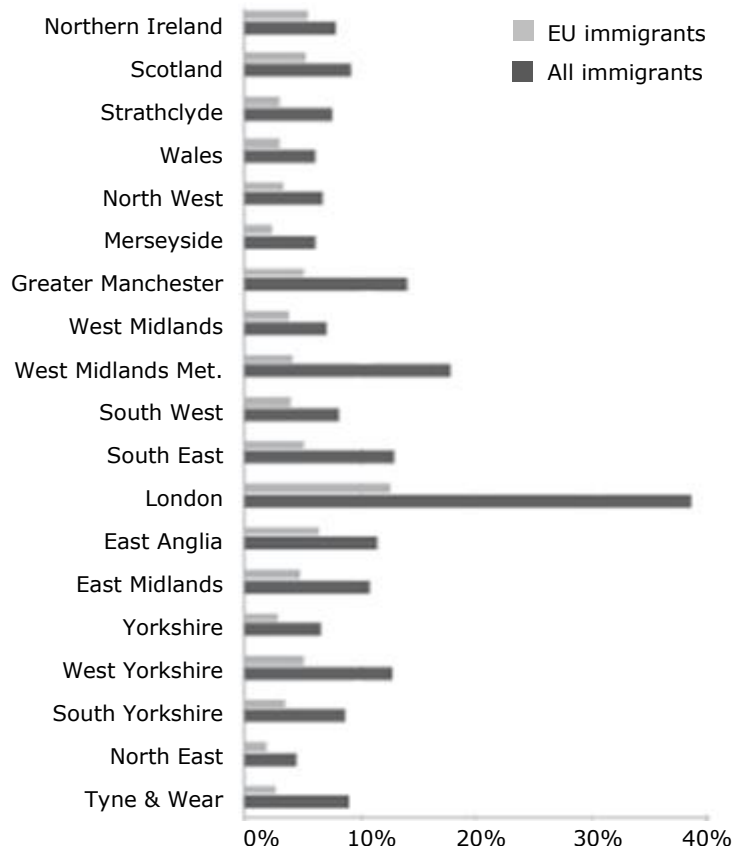
	EU migrant share of employment	Non-EU migrant share of employment
Arla	8%	2%
Agriculture (industry average)	9%	n/a
Food & drink manufacturing (industry average)	30%	4%
Economy average	6%	4%

Source: Arla Foods Ltd, ONS, own calculations

3.1.2. EU migration across regions

The current distribution of migrants from the EU varies significantly across different regions (see figure 7). Current immigration tends to be concentrated in areas that already have a significant migrant population and therefore emigration is a more tangible concern for those areas. Hence the negative labour supply shock induced by a reduction in net migration from the EU varies significantly across different regions and will be most concentrated in the regions that currently have a high stock of migrants.

Figure 7: Regional Distribution of Migrants



Source: ONS LFS

The regions with the highest migrant share are metropolitan areas like London and Greater Manchester as well as Scotland, Northern Ireland, the South East and East Anglia. As a result, Aylesbury Dairy, Oakthorpe Dairy and Hatfield RDC likely have local labour markets that are more exposed to the potential negative labour supply shock. But given that most of Arla’s employment is located in more rural areas of England, it is likely to be relatively less affected by the regional impacts of reduced migration from the EU, compared to firms with more metropolitan local labour markets. The only exception could be Arla’s Head Office and operations in Leeds/West Yorkshire, which is one of the regions with a relatively high share of EU migrants in the current population. However, since less than 5% of Arla’s workforce around Leeds consists of migrants from the EU, the exposure to the labour supply shock seems very limited (see table 3).

Arla relies most heavily on EU migrants at Trevarrian Creamery, Hatfield RDC, Malpass Creamery and Oswestry Packaging, so it might experience increased labour turnover at these locations (see table 3).

Table 2: Regional distribution of EU workforce at Arla

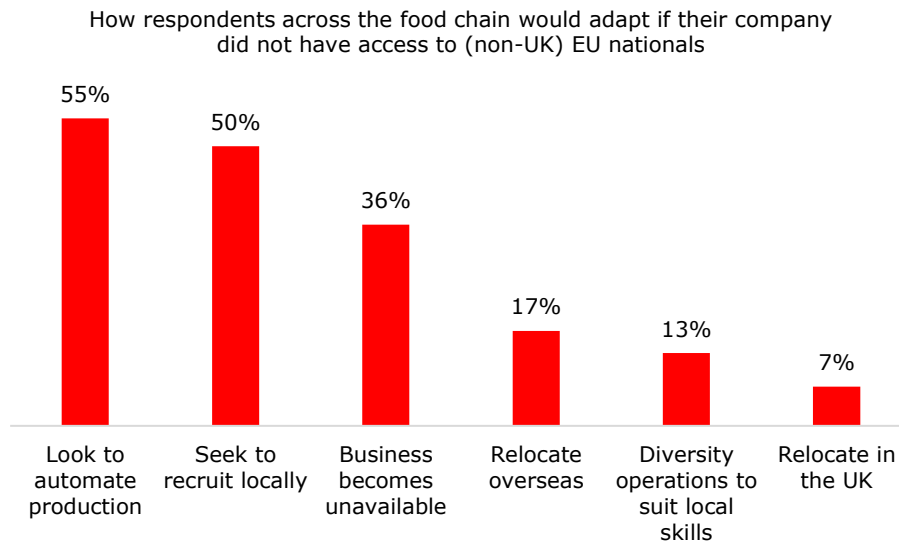
Location	Number of Employees	Proportion of EU workers	Proportion of Low Skilled/ Blue Collar	Local Authority
Arla Head Office	463	5%	20%	Leeds
Aylesbury Dairy	441	13%	88%	Aylesbury Vale
Burton Upon Trent	82	7%	95%	East Staffordshire
Hatfield RDC	11	18%	55%	Welwyn Hatfield
Llandyrnog Creamery	97	5%	78%	Denbighshire
Lockerbie Dairy	313	1%	84%	Dumfries & Galloway
Malpass Creamery	43	16%	88%	Cheshire West
Melton Mowbray Creamery	91	13%	89%	Melton
Oakthorpe Dairy	198	9%	85%	Enfield
Oswestry Packaging	370	15%	87%	Shropshire
Settle Creamery	99	8%	85%	Craven
Stourton Bulk Farm	90	4%	92%	Leeds
Stourton Dairy	471	4%	88%	Leeds
Stourton NDC	260	3%	93%	Leeds
Taw Valley Creamery	124	2%	81%	West Devon
Trevarrian Creamery	41	20%	83%	Cornwall
Westbury Dairies	253	9%	89%	Wiltshire
Westbury Distr. Centre	84	7%	89%	Wiltshire

Source: Arla Foods Ltd, own calculations

3.1.3. Industry-level reactions to changes in aggregate labour supply

A recent survey of producers along the food supply chain suggests that producers who rely more on migrant labour from the EU will react to a decrease in migration from the EU by increasing automation (see figure 8). These adjustments by more exposed competitors will have a dampening effect on how changes in labour supply will affect Arla, since they reduce the overall demand for labour.

Figure 2: Industry-level strategic responses to a reduction in migration



Source: Food and Drink Federation (2017)

3.1.4. The wage effect of changes in net migration

Academic studies on the effect of migration on wages suggest that these effects are likely to be small. While the majority of studies find no effects, some studies find that an increase in migration of low-skilled workers leads a decrease in wages and employment for low-skilled workers and a small increase in wages for high-skilled workers. However, these magnitudes are equilibrium outcomes and include other effects such as firms adjusting their production decisions (e.g. increasing automation) following changes in the supply of labour.

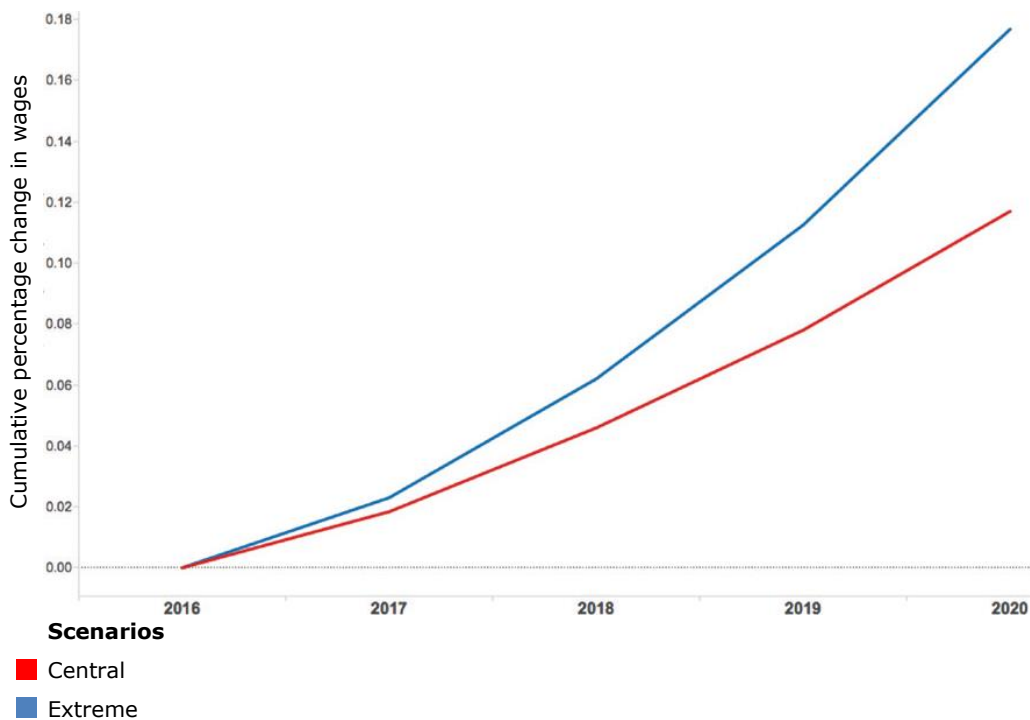
Portes and Forte (2017) predict that work-related migration will fall by 100,000 from pre-referendum levels of 180,000 net migrants per year. Based on this they predict a cumulative increase in wages of 0.12 per cent by 2020 and 0.51 per cent by 2030 for low- to medium-skilled service sectors that provide an upper bound for the wage effect (see figure 9).

The prediction by Portes and Forte is at the upper end of estimates of the potential effect on wages. Using an elasticity of wages with respect to migration¹⁰ from Dustmann et al. (2017) that is also at the upper-end of estimates from the academic literature on migration, we would predict a decrease in wages of less than 0.1% for unskilled occupations. The main source of uncertainty with these estimates is that most studies are based on an increase in migration, since abrupt decreases in migration have been less commonly observed in more recent times.

Overall, any increase in wages due to a decrease in migration is likely to have relatively negligible effects on Arla.

¹⁰ I.e. the % change in wages due to a % change in migration.

Figure 9: Predicted cumulative wage effect of reduced migration



Source: Portes and Forte (2017)

3.2. The impact of Brexit on aggregate labour demand

Brexit induced trade costs are predicted to have a strong negative effect on overall output, and thus aggregate labour demand is also likely to reduce.

Analysis from the Centre for Economic Performance (CEP) suggests that higher trade costs in a 'soft' and 'hard' Brexit scenario will reduce GDP 1.28% and 2.61% per annum respectively, over a ten-year period (Dhingra et al. 2016).

The hard scenario assumes trading with the EU under WTO conditions and thus introduces both tariffs as well as an increase in non-tariff barriers (NTBs) of 8.31%. The soft scenario could be likened to a Norway style arrangement where only NTBs increase (trade costs increase by 2.77% in this scenario).¹¹

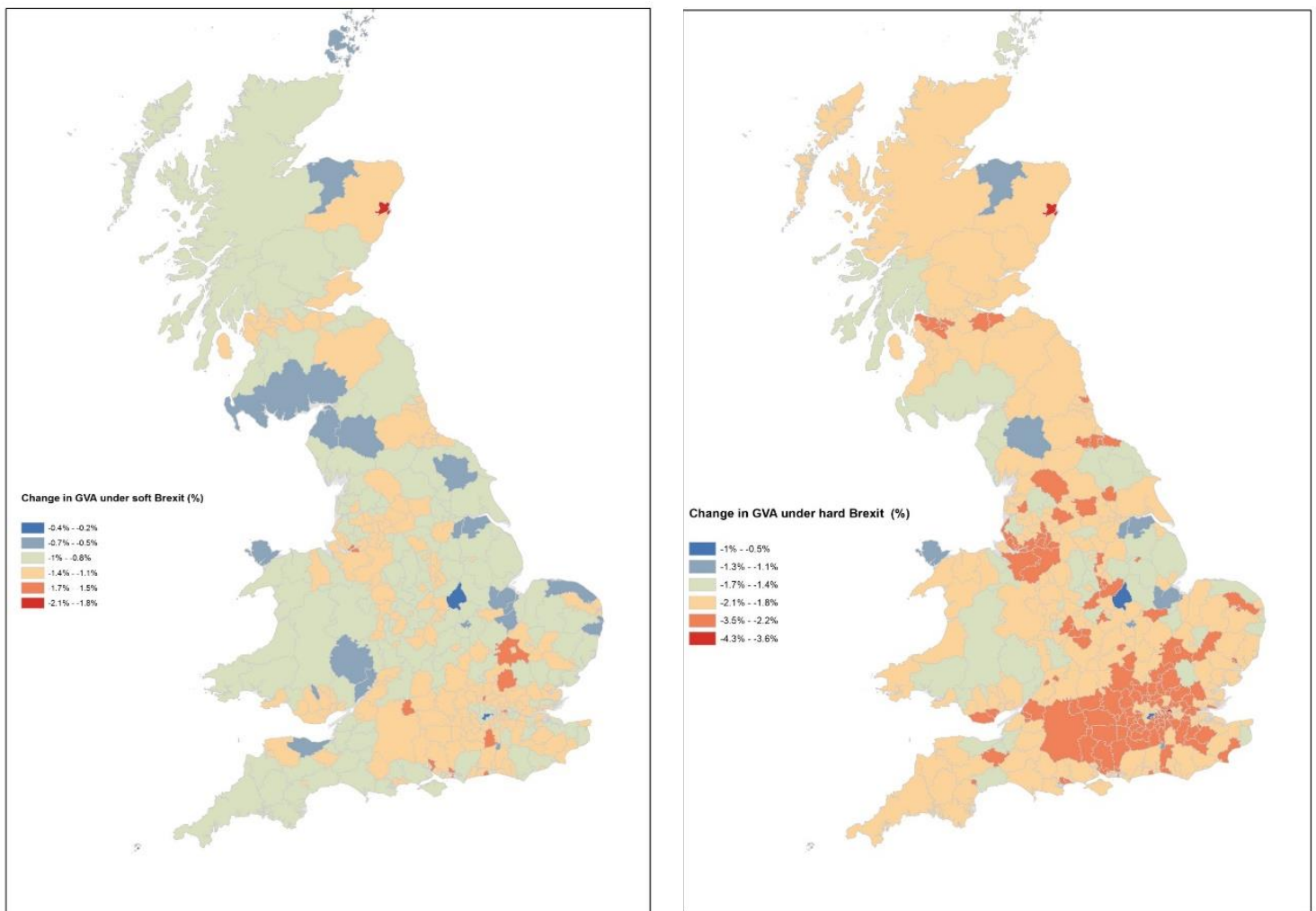
The quantitative model is estimated using data from the World Input Output Database which contains information on trade flows and inter-country sectoral input/output linkages. The model is driven by the observed gravity relation in international trade (trade increases with the size of the trading partners and decreases in distance between trading partners) and estimates are computed using trade volumes as well as trade elasticities.¹²

¹¹ For more detail please see Appendix A1 in Dhingra et al. (2017)

¹² Trade Elasticity = $\frac{\% \Delta \left(\frac{\text{imports}}{\text{domestic demand}} \right)}{\% \Delta \text{ bilateral trade cost}}$

In the labour market analysis, we focus on the effects of Brexit on the local authority level following Dhingra et al. (2017), since low- and medium-skilled workers tend to be hired locally. Figure 10 shows how the impact of Brexit varies significantly across local authorities. These differences are driven by the sectoral impacts estimated in the CEP’s quantitative trade model and the local authority employment shares in different sectors. One can see from figure 10 that impacts are distributed similarly under both the hard and soft scenario and that the south-east is posed to experience the largest negative impacts from Brexit. Additionally, urban areas appear the most exposed to a negative Brexit shock.

Figure 10: GVA impact by local authority under “soft” and “hard” Brexit



Source: Dhingra et al. 2017

As Arla’s produce is sold nationally, variation in local goods demand conditions are not likely to significantly impact Arla’s sales. However, local economic conditions will be important for Arla’s production costs due to their impact on local labour demand conditions (Manning and Petrongolo 2017). In particular, the greater the local negative impact of Brexit, the larger the reduction in demand for local labour. This in turn will likely place downward pressures on local wages. This fall in the wage level is likely to be persistent if it follows a similar trajectory as that of the Great Recession’s, where wages are yet to recover completely to levels seen in 2008. This downward

pressure is likely to be more pronounced for unskilled workers who are generally less occupationally and geographically mobile.

Local GVA impacts allow us to analyse the development of each local labour market in which Arla's activities and employment are based. Table 4 presents the 18 locations for which Arla has operations in the UK along with the estimated Brexit impacts for the local authority and information on the structure of employment for the area. We highlight the local authorities that are least affected by Brexit and thus will experience the least loosening of local labour market conditions. Arla production locations which are located in these local authorities are Lockerbie Dairy, Melton Mowbray Creamery, Oswestry Packaging and Taw Valley Creamery.

Table 3: Regional distribution of Brexit labour demand shock among Arla locations

Location	Local Authority	Soft Brexit LA Impact (% GVA, annualised)	Hard Brexit LA Impact (% GVA, annualised)	Wage Impact Soft (%)	Wage Impact Hard (%)
Arla Head Office	Leeds	-1.31	-2.58	-1.86	-3.65
Aylesbury Dairy	Aylesbury Vale	-1.19	-2.25	-1.69	-3.19
Burton Upon Trent	East Staffordshire	-0.98	-1.88	-1.39	-2.66
Hatfield RDC	Welwyn Hatfield	-1.29	-2.49	-1.83	-3.53
Llandyrnog Creamery	Denbighshire	-1.30	-2.09	-1.84	-2.96
Lockerbie Dairy	Dumfries	-0.74	-1.45	-1.05	-2.05
Malpass Creamery	Cheshire West	-1.27	-2.53	-1.80	-3.58
Melton Mowbray Creamery	Melton	-0.41	-0.85	-0.59	-1.20
Oakthorpe Dairy	Enfield	-1.17	-2.24	-1.66	-3.17
Oswestry Packaging	Shropshire	-0.93	-1.77	-1.31	-2.51
Settle Creamery	Craven	-1.42	-2.77	-2.01	-3.93
Stourton Bulk Farm	Leeds	-1.31	-2.58	-1.86	-3.65
Stourton Dairy	Leeds	-1.31	-2.58	-1.86	-3.65
Stourton NDC	Leeds	-1.31	-2.58	-1.86	-3.65
Taw Valley Creamery	West Devon	-0.89	-1.75	-1.26	-2.48
Trevarrian Creamery	Cornwall	-0.94	-1.83	-1.33	-2.60
Westbury Dairies	Wiltshire	-1.18	-2.26	-1.68	-3.20
Westbury Distr. Centre	Wiltshire	-1.18	-2.26	-1.68	-3.20

Source: Arla Foods Ltd, Dhingra et al. (2017), Gregg and Machin (2012), Abel and Bernanke (2005), own calculations

3.3. The overall labour market impact of Brexit for Arla

The aggregate impact of labour market conditions depends on the interplay of labour supply and demand.

Overall, Arla is likely to experience a loosening of labour market conditions, both in absolute terms and relative to the industry average.

Table 5 summarizes the labour market effects for different locations of Arla, combining the results of our supply and demand-side analyses.¹³ The two main results are as follows. First, the demand factors are always more than an order of magnitude larger than the supply effects, indicating the overall effect of Brexit will be a labour market loosening. Second, there seems to be a positive correlation in the exposure to the supply and the demand shock. Those regions that have many migrants and hence are likely to experience a large increase in wage following a reduction in net migration are also more exposed to the negative labour demand effect through reduced economic activity. Therefore, none of Arla’s production locations are overly exposed to a labour market tightening.

Nevertheless, there are certain occupations for which Arla might face a tightening of the labour market, due an interaction of demand and supply factors. In particular, this will affect HGV drivers and providers of veterinary services.

Figure 3: Time series of hourly wage rates for HGV drivers



Source: Labour Force Survey, ONS, Own calculations

¹³ The central and the extreme estimate assume an annual reduction in migration of 100,000 and 150,000, respectively. The supply effects were calculated using a number of additional assumptions. We have to assume that the distribution of EU migrants is equal to the distribution of overall migrants, due to a lack of data on origin specific migration at the local authority level. This reduction is translated into a wage effect using the elasticity estimated by Dustmann et al. (2017).

The labour market for lorry drivers is likely to tighten as a net result of demand and supply factors. On the supply side, given that 12% of lorry drivers in the UK are migrants from the EU (7% of lorry drivers employed directly by Arla are migrants from the EU) this occupation faces a negative labour supply shock. Figure 11 presents the time series of hourly wages for HGV drivers in the UK. As one can see, following the referendum nominal wages have increased around 10%. This is in line with anecdotal evidence reported by industry insiders, who have reported they have seen hourly wages increase by £1 since the referendum. Around half of this increase appears to be attributable to inflationary pressures, though it is unclear whether HGV drivers would have sufficient bargaining power to mitigate any inflationary losses through increased wages. Further evidence from industry insiders suggests that the availability of Eastern European drivers has decreased reducing both recruitment and retention. This is unsurprising, as the sterling depreciation would have meant an approximate 10% fall in wages for Eastern European drivers who evaluate their incomes in their home currency. This reduction in labour supply would inevitably place upward pressures on wages, as hauliers would have either to rely more on expensive agency drivers, or change their wage structures to continue attracting migrant labour.

As discussed in section 2.1.5., the British Veterinary Association estimates that the volume of goods requiring veterinary checks will increase by 325%, so there will be a significant increase in demand for veterinary services in the border regions. At the same time a significant number of registered and newly registering veterinary practitioners are EU migrants. Given the expected fall in net migration from the EU this will decrease labour supply. Using the projected estimate of Portes and Forte (2017) we find that the supply of veterinary surgeons is going to decrease by around 10% of current RCVS members over the next five years. This horizon is chosen as new supply of surgeons is only going to react sluggishly given the training required to enter the profession. This estimate has to be used with caution as it assumes that the changes in net migrations are in line with the estimated average of other occupations and thus does not account for potential government policies that could try to avoid a shortage of veterinarians. Combining the changing supply and demand factors, and assuming no adjustments of veterinary surgeons across different sub-occupations, the workload for a surgeon working in border checks is going to increase by around 372%.

Table 4: Regional distribution of demand and supply effect in local labour markets

		Demand factors		Supply factors	
Location	Local Authority	Wage Impact Soft (%)	Wage Impact Hard (%)	Wage Impact Central estimate (%)	Wage Impact Extreme estimate (%)
Arla Head Office	Leeds	-1.86	-3.65	0.04	0.07
Aylesbury Dairy	Aylesbury Vale	-1.69	-3.19	0.03	0.04
Burton Upon Trent	East Staffordshire	-1.39	-2.66	0.03	0.05
Hatfield RDC	Welwyn Hatfield	-1.83	-3.53	0.09	0.11
Llandyrnog Creamery	Denbighshire	-1.84	-2.96	0.01	0.02
Lockerbie Dairy	Dumfries	-1.05	-2.05	0.01	0.02
Malpass Creamery	Cheshire West	-1.80	-3.58	0.02	0.03
Melton Mowbray Creamery	Melton	-0.59	-1.20	0.01	0.02
Oakthorpe Dairy	Enfield	-1.66	-3.17	0.11	0.17
Oswestry Packaging	Shropshire	-1.31	-2.51	0.02	0.03
Settle Creamery	Craven	-2.01	-3.93	0.02	0.04
Stourton Bulk Farm	Leeds	-1.86	-3.65	0.04	0.07
Stourton Dairy	Leeds	-1.86	-3.65	0.04	0.07
Stourton NDC	Leeds	-1.86	-3.65	0.04	0.07
Taw Valley Creamery	West Devon	-1.26	-2.48	0.02	0.03
Trevarrian Creamery	Cornwall	-1.33	-2.60	0.02	0.03
Westbury Dairies	Wiltshire	-1.68	-3.20	0.02	0.04
Westbury Distr. Centre	Wiltshire	-1.68	-3.20	0.02	0.04

Source: ONS, LFS, Arla Foods Ltd, Dhingra et al. (2017), Gregg and Machin (2012), Abel and Bernanke (2005), own calculations

4. The impact of Brexit on the market for dairy products

As a result of Brexit the economy has experienced, and is likely to experience further, negative effects on households' real incomes and population growth, which will affect the demand for dairy products. Given that the precise arrangements for trade and customs are uncertain the analysis below does not take their impact into account. However, the effects described here could well be accentuated in the event of significant product shortages and subsequently higher prices caused by any friction at the border between the UK and the EU.

4.1. Long-run effects

The CEP's workhorse Brexit trade model (Dhingra et al., 2016) predicts annualised negative welfare impacts from Brexit of -1.28% under a soft Brexit, and -2.61% under a hard Brexit, from an increase in trade barriers. In terms of annual household income this translates to approximately -£850 and -£1700 respectively. Given that these estimates are for a ten-year period each year, the cumulative impact would be much greater and is likely to have significant effects in the longer run.

Similarly, estimates from the Office for Budget Responsibility (OBR) suggest that Brexit-induced reductions in migration will cause a yearly drop in economic growth against the trend by 0.2%. (OBR, 2016). This drop is entirely attributed to the fall in aggregate labour supply (and population) and assumes that productivity remains constant. Therefore, we estimate Arla's produce will experience a 0.2% drop in demand due to loss of migrant population against the no-Brexit counterfactual.

Such effects are also likely to be important for the Copenhagen Economics model which currently assumes that UK dairy consumption will grow along with the population at 0.6% per year. This figure is based on trend population growth for the UK since 2005. There are downside risks to this assumption, however: almost 60% of this growth rate is attributable to net migration, of which approximately half has historically come from the EU (ONS, 2017). Thus, this level of consumption growth is likely to be an overestimate.

Table 5: Long-run demand impacts

Product	Income elasticity of demand ¹⁴	Annualised Trade Induced Demand Change (Hard) %	Annualised Trade Induced Demand Change (Soft) %	Annualised Migration Induced Demand Change %
Cheddar	-0.23	0.60	0.29	-0.2
Mozzarella	-0.23	0.59	0.29	-0.2
Other cheese	-0.23	0.60	0.29	-0.2
Yoghurt	-0.22	0.58	0.29	-0.2
Condensed milk	-0.20	0.52	0.26	-0.2
Milk powders	-0.10	0.26	0.13	-0.2
Raw milk	0.00	0.00	0.00	-0.2
Liquid milk & other	0.00	0.00	0.00	-0.2
Butter	0.26	-0.67	-0.33	-0.2

Source: Arla Foods Ltd, ONS, own calculations

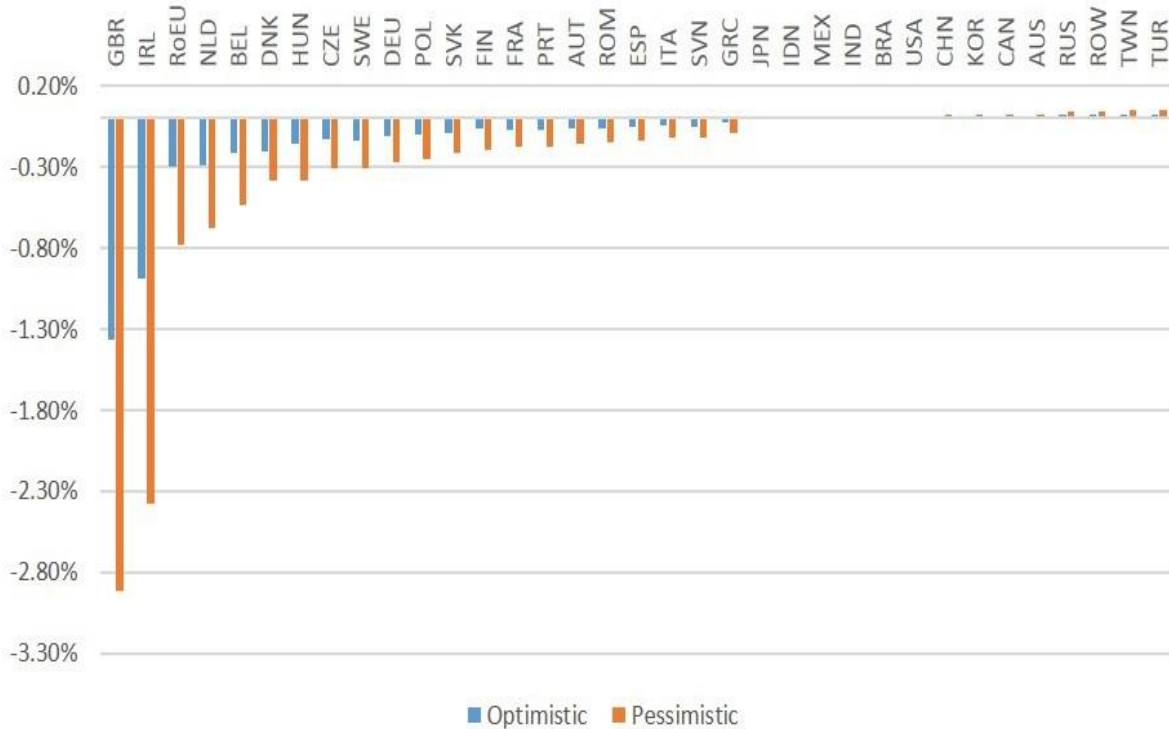
The permanent reduction in household income will impact demand for Arla products. Table 6 presents estimates for the long-run annual demand changes for Arla products as a result of the income changes (due to adjustments in trade and migration), against a counterfactual of no Brexit. As many Arla products are inferior goods in the economic sense,¹⁵ as incomes fall, they are likely to experience an increase in demand as households will switch to more basic products from more luxurious substitutes. The various forms of liquid milk are unlikely to experience any income effects. However, butter may be more exposed to decreases in demand. Under a hard Brexit scenario, the CEP and OBR estimates imply butter would experience a yearly fall in demand of 0.87%. Cumulatively over a ten-year period this would mean a 9% loss of demand for butter against the counterfactual no Brexit scenario.

These impacts for Arla demand refer to the UK market. However, as noted in figure 12, other EU countries are likely to experience reductions in welfare too, with Ireland facing only marginally lower welfare losses than the UK. Thus, if there are any Arla products with a large sale share in Ireland and which are sensitive to incomes, these would also be exposed to Brexit-induced decreases in demand.

¹⁴ Taken from Copenhagen Economics Model.

¹⁵ Inferior goods are products which experience an increase in demand as incomes fall and vice versa. This is not a value judgement of Arla products.

Figure 12: Welfare impacts for different European countries



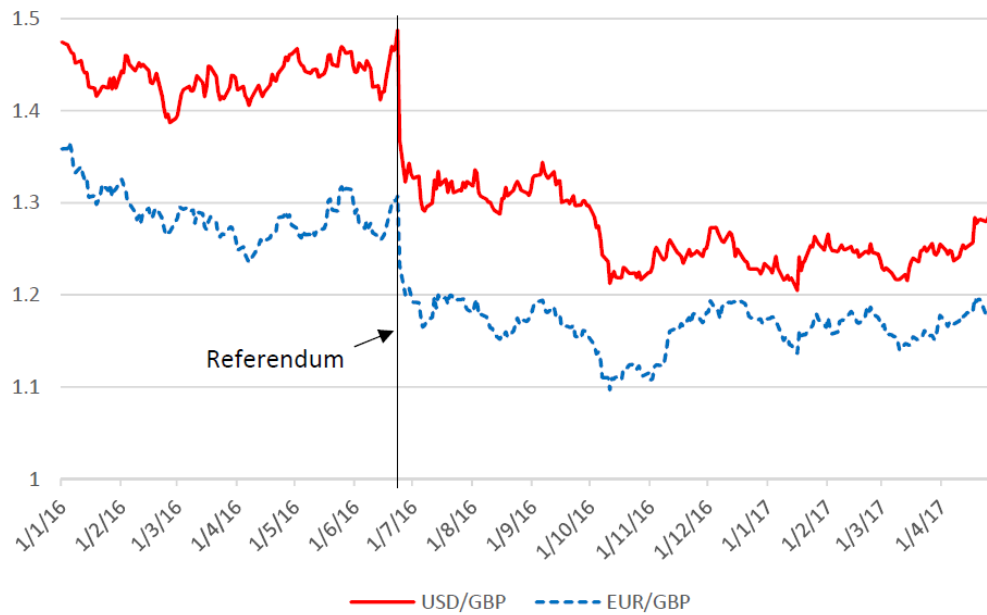
Source: Dhingra et al. (2016)

4.2. Short-run effects

As the UK will continue to be a member of the EU until March 2019, and business will continue as normal until the end of the transition period on 31st December 2020, the longer run impacts are unlikely to materialise for at least the next two and a half years. Short run impacts, however, have already started to manifest through two mechanisms.

First, following the referendum, sterling immediately depreciated by approximately 10% against other major currencies (see figure 13) which decreased households’ real income. A study from the CEP that exploits variation in import exposure of goods demonstrates that the sterling shock resulted in an increase of inflation of 1.7% the year after the referendum (Breinlich et al., 2017).

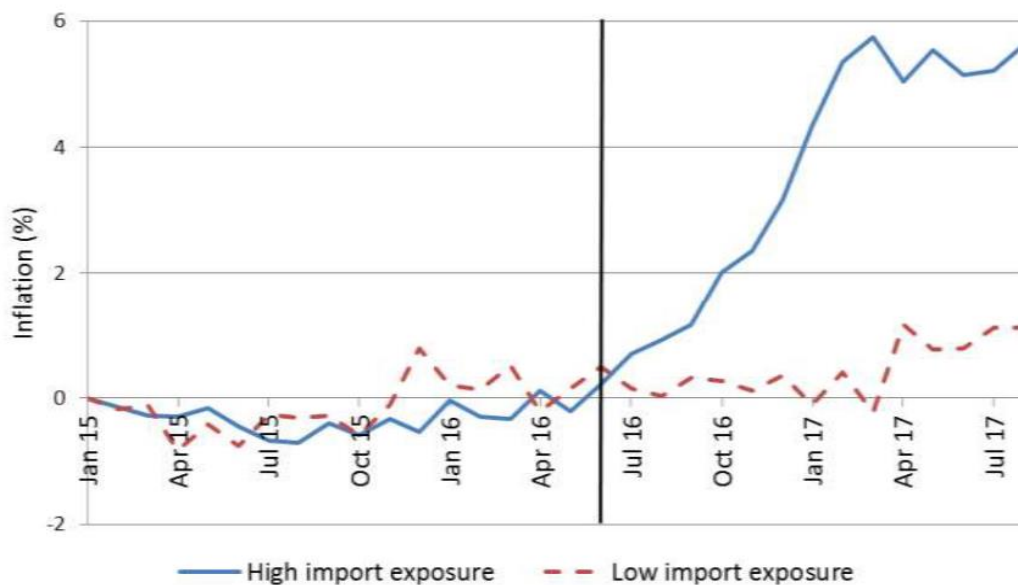
Figure 13: Sterling price 2016-2017



Source: Breinlich et al. (2017)

This in turn translates into a real loss of household disposable income by approximately £404, which affects consumers’ spending patterns. Aggregate effects would mean that all households have effectively less to spend and thus any income-sensitive products of Arla may face falls in demand. More critically however, one can see from figure 14, products with a higher import exposure experienced an inflation rate around 4% higher than low import exposure products. Therefore, any imported Arla produce will either have faced a loss in mark-up to remain competitive, or faced a price increase which would likely impact demand.

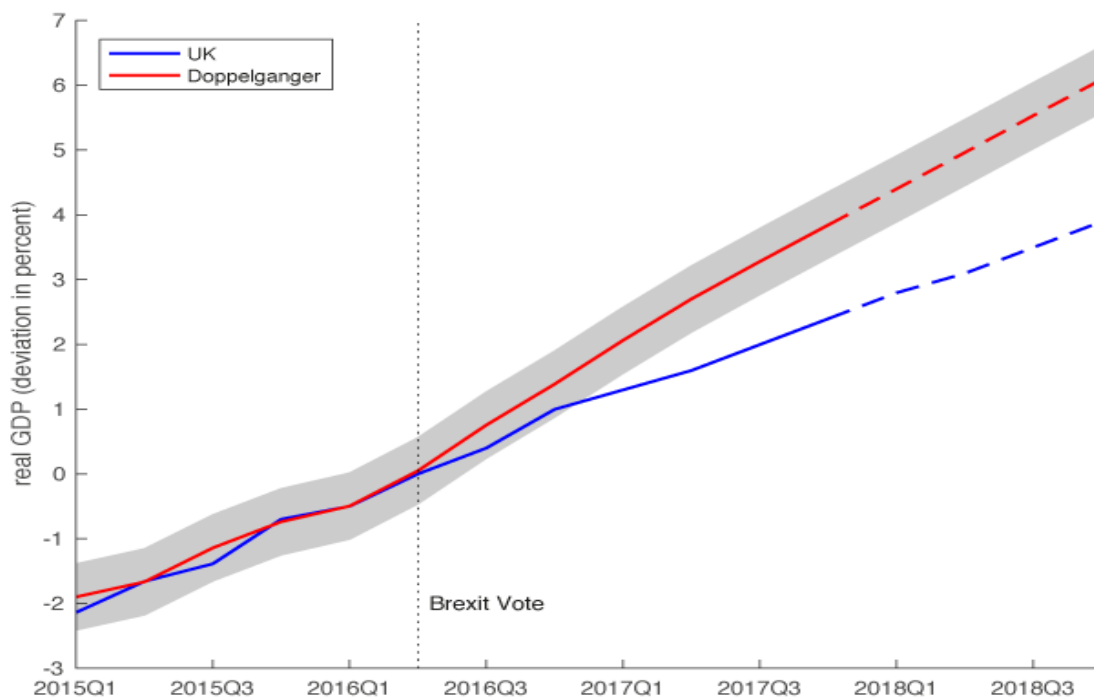
Figure 14: Inflation by import exposure



Source: Breinlich et al. (2017)

Second, increased uncertainty also appears to have had some important short run impacts on UK GDP. A synthetic control study (Born et al., 2017), which creates a doppleganger (or no Brexit counterfactual) based on pre-trend similarities across other non-UK countries for the development of the UK economy, had Brexit not occurred, found that by the 3rd quarter of 2017 the cost of Brexit stood at 1.3% of GDP (see figure 15). The authors conclude that this was caused predominantly by increased uncertainty, which in turn depressed both consumption and investment as firms and households became more cautious with their spending. Again such impacts are likely to lead to short run falls in demand for Arla products which are not seen as “necessities”.

Figure 15: Real GDP of UK and Doppelganger



Source: Born et al. (2017)

Table 7 presents the shorter run effects on demand due to both the depreciation in sterling and increased uncertainty following the referendum. As before, a number of Arla products are likely to have experienced a relative increase in demand, while only butter is likely to have been exposed to a negative demand shock.

Table 6: Short-run demand impacts

Product	Income elasticity of demand ¹⁶	Depreciation Induced Demand Change %	Uncertainty Induced Demand Change %
Cheddar	-0.23	0.39	0.30
Mozzarella	-0.23	0.38	0.29
Other cheese	-0.23	0.39	0.30
Yoghurt	-0.22	0.38	0.29
Condensed milk	-0.20	0.34	0.26
Milk powders	-0.10	0.17	0.13
Raw milk	0.00	0.00	0.00
Liquid milk & other	0.00	0.00	0.00
Butter	0.26	-0.44	-0.33

Source: Copenhagen Economics, Breinlich et al. (2017), Born et al. (2017), own calculations

4.3. The overall impact of Brexit on the markets for dairy products

Both the long and short-term impacts on Arla’s profits will depend on their sales composition of different products. If a large portion of their revenue is from butter and milk, and cheese makes up a smaller portion of their sales, they may experience some drops in profits, all else equal.

It should also be noted that the above elasticities are for general product groups. There may be variation within product groups and this should be considered for any Arla products which may be considered non-essential or luxury (e.g. organic), as such products are likely to face greater income sensitivity for its demand.

Overall, Brexit will reduce household disposable income both in the short and in the long-run, and reduce the population size in the long-run. Since the demand for most of Arla’s products increases when income decrease they are not affected negatively by the reduction in household disposable income, as these increases in demand outweigh the losses due to a reduction in population. The notable exception is butter, which will experience an overall decrease in demand.

Note that this analysis only focuses on overall demand and does not account for increased production costs for Arla due to an increase in trade cost, nor the altering effects on consumer supply and demand that might be caused by product shortages and higher prices.

¹⁶ Taken from Copenhagen Economics Model.

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