# QUANTITATIVE MODELLING FOR POST-BREXIT SCENARIOS

Final report for
AHDB

Submitted by


**Agribusiness Consulting | Informa**

*in association with*
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## S1. Executive summary

The UK's decision to leave the European Union (EU), its Single Market and the Common Agricultural Policy (CAP), has created much uncertainty for the agricultural sector. The Agriculture and Horticulture Development Board (AHDB) has identified four main areas of concern. These are (i) the terms of international trade, both with the remaining EU-27 and with other countries; (ii) domestic agricultural policy, as manifest in support payments, rural development and market management; (iii) migrant labour and its availability; and, (iv) the UK regulatory environment.

This study explores these four areas of concern using three scenarios specified by AHDB. These scenarios are intended to bound the likely possibilities resulting from the UK's exit from the EU. The first scenario (termed ***Evolution***) represents essentially a 'Business as Usual' option where the policy, regulatory framework and trading relations remains as close to the *status quo* as is possible given that the UK will no longer be part of the EU's Single Market. The other two options involve in addition degrees of reduction in support payments to UK farmers and restrictions to migrant labour, plus either the adoption by the UK of a liberal approach to trading (termed ***Unilateral Liberalisation***) which implies increased competition from imports outside the EU, or an alternative in which trade only takes place under World Trade Organisation (WTO) Most Favoured Nation (MFN) tariffs, termed ***Fortress UK***. More specifically, the three scenarios are as follows:

- ***Scenario 1: Evolution:*** Pillar I and Pillar II payments[1] are retained and there is no restriction on migrant labour, though there are additional costs of trading incurred by leaving the Single Market.
- ***Scenario 2: Unilateral Liberalisation:*** Pillar I payments are removed and Pillar II-type payments increased to equal 50% of the total current Pillar I and Pillar II support, migrant labour is restricted to 50% of current levels for regular labour (interpreted as a 50% rise in its cost), the costs of complying with regulations is reduced by 5% and the UK unilaterally removes tariffs on all imports (UK exports would be subject to WTO MFN tariffs).
- ***Scenario 3: Fortress UK:*** Pillar I payments are removed and Pillar II payments increased to equal 25% of the total current Pillar I and Pillar II support, migrant labour is restricted to 50% of current levels for both regular and casual labour (interpreted as a 50% rise in the cost of both regular and casual labour) and all trade takes place with WTO MFN tariffs, with the exception of the existing TRQ for imports of New Zealand lamb.

This study explores the impacts of each scenario on seven types of farming found within the Farm Business Survey (FBS) that covers England: cereals, general cropping (with special attention given to potatoes), dairy, pigs, beef and sheep (uplands), beef and sheep (lowland) and horticulture. Together these cover the main production sectors of UK agriculture. The all-farms situation is also described.

[1] Though the CAP and its Pillars would disappear under post-Brexit domestic agricultural policy, the widespread awareness of the different types of support offered under the two justifies their continued use in this Report.

The objective of the research is to help AHDB levy payers and the wider industry make sense of the issues facing the industry over the course of the negotiations for UK exit from the EU and beyond. The scenarios are not meant to be definitive policy options – in reality, the final agreement may well have aspects drawn from different scenarios presented here. Between them the scenarios, and the analysis of the impacts arising from them, is intended to enable the AHDB to prepare its levy payers for the most likely future operating environment.

### S1.1. Methodology

Following literature review of previous studies of the impact of the UK's exit on agriculture, a micro-economic farm-level model was constructed to estimate the impact of the scenarios on Farm Business Income (FBI). This farm-level model was built using Farm Business Survey (FBS) data for the three years 2013/14, 2014/15 and 2015/16 to smooth out annual volatility. To calculate changes in farm Business Income (FBI), the model required inputs in terms of changes in direct payments, labour costs, the prices received by UK farmers from the domestic market, and the regulatory burden. The estimation of prices were derived using a gravity model with inputs taken from European Commission price forecasts, Defra data on production, consumption and trade and WTO tariff rates for representative commodities. Changes in prices and costs were validated through discussions with AHDB experts. The impact of the scenarios on FBI was compared against a baseline of the current situation.

Before setting out our results and conclusions on the impact of the scenarios and their implications, the importance of the specifications within the scenarios should be acknowledged. Where these relate to policy there is a great deal of certainty; Pillar I payments are either made (Baseline and ***Scenario 1: Evolution***) or they are not made (***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK***). There is more uncertainty with respect to the cost of labour should access to migrant labour be restricted, and with respect to commodity prices that may result under each of the trade arrangements. For both of these, we recommend that further, more detailed work be undertaken. With respect to labour this should focus on the availability of non-migrant labour and the working conditions and level of wages required to attract UK workers.

With respect to prices, greater attention should be given to establishing appropriate comparators. For example, existing authoritative estimates of world beef prices (especially projections for future periods) differ widely, even between different projections produced by the same source, and this can lead to very different assessments of impacts at the farm level. When newer or more robust data become available, revisions in impact assessments are inevitable. Generally, projections of prices far into the future are likely to be less trustworthy than current observations or those relating to nearer times.

When considering likely competition from imports, factors that go beyond price should also be considered, such as the characteristics of commodities produced outside the UK (are they really comparable in terms of quality, production characteristics, etc.), retailer/consumer attitude to imports from specific countries, transport requirements (port infrastructure, supply chain length, chill-chain,

availability, etc.), availability of greater supplies from abroad, and likely exchange rate movements which can have a substantial impact on relative prices.

### S1.2. The relative impact of the scenarios on Farm Business Income

Before considering each farming type in turn it is useful to give an overview. As would be expected from the definition of the scenarios, ***Scenario 1: Evolution***, implies the least change in FBI to the *status quo* (baseline). Under this scenario, most farm types would see FBI retained or enhanced as the rising cost of imports will cause domestic prices to increase in sectors where the UK is a net importer (all except barley and oilseed rape). Only cereal farms would experience decreases in FBI (assuming that they made no longer-term adjustments to their business structure and/or management practices). This is because of the importance to the value of their production of barley and oilseed rape; prices of these would be expected to decline as UK exports would no longer be economically viable due to trade friction costs.

The removal of Pillar I payments and their partial replacement with enhanced Pillar II-type support under domestic agricultural policy is a key driver of lower FBIs under the other two scenarios. Under ***Scenario 2: Unilateral Liberalisation***, FBI would fall for all farm types, with the exception of pig farms. The impact of the removal of Pillar I payments is only partially compensated by increased Pillar II payments (and these are focused on certain farm types such as LFA sheep and beef), exacerbated by decreases in the value of sheep and beef production as lower priced imports exert downward pressure on domestic prices. Sectors with the least reliance on Pillar I support as a proportion of revenue (pigs, dairy and horticulture) are best protected from falls in FBI.

Under ***Scenario 3: Fortress UK***, all farm types, with the exception of dairy and pigs, would see reductions in FBI compared to the baseline. However, for some farm types, FBI would be higher than under the second scenario (general cropping, lowland sheep and beef and horticulture) as the protection afforded by WTO MFN tariffs would allow domestic prices to rise, more than offsetting lower Pillar II-type payments.

Drawing the elements of the scenarios together shows the importance of policy decisions on direct support payments to levels of FBI for most farm types. This is especially the case with respect to Pillar I for cereals and Pillar II for LFA sheep and beef. The CAP's Pillar I and Pillar II are less important for horticultural, pig and dairy producers. Sectors with a reliance on enterprises for which the UK currently has a net exportable surplus will see reductions in FBI. Sectors which have high labour requirements will be hardest hit by increases in labour costs; this will affect horticultural enterprises especially. Sectors which produce commodities for which the UK has a substantial import requirement will see FBI protected by higher domestic prices under ***Scenario 3: Fortress UK***; this will be especially the case in the pig sector, but also in the dairy and horticultural sectors. In the red meat sector, decreases in sheep prices will be balanced to some extent by increases in beef prices under the third scenario.

All of the impacts above will be affected to some extent by supply decisions taken by retailers and consumer preference and will be mitigated by the adjustments that farmers make.

### S1.3. The impact of the scenarios on Farm Business Income by sector

**Cereal farms**

- The 9% decrease in FBI seen under ***Scenario 1: Evolution*** is driven mainly by decreases in the output values for oilseed rape and barley, caused by the loss of export potential, which is not compensated for by the smaller increase in the value of wheat output; the FBIs of farms relying on these two crops will be especially vulnerable. This scenario is likely to slightly increase existing structural trends in the cereal sector. There could also be a shift in production away from barley and oilseed rape and towards wheat and other crops such as potatoes and sugar beet where this is agronomically possible.
- The 81% decrease in FBI under ***Scenario 2: Unilateral Liberalisation*** is driven mainly by the removal of Pillar I payments (£37,439 per business) which is only partial offset by the increase in Pillar II payments. Decreases in the value of production output and increases in regular labour costs also have an impact, though reductions in regulatory costs provide some marginal relief for these changes. There is likely to be increased pressure on the less efficient farmers and there may also be downward pressure on farm size in order to reduce labour costs.
- Under ***Scenario 3: Fortress UK,*** the negative FBI results from a smaller increase in Pillar II support which provides less offset for the loss of Pillar I support, and both casual and regular labour costs increase. The value of production output also decreases relative to the baseline. There is likely to be severe pressure on the less efficient farmers and downward pressure on farm size in order to reduce costs of paid labour

**General cropping farms**

- There will be little change in FBI under ***Scenario 1: Evolution*** and as such, there is likely to be a continuation of existing structural trends. A shift in production is to be expected, away from barley and oilseed rape and towards wheat and crops such as potatoes and sugar beet where this is agronomically possible. The processed potato sector will become more profitable.
- The main driver of the 70% decrease in FBI under ***Scenario 2: Unilateral Liberalisation*** is the loss of Pillar I payments (£39,084), even though this is mitigated by increased payments under Pillar II; increased regular labour costs also have an impact, as do reductions in regulatory costs in the other direction. The profitability of processed potatoes is likely to be little changed with higher prices offset by higher paid labour costs. There will be increased pressure on the less efficient farmers and there may be see some downward pressure on farm size in order to keep paid labour costs under control.
- FBI under ***Scenario 3: Fortress UK*** is reduced by the loss of Pillar I support and the lower level of replacement under Pillar II, although the value of production output increases slightly, offsetting this to some extent; higher prices for processed potatoes offset high paid labour costs to result in substantially higher FBI. Additional casual and regular labour costs also contribute to the 60% decrease in FBI. There is likely to be some pressure on the less efficient farmers and some

adjustment of cropping patterns with areas of potatoes and sugar beet likely to increase on average.

**Horticultural farms**

- Public support under the CAP does not form an important component of total output in the horticulture sector, so the loss of Pillar I makes little impact. All three scenarios feature an increase in the value of production output, although FBI only increases under ***Scenario 1: Evolution*** (by 42%), which would appear to be a positive outcome for the horticultural sector.
- Under ***Scenario 2: Unilateral Liberalisation***, FBI declines by 12% as the increase in production is offset by increases in the cost of regular labour, despite a reduction in the costs of regulatory compliance. This scenario presents a number of major challenges to the horticultural sector, the most important of which will be finding a solution to the issue of labour availability and cost.
- Under ***Scenario 3: Fortress UK***, the 8% decrease in FBI results primarily from the increased cost of labour, which includes in this scenario not only regular workers, but the extra cost of casual labour too. This scenario is likely to be challenging for horticulture, especially for low and medium performers. Labour is the key issue to contend with. Being a large-scale growing operation will not be enough, being best in class and a high performer will be the key, regardless of operational scale. This might provide opportunities at a certain level for smaller and even some part-time farms, but the real challenge will be how the larger-scale, more commercial units solve the issues related to labour. Automation of picking and packing operations is clearly one way forward, but there will need to be a wider supply chain view of the future taken. Just solving the labour issue on its own might not be enough.

**LFA sheep and beef farms**

- Changes in the value of beef and sheep output offset one another under ***Scenario 1: Evolution***. There is likely to be little change to LFA sheep and beef farms, although some rebalancing away from sheep and towards beef is likely where this is technically possible.
- The loss of Pillar I payments (£19,482) under ***Scenario 2: Unilateral Liberalisation***, is almost entirely compensated by increases in Pillar II support. The key explanation for the 51% reduction in FBI here is the lower value of production driven by substantially lower sheep prices and fractionally lower beef prices. Higher regular labour costs have a larger negative impact on FBI than savings in regulatory compliance costs. This will result in marginal producers either leaving the sector or relying on off-farm income and Pillar II-type support. Sheep enterprises will be under the greatest pressure.
- Under ***Scenario 3: Fortress UK,*** FBI falls by 109% and becomes negative due to the inability of marginally increased Pillar II payments to compensate for the loss of Pillar I support. A decrease in the value of sheep production is offset by an increase in the value of beef production. The future prospects for the sheep and beef LFA producers look especially challenging under this scenario; only the most efficient producers will be economically viable without off-farm income.

**Lowland sheep and beef farms**

- The 7% increase in FBI under ***Scenario 1: Evolution*** is the result of decreases in the value of output from sheep being countered by a slightly larger increase in the value of output from beef. This scenario implies little change for lowland sheep and beef farmers, although there may be an increase in beef production as sheep production declines.
- Under ***Scenario 2: Unilateral Liberalisation***, FBI decreases by 81% as the loss of Pillar I payments (£15,963) is partially compensated by increases in Pillar II payments, but production output decreases as output from the sheep enterprise falls considerably. Variable costs decrease slightly due to the reduction in the cost of complying with regulations while fixed costs increase slightly as labour costs go up. An acceleration of restructuring is probable with the least efficient farms coming under increasing economic pressure. There is also likely to be a switch away from sheep and beef towards other sectors, especially dairy, where this is possible.
- Under ***Scenario 3: Fortress UK***, FBI decreases by 77% as the loss of Pillar I payments is mitigated by an increase in the value of beef output which offsets the lower value of sheep output. Adjustments can be expected to be similar, although less extreme, to those under the second scenario.

**Dairy farms**

- The 29% increase in FBI under ***Scenario 1: Evolution*** is driven by an increase in the value of production output as imports of dairy products become more expensive outside the single market allowing the domestic milk price to rise. This scenario is likely to lead to a generally positive environment for the dairy sector in the UK. Structural changes can be expected to be cushioned compared with the baseline of the current CAP.
- FBI falls by 35% under ***Scenario 2: Unilateral Liberalisation*** as there is virtually no change in the domestic milk price and hence only a very marginal change in the value of production output. Though Pillar I payments form only a relatively small proportion of the value of total output for dairy farms (£24,870), their removal accounts for the difference in FBI compared to the baseline. Variable costs are lower under this scenario as a result of the savings in regulatory compliance costs and lower livestock feed costs, but fixed costs are higher due to the increase in the cost of regular paid labour. This scenario presents a very challenging outcome for the dairy sector which could lead to a permanent adjustment in its structure.
- Under ***Scenario 3: Fortress UK***, FBI increases by 33% as the value of production rises further as all imports are faced with WTO MFN tariffs, providing further protection for UK production and leading to even higher domestic prices. This increase in the value of production is sufficient to compensate for an increase in fixed costs as the cost of regular paid labour increases. This scenario is generally encouraging for the UK dairy farming sector, but maybe less so for the UK consumer faced by higher prices.

**Pig farms**

- FBI increases under all scenarios, driven by increases in the value of production output which results from higher UK market prices caused by the additional costs of imports. The role of public support under Pillar I and Pillar II is not an important factor in the pig sector.
- Overall, ***Scenario 1: Evolution*** will see increases in production, but limited by a lack of labour and advanced managerial skills.
- Changes in variable and fixed costs under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** approximately cancel each other out. It should be noted that the carcass balancing trade is very important in the pig sector and while higher prices are likely to be possible for cuts in demand, an inability to extract value from cuts for which there is no domestic demand would mean that the price rises seen here, and the consequential large increases in FBI, would be reduced, possibly considerably. The second scenario will see a similar outcome to that under the first scenario, although the incentive to increase production will be not be so strong. The third scenario will see increases in production and new investment in the sector. Access to labour and managerial expertise will remain as key barriers to growth. Further consolidation of the supply chain is expected.

### S1.4. Conclusions on farm size and performance level

It is generally the case that FBI increases with farm scale, irrespective of the scenario. However, there are some exceptions. Medium-size cereal farms would have higher FBI than large cereal farms under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** because large farms have higher paid labour costs, which are increased under these scenarios, and higher Pillar I payments, the loss of which has a greater impact on FBI. The same pattern is evident for Lowland sheep and beef farms with respect to ***Scenario 2: Unilateral Liberalisation***. It is not therefore the case that increased farm scale always results in more favourable FBI.

The picture is rather clearer with respect to performance level (ranked according to the farm's ratio of the value of output generated to the value of inputs used, including an imputed cost for the farmer's own labour). FBI for low performers is usually negative under the baseline and all scenarios (dairy farms under ***Scenario 1: Evolution*** and ***Scenario 3: Fortress UK*** are exceptions, as are horticultural farms under the baseline and ***Scenario 1: Evolution***). FBI for high performers is always positive under the baseline and all scenarios. For horticultural farms, FBI under ***Scenario 3: Fortress UK*** is proportionally lower for high performers than it is for the all farm group because of the high use of hired (paid) labour. The impact of the scenarios on medium performers is more varied with FBI positive for some farm types under some scenarios and negative in other cases. For cereal and LFA sheep and beef farms, FBI is negative for medium performers under ***Scenario 3: Fortress UK***. However, for Lowland sheep and beef and general cropping farms, FBI is negative for medium performers under ***Scenario 2: Unilateral Liberalisation***. FBI for medium performers is positive under all scenarios for pig and dairy farms. The clear conclusion with respect to performance levels is that high performers are better protected under any outcome.

### S1.5. Implications of the conclusions

The results in terms of the implications at the farm level for the various scenarios chosen by the AHDB carry lessons for both UK farmers and for organisations such as the AHDB that support the agricultural industry. As expected, there are substantial impacts on projected levels of FBI. Though these should not be interpreted as precise predictions (see methodology) they are reasonable indications of where the greatest levels of financial pressure on farms will be felt, and to which farmers can be expected to respond by longer-term adjustments, such as structural change (including exiting the sector).

There are significant expected impacts from moving from the present situation, or its close approximation involving only higher trading costs (***Scenario 1: Evolution***), to the more extreme scenarios assessed here that involve both changed trading relationships and altered domestic support. Though for the industry as a whole incomes can be expected to fall in these situations, there are differences between farming types. Trade issues are relevant for all types (sometimes in different directions) and critical for a few. So too is the way that greater restrictions on migrant labour can be expected to affect labour costs, with the impact felt most strongly in horticulture. However, for most farming types, and thus the industry as a whole, these factors are of less importance than the postulated changes in domestic support arrangements.

The opportunities to influence outcomes or to mitigate them vary. Trading arrangements for agriculture after leaving the EU can be expected to be negotiated within the broader context of the general relationship between the UK and the EU, and the ability of farmers, even acting collectively, to influence the result is likely to be limited. However, the nature of domestic support in the UK's agricultural policy will be decided at national level (UK or devolved administrations) and can be expected to be more responsive to evidence and proposals. Awareness of the importance of the removal of direct income payments will be useful to the AHDB and to government, not least in their design of Pillar II-type schemes that are commonly seen as being easily justified (on public-goods arguments) and pragmatically useful in partially compensating for the withdrawal of Basic Payments. Similarly, a demonstration of the impact of increased labour costs resulting from restrictions on migrant labour should assist with the design of targeted measures to ease this specific problem.

There are also important messages to be conveyed to the agricultural industry by the AHDB and other organisations that support farmers. Perhaps the most significant is that, according to the evidence, high performing farms (in terms of their output/input ratios) are shown to be in a far stronger position to cope with the changes associated with the scenarios. This should focus attention on farmers knowing their relative performance (such as by using benchmarking) and on pursuing practical ways of improving output and containing costs. High performance is not necessarily associated with larger farms, and there is the possibility of improving performance across the size spectrum. Another general lesson is the importance of adaptation; the literature points to the proven ability of UK farmers as a group to absorb and adjust to shocks and pressures. Again, support organisations and governments need to promote this ability by identifying and tackling constraints; knowledge transfer and skills training are likely to play prominent parts in the assistance provided to farmers.

# 1. Introduction

One role of the Agriculture and Horticulture Development Board (AHDB) is to assess and inform levy payers and policy makers of the potential impact of policy changes through the provision of high quality and impartial evidence. The UK's decision to leave the EU has created a great deal of uncertainty for the agricultural sector, and the AHDB wishes to understand, and, to the extent possible, quantify the potential impact of this exit. Following a call for tenders, Agra CEAS Consulting, in association with Promar International, was contracted to produce an impact assessment and analysis of potential post-exiting the EU scenarios on the UK agricultural industry. The work was carried out by Dr Dylan Bradley and Professor Berkeley Hill. Promar input was led by John Giles.

During the process of leaving the EU, the nature of the UK's future domestic agricultural policy and its trading relationship with the EU remain uncertain. Both of these elements can be expected to reflect the closeness or distance in the final relationship between the UK and EU. Following the UK's exit from the EU it seems likely that, in line with the UK's long-standing position on the direction of reform, there will be a shift in focus towards payments for public goods (currently under the CAP's Pillar II) and away from direct payments (currently Pillar I), though a range of possibilities exist.[2] Similarly, trade policy will be affected, and this may range from good access for the UK to the EU market, probably in the form of a Free Trade Agreement, to a more distant relationship likely to involve a more fundamental change to border arrangements and import tariffs.

The AHDB has identified four main areas of concern for UK agriculture which this study explores:

1. international trade, both within and outside the EU (interpreted in a post-exiting the EU situation as meaning trade with the remaining EU-27 and with other countries);
2. agricultural policy, support payments, rural development and market management (interpreted as how these will be treated in post-EU exit UK domestic agricultural policy);
3. migrant labour and its availability; and,
4. the UK regulatory environment.

To address the uncertainty, AHDB developed three scenarios, the impact of which are to be examined in this study. Described below, these are intended to bound the likely possibilities resulting from the UK's exit from the EU. The first is a scenario that represents essentially a 'Business as Usual' option where the policy, regulatory framework and trading relations remain as close to the *status quo* as is possible given that the UK will no longer be part of the EU's Single Market. At the other are two options that involve degrees of reduction in support payments to UK farmers and restrictions to migrant labour, plus either the adoption by the UK of a liberal approach to trading (which implies increased competition from imports outside the EU), or an alternative in which trade only takes place under World Trade Organisation (WTO) Most Favoured Nation (MFN) tariffs.

[2] For convenience, we refer to the division of support into Pillars as what each represents under the CAP is widely understood though, of course, after Brexit UK national policy may adopt other groupings.

The objective of the research is to help AHDB levy payers and the wider industry make sense of the issues facing the industry over the course of the negotiations and beyond. The scenarios are not meant to be definitive policy options – in reality, the final agreement may well have aspects drawn from the different scenarios presented here. Between them the scenarios, and the analysis of the impacts arising from them, are intended to enable the AHDB to prepare its levy payers for the most likely future operating environment.

This study examines the impacts arising from the three scenarios for each of seven types of farming found within England's Farm Business Survey (FBS)[3]: cereals, general cropping (with special attention given to potatoes), dairy, pigs, beef and sheep (uplands), beef and sheep (lowland) and horticulture. Together these cover the main production sectors of UK agriculture.

Each farming type will face some of the same issues, though differences in type and magnitude of impact can be anticipated. For example, the pig and potato sectors have been less reliant on support under the CAP and are therefore less likely to be affected by changes in the amount of public subsidy available. The availability of migrant labour is likely to have the biggest impacts in those types of farming with relatively high labour requirements, such as horticulture. The beef and sheep businesses are fairly reliant on CAP support and the magnitude and form of future support is likely to have a disproportionate impact here. While farms with cereals and oilseeds are likely to lose public support payments, large-scale producers tend to be efficient and can compete near the world market price. Easier availability of cheap meat from Australia and New Zealand may make the sheep sector disproportionally vulnerable to competition; this may also be the case for some dairy products, although the liquid milk market is likely to be protected by the substantial transportation costs and the need for freshness.

The approach taken in this study is to clarify the scenarios proposed by the AHDB and to turn them into specific changes to support payments, labour costs, regulatory burdens (represented by costs) and commodity prices resulting from changes in trade conditions, the last making use of both economic analysis and a gravity model. These are then fed into a microeconomic farm-level model to estimate the short-term implications for average revenues, costs and Farm Business Incomes (FBI) in each type of farming, sub-divided by farm (economic) size and by level of performance (as measured by the ratio of the value of outputs to inputs). The impacts of the three scenarios are each expressed in comparison with the baseline position provided by the present CAP and trade relationships. Thus, there is an attempt to quantify changes in the main components of income that are expected to flow from the UK's exit from the EU in the scenarios chosen and to generate estimates of what they mean at the farm level in terms of changes in FBI. While the modelled markets imply some response by supply, the changes in prices received by farmers will no doubt lead to further change as they adjust longer-term enterprise mixes, cost structures and embrace more fundamental structural changes. These are the subject of a further step in our analysis.

[3] Similar surveys are conducted in Scotland, Wales and Northern Ireland, but data from these were not available on the same basis.

Finally, we bring together the main conclusions of our analysis and draw attention to their implications for the agricultural industry and organisations that represent it or who help shape policy. Clearly some of these are of importance to the AHDB and to its levy payers.

Our analysis of the impacts of the scenarios, as with any study of this sort, inevitably involves assumptions and simplifications. The validity of our findings depends on their reasonableness. Some are based on the best information available from the literature on similar situations in the past, such as the effect on domestic prices resulting from the introduction of tariffs on trade. Others are simply unknowable at this stage, such as the nature of future UK policy measures aimed at delivering public goods and their influence on costs and incomes, though what exists currently may form a good guide. With the passage of time, more information will become available. In the meanwhile, analysis has to work with what is to hand.

Unlike some previous studies, we have attempted to make clear our assumptions and the implications they entail, not least by the use of sensitivity analysis where appropriate. However, it follows that our results in terms of shifts in incomes (FBI) should be regarded primarily as indications of where the greatest economic pressures are likely to be felt within the agricultural industry and the predominant causes of these changes. It should be remembered that FBI does not include off-farm income earned by farmers and/or other family members, pensions, or interest on (non-farm) investments, etc. Incomes from such non-agricultural sources may enable farms to be sustainable even in the face of negative FBIs, as often applies currently under the baseline for low performing farms and will be the case for some farms when FBI becomes negative under some scenarios. Similarly, capital gains (and losses) are not covered. Nevertheless, falls in FBI can be a useful indicator of where the AHDB and other organisations tasked with supporting the agricultural industry can best deploy their resources and focus their attention.

Without wishing to pre-empt what comes from the results, it may nevertheless be helpful to subsequent interpretation of details to bear in mind some basic findings:

- Though political discussions tend to focus on trade issues, the analysis shows that for most types of farming a greater impact on FBIs in the scenarios comes from changes in domestic policy in the form of removing Pillar I direct payments and their partial replacement by enhanced Pillar II payments. This suggests that greater emphasis by groups representing farmers should be given to issues of direct support. While the expansion of Pillar II-type support can help, much of the impact on income will depend on the extent to which such payments compensate for income forgone or genuinely add additional income (costs incurred in delivering Pillar II schemes have been increased in the scenarios *pro rata* based on those included within the FBS data).
- Higher labour costs resulting from restrictions on migrant labour are of importance, particularly so for a few farming types such as horticulture.
- The scenario that involves the introduction of only minor impediments to trade keeps FBI near to the current levels (and in some types of farming slightly above). More major changes (to policy as well as to trading arrangements) can reduce incomes (most sectors) or increase them, depending on the scenario being applied and the type of farm being considered.

- Whichever scenario is chosen, FBIs reflect the level of economic performance of farms (classified on the ratio of values of outputs to costs of all inputs), and this applies to all scenarios. There is a link between higher performance and greater farm size, although this is not exact. Across agriculture as a whole, the higher performance farms are capable of generating positive incomes when the lower performance farms are making losses. This suggests that steps to improve productivity and performance would enable farmers to mitigate potentially negative impacts of leaving the EU, even before details on agricultural trade or policy emerge.

## 2. The scenarios

In the Terms of Reference (ToR) for this study, the AHDB provided an outline of three scenarios that should be explored and noted that these needed to be further developed at an early stage of the research. OECD (2006) explains that one of the uses of scenarios is to provide "*coherently structured speculation*". Scenarios are not predictions of what is likely to happen; rather, they provide a structured framework within which to think about outcomes. Scenarios offer a "*consistent and coherent description of alternative hypothetical futures*".

The OECD makes the point that scenarios can often be criticised for excessive complexity and that simple scenarios can be more effective. It is therefore important to limit the parameters defined in a scenario to a manageable number so that the scenarios can be easily understood. Sensitivity analysis can then be used within the scenarios to examine the impact of changes which can be compared across the scenarios.

The draft scenarios provided by the AHDB met this need to avoid excessive complexity. In essence, they contained the following five elements:

- public support for agriculture;
- access to migrant labour;
- post-exiting the EU regulatory environment;
- trade relationship with the EU; and,
- trade relationship with the rest of the world (RoW).

In covering these elements, these scenarios go considerably beyond the scenarios examined in the FAPRI-UK study (Davis, *et al.*, 2017), financed by UK government departments, that was published late in the period of our research for the AHDB. The Davis *et al.* (2017) scenarios extend only to the UK's trade relationship with the EU and the rest of the world, although in this aspect they are broadly the same as those used here. This means that they assume no change to the policy environment, regulatory costs, or to labour costs arising from restrictions in the use of migrant labour, all of which we consider. Our work also covers a wider range of commodities.

The AHDB scenarios are designed to present the ***range*** of likely outcomes from the negotiations to exit the EU and on the design of post-exit national policy; it is felt likely that any actuality will lie within these bounds. To this end, one scenario, termed "***Evolution***", presents an outcome which, as closely as possible in the circumstances, represents the continuation of the *status quo*, i.e. a Free Trade Agreement (FTA) between the UK and the EU (to replace membership of the single market) and support at the current CAP levels. Inevitably, this leads to an increase in the costs of trading as various activities not necessary in a single market have to be introduced, such as inspections at the border ("trade facilitation costs", the expected magnitude of which can be estimated from literature on current experience).

At the other extreme are two scenarios that involve versions of reduced support levels, restrictions on labour from other EU Member States, changes in the regulatory burden, and trade relations. Of these one, termed "***Fortress UK***", presents an outcome which represents a failure to agree a FTA between the UK and EU and the reversion to the use of World Trade Organisation (WTO) rules and Most Favoured Nation (MFN) tariffs. This is combined with a reduced level of support in which Pillar I direct payments are removed but partially replaced with higher levels of Pillar II payments, and restrictions are placed on all migrant labour. The other, termed "***Unilateral Liberalisation***", is designed to reflect a situation in which the UK opens up its domestic market by a unilateral removal of tariffs on trade with the rest of the world. Again, there is a reduction in public support, though less severe, and restrictions on migrants apply to regular workers only (not casual labour). In these respects, "***Unilateral Liberalisation***" can be seen as an intermediary position between the other two scenarios. The regulatory burden is also lightened in this scenario, reflected in lower costs of production. Following discussion with the AHDB, the details of the scenarios were refined and agreed as shown in the next section.

Taken together, the three scenarios sketch out a frontier of outcomes deemed possible by the AHDB and for which first-order impacts can be estimated and then compared. From this position, subsequent order responses can be considered. Together these allow a reasoned opinion to be developed of the implications of the scenarios for the agricultural industry and its various elements.

### 2.1. Operationalising the scenarios

Before it is possible to estimate first-round impacts on farms the scenarios need to be translated from text into numbers. These can then be used as inputs to the modelling process. Specifically, the changes in support levels need to be quantified, the implications of restrictions on non-UK labour must be expressed in terms of higher labour costs, any lightening of the regulatory burden has to be turned into cost reductions, and the various trade relationships have to be realised as shifts in the market prices received by farmers. Discussion with the AHDB have led to the quantitative details shown in Table 2.1 for principles relating to support expenditure, labour costs and the regulatory burden. The implications for farm prices of the various trade relationships are dependent on modelling the various commodity markets. The details of each are explained in the Methodology in Chapter 4.

**Table 2.1: "Operationalisation" of the scenarios**

| | Scenario 1: Evolution | Scenario 2: Unilateral Liberalisation | Scenario 3: Fortress UK |
|---|---|---|---|
| **Public support** | • Direct Payments (DPs) and agri-environment payments are maintained at current levels | • Direct Payments (DPs) removed, agri-environment and other payments under Pillar II (the RDP) are increased to equal 50% of current overall support | • Direct Payments (DPs) removed, agri-environment payments reduced to 25% of current levels of overall support |
| | • Pillar I and Pillar II payments remain the same | • Pillar I payments reduced to 0%, Pillar II payments (and associated costs) increased by 259% to disburse 50% of total PI+PII funds | • Pillar I payments reduced to 0%, Pillar II payments (and associated costs) increased by 130% to disburse 25% of total PI+PII funds |
| **Labour cost** | • Retained at the current level | • Non-UK regular labour restricted to 50% of current levels<br>• Retained at the current level for seasonal (casual) workers | • Non-UK regular labour restricted to 50% of current levels<br>• Non-UK seasonal (casual) labour restricted to 50% of current levels |
| | • No change to labour costs | • 50% increase in regular labour cost, no change in casual labour cost | • 50% increase in regular labour cost, 50% increase in casual labour cost |
| **Trade relationship with the EU** | • Comprehensive FTA enabling tariff-free trade between the UK and the EU | • No trade deal between the UK and the EU is agreed<br>• UK-EU trade relationship the same as with the RoW | • No trade deal between the UK and the EU is agreed<br>• UK-EU trade relationship the same as with the RoW |
| | • Increase of 5% in UK prices to reflect the cost of trade friction in an FTA | • Increase of 8% in UK prices to reflect the cost of trade friction without an FTA, no tariff applied | • Increase of 8% plus cost of WTO tariff in UK prices, exceptions for lamb and beef in line with existing quota |
| **Trade relationship with the RoW** | • WTO rules apply<br>• UK has access to a share of the EU's existing WTO TRQs and agrees FTAs with third countries which already have FTAs with the EU | • WTO rules apply, although UK unilaterally reduces import tariffs to 0% for all agricultural products within set quotas | • UK adopts the same common external schedule of tariffs as the EU and retains a proportion of its existing WRO TRQs, including for New Zealand and Australian lamb and the Hilton Beef quota |
| | • Increase of 8% in UK prices to reflect the costs of trade friction with the RoW | • Increase of 8% in UK prices to reflect the cost of trade friction, no tariff applied | • Increase of 8% plus cost of WTO tariff in UK prices, exceptions for lamb and beef in line with existing quota |

| | Scenario 1: Evolution | Scenario 2: Unilateral Liberalisation | Scenario 3: Fortress UK |
|---|---|---|---|
| **Regulatory environment** | • All existing EU regulations adopted into UK law meaning no change to regulatory costs | • All existing EU regulations adopted into UK law with the regulatory burden reduced over time | • All existing EU regulations adopted into UK law meaning no change to regulatory costs |
| | • No change to costs | • 5% decrease in costs of seeds, fertilisers, crop protection, other crop costs, veterinary fees & medicines and other livestock costs | • No change to costs |

The sub-sections below set out some points to note in translating the scenarios.

### 2.1.1. Domestic support

In increasing support under Pillar II when direct payments under Pillar I are discontinued, it is assumed that the infrastructure exists to enable additional funds to be disbursed at the farm level. This implies a combination of more being channelled through existing schemes and the introduction of new ones (such as perhaps payments to farmers under agreements related to animal welfare). Total existing public support (for the three years 2014/15-2015/16) has been summed at the aggregate level and then a ratio calculated between existing Pillar II support and the level necessary to disburse 50% and 25% of the current total support. This ratio is then applied to Pillar II payments under each farm type. The underlying assumption is therefore that the distribution of Pillar II funds will remain as it is currently, although the total disbursed will increase.

Some important simplifying assumptions should be noted. First, despite Pillar I payments being nominally decoupled, the literature finds some evidence that there may be some links with decisions on production (Howley, *et al.*, 2012; Davis, *et al.*, 2017). However, any impact of removing Pillar I payments on levels of production and hence on market prices and revenues are ignored in this study. Second, it is assumed that Pillar II payments can be treated as additional income rather than as compensation for income forgone. It should be noted that much of the payments under EU-supported Rural Development Programme (RDP) agri-environment schemes is intended by design only to compensate for any income forgone or higher costs incurred by following prescribed actions; this is set out in the underlying Regulation. If this principle were to be maintained under post-exiting the EU national agricultural policy, expansion of Pillar II-type funds under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** would, if strictly applied, leave farm incomes unchanged, which is not the understanding generally given by commentators when this issue is discussed in the media.

However, even under the RDPs, farmers in disadvantaged (Less-Favoured) areas were able to benefit from area payments intended to compensate them for the conditions under which they operated; though not currently used in England or Wales, in Scotland, the Less Favoured Area Support Scheme (LFASS) has been of this type. It follows that the impact on FBI of this part of scenarios 2 and 3 depends critically on the nature of the schemes applied. For simplicity, we have assumed that the expanded Pillar II-type payments are of the LFASS variety – in effect, a form of area payment. However, the impact of this assumption is something that we test later in sensitivity analysis.

### 2.1.2. Migrant labour

Economic analysis indicates that restricting migrant labour will result in increasing wages and labour costs; the workings of the market will lead to higher wages being paid to both UK and migrant labour. The case for using a 50% rise is given in Chapter 4, based on payments thought necessary to attract UK labour from alternative occupations. However, this reflects the elasticity of supply; in the short-term a greater quantity of domestic labour may not be available to maintain production, which will

hasten the longer-term process of mechanisation and structural change (including the relocation of production to places where labour is more readily available).

### 2.1.3. Trade issues

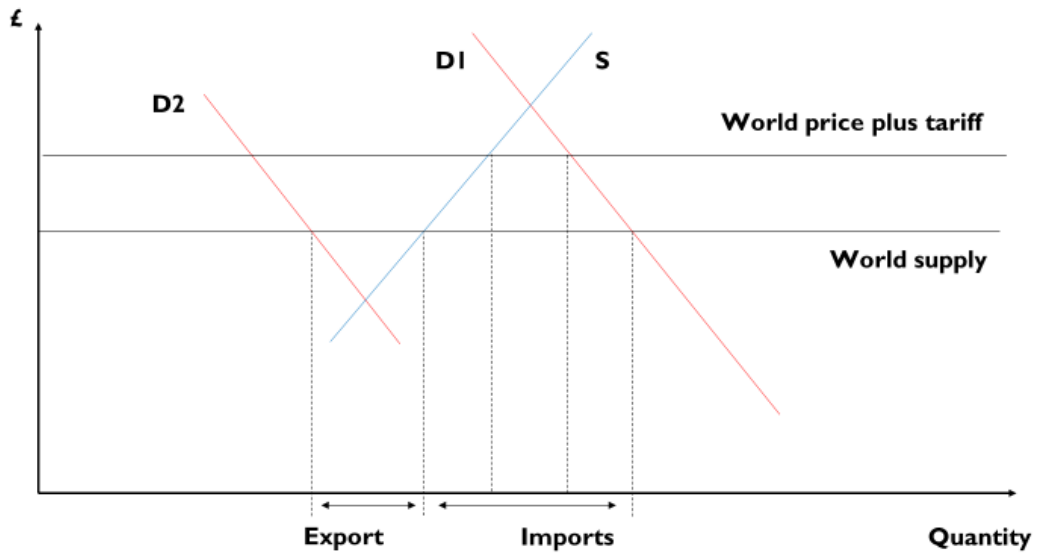
Although the scenarios include trade relationships between the UK with the EU and, separately, with the Rest of the World (RoW), in practice, goods will flow from whichever of these two blocs has the lower price (assuming otherwise comparable products and consumer preference). These two scenario elements are therefore reduced to one impact on UK prices.

The different trade relations that are part of the scenarios can be expected to have implications for the prices received by UK farmers from the domestic market and which in turn shape their farm incomes. For commodities in which the UK is not self-sufficient, any increased costs of imports arising from higher costs of trading and/or the imposition of tariffs will raise price on the domestic market, which will benefit UK producers until a point is reached at which no imports occur because of a combination of increased domestic supply and reduced demand. Conversely, where the UK is an exporter, factors that constrain these exports (such as the imposition of a tariff by a foreign importer) will lower the domestic market price, a bottom in the market being when all production is absorbed by domestic demand (or when domestic prices fall to the point that exports become viable once again). It is helpful to bear in mind the basis economics of the situation, shown in Box 2.1.

In reality, there will be a complex inter-play between supply and demand for specific products, and there will also be cross-impacts between products (higher prices for one product may lead to some substitution by another). The elasticities of supply and demand will be relevant here, as will be also the selection of appropriate tariffs to match the imports the UK might make and those that might be applied to UK exports by importing countries. Prices will ultimately settle at a new equilibrium which balances supply and demand. Without a sophisticated General Equilibrium Model, these interactions cannot be taken into account quantitatively; these interplays will be examined using a gravity model and qualitatively, in ways described below.

**Box 2.1: The basic economics of importing and exporting markets**

S represents the supply curve of production in the UK, showing the amounts farmers are willing to supply at a given range of prices. In reality, it would be steeper in the short-term (lower price elasticity of supply) and less steep in the longer-term (greater elasticity) as producers would be able to make more adjustments. Two situations of demand are given. D1 corresponds to a commodity in which the UK is not self-sufficient and imports are required from the world market to meet domestic demand; many agricultural commodities are of this type in the UK. D2 is the situation in which there is a domestic surplus of production, and exports to the world market would be expected; only a few are of this type in the UK.




Supply from the world market is shown as infinitely elastic, that is any required quantity of product is available to be imported into the UK without affecting the world price (the so-called small country assumption where the quantities are insignificant compared with the total).

As a general principle, higher prices of commodities imported from outside the UK (whether caused by tariffs or higher costs of trading such as the need for more inspection) will cause UK market prices to drift upwards. The effect will be a reduction in imports as (a) domestic producers expand up their supply curves in response to the higher prices; and, (b) domestic consumption falls as users retreat up their demand curve.

There is a limit to which prices on the domestic market will be raised by imposing tariffs or the imposition of trade facilitation costs. This is the point at which the D1 and S curves intersect, and no imports take place.

For commodities illustrated by D2, there is a domestic surplus available to export to the world market. Without this possibility, prices on the domestic market would fall to a low level (the point of intersection between D2 and S) as supply to the domestic market increases. Access to the world market enables farmers to avoid this low price in favour of the world price. Anything that prevents this access (such as trading regulations or the imposition of tariffs by importing countries) will, in effect, lower the prices obtained on the export market (not shown on the diagram).

# 3. Key points from the literature review

The focus of this review is literature that includes material pertinent to the development of the range of scenarios facing agriculture that are of interest to the AHDB and their implication for farming output, income and structure. The full literature review is given as Appendix 2 to this report. This shows that, in terms of considering the impacts arising from the scenarios, the literature is characterised by a small number of studies that are of direct relevance (most pertinently Davis, *et al.* (2017) and Berkum, *et al.* (2016)) and a long tail of publications that are marginal.

In terms of primary sector farming, significant reports have been produced by and for various organisations which contain insights into how trade policy might look and what this is likely to mean for the farming sector (though additional stages in the food chain may also be covered). Trade policy seems to have attracted most attention so far, something that is not unreasonable given that trade relations will be closely affected by the outcome of the negotiations to leave the EU. However, others have focused on domestic policy and, in particular, the way that Pillar I payments to farms may evolve; in reality, as this study will show later, this is by far the more significant influence on farm incomes for most farming types in the UK. Some papers combine both trade and domestic policy expectations. Considerable information has been provided to the House of Commons and House of Lords Select Committees dealing with the UK's exit from the EU (the House of Lords has a sub-committee devoted to leaving the EU and agriculture), and these parliamentary reports often form useful compendia of what is available in published reports.

The key points which emerged from the literature review are set out in the sub-sections below. The overall conclusion must be that existing literature can, to varying extents, throw light onto the impacts of the scenarios chosen by the AHDB as the basis for the current study. However, none are sufficiently close to avoid the necessity of taking an independent approach.

## 3.1. General points

- Sector-level models (as used by some of the prominent studies, such as that by LEI for the NFU (Berkum *et al.*, 2016 and Davis, *et al.*, 2017) are dependent on the assumptions and coefficients built into them. Policy scenarios that represent large shifts (such as are represented by some of the scenarios put forward by the AHDB) and contain the potential to trigger structural changes are less suitable for modelling, and any results should be interpreted with caution. Davis, *et al.* (2017) make the point that some of the projected price changes go beyond the range of variation on which the FAPRI model is calibrated and note that this adds some uncertainty to their projections.
- Static analysis at the farm level to changes in policy, prices and/or costs ignores the behavioural responses by farmers, including by both short-term adjustments and longer-term structural change, investment and innovation. These could be considerable. Again, first round impacts should not be interpreted as the final adjusted position.

### 3.2. Support under UK domestic agricultural policy

- It is widely assumed in the literature that Pillar I payments to UK farmers will be reduced or terminated post-exiting the EU (though assurances by the Conservative government indicate that they will be maintained to 2022).
- It is also widely assumed that Pillar II payments, encompassing agri-environment and other payments under the Rural Development Programme, will be at least continued post-exit from the EU.
- Both forms of support will be/are devolved responsibilities, and different patterns and levels may emerge in the constituent countries of the UK.
- Static analysis can easily show that removing or scaling back Pillar I payments would have significant impacts on Farm Business Income, and be particularly damaging for certain farming types (such as LFA livestock farms). However, it is also pointed out that farmers have a history of adaptation and adjustment, so in the longer-term the impacts could be very different.
- Defra's analysis on the initial impact of cutting the level of Pillar I payments on income distributions, based on averaging figures on individual farms over five years, shows a predictable shift towards lower incomes.
- There is evidence that there is a wide variety of responses at the farm level to economic shocks. However, the proportion of farmers who intend to 'carry on as before' in the face of economic signals declines with greater persistence of these signals, and more fundamental changes are explored.
- Policymakers have in the past frequently under-estimated the ability of farmers and their households, as a group, to adjust to economic shocks. Given adequate notice, transitional arrangements, which may be advocated on economic, welfare or political economy grounds, may be unnecessary. However, experience in New Zealand points to the contribution that can be made by an exit package, financial advice and support to household consumption.
- Though Pillar I payments are nominally decoupled from production decisions, there are links that impinge on production decisions, so that removal of such payments could be expected to impact on output. Though more likely to affect sectors that are relatively large recipients of such payments, the extent of this output link in the UK is not well established.

### 3.3. Labour costs

- Several studies have considered the implications of leaving the EU for the supply of labour to the UK agricultural industry, and specifically the way that the supply of migrant labour will be affected.
- It is widely assumed that restricting access to migrant labour will cause difficulties for agriculture and the wider supply chain, with the greatest impact likely to be seen in the horticulture sector. The impact of these restrictions is assumed to be reflected in the labour costs faced by agricultural businesses.
- Wages are not the only factor in attracting labour. A lack of available UK labour and the perception of difficult working conditions are likely to exacerbate the difficulties in replacing migrant labour by UK employees.

- Some prominent studies have omitted any consideration of labour costs. The NFU-LEI research project on the UK's exit from the EU (Berkum *et al.*, 2016), with its modelling of commodity prices and trade, did not include any movement of labour costs, an important gap especially with the horticulture sector. Labour cost changes were also beyond the scope of the FAPRI analysis (Davis, *et al.*, 2017).
- There is no direct evidence on the magnitude of the likely increase in labour costs associated with leaving the EU. However, there is evidence on the impact of higher labour costs on output prices, which can be used to estimate the implied increase in labour costs.

### 3.4. Trade arrangements

- Leaving the EU Single Market (even though remaining in a Customs Union or Free Trade Area with the EU) will incur additional costs to trading, in the form of more border controls, checks on regulatory compliance, etc. For commodities that the UK imports, this will lead to a rise in market prices for UK farmers. *Ceteris paribus* this will lead to greater domestic production (replacing imports), and farm incomes will increase. [The quantity demanded in the UK will also be reduced by the rise in market prices.]
- Trading relationships that involve placing import taxes on trade coming into the UK from the EU will take this increase in market price a stage further, resulting in higher prices and higher incomes for UK farmers, further expansion in domestic production and reduced imports. A similar effect will come from raising existing tariff levels. [Note: this effect on prices will cease once imports have been reduced to zero.]
- Trading relationships that open the UK market for commodities that UK agriculture produces to low-cost suppliers will lower the market price received by British farmers, cause them to supply less, and put downward pressure on their incomes.
- Where the UK exports farm output to the EU, more impediments (border checks, etc.) or tariffs (if applied by the EU on goods from the UK) are likely to depress the prices received by UK farmers.
- Only the NFU/LEI study (Berkum, *et al.*, 2016) and Davis, *et al.* (2017) quantify price shifts in these scenarios, and they do so for a range of commodities. However, there is a lack of clarity in the information available on the NFU/LEI methodology that suggests alternative approaches should also be employed, such as the use of a range of possible price shifts or sensitivity analysis.
- Real markets are often far more complex than can be assumed in trade models, and additional factors (such as consumer preferences for credence attributes like place of origin) need to be considered. Similarly, many commodities are not homogeneous, for example, lamb which can be differentiated by age, cuts, specification and seasonality.
- Currency exchange rates, as between £ Sterling and the Euro, influence competitiveness. A change here can easily outweigh any cost advantage arising from comparative advantage.
- Some costs of production in the UK will be affected by trading relationships and can influence farmers' supply decisions and farm incomes.

# 4. Methodology

This report has been constructed on the basis of a literature review (see Chapter 3 for a summary of key points and Appendix 2 for the full review) and the construction of a micro-economic farm-level model. This model requires inputs in terms of changes in direct payments, labour costs, the prices received by UK farmers from the domestic market, and the regulatory burden. The estimation of values to use in the farm-level model (the operationalisation of the scenarios), and its construction, are explained below.

## 4.1. Estimation of the impact of policy changes for use in the farm model

***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** feature the removal of Pillar I support and its replacement by additional funds to be disbursed under Pillar II-type activities. These funds are equivalent to 50% and 25% respectively of current total support under both Pillars. Total support under Pillar I and Pillar II was taken from Agriculture in the United Kingdom[4] for 2014, 2015 and 2016. Ratios were then constructed to inflate current Pillar II support so that it equalled 50% and 25% of total current support. These ratios were then used under scenarios 2 and 3 to inflate support (and associated costs) provided under Pillar II while support under Pillar I was removed. As noted in section 2.1 above, there are important assumptions on the decoupled nature of the Pillar I support removed and the design of schemes expanded or introduced under the Pillar II heading (so that they bring additional revenue).

## 4.2. Estimation of labour costs for use in the farm level model

Although the literature review reports considerable evidence suggesting that labour costs would increase if migrant labour is restricted post-EU exit, no estimates of the magnitude of expected increase were found. However, an examination of the difference between wages in the construction and manufacturing sectors (ONS data) and the agricultural sector (FBS data) showed that a 52% increase in agricultural wages would be necessary to achieve parity between the sectors. British Summer Fruits (2017) reported that it expects that prices for strawberries and raspberries will rise by between 35% and 50% as a result of restrictions in access to migrant labour. Working this range through the cost structure of production in our horticultural model, we estimated that such a price increase would be produced if labour costs increased by around 50%. Based on both these approaches, we therefore assume that limiting the supply of migrant labour under ***Scenario 2: Unilateral Liberalisation*** (regular labour) and ***Scenario 3: Fortress UK*** (regular and casual labour) will result in an increase in the respective labour costs of 50% as employers need to offer higher wages to attract workers from other sectors to replace lost migrant workers.

Our assumption is that it would be possible to attract the required levels of labour in this way in what in reality is a tight labour market. In practice, a premium might be required to compensate for what are sometimes seen as difficult working conditions. In our modelling we have taken no account of the

[4] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/621456/AUK-2016-22jun17.pdf

forthcoming introduction of the National Living Wage which could add 35% to the cost of seasonal wages over the period 2016-2021 (Migration Watch UK, 2016).

### 4.3. Estimation of prices for use in the farm level model

Changes to domestic UK prices under the three scenarios were estimated using a gravity model followed by validation by AHDB and Promar experts. There is generally a high degree of conformity with the prices derived by Davis, *et al.* (2017), although these authors had access to a more sophisticated trade model.

Initial price data were taken from the European Commission's EU Agricultural Outlook: Prospects for EU agricultural markets and income 2015-2025, December 2016 edition.[5] An average of the period 2014-2018 was used to smooth out annual volatility. This period was chosen to cover the period of data on which the farm-level model was constructed (2014-2016, see section 4.5), plus a further two years to include an element of anticipated future price changes. There were some exceptions where alternative data had to be sourced (see below).

Domestic production, consumption and net trade data were taken from Defra statistics.[6] An average of the 2012-2016 period was used to smooth out annual volatility.

In order to calculate the impact on prices under ***Scenario 3: Fortress UK*** it was necessary to select appropriate tariff lines (we used WTO MFN bound tariffs). In some cases, this was straightforward (commodity crops), but for the livestock sectors a choice had to be made in terms of which tariffs were most appropriate or a trade weighted average was used. This choice was made with the assistance of the AHDB sector experts and reflected the composition of imports to the UK. Trade weighted average tariffs were produced by the AHDB from their trade databases.[7]

The impact of the three scenarios was calculated for each commodity. Under ***Scenario 1: Evolution*** this involved adding a 5% cost to the EU price to reflect the loss of frictionless trade with the EU, but the presence of a Free Trade Agreement; 8% was added to the Rest of World (RoW) price to reflect the transaction/facilitation costs, plus the appropriate tariff. Under ***Scenario 2: Unilateral Liberalisation***, 8% was added to the EU and RoW price to reflect the transaction costs; no tariffs are applied by the UK under this scenario, but we have assumed that the same trade friction costs apply to UK exports where relevant, an assumption also made by Davis, *et al.* (2017). Under ***Scenario 3: Fortress UK***, 8%, plus the appropriate tariff was added to the EU and RoW price. These percentages were taken from Berkum, *et al.* (2016) (the (LEI/NFU study) which in turn based them on specialised

[5] It should be noted that the LEI/NFU work (Berkum, *et al.*, 2016) used the previous edition as a source for prices. An important difference is that EU and world beef prices are similar in the latest edition while world prices were forecast to be substantially lower in the earlier version. This means that the change in beef prices calculated in this work under ***Scenario 2: Unilateral Liberalisation*** is very much smaller than that used by Berkum, *et al.* This is also a point of difference between our work and Davis, *et al.* (2017). While the source used in the latter case is not explicit, the latest FAPRI baseline briefing features world beef prices similar to those used by Berkum, *et al.*, i.e. lower than those used here.

[6] The Defra trade data exclude processed and manufactured meat products.

[7] Davis, *et al.* (2017) select specific tariffs rather than using a trade weighted average.

trade literature; these costs do not reflect the presence of any specific non-tariff barriers to trade. Davis, *et al.* (2017) used the same percentages to reflect trade friction costs.

Some adaptations were required for commodities where the UK is a net exporter (barley and oilseed rape). Here the assumption was that additional transaction costs and tariffs would effectively lower the price at which UK exporters could sell on the world market and UK prices were reduced accordingly. In these cases, the world price also provided a floor below which UK domestic prices could not fall as at this price point commodities would be exported rather than sold at a lower price within the UK (under the assumption that a market is available) (see also below).

In all cases the lower of the EU and RoW adjusted price was used to estimate the impact of the scenarios in the gravity model reflecting the fact that, *ceteris paribus*, imports will be drawn from the lowest cost producers.

The gravity model requires a number of assumptions which do not necessarily reflect reality and for this reason, the prices produced were discussed with AHDB experts to validate them. First, trade is net and assumes product homogeneity. This means that no account is taken of trading complexities such as an import requirement for bread wheat and an exportable surplus of feed wheat; market segmentation also results in different prices for what are in effect, different commodities. The situation in relation to livestock products is more complicated in that no account is taken of carcass balancing (the import of, say, beef fillets, and the export of the fifth quarter). It is also not possible to take account of the carousel trade (where product is exported and then reimported after processing). The gravity model also assumes that there is always product available to be imported and that this product is homogenous in its characteristics. These simplifying assumptions are common to all but the most sophisticated trade models.

The implication of not being able to take account of carcass balancing trade is particularly important. High tariffs on the cuts which are demanded in the UK implies substantial increases in domestic prices given the UK's net import requirement. However, UK producers will need to find a market for cuts which are not in demand and if this is not possible, or the value obtained is very low, this will offset the high prices for cuts which are in demand. The net impact on domestic livestock prices will therefore be lower than that estimated by the gravity model. This is especially likely to be the case in the pig sector, notwithstanding the recent announcement by Defra that market access has been secured for seven businesses across England and Northern Ireland to export pigmeat to China.[8].

The gravity model requires the selection of values for supply elasticity and for price elasticity of demand.

- ***Supply elasticity:*** this reflects the ability of the agricultural sector to increase or decrease the quantity supplied over a given period in response to price signals. The value can range from 0 (no ability to respond; completely inelastic) to infinity (completely elastic). In practice, the supply

[8] https://www.gov.uk/government/news/huge-export-win-to-china-for-uk-food-producers

elasticity in agriculture in response to rising prices is effectively 0 in the short-term (as once a crop is planted and inputs applied, there is nothing that can be done by farmers to expand output until next season) with elasticity increasing as the time period under consideration is lengthened. An elapsed time of several years may be required to make fundamental changes such as switching between dissimilar enterprises. Responses to falling prices may show a different elasticity; crops may be ploughed in and breeding animals slaughtered, though there will be a reluctance to reduce capacity if there is a prospect of price recovery. Supply elasticities are notoriously difficult to estimate and come with significant caveats. The limited literature available suggests that supply elasticities are relatively low in agriculture and we have used a value of 0.5 which means that a 10% change in price would induce a 5% response in supply.

- ***Price elasticity of demand:*** this reflects the change in quantity demanded per time period as prices increase/decrease. For 'normal' goods, as price increases, demand decreases and *vice versa*, coefficients are negative. As a general principle, essential goods and those that are relatively inexpensive have a lower elasticity of demand than higher priced 'luxury' goods. The availability (and price) of substitute goods is also a determining factor. Demand elasticities assessed at the farm gate will differ from those at retail level (where measurement usually takes place), being generally lower. However, there is little guidance from the literature which is directly relevant here; Andreyeva, *et al.* (2010) found that studies reporting price elasticities for food products in the US between 1938 and 2007 placed these in a range between -0.27 and -0.81, depending on the product with values for staple products tending to be lower. Price elasticity is likely to have changed over time as levels of disposable income have changed and as the availability and price of alternatives have moved; it does not follow that elasticities in this time period in the US shed much light on price elasticities in the UK post-exiting the EU. We have assumed a price elasticity of demand of -0.5, which means that if prices increase by 10%, demand falls by 5%.

Estimates of prices on the domestic market are sensitive to changes in both the elasticities used. Increases (decreases) in the price elasticity of demand or in the supply elasticity result in lower (higher) price changes. Sensitivity analysis on the prices used is carried out in Appendix 1.

The economic logic behind the changes in prices is as follows:

***Cases where the UK is a net importer***

The imposition of trade facilitation costs and tariffs increases the cost of imports (see Box 2.1 above). The higher costs allow UK domestic prices to drift upwards to the point at which imports cease, higher prices result in greater domestic supply and a reduction in demand.

***Cases where the UK is a net exporter***

The imposition of trade facilitation costs and tariffs increases the cost of UK commodities on export markets. In order to be able to export, UK producers must lower their prices accordingly and/or sell their surplus production on the UK market (again, see Box 2.1 above).

The changes to domestic prices produced by the gravity model, and validated by the AHDB experts, are shown in Table 4.1. It should be borne in mind that this is a considerable simplification of reality (see above). The economic logic underpinning the price changes for each commodity is as follows:

- **Wheat.** The UK has a relatively small import requirement for wheat. As trade friction and tariffs are applied, the cost of imports from the EU increases. This allows UK domestic prices to rise to replace some of these imports. Because the import requirement is small, only a small price increase takes place before imports cease, and the response is the same under each scenario. If the import requirement were larger, the price response would differ between scenarios.
- **Barley.** The UK is an exporter of barley. The imposition of trade facilitation costs and tariffs (by importing countries) will make UK exports more expensive abroad, thus reducing the UK's ability to export. There is therefore greater availability on the UK domestic market which depresses prices. Under ***Scenario 1: Evolution***, the UK price cannot fall far before exports become economically viable. The additional trade costs under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** mean that the price fall is larger and is the same in both cases as exports are no longer possible. Davis, *et al.* (2017) assume that the UK can continue to export malting barley to the EU; this is not an assumption we have made.
- **Oilseed rape.** The logic behind the price changes for oilseed rape is the same as for barley.
- **Potatoes.** Potatoes are largely traded in processed form and the UK has a substantial import requirement. Under all scenarios, imports become more expensive due to the costs of trade friction and, under ***Scenario 3: Fortress UK***, tariffs, allowing UK domestic prices to increase.
- **Sugarbeet.** The UK has an import requirement. The retention of existing TRQs under ***Scenario 1: Evolution*** and an increase in costs of trade with the EU means that there would be a small increase in import costs reflecting the relative weight of imports drawn from the EU and the world market and the assumption that there would be no increase in imports of raw sugar at 0% tariff under the existing TRQs. This translates to a small increase in UK domestic prices for farmers. Under ***Scenario 2: Unilateral Liberalisation***, all tariffs and TRQ limits are removed meaning that the import price is the world price plus trade facilitation costs; this implies a decrease in import costs of raw sugar as some imports are currently with tariff. ***Scenario 3: Fortress UK*** is the most complicated, here we assume that imports are faced by the WTO MFN tariff, with the exception of the 0% tariffs granted under the Everything But Arms agreement, in addition to additional trade facilitation costs. We therefore use a trade weighted average tariff and this implies a substantial initial increase in domestic prices.
- **Outdoor vegetables.** Onions were selected as a representative crop within this class. The UK has an import requirement (largely met from the EU) and the extra costs of trade in the form of friction and tariffs results in higher prices for imports which allows UK prices to move upwards. The UK price is sufficiently close to the world price to mean that an increase is implied even without tariff under ***Scenario 2: Unilateral Liberalisation***.
- **Glasshouse vegetables.** Tomatoes were selected as a representative crop within this class. The logic behind the price changes for tomatoes is the same as for onions.
- **Outdoor flowers, bulbs and nursery stock.** No data are available to identify a representative crop within this category. The same underlying logic applies to this category as it does to onions,

but here we have used price increases of 5% and 8% for ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** respectively to represent the costs of trade friction. For Scenario 3: Fortress UK, we applied the 8% trade friction cost and then multiplied this by the tariff rate for these products.

- **Glasshouse flowers, bulbs and nursery stock.** This category was addressed in the same way as the outdoor flowers, bulbs and nursery stock category.
- **Top fruit.** According to export advice, domestic top fruit production does not compete directly with imported produce and therefore increases in import costs are not likely to cause domestic prices to rise. For this reason, no cost increase was applied to this category under any of the scenarios.
- **Soft fruit and strawberries.** Strawberries were selected as a representative crop for this category. The same logic applies to this category as it does to onions.
- **Milk.** There is virtually no trade in liquid milk. As the most traded commodity, cheese was selected as the representative product; movements in the cheese price are linked to the milk price by a coefficient calculated by the AHDB[9]. Whilst the same underlying logic applies here as it does to onions, the difference is that the world price is sufficiently lower than the UK price, meaning that the increase in trade friction under ***Scenario 2: Unilateral Liberalisation*** results in only a small increase in the cost of imports, implying that the UK domestic milk price can only increase marginally.
- **Beef.** The same logic applies to beef as it does to milk, although in this case the world price is low enough to mean that imports are likely to increase under ***Scenario 2: Unilateral Liberalisation***, placing some downward pressure on UK domestic prices.[10]
- **Sheep.** The scenarios are complicated with regard to trade in sheep meat. Under ***Scenario 1: Evolution***, it is assumed that the TRQs currently in place are retained and that UK exports to the EU are also maintained at the current level through with a small decrease (5%) in UK price resulting from additional trade friction. Under ***Scenario 2: Unilateral Liberalisation***, the substantially lower world price means that imports are cheaper, even with trade friction costs, and this results in substantial downward pressure on UK domestic prices. Under ***Scenario 3: Fortress UK***, while the retention of the TRQ for New Zealand lamb means that there is no change in the cost of imports and hence no impact on domestic prices, trade friction and tariff on UK exports makes these prohibitively expensive in the traditional EU market and the presence of this unexportable surplus on the UK market depresses domestic prices considerably.
- **Pigs.** The UK has a large import requirement for pigs, met currently from the EU. Under all scenarios, the cost of imports is increased by trade friction and, under ***Scenario 3: Fortress UK***, tariffs. This allows the UK domestic price to drift upwards. The carcass balancing caveat above should be borne in mind; the price increase estimated here is likely to be substantially mitigated if markets for low value cuts cannot be found.

[9] A 1% change in the Milk for Cheese Value Equivalent (MCVE) leads to a 0.74% change in farm-gate milk price.

[10] As noted previously, *Berkum, et al.* (2016) used an earlier source for world prices which put these considerably lower than the most recent source used here. This resulted in a much stronger implied decline in UK producer prices.

**Table 4.1: Price changes used in the farm-level model**

| | Scenario 1: Evolution | Scenario 2: Unilateral liberalisation | Scenario 3: Fortress UK |
|---|---|---|---|
| Wheat | 2.29% | 2.29% | 2.29% |
| Barley | -5.00% | -16.38% | -16.38% |
| Oilseed rape | -14.35% | -17.05% | -17.05% |
| Potatoes | 5.14% | 8.22% | 23.01% |
| Sugarbeet | 1.08% | -2.69% | 40.61% |
| Outdoor vegetables (onions) | 7.37% | 11.80% | 25.95% |
| Glasshouse vegetables (tomatoes) | 5.08% | 8.13% | 19.91% |
| Outdoor flowers, bulbs and nursery stock | 5.00% | 8.00% | 16.96% |
| Glasshouse flowers, bulbs and nursery stock | 5.00% | 8.00% | 15.00% |
| Top fruit | 0.00% | 0.00% | 0.00% |
| Soft fruit and strawberries (strawberries) | 5.36% | 8.58% | 21.66% |
| Milk | 3.97% | 0.40% | 12.09% |
| Beef | 4.55% | -0.45% | 21.45% |
| Sheep | -5.00% | -20.04% | -25.42% |
| Pigs | 4.23% | 6.77% | 41.05% |

While the prices determined through our gravity model are generally consistent with those produced by the FAPRI model (Davis, *et al.*, 2017), there are some key differences arising from the data sources used and the assumptions made (see Box 4.1).

**Box 4.1: Comparisons of price changes with those produced by the FAPRI model (Davis, *et al.* 2017)**

As noted in the Literature Review, during the period of our study for the AHDB we were made aware of other work on the impact of the UK leaving the EU being carried out by the FAPRI-UK project and financed by Defra and the other UK agriculture departments. The FAPRI-UK model estimates UK market price changes for agricultural commodities by 2025 for three different trading relationships; these estimates were published (Davis, *et al.*, 2017) very late in the life of our work for the AHDB. It must be stressed that our AHDB study considers scenarios that, in addition to trade, also include changes in domestic policy, labour costs, and the administrative burden, and extend to farm-level impacts, which the FAPRI-UK work does not. Though comparisons between the impacts on market prices from the two pieces of work may be instructive, the following fundamental differences must be born in mind:

- They use different basic data sources (this affects in particular the assumed world price of beef, see below).
- The FAPRI-UK estimates relate to the prices projected for 2025 compared with the baseline, whereas our work is based on prices in the European Commission's EU Agricultural Outlook (2016 edition) averaged over the years 2014-2018 which is then fed into a gravity model and compared with our (different) baseline.

As noted above, the price changes determined through our gravity model are generally consistent with those published from the FAPRI-UK model. The key differences are explained below.

- **Wheat prices:** the trade data used in this research for AHDB showed a small import requirement for wheat which resulted in a small *increase* in domestic price under all scenarios. In contrast, the FAPRI data show a small exportable surplus that results in a small *decrease* in price by 2025. Our sensitivity analysis considers the impact of a small exportable surplus and, under this assumption, a small decrease in price consistent with FAPRI is produced.
- **Milk prices:** under ***Scenario 2: Unilateral Liberalisation***, we show a marginal increase in the milk price. Under the equivalent scenario, FAPRI shows a 10% price decrease for milk and dairy products. It is not clear whether the FAPRI price reduction is in raw milk equivalent terms (as ours is).
- **Beef prices:** under ***Scenario 2: Unilateral Liberalisation***, we show a marginal decrease in the beef price. In contrast, FAPRI show a decline of 45%. We note that the world beef price is substantially below the EU beef price in the FAPRI baseline and that this was also the case in the data used by Berkum, *et al.* (2016). However, we use the latest data sources; had we not done this we would have estimated a much more significant decrease in the beef price under this scenario. We also use a trade weighted blended tariff rate rather than the tariff for beef carcases (which does not reflect the structure of UK beef imports).
- **Pig prices:** under ***Scenario 2: Unilateral Liberalisation***, we show a small increase in pig prices; FAPRI shows a decline of 12%. We believe that the explanation for this difference, like that for beef, lies in the world price data and tariff used. Under ***Scenario 3: Fortress UK***, we show a large increase in the pig price, slightly more than double the price rise forecast by FAPRI. We note that Davis, *et al.* (2017) state that their pig price increase could be an under-estimation based on high tariffs for processed pigmeat. Again, we used a trade weighted blended tariff rate in our calculations.

Given the explanations for the differences, we believe that the figures on price changes we use are to be preferred for use in our farm level model.

### 4.4. Estimation of the impact of regulatory simplification for use in the farm level model

***Scenario 2: Unilateral Liberalisation*** includes a reduction in regulatory requirements. Savings might follow, for example, through a reduction in requirements to complete paperwork. There is no robust evidence on the level of savings that might be possible and, given that most EU laws in this area are likely to become British law under the anticipated European Union (Withdrawal) Bill, it is plausible that any such savings would be minimal. For the purposes of the scenario, discussions with AHDB experts suggested that a 5% reduction in costs associated with a number of variable cost elements[11] might be expected at most. This is consistent with European Commission (2011) where a partial examination of the cost of compliance with EU legislation suggested savings of below 5%.

[11] Seeds; fertilisers; crop protection; other crop costs; veterinary fees and medicines; and, other livestock costs.

### 4.5. The farm level model

While the process described above enables estimates of changes in support payments, labour costs, commodity prices and the regulatory burden to be generated, these need to be translated to change in Farm Business Income (FBI) to assess the impact at farm level. A micro-economic model was built using England's Farm Business Survey (FBS) data.[12] In order to assess the impact of the scenarios on Farm Business Income (defined as total output minus total costs)[13], output was sub-divided into:

- Production output
- Output (in effect, revenue) from Pillar I subsidies
- Output (in effect, revenue) from Pillar II schemes
- Output from diversification activities

For the same purpose, total costs were sub-divided into fixed and variable costs. Fixed costs were identified as:

- Regular labour
- Machinery running costs
- Machinery depreciation
- Depreciation of glasshouses & permanent crops
- Bank charges & professional fees
- Water, electricity and other general costs
- Share of net interest payments
- Write-off of bad debts
- Rent paid
- Maintenance, repairs and insurance
- Depreciation of buildings and works
- Miscellaneous fixed costs (including for work done on other farms)

Variable costs were identified as:

- Seeds
- Fertilisers
- Crop protection
- Other crop costs
- Purchased feed & fodder
- Home grown feed & fodder
- Veterinary fees & medicines
- Other livestock costs
- Casual labour

[12] Similar surveys are operated in Scotland, Wales and Northern Ireland. It would be possible to carry out a similar exercise using these datasets.

[13] Further expressions of profitability are also used by the FBS which go beyond FBI to include, for example, changes in the value of breeding livestock, land, etc.

In line with Hill and Bradley (2015), averages of three years' data were used to smooth out annual variations which could otherwise present a misleading picture. The latest data available allowed the inclusion of data from 2013/14, 2014/15 and 2015/16. All data were converted to 2015/16 prices.

### 4.5.1. Model construction

The base for each sector model used in our study was the average farm of that type within the FBS sample. Defra publishes FBS data for all farms classified as, for example, dairy, in which the activities undertaken are summed and then divided by the number in the sample. The average dairy farm therefore has a certain number of dairy cows, certain areas of specific crops, etc.[14] In our model, within each sector sub-models were produced for part-time (in effect, very small), small, medium and large farms, and also for low, medium and high performance farms, using published Defra FBS statistics as the base (some breakdowns were not available for some sectors for disclosure reasons) (see Box 4.2 for the basis of categorisation).

**Box 4.2: FBS categorisation of farms by type, size and performance**

Details of how the FBS classifies businesses by type and size are reported by Defra[15]. Classification of Farm Businesses by type is based on the contribution of different enterprises to Standard Output. For example, to be classified as a dairy farm, two-thirds of the Standard Output must come from dairy cows.

Standard Labour Requirements (SLRs) are used to provide an estimate of the total amount of standard labour used on the farm based on a calculation by livestock and crop types. The use of SLR (rather than actual labour requirements) means that account is taken of different levels of mechanisation. Farms are then classified according to the number of full-time equivalent (FTE) workers. For example, part-time farms are those where the labour requirement is between 0.5 and 1 FTE (it does not mean that in practice the farm is operated part-time); a medium sized farm has a labour requirement between 2 and 3 FTEs.

Farms are allocated to performance bands according to the ratio of total farm output divided by total farm costs. Total costs for this calculation include an adjustment for unpaid manual labour. The farms are then ranked with the bottom quartile making up the low performance group and the top quartile the high performance group; the remaining farms in the middle make up the medium performance group. This ranking is independent of farm type, so it is possible that certain farm types are over/under represented in specific performance groups.

In order to produce a model to be used to address the AHDB scenarios it was necessary to deconstruct published FBS data, such as output from production, into its component parts so that elements could be varied to represent the scenarios.[16] The model was validated by comparing the

[14] The composition of the different farm types can be accessed from: https://www.gov.uk/government/statistics/farm-accounts-in-england
[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365564/fbs-uk-farmclassification-2014-21oct14.pdf
[16] The FBS does not permit access to farm-level raw data by which this might be done directly.

values produced to the original data; there are some minor differences due to rounding, but all modelled values were within less than 0.5% of the original data, and most were within 0.1%.

The sub-sector models (farm size and performance level) had to be constructed differently to the main sector models because some data are not available at the necessary level of disaggregation. For example, financial output for individual crops is available for the main farm types, but for different farm sizes and performance levels within farm type, output is only published for all cropping enterprises and all livestock enterprises. To counter this, the contribution of different enterprises to total cropping output/livestock output for all farms was used as a key to distribute total output for the different farm sizes and performance levels by enterprise. This approach means that the total crop and livestock financial outputs match the FBS data for specific farm types and performance levels, but the financial outputs for individual enterprises are estimates. The same approach was used to distribute fixed and variable costs. These sub-sector models were validated in the same way as the main models.

Before turning to the results, it is necessary to reflect on how they should be interpreted. The price changes at the market level, shown in Table 4.1. above, are used as input to our farm-level model to assess their implication for Farm Business Incomes for businesses of various types of farming, economic size and performance level. This two-stage approach is common in this sort of work, including the 2016 NFU/LEI study (Berkum, *et al.*, (2016). However, it must be recognised that some supply response from the industry as a whole to changing prices resulting from the imposition of tariffs has already been incorporated into the commodity price movement through the elasticity of supply coefficient adopted.

Furthermore, the impact at farm level of shifts in labour costs, regulatory costs and product prices assumes that the production structure remains fixed, so that changes in these elements translate directly into changes in FBI without farmers making adjustments to optimise the new marginal relationships (though the model does incorporate allowances for changes in costs of feed for livestock associated with changing cereal/oilseed prices).

In reality, farmers would be expected to make further rounds of adjustments (scale, enterprise substitution, etc.) that would impact on their incomes; we take these into account in subsequent qualitative assessments. As indicated previously, the upshot is that the implications for FBI produced by the assessment process are best regarded only as indicators of where financial pressures resulting from the scenarios are likely to be most severe (types of farming, levels of performance, etc.).

# 5. Results

This Chapter sets out the results of our modelling of the scenarios. A brief overview of the initial impact of the scenarios on Farm Business Income (FBI) is followed by a more detailed examination of the impact, and the drivers of change, for each farming sector considered. Within the analysis of each sector we consider the sensitivity of key elements of the scenarios and the likely subsequent reaction as the sectors adjust to the new operating environments implied by the scenarios.

## 5.1. Overview of results

The first-order impact of ***Scenario 1: Evolution*** on each of the examined sectors is shown in Figure 5.1. This reflects only the additional costs of trade. FBI in cereal farms (the blue column) falls relative to the baseline (current situation, indicated by the red dot) as, while there is an increase in the wheat price and hence a greater value of wheat output, this is more than offset by decreases in barley and oilseed rape prices as the surplus cannot be exported at a competitive price and therefore needs to be disposed of on the domestic market. FBI in several sectors (general cropping, LFA sheep and beef and lowland sheep and beef) is little changed as increases in prices and values of output for some enterprises are balanced out by decreases for others. There is a noticeable increase in FBI in the dairy and pig sectors as the cost of imports increases, allowing domestic prices and the value of outputs to drift upwards.

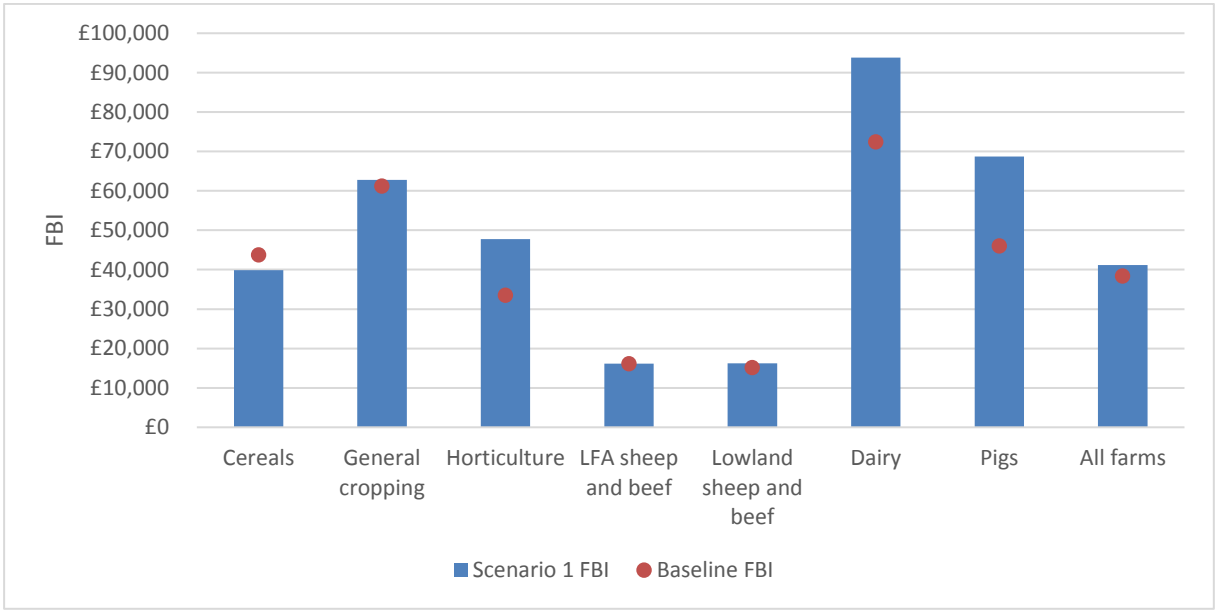



**Figure 5.1: Farm Business Income under *Scenario 1: Evolution* for each sector**

Figure 5.2 presents the first-order impact of ***Scenario 2: Unilateral Liberalisation*** on each of the examined sectors. The picture here is very different, with large decreases in FBI (compared with the baseline) expected in all sectors except pigs. The main difference between the outcome of this scenario and the first scenario is the removal of Pillar I support and an increase in Pillar II support, but only to 50% of the total support available currently. The cost of regular labour also increases as access to

migrant labour is restricted. Reductions in the cost of regulation mitigate the fall in FBI to a limited extent. FBI in all sectors remains positive, although in the case of lowland sheep and beef FBI is fairly marginal.

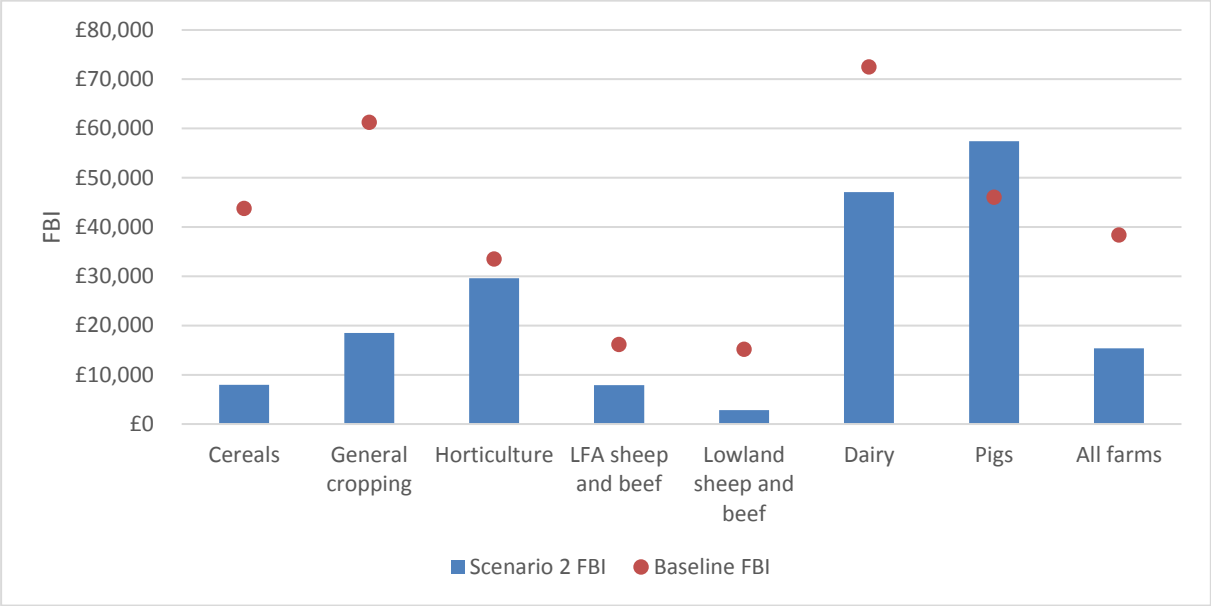



**Figure 5.2: Farm Business Income under *Scenario 2: Unilateral Liberalisation* for each sector**

The first-order impact of ***Scenario 3: Fortress UK*** is presented in Figure 5.3. The key point to note here is that FBI becomes negative for cereal and LFA sheep and beef farms; FBI for lowland sheep and beef farms is positive, but only just. The protection to domestic producers afforded by the use of WTO MFN tariffs, and the relatively small impact of changes to policy, mean that FBI in dairy farms increases relative to the baseline; FBI also increases in the pig sector for the same reasons. In both cases the increase in FBI is mitigated to some extent by extra labour costs.

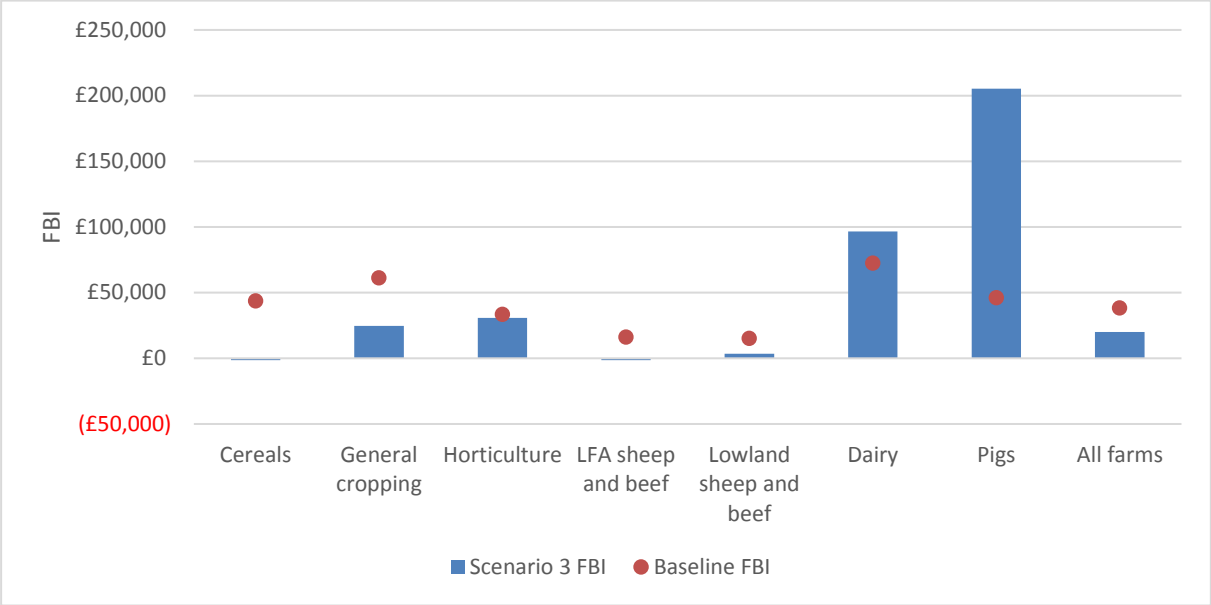



**Figure 5.3: Farm Business Income under *Scenario 3: Fortress UK* for each sector**

In addition to the impacts on FBI produced by our assessment there are likely to be long-term impacts on the structure of the industry, as reflected in numbers of farms; changes in farm sizes as some release land (especially by quitting farming) and others attempt to expand; the substitution of capital for hired labour as the latter becomes relatively more expensive; restructuring of the farm business (such as a major change of enterprises); and, the broadening of income sources by on-farm diversification or the development of off-farm jobs and business enterprises. There may also be an impact on land prices. We consider such changes, which go well beyond the span of our farm-level model, by drawing on expert opinion. As will become clear, the diversity within the agricultural industry means that these subsequent adjustments have to be related to each of the farming types, though at the end it is possible to draw some important general conclusions.

We turn next to the results of each type of farming in turn.

## 5.2. Cereal farms

### 5.2.1. Initial impact

The baseline FBI for cereal farms[17] is £43,796 (Figure 5.4). Under ***Scenario 1: Evolution***, this falls by 9% to £39,788, under ***Scenario 2: Unilateral Liberalisation***, FBI falls by 81% to £8,216 while under ***Scenario 3: Fortress UK***, FBI becomes negative after falling by 103% to -£1,341.

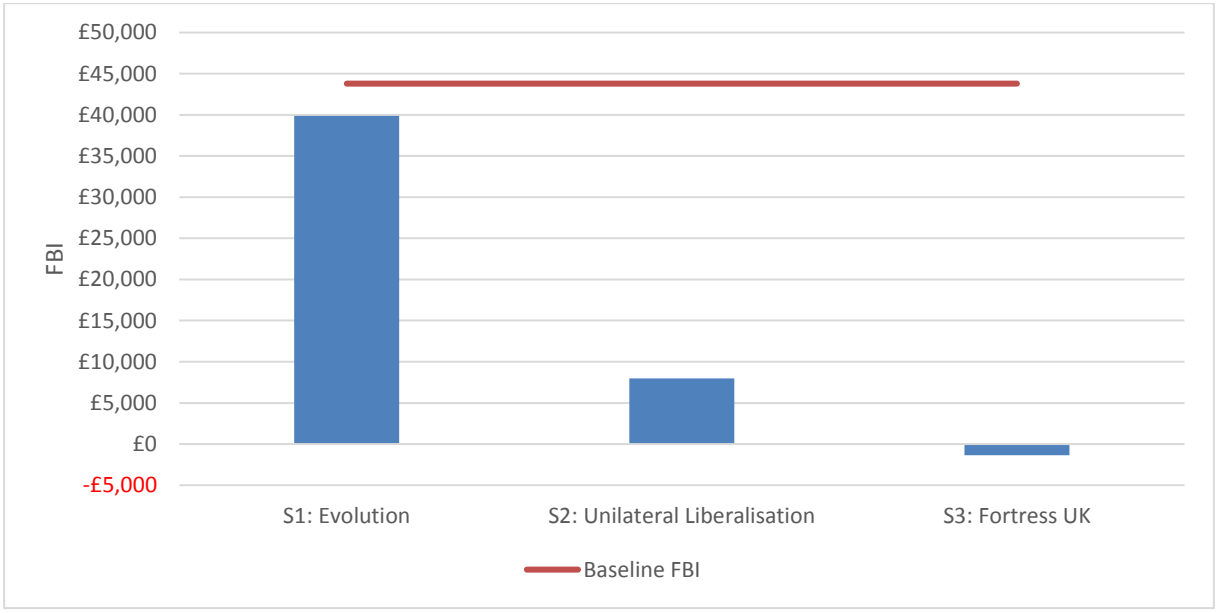



**Figure 5.4: Impact of the scenarios on FBI: Cereals**

Figure 5.5 shows the components of FBI for each scenario and the baseline; comparisons between them give the explanation why FBI differs between scenarios. As noted above, the fall in FBI under ***Scenario 1: Evolution***, seen as a slight decrease in the production output components, is driven mainly by decreases in the output values for oilseed rape and barley, caused by the loss of export potential, which is not compensated for by the smaller increase in the value of wheat output.

Comparison of the columns (and the data behind them) shows that the key driver for the fall in FBI under ***Scenario 2: Unilateral Liberalisation*** is the removal of Pillar I payments (£37,439) which is not fully compensated for by the increase in Pillar II payments. The value of production output from UK farms also falls further due to downward pressure on domestic prices as the cost of imports is reduced through the unilateral removal of tariffs. In addition, regular labour costs increase by around a third while reductions in regulatory costs means that total variable costs decrease marginally.

Under ***Scenario 3: Fortress UK***, the increase in Pillar II payments is less significant than under Scenario 2 increasing only marginally as Pillar I payments are removed. Both casual and regular labour costs

[17] Holdings on which cereals, combinable crops and set aside account for more than two-thirds of the total Standard Output (SO) and where set aside alone does not account for more than two-thirds of the total SO.

increase, although the additional increase compared to Scenario 2 is marginal as casual labour is only a small cost element in cereal farms. The value of production output decreases, but not by as much as under Scenario 2 given the protection to domestic prices offered by WTO tariffs.

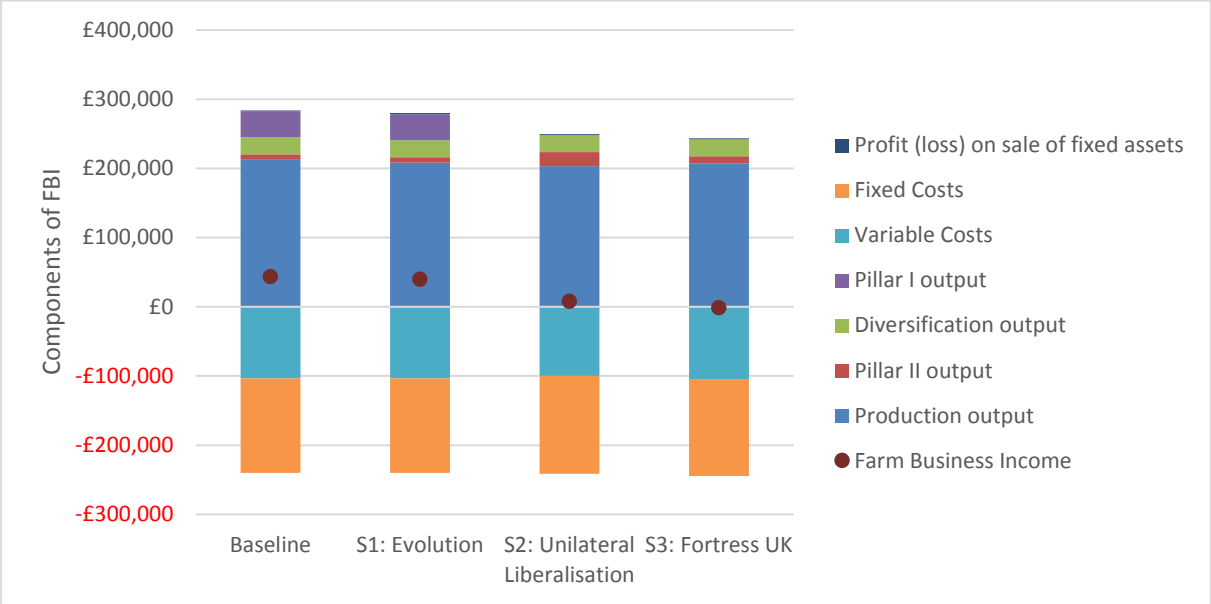



**Figure 5.5: Impact of the scenarios on components of FBI: Cereals**

The impact of the scenarios disaggregated by farm size and performance level is shown in Figure 5.6. FBI becomes negative under ***Scenario 3: Fortress UK*** for all cereal farms, driven by the largest farm size where regular labour costs are more substantial than in the other size groups. The largest size group is also outperformed by the medium size group under ***Scenario 2: Unilateral Liberalisation***, again as a result of relatively high regular labour costs (the higher level of Pillar I payments that larger farms have is also a factor). Under ***Scenario 1: Evolution***, the impact on FBI is proportional to farm size because there is no change in Pillar I or II support and no change to labour availability or regulatory costs.

With respect to farm performance groups, all scenarios result in decreases in FBI for all groups, which makes FBI increasingly negative for low performance farms when moving across from Scenario 1 to 3. However, medium and high performance farms retain positive FBI under ***Scenario 1: Evolution***, and high performance farms retain positive FBI under all scenarios. In all cases, FBI falls furthest under ***Scenario 3: Fortress UK***. It should be noted that baseline FBI is negative for the low performance group. It is possible for negative FBI to be sustained due to off-farm income earned by the farmer, spouse and/or other family members which is not included within the FBI calculation.

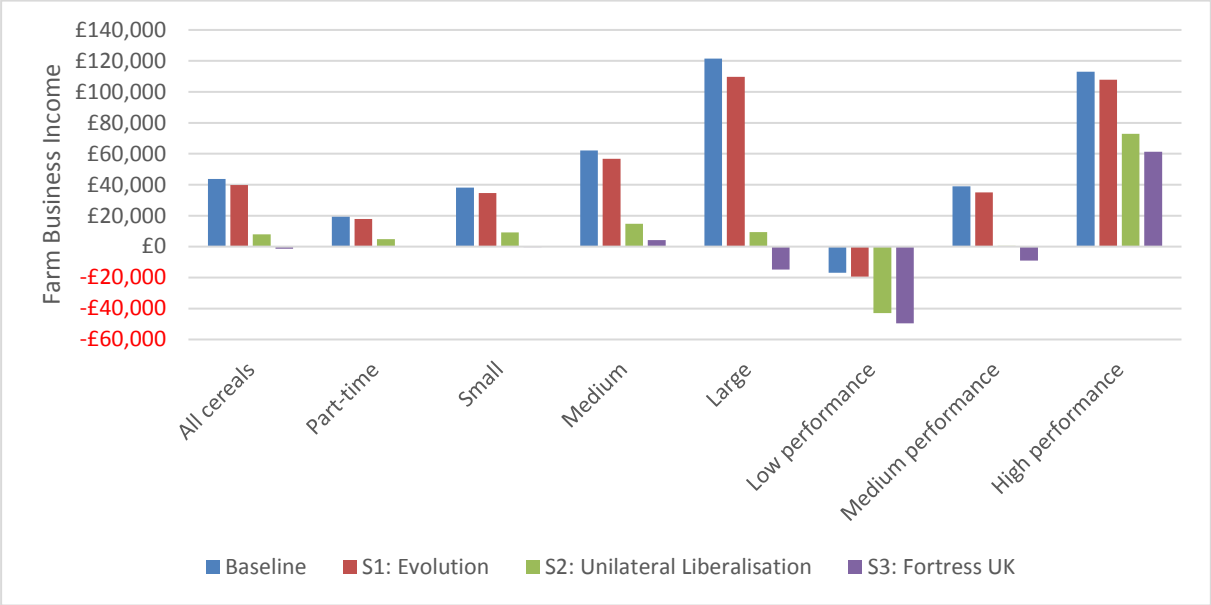



**Figure 5.6: FBI by farm size and performance level: Cereals**

### 5.2.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. At least 50% of new income from Pillar II would need to be additional to retain a positive FBI under ***Scenario 2: Unilateral Liberalisation***. The impact on FBI under ***Scenario 3: Fortress UK*** would be smaller.

Varying the price of wheat by ±10 percentage points[18] would result in a ±24% change in FBI under ***Scenario 1: Evolution***. As a result of the lower FBIs under the other two scenarios, the impact of this change in wheat prices would result in a ±120% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±210% change in FBI under ***Scenario 3: Fortress UK***.

The impact of higher additional labour costs is not so important for cereal farms, although given the low FBI under the third scenario additional labour costs of 40% rather than 50% would mean that FBI would remain positive. The impact of varying the reduction in regulatory cost savings is relatively unimportant for this farm type.

The assessment assumes that the UK is a net importer of wheat (the situation for the reference period). If the UK were to have an exportable surplus of wheat, such as from a year of unusually high yields, it would not be possible to sell this competitively on the export markets due to the additional trade friction costs and/or tariffs. This would result in further reductions in FBI.

[18] This equates to a price change of -7.71% to 12.29% under all three scenarios.

### 5.2.3. Subsequent adjustments

#### 5.2.3.1. Scenario 1: Evolution

Farm Business Income will reduce slightly on average under this scenario and this will increase pressure on marginal farmers, i.e. low performers and those farming at a smaller scale. The existing trend towards fewer and larger farms is therefore likely to continue, although it should be borne in mind that not all farmers are trying to maximise profits; some farm for the lifestyle and some can support income from the farm with income from off-farm employment and/or investments, etc.

All cereal farmers are likely to consider the prices of specific enterprises and will, over time, move away from those where prices are likely to fall (barley and oilseed rape) in favour of enterprises where prices are more stable (for example, wheat). These adjustments can be expected to reduce the rate at which prices for barley and oilseed rape fall as supply is reduced; increases in demand for livestock feed from sectors which are likely to expand, such as pigs and dairy, may also mitigate falling prices to some extent. Increases in the area of wheat grown could result in an increased exportable surplus, although exports will have to be at a small discount to domestic supply to allow for the costs of trade friction. There may though be limits in terms of how much oilseed rape can be removed for rotational reasons.

It should be noted that the wheat and barley markets are differentiated into feed and milling/malting quality and the impact on these market segments might not be the same. For example, within the wheat sector, the UK imports milling quality wheat and there may be an opportunity to replace some imports with domestic production; the impact on the feed wheat sector could be different.

Overall, ***Scenario 1: Evolution*** is little different in FBI terms to the baseline and, as such, it is likely to slightly exacerbate existing structural trends in the cereal sector. There could also be a shift in production away from barley and oilseed rape and towards wheat and other minor crops such as potatoes and sugar beet where this is agronomically possible.

#### 5.2.3.2. Scenario 2: Unilateral Liberalisation

Under ***Scenario 2: Unilateral Liberalisation***, the removal of Pillar I payments will reduce average FBI dramatically and this is likely to prompt substantial structural change. The losses made by low performers will require considerable off-farm income to make continuation an economically viable option. Medium performers are likely to require off-farm resources to continue and there will be pressure for many to exit the sector; only high performers will see their FBI remain at reasonable levels, although this still entails a sizeable reduction. This will place increased pressure on costs which will be felt throughout the input supply chain.

Scale will not necessarily result in economic viability; FBI on large farms will be comparable to that on small farms with medium-sized farms retaining slightly higher FBI. In structural terms, this could result in a reduction in cereal farm size as producers look to reduce costs of paid labour. There will also be

increased interest in the replacement of labour by capital to the extent that this is possible. There may also be increased interest in Pillar II schemes to replace the income lost under Pillar I.

There are likely to be regional impacts with cereal farms concentrating in more favourable areas where higher yields can be achieved.

As under the first scenario, there is likely to be some readjustment of enterprises to move away from those where prices are expected to fall and into those where prices are expected to be more stable or to increase. Again, these moves will moderate the price changes seen in the short-term.

Overall, ***Scenario 2: Unilateral Liberalisation***, will see increased pressure on the less efficient farmers, possibly with some regional impacts and may see downward pressure on farm size in order to reduce labour costs.

#### 5.2.3.3. Scenario 3: Fortress UK

FBI in ***Scenario 3: Fortress UK***, becomes negative on average as a result of the loss of Pillar I payments; this scenario is a more extreme version of the previous one. However, FBI remains positive for part-time farms, medium-sized farms and the high performance group as a result of their specific characteristics, namely a relatively high proportion of output being derived from diversification activities (unaffected under any of the scenarios) and a relatively low requirement for paid labour. That said, only the high performance group is likely to remain economically viable without recourse to off-farm income sources. Diversification will be easier for farms that already have successful core businesses, whereas more can be expected to explore farm-to-farm cooperation to improve scale and obtain access to better management. This scenario might prompt greater interest in cooperation between farmers to spread fixed costs and/or increase management skill.

As was the case under the second scenario, scale will not necessarily protect FBI and large farms may seek to reduce their scale to reduce their paid labour costs. As smaller farms may wish to increase their scale, the number of medium-sized operations could be increased from both directions. As was the case under the second scenario, there will be general pressure on labour use and where possible, those that can afford to make the investments are likely to increase automation.

The same regional impacts as expected under the second scenario are also likely to occur, although the pressures driving this will be stronger.

In line with both the other scenarios, there will of course be adjustments in the enterprise mix in favour of those where prices are more favourable (feed prices may be held up to some extent by increased demand in the pig and dairy sectors).

Overall, ***Scenario 3: Fortress UK***, will see severe pressure on the less efficient farmers, probably with regional impacts and may see downward pressure on farm size in order to reduce costs of paid labour.

## 5.3. General cropping

### 5.3.1. Initial impact

Figure 5.7 shows that the baseline FBI for general cropping farms[19] is £61,231. Under ***Scenario 1: Evolution***, FBI rises marginally, but FBI falls to around one-third of this level under ***Scenario 2: Unilateral Liberalisation***. FBI also falls under ***Scenario 3: Fortress UK***, but only to £24,710.

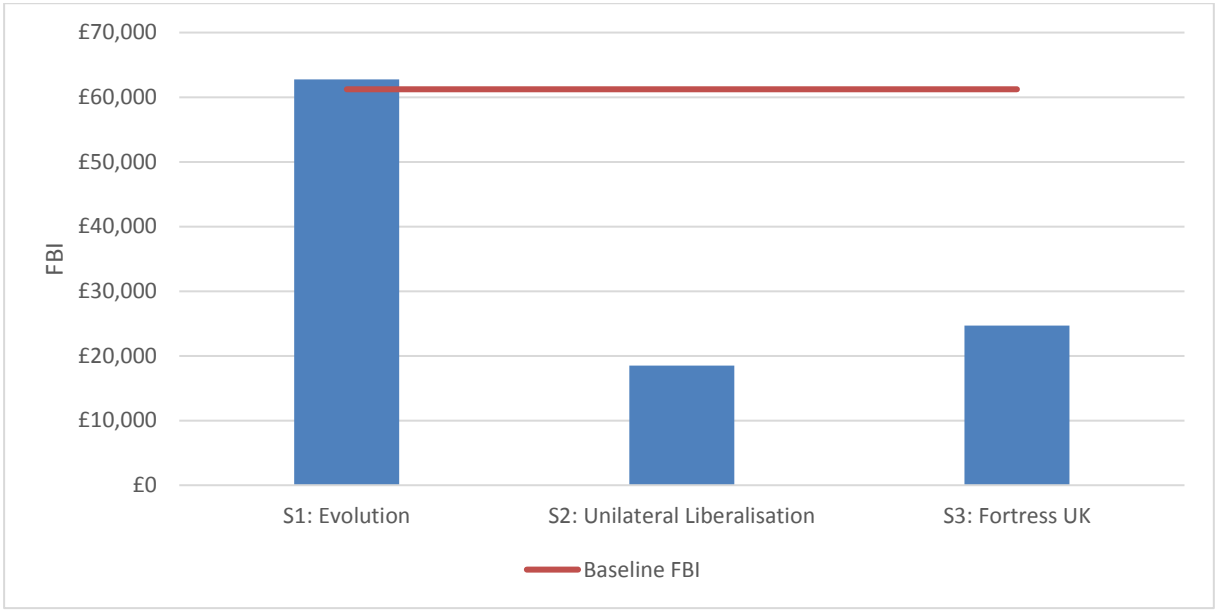



**Figure 5.7: Impact of the scenarios on FBI: General cropping**

Components of FBI under the three scenarios and the baseline (current situation) are shown in Figure 5.8 and it is instructive to compare them (and the data behind them). The mix of enterprises on general cropping farms results in a slight increase in the value of production output under ***Scenario 1: Evolution***. There is a marginal reduction in the output value under ***Scenario 2: Unilateral Liberalisation***, but the main driver of decreased FBI is the loss of Pillar I payments (£39,084), even though this is mitigated by increased payments under Pillar II. Fixed costs also increase as regular labour is more expensive, although variable costs decrease slightly a result of savings in the cost of complying with regulations.

Tariff protection under ***Scenario 3: Fortress UK*** results in an increase in the value of production output which helps to offset the loss of Pillar I payments; Pillar II payments increase only marginally. Additional casual labour costs result in an increase in variable costs while fixed costs are inflated by the additional costs of regular labour.

[19] Holdings on which arable crops (including field-scale vegetables) account for more than two-thirds of their total Standard Output (SO) excluding holdings classified as cereals; holdings on which a mixture of arable and horticultural crops account for more than two-thirds of their total SO excluding holdings classified as horticulture and holdings on which arable crops account for more than one-third of their total SO and no other grouping accounts for more than one-third.


**Figure 5.8: Impact of the scenarios on components of FBI: General cropping**

Figure 5.9 shows the impact of the scenarios on FBI broken down by farm size and performance level. FBI remains positive for all farm size groupings, although there is a positive relationship with scale such that larger farms maintain higher FBIs than smaller farms under all scenarios. The difference in FBI under ***Scenario 1: Evolution*** and the other two scenarios is magnified substantially within the large size group as a result of the increases in regular labour costs.

In terms of performance groups, FBI is negative in the baseline and under all three scenarios for the low performers and is positive under all scenarios for the high performers; there is also less difference between FBI under ***Scenario 1: Evolution*** and the other two scenarios for the high performance group where the ratio of outputs to inputs is more favourable. FBI becomes marginally negative for the medium performance group under ***Scenario 2: Unilateral Liberalisation***, and is only marginally positive under ***Scenario 3: Fortress UK***.

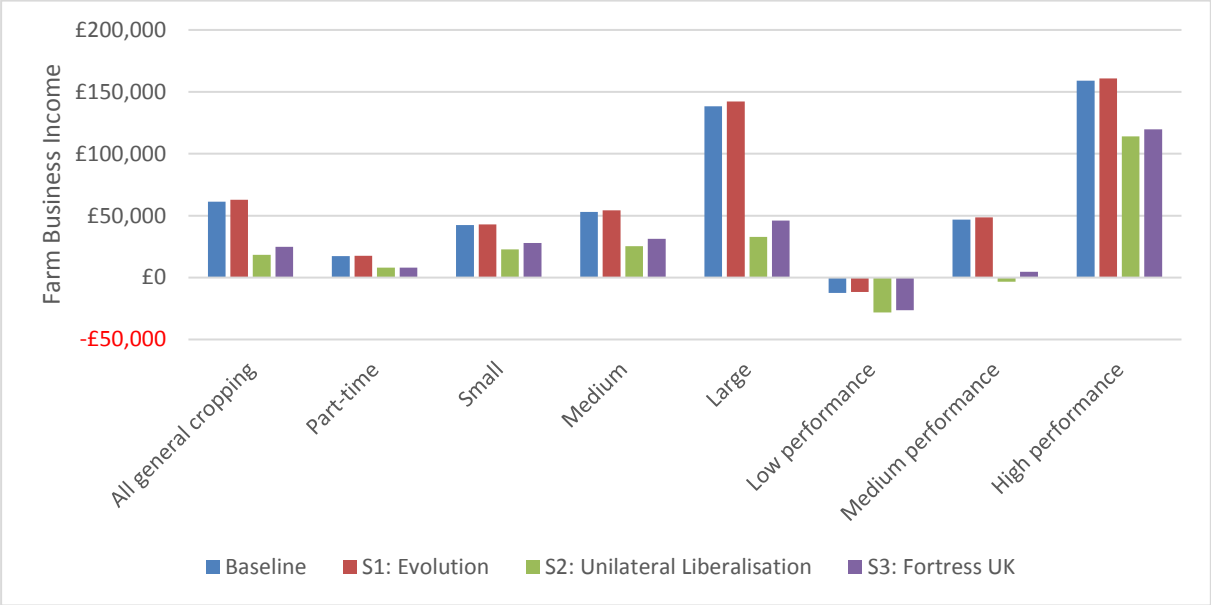



**Figure 5.9: FBI by farm size and performance level: General cropping**

### 5.3.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. Even if all additional Pillar II payments were in the form of income foregone, FBI would remain positive under all three scenarios. Under ***Scenario 2: Unilateral Liberalisation***, FBI would though fall by around three-quarters under this assumption.

Varying the price of wheat (the single largest contributor to the value of production) by ±10 percentage points[20] would result in a ±13% change in FBI under ***Scenario 1: Evolution***, a ±44% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±44% change in FBI under ***Scenario 3: Fortress UK***.

The impact of higher additional labour costs is not so important for general cropping farms; neither is the impact of varying the reduction in regulatory cost savings.

### 5.3.3. Subsequent adjustments

#### 5.3.3.1. Scenario 1: Evolution

Farm Business Income will increase marginally on average under this scenario meaning that there will be no significant change to the current drivers of the sector. The existing trend towards fewer and larger farms is therefore likely to continue, although it should be borne in mind that not all farmers are trying to maximise profits; some farm for the lifestyle and some can support income from the farm with income from off-farm employment and/or investments, etc.

All general cropping farmers are likely to consider the prices of specific enterprises and will, over time, move away from those where prices are likely to fall (barley and oilseed rape) in favour of enterprises

[20] This equates to a price change of -7.71% to 12.29% under all three scenarios.

where prices are more stable (for example, wheat); there may be more substantial increases in the area of crops such as potatoes (see the focus on processing potatoes in section 5.3.4) and, to a lesser extent, sugar beet where price rises are likely; (the lifting of restrictions on sugar beet marketing will facilitate increases in sugar beet area). These adjustments can be expected to reduce the rate at which prices for barley and oilseed rape fall as supply is reduced; increases in demand for livestock feed from sectors which are likely to expand, such as pigs and dairy, may also mitigate falling prices to some extent. Increases in the area of wheat grown could result in an increased exportable surplus, although exports will have to be at a small discount to domestic supply to allow for the costs of trade friction. There may, though, be limits in terms of how much oilseed rape can be removed for rotational reasons unless replaced by other break crops.

It should be noted that the wheat and barley markets are differentiated into feed and milling/malting quality and the impact on these market segments might not be the same. For example, within the wheat sector, the UK imports milling quality wheat and there may be an opportunity to replace some imports with domestic production; the impact on the feed wheat sector could be different.

Overall, ***Scenario 1: Evolution*** is little different in FBI terms to the baseline and, as such, there is likely to be a continuation of existing structural trends. There could also be a shift in production away from barley and oilseed rape and towards wheat and crops such as potatoes and sugar beet where this is agronomically possible.

#### 5.3.3.2. Scenario 2: Unilateral Liberalisation

Under ***Scenario 2: Unilateral Liberalisation***, the removal of Pillar I payments will reduce average FBI substantially and this is likely to result in some structural change. The losses made by medium and, especially, low performers will require considerable development of other income sources (including diversification and off-farm activities to make continuation an economically viable option. There will be increased pressure for farmers in these groups to exit the general cropping sector; only high performers will see their FBI remain at reasonable levels. There will be increased pressure on costs which will be felt throughout the input supply chain.

The relationship between scale and increased FBI will be weakened. In structural terms, this could act as a brake on increasing farm sizes as producers look to control the costs of regular paid labour. There is likely to be some increased interest in the replacement of labour by capital to the extent that this is possible. There may also be increased interest in Pillar II schemes to replace the income lost under Pillar I.

As under the first scenario, there is likely to be some readjustment of enterprises to move away from those where prices are expected to fall and into those where prices are expected to be more stable (for example, potatoes) or to increase. Again, these moves will moderate the price changes seen in the short-term.

Overall, ***Scenario 2: Unilateral Liberalisation***, will see increased pressure on the less efficient farmers and may see some downward pressure on farm size in order to keep labour costs under control.

#### 5.3.3.3. Scenario 3: Fortress UK

FBI in ***Scenario 3: Fortress UK***, is higher than under the second scenario, although still lower than the baseline. In effect, the impact of this scenario will be similar to the second scenario, but less extreme. The relationship between scale and increased FBI, while weakened, remains present and, as a result, the existing pressure towards fewer and larger farms should continue to some extent. That said, there is likely to be a greater focus on the costs of paid labour and increased automation is likely where investments are possible in order to keep costs under control.

In line with both the other scenarios, there will of course be adjustments in the enterprise mix in favour of those where prices are more favourable (feed prices may be held up to some extent by increased demand in the pig and dairy sectors). There is likely to be greater interest in potato and sugar beet production. In the latter case, the lifting of marketing restrictions could result in a substantial increase in area. Those with specialist processing potato enterprises are likely to be able to expand these (see section 5.3.4).

Overall, ***Scenario 3: Fortress UK***, will see some pressure on the less efficient farmers and some adjustment of cropping patterns with areas of potatoes and sugar beet likely to increase on average.

### 5.3.4. Focus on the processed potato sector

Because potatoes are not well represented within any of the farm types defined by the FBS, and a specific "potato farms" is not a recognised group in the published typology, a separate exercise was carried out using data made available by the AHDB. These data allowed the synthesis of a model on a per hectare basis, i.e. this model differs from the others in that it represents the potato enterprise rather than a specific farm type. Data not in the AHDB source, but necessary to allow the scenarios to be constructed, were estimated using the "general cropping" FBS data:

- **Pillar I and Pillar II payments:** a value for revenue and associated costs per hectare was calculated by dividing total Pillar I/Pillar II payments/cost elements by Utilised Agricultural Area.
- **Casual labour:** the data provided by the AHDB did not separately distinguish casual labour within total variable costs. The ratio of casual labour to total variable costs in the general cropping model was used to estimate the cost of casual labour in the potato model to allow the change in this to be modelled under Scenario 3.
- **Costs of complying with regulations:** the cost reduction was based on all variable cost after the removal of casual labour; the AHDB data did not disaggregate variable costs.

The baseline synthesised FBI for potatoes is £639 per hectare (Figure 5.10). Under ***Scenario 1: Evolution***, this increases to £973 per hectare and to £1,400 per hectare under ***Scenario 3: Fortress***

***UK***. Under ***Scenario 2: Unilateral Liberalisation***, FBI remains virtually unchanged at £636 per hectare.

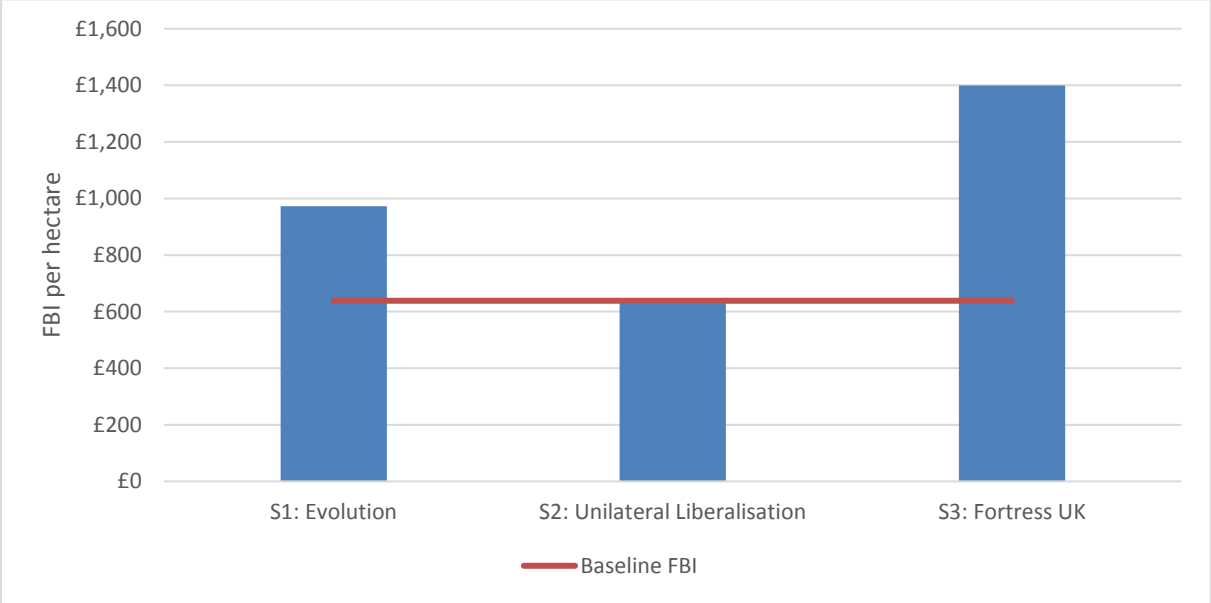



**Figure 5.10: Impact of the scenarios on FBI: Potatoes**

Figure 5.11 shows the changes in the components of synthesised FBI under the three scenarios. Pillar I and Pillar II payments are relatively insignificant and changes in these make little difference to FBI under any of the scenarios. The main change in a positive direction comes from production output where trade friction costs and WTO tariffs under ***Scenario 3: Fortress UK*** cause UK prices for processing potatoes to rise. This increase is mitigated to some extent by increases in the cost of regular labour under Scenarios 2 and 3 and, in the latter, also by increases in the cost of causal labour. Variable costs are reduced slightly under ***Scenario 2: Unilateral Liberalisation*** as the costs of complying with regulation are reduced.


**Figure 5.11: Impact of the scenarios on components of FBI: Potatoes**

## 5.4. Horticulture

### 5.4.1. Initial impact

Figure 5.12 compares the baseline FBI (£33,517) for horticultural holdings[21] to that under the three scenarios. FBI increases by approximately £15,000 under ***Scenario 1: Evolution***, but falls under both ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** to £29,632 and £30,890 respectively.

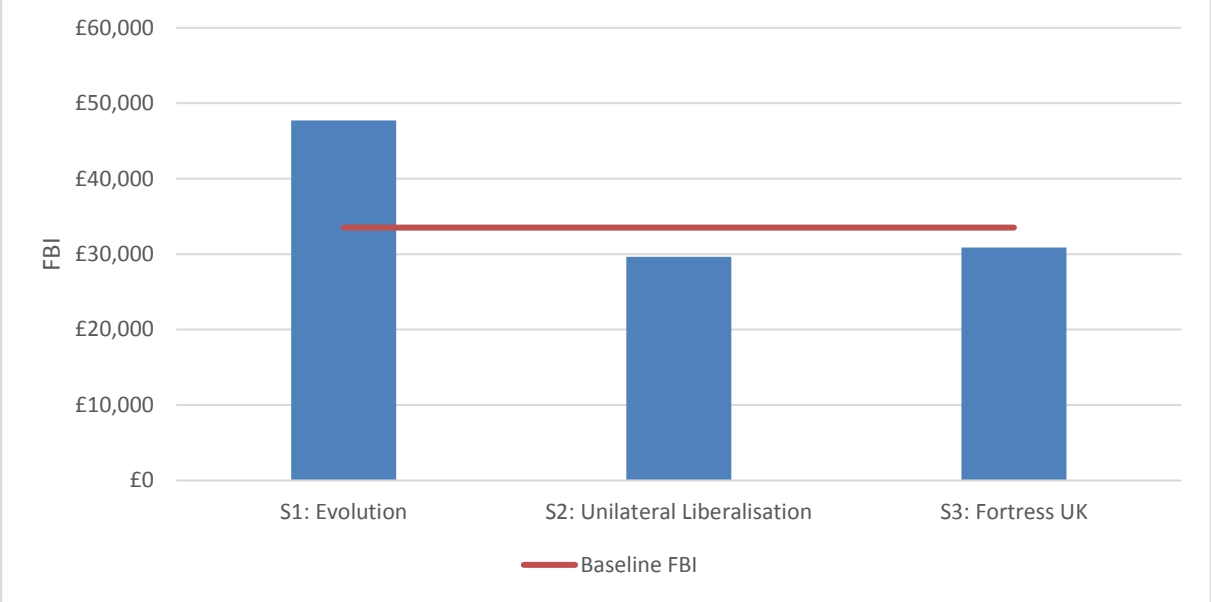



**Figure 5.12: Impact of the scenarios on FBI: Horticulture**

Figure 5.13 shows the components of FBI under the three scenarios and the baseline. The first point to note is that public support under Pillar I and Pillar II does not form an important component of total output in the horticulture sector; the key drivers of FBI are labour costs and the value of production output.

Under ***Scenario 1: Evolution***, the higher cost of imports arising from increased trade friction allow domestic prices to rise. Price rises are also a feature of ***Scenario 2: Unilateral Liberalisation***, again the result of trade friction adding to the cost of imports from the EU. In this case though, the increase in the cost of regular labour is substantial and this is not offset by decreases in regulatory compliance costs and FBI is lower. WTO MFN tariff protection under ***Scenario 3: Fortress UK*** results in a substantial increase in the value of production output. However, this is offset by the increase in cost of regular labour which is exacerbated by the increase in cost of casual labour. Under this scenario there is no reduction in regulatory compliance costs to mitigate these increases.

[21] Holdings on which fruit (including vineyards), hardy nursery stock, glasshouse flowers and vegetables, market garden scale vegetables, outdoor bulbs and flowers, and mushrooms account for more than two-thirds of their total Standard Output.


**Figure 5.13: Impact of the scenarios on components of FBI: Horticulture**

The impact of the scenarios by farm size and performance level is shown in Figure 5.14. FBI remains positive for all farm size groupings, except the largest farms where the greater use of hired labour results in a negative FBI under ***Scenario 2: Unilateral Liberalisation*** and a substantial negative FBI under ***Scenario 3: Fortress UK***.

In terms of performance groups, FBI is positive under the baseline and ***Scenario 1: Evolution*** for all groups, although only just for the low performers. FBI under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** is negative for the low and medium performance groups, more so in the latter category where hired labour costs are higher. FBI is positive under the baseline and all scenarios for the high performance group, although the difference between scenarios 2 and 3 and the baseline and the first scenario is exacerbated compared with the all farm group due to the importance of the cost of hired labour.

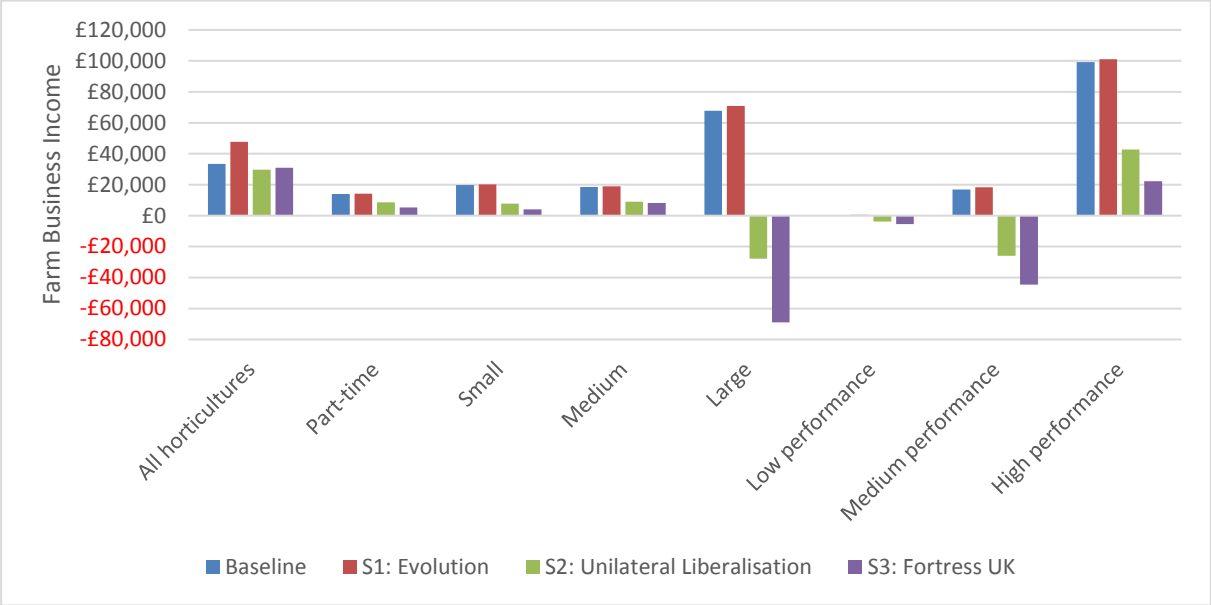



**Figure 5.14: FBI by farm size and performance level: Horticulture**

### 5.4.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. Pillar II support is not an important contributor to total output for horticultural farms; neither is the impact of varying the reduction in regulatory cost savings.

Varying the price of outdoor flowers, bulbs and nursery stock (which account for a quarter of total production output) by ±10 percentage points[22] would lead to a ±16% change in FBI under ***Scenario 1: Evolution***, a ±26% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±24% change in FBI under ***Scenario 3: Fortress UK***.

While the percentage change in FBI resulting from increases/decreases in the cost of hired labour are relatively modest (a change of ±10 percentage points in labour cost would result in a ±21% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±32% change in FBI under ***Scenario 3: Fortress UK***), in absolute terms these changes are quite large.

### 5.4.3. Subsequent adjustments

#### 5.4.3.1. Scenario 1: Evolution

The relative lack of CAP support for the horticultural sector in the past has resulted in a generally agile and nimble industry which has risen to the challenge of the way modern markets operate in the UK. The number of UK growers has consistently fallen, the supply chain has become very streamlined and the sector has been exposed to imports from the rest of the EU and other parts of the world such as

[22] This equates to price changes of -5.00% to 15.00% under ***Scenario 1: Evolution***, -2.00% to 18.00% under ***Scenario 2: Unilateral Liberalisation*** and 6.96% to 26.96% under ***Scenario 3: Fortress UK***.

Africa, Latin America and parts of Asia. As this scenario represents the nearest to "business as usual", it is difficult to see too much of this changing fundamentally.

Under this scenario, domestic prices will rise and UK producers can be expected to increase production in response. The UK market is dominated in most cases by sales to the leading supermarkets and, while all growers are able to do well, it will be those who are already in groups/organisations closely linked to these supply chains that will be in the best position to prosper, rather than new entrants.

As with several other farm sectors being assessed in this study, it will the larger units and the high performers who fare best of all. Being a low performer will inevitably bring difficulties in the mid to long-term. Part-time farms should be able to survive under this scenario (because of their other income sources), but the move towards bigger and more consolidated units of production is more likely to be the way forward. Farm numbers are likely to consolidate further. Even with some increase in prices, part-time and smaller farms will probably be best suited to supplying niche markets such as box schemes, farmers markets, farm-gate sales, etc. As such, there will be a further polarisation of the producer base between small/part-time farms and the larger, more commercially driven units who are focused in most cases on supplying a relatively small number of key supermarket customers (maybe only two or three at most). Production can be expected to continue to be concentrated in the existing strongholds of UK horticulture such as Kent, Lincolnshire and Worcestershire, etc.

UK supermarkets are keen to promote the "Britishness" of the produce they sell and will continue to provide this support to UK growers. Growers will still need to adhere to well established production and accreditation standards with schemes such as the Red Tractor setting the minimum levels required. Many supermarkets will impose additional requirements on their suppliers to do with input usage, other sustainability linked criteria, and wider issues related to corporate social responsibility, etc. A rise in the level of domestic prices does not mean that growers should neglect to control costs or fail to engage in benchmarking schemes, and they will need to carry on investing in new varieties, some of which might be grown only for specific customers. Investment in logistics, cool stores, packing facilities, etc. will also be an ongoing requirement.

Labour is a critical issue for the horticultural sector and will continue to be an area of key focus even under this scenario where no additional restrictions are placed on the availability of migrant labour. Most UK units, especially larger ones, are very dependent on the use of migrant labour from the rest of the EU for picking and packing operations. The larger the unit of production, the more acute the issue becomes. Automation of production might be part of the answer here, but it is expensive for growers to invest in, and this might act as a constraint.

A number of the leading produce groups have already invested in growing and packing facilities in other parts of Southern Europe, North Africa, and in some cases, further afield. If, as expected, the cost of imports rises under this scenario, the role of these off-shore locations might be less important in the future, although major customers will still want to have an all-year-round supply of produce. The trend

to increased integration between growers/packers and distributors, the development of joint ventures and strategic alliances at all stages of the supply chain will continue.

Overall, ***Scenario 1: Evolution*** would appear to be a positive outcome for the horticultural sector.

#### 5.4.3.2. Scenario 2: Unilateral Liberalisation

Under this scenario, while domestic prices are expected to increase as the result of trade friction costs, the cost and availability of labour for horticultural production units become a major issue. Here the impact comes from restrictions on migrants that form part of the regular labour force (casual labour is unaffected, unlike the third scenario below).

The choice for horticultural growers will be either to find access to indigenous UK labour (this seems unlikely) or look to invest in automation. If neither of these solutions can be found, UK horticultural production might be forced to look at overseas locations to produce the crops they require. This would have knock on impacts on the rest of the supply chain such as input suppliers, packing, transport and storage operations and in some cases, would detract from the "Britishness" of production and procurement that retail customers and consumers want/desire.

For some of the growing organisations who have developed joint ventures/their own growing operations outside of the UK, the solution would be to increase production abroad, especially for commodity varieties, and concentrate UK-based production on more niche and higher value varieties on scaled-back growing operations. Having access to both UK and international sources will provide the all-year-round supply that supermarket customers will demand and give a higher degree of flexibility to the overall operation.

Supermarkets in the UK are unlikely to lower technical and commercial demands made on growers in areas such as traceability and sustainability and being able to supply on an all-year-round basis at competitive prices. In effect, the big growing organisations will probably have to get bigger in order to make the future investments required; growers will need to (if they have not already) align themselves to those packers/distributors who have access to the key routes to market.

Many of the other features of the first scenario and the things that growers and their supply chain partners need to do in the future also apply here, but more urgently. Growers will still need to control costs, engage in benchmarking schemes and will need to carry on investing in new varieties, some of which might be grown only for specific customers. Investment in logistics, cool stores, packing facilities, etc. will also be an ongoing requirement. However, being a large-scale grower might not be the full answer under this scenario; being a high performer (in the sense of achieving a high ratio between output values and input costs) will be the key.

Overall, ***Scenario 2: Unilateral Liberalisation*** is likely to present a number of major challenges to the horticultural sector, the most important of which will be finding a solution to the issue of labour availability and cost.

#### 5.4.3.3. Scenario 3: Fortress UK

Under this scenario, the elimination of Pillar I payments and their only partial replacement by an expanded Pillar II (to 25% of the former total) is much less of an issue for horticulture than for some other sectors. Though market prices are expected to increase substantially (as the result of tariffs on imports), labour availability and cost is the key issue for the horticulture sector under this Scenario, where restrictions on migrant labour also applies to casual labour.

To deal with the labour issue growers will have to do one of three things. First, attract more indigenous labour to the farm, although on past evidence this looks extremely unlikely to happen. An alternative would be to look at how picking and packing functions might be more automated and so reduce the dependence on labour. The costs of doing this will be difficult to bear for smaller and low performing units and there would be gravitation towards bigger, higher performing and more consolidated units of production with higher levels of automation. A third possibility is the relocation of production to countries in which suitable labour is more available. The fallout from the UK horticultural sector for those that are not able to find a solution to the issue of labour cost and availability could be severe, though some small scale and part-time farms will be able to survive mainly due to the fact that their labour requirements are much less of an issue. The worst affected enterprises will likely be among the medium to large units of production and they might be the first to exit if solutions to the labour issue cannot be found.

Regulatory costs and the technical and commercial demands associated with meeting specific requirements of leading supermarket customers will not go away. They will still want to stock UK produce, but will be normally unwilling or reluctant to pass on the additional costs of production to their consumers. Growers and the supply chains they operate within will need to consider additional ways of increasing efficiency and reducing costs as much as possible. Besides looking at labour related issues, areas of such as reducing produce wastage at all stages of the supply chain, improved crop production planning, better and more efficient use of inputs, making better use of climate related data, etc. in order to produce a more streamlined supply chain will all be important.

Many of the leading growers and produce companies are already investing in these sorts of techniques, but they will become the norm for what can be seen as the best in class. The UK horticultural sector will need to have more of these sorts of business in the future, not fewer.

Production in the UK will tend to be concentrated on higher value crops that might be more able to withstand the relatively high labour costs, etc., and less so on low value, undifferentiated commodity products.

Overall, ***Scenario 3: Fortress UK*** is likely to be challenging for the horticulture sector, especially for low and medium performers. Labour is the key issue to contend with and effective solutions for this will need to be found. Being a large-scale growing operation will not be enough, being best in class and a high performer will be the key, regardless of operational scale. This might provide opportunities at

a certain level for smaller and even some part-time farms, but the real challenge will be how the larger-scale, more commercial units solve the issues related to labour. Automation of picking and packing operations is clearly one way forward, but there will need to be a wider supply chain view of the future taken. Just solving the labour issue on its own might not be enough.

## 5.5. Less Favoured Area sheep and beef

### 5.5.1. Initial impact

The baseline FBI for LFA sheep and beef farms[23] is £16,166 (Figure 5.15). FBI is virtually unchanged under ***Scenario 1: Evolution***, but FBI falls by half under ***Scenario 2: Unilateral Liberalisation***. Under ***Scenario 3: Fortress UK***, FBI becomes negative (-£1,409).

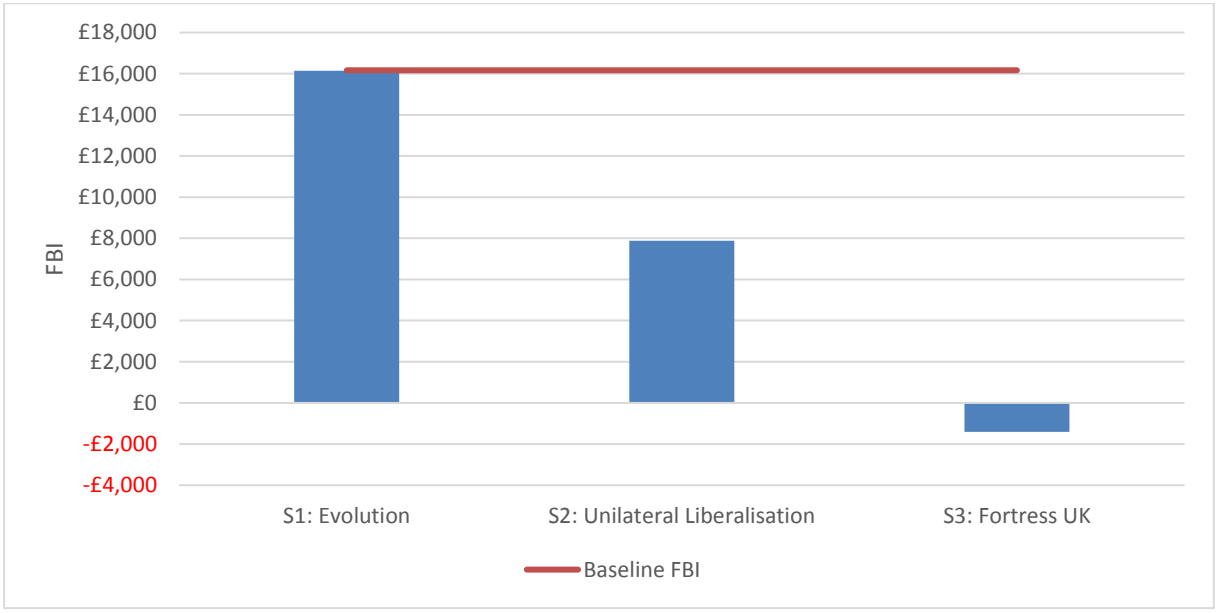



**Figure 5.15: Impact of the scenarios on FBI: LFA sheep and beef**

Figure 5.16 shows the changes in the composition of FBI under each scenario. Under ***Scenario 1: Evolution***, the virtually unchanged FBI masks an increase in production output from beef, offset by a decrease in output from sheep (not detailed in the Figure).

Under ***Scenario 2: Unilateral Liberalisation***, the loss of Pillar I payments is almost entirely offset by increases in Pillar II support (although costs associated with Pillar II increase proportionally); the lower FBI results from decreases in production output driven by substantially lower sheep prices and fractionally lower beef prices. Reductions in variable costs resulting mainly from savings in the cost of complying with regulations are balanced by increases in regular labour costs.

FBI becomes negative under ***Scenario 3: Fortress UK***, as Pillar II payments do not compensate for the loss of Pillar I support and there is no benefit from reductions in the cost of complying with regulations as there is under the second scenario. Production output is marginally lower than under the baseline as a large reduction in output from sheep is offset by large increases in beef enterprise output; although sheep output falls further under scenario 3 than it does under scenario 2, the increase in beef enterprise

[23] Holdings on which cattle, sheep and other grazing livestock account for more than two-thirds of their total Standard Output (SO) except holdings classified as dairy. A holding is classified as a Less Favoured Area (LFA) holding if 50% or more of its total area is in the LFA.

output is the main reason why total production output increases in the third scenario in comparison to the second scenario.

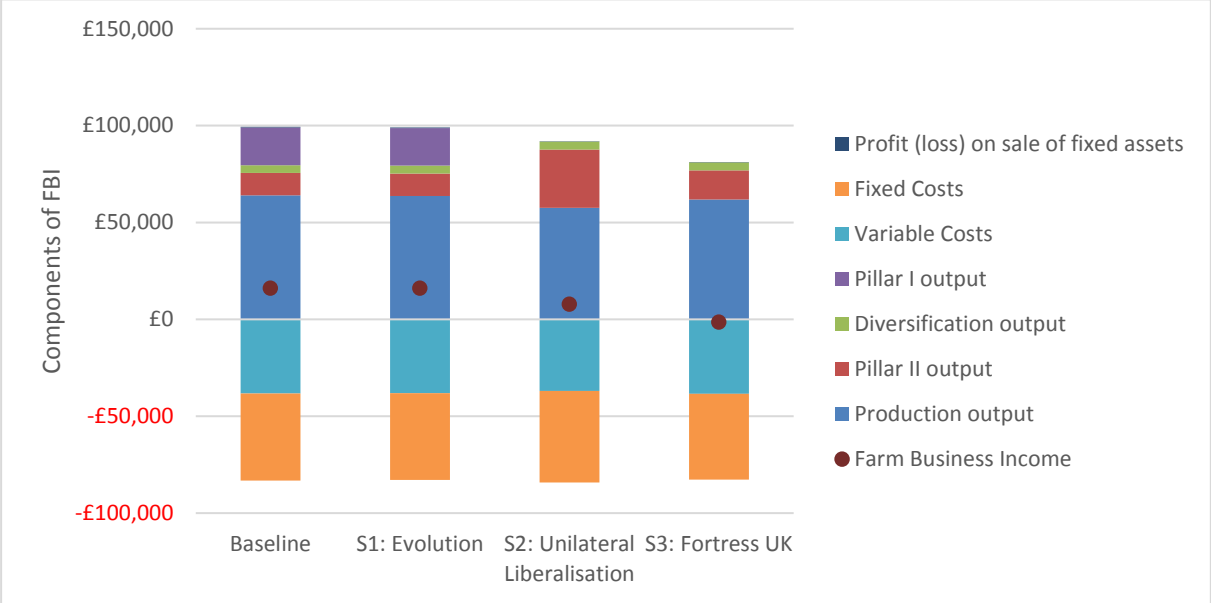



**Figure 5.16: Impact of the scenarios on components of FBI: LFA sheep and beef**

The impact on FBI of the scenarios by farm size and performance level is shown in Figure 5.17. FBI under ***Scenario 3: Fortress UK***, is slightly negative for the part-time and medium groupings, but is more so in the other groups. The difference between ***Scenario 1: Evolution*** and ***Scenario 2: Unilateral Liberalisation*** is most pronounced in the large size group, and reflects the greater proportion of their revenue coming from the market compared to that from Pillar II payments.

FBI is negative for the low performance group under the baseline and each scenario, but for the high performance group is positive for the baseline and under all scenarios. FBI under ***Scenario 1: Evolution*** and ***Scenario 2: Unilateral Liberalisation*** is similar for the high performance group where output from Pillar II payments is relatively high (this is a key difference between the high performance group and the large farm group). The medium performance group retains positive FBI under the first two scenarios, but FBI becomes negative under ***Scenario 3: Fortress UK***.

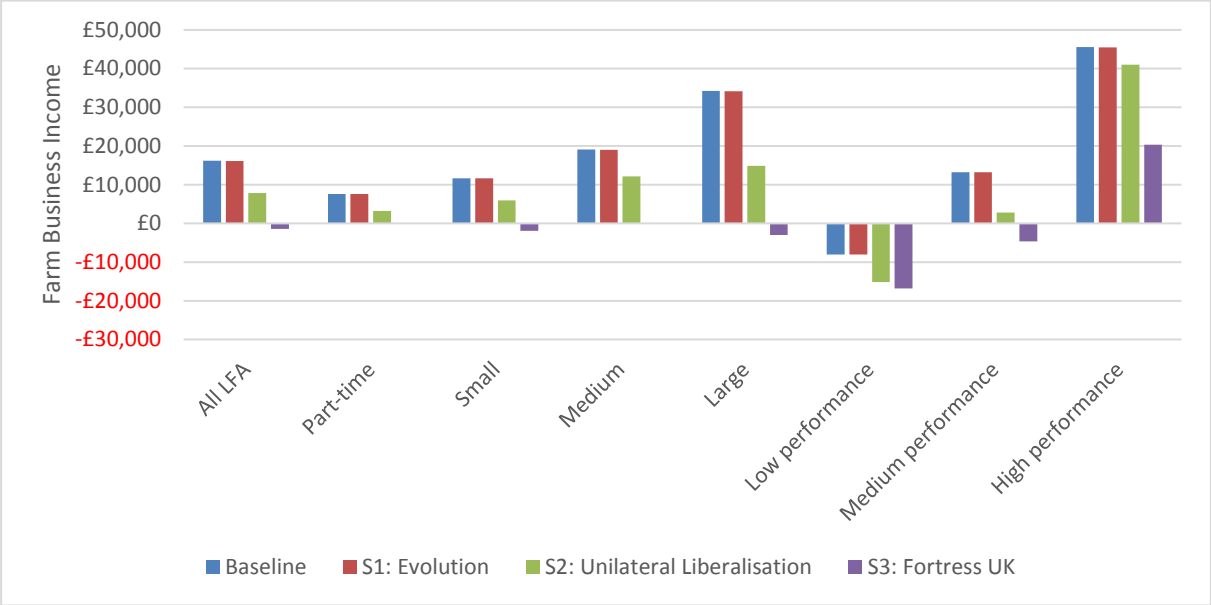



**Figure 5.17: FBI by farm size and performance level: LFA beef and sheep**

### 5.5.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. If none of the Pillar II payments were genuinely additional, FBI would become negative under ***Scenario 2: Unilateral Liberalisation***, and would become increasingly negative under ***Scenario 3: Fortress UK***. To retain a positive FBI, between 50% and 75% of Pillar II payments need to be genuinely additional revenue under the second scenario.

The greater contribution of the sheep enterprise to the total value of production relative to the contribution from the beef enterprise means that FBI is more sensitive to variations in the sheep price. Varying the price of sheep by ±10 percentage points[24] would result in a ±19% change in FBI under ***Scenario 1: Evolution***, a ±39% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±218% change in FBI under ***Scenario 3: Fortress UK*** (the high percentage change is due to the low FBI under this scenario).

Varying the price of beef by ±10 percentage points[25] would result in slightly lower percentage changes in FBI. Under ***Scenario 1: Evolution***, FBI would change by ±16%. The equivalent changes for ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** would be ±34% and ±188% respectively.

The impact of higher additional labour costs is not so important for LFA sheep and beef farms; neither is the impact of varying the reduction in regulatory cost savings.

[24] This equates to price changes of -15.00% to 5.00% under ***Scenario 1: Evolution***, -30.04% to -10.04% under ***Scenario 2: Unilateral Liberalisation*** and -35.42% to -15.42% under ***Scenario 3: Fortress UK***.

[25] This equates to price changes of -5.45% to 14.55% under ***Scenario 1: Evolution***, -10.45% to 9.55% under ***Scenario 2: Unilateral Liberalisation*** and 11.45% to 31.45% under ***Scenario 3: Fortress UK***.

### 5.5.3. Subsequent adjustments

#### 5.5.3.1. Scenario 1: Evolution

The very small impact of ***Scenario 1: Evolution*** on farm incomes compared with the baseline means that many of the existing key trends in the beef and sheep sectors will in effect, continue. Whilst UK retailers do have an interest in stocking UK products, upland lamb is more usually exported and it is unlikely that domestic demand for this type of lamb will alter.

There will still be a wide variation in the range of performance, profitability and scale of activity, and this will remain a highly fragmented sector. There will still be lots of part-time farmers. This is driven largely by topography and the lack of opportunities for introducing mechanisation to the farms, and reflects the use of family and/or seasonal labour. In the beef sector, farms with suckler herds are more reliant on subsidy than those in the dairy beef sector; they are also often more resilient to price shocks and this will continue to be the case.

Though the results indicate an expected change in the balance of output towards beef and away from sheep, it must be noted that land farmed in the LFA for sheep is often not suitable for beef farming and this acts as a constraint on any major switch of farm activity. This is exacerbated by the different types of labour required to manage and operate these farms. Low performers are already making losses in this sector and to move forwards under this scenario from farming alone, it will be necessary to be in the high performing category of farms. That said, income from off-farm sources will continue to play an important role in maintaining farms as sustainable units.

Overall, ***Scenario 1: Evolution*** will result in little change to LFA sheep and beef farms, although some rebalancing away from sheep and towards beef is likely where this is possible.

#### 5.5.3.2. Scenario 2: Unilateral Liberalisation

Under this scenario, there is a large drop in farm income. Unless the farm household has substantial income from other sources, only the very best farmers will be able to stay in business; others will eventually be forced to exit the sector. The most indebted farmers will at most risk. These changes will force a restructuring of the sector, with associated falls in land prices. Farmers can be expected to exit from marginal land first, although this may involve renting out the land or share farming rather than land sales. Unless land is absorbed by others in the process of restructuring, this will ultimately return to bracken and heather.

The loss of EU export markets, which is likely under this scenario, will make this a particularly difficult sector to be involved in. Under this scenario, the overall sector will shrink, aggravated by the continuing decline in domestic demand for upland sheep, despite retailer interest in promoting British lamb. Those farmers more reliant on the lamb export trade will be more at risk than those serving UK markets.

UK retailers tend not buy sheep from the LFA regions (i.e. hill/light lambs, etc.); the product has traditionally been exported and not sold in the domestic market to any great extent. Overall, the market for sheep from LFA regions will remain depressed.

All in all, it can be expected that there will be greater interest in Pillar II-type support, especially in Severely Disadvantaged Areas, more farm diversification activity (that is, non-agricultural activities on farms) and a need to generate more off-farm income, with the consequence of more part-time farmers. An accelerated polarisation of farm sizes is likely. A switch from sheep to beef is not always possible from a technical point of view. Although more likely to be technically possible, the huge pressure seen in the sheep sector means that farmers switching from beef to sheep is unlikely.

Overall, ***Scenario 2: Unilateral Liberalisation*** will result in marginal producers leaving the sector or relying on off-farm income and Pillar II-type support. Sheep enterprises will be under the greatest pressure.

#### 5.5.3.3. Scenario 3: Fortress UK

Under ***Scenario 3: Fortress UK***, only the high performance group can expect positive FBI. The expected loss of some farmers from the hills under the second scenario is even more likely under this scenario (land may be rented or share farmed rather than sold); again, those serving lamb exports markets will be hardest hit with no increase in domestic demand for upland lamb expected, despite retailer interest in stocking British produce. The best managers will try something different – this might be the better use of genetics, the use of online selling, or the development of diversified activities and/or off-farm jobs – but many others will be unwilling or unable to do this and simply will not be able to survive financially with their traditional way of farming. This could have serious consequences for the farming environment and social infrastructure of the LFA regions.

Sheep farmers are more likely to exit from the sector than beef producers, not least due to the loss of export markets and relative lack of domestic demand for upland sheepmeat. Beef producers will benefit from a stronger domestic market and lower reliance on exports markets. The apparent unwillingness of UK retailers to stock upland-sourced beef and sheep means that there is no drive to develop integrated supply chains and afford LFA farmers some of the protection that these can offer. Some switching of farm activity might be seen, but this still remains difficult, due to the type of land found and the culture of farming in the LFA regions.

There is likely to be increased interest in Pillar II-type support, especially in Severely Disadvantaged Areas and from smaller-scale and/or less efficient producers; the most efficient producers may be more inclined to increase production seeking higher returns from the market and increasing the efficiency of their labour use.

Overall, ***Scenario 3: Fortress UK*** will make the future prospects for the sheep and beef LFA producers look especially challenging; only the most efficient producers will be economically viable without off-farm income.

## 5.6. Lowland sheep and beef

### 5.6.1. Initial impact

Figure 5.18 shows that the baseline FBI for lowland beef and sheep farms[26] is £15,188. Under ***Scenario 1: Evolution***, this increases slightly to just over £16,000. FBI under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** would fall considerably to £2,849 and £3,461 respectively.

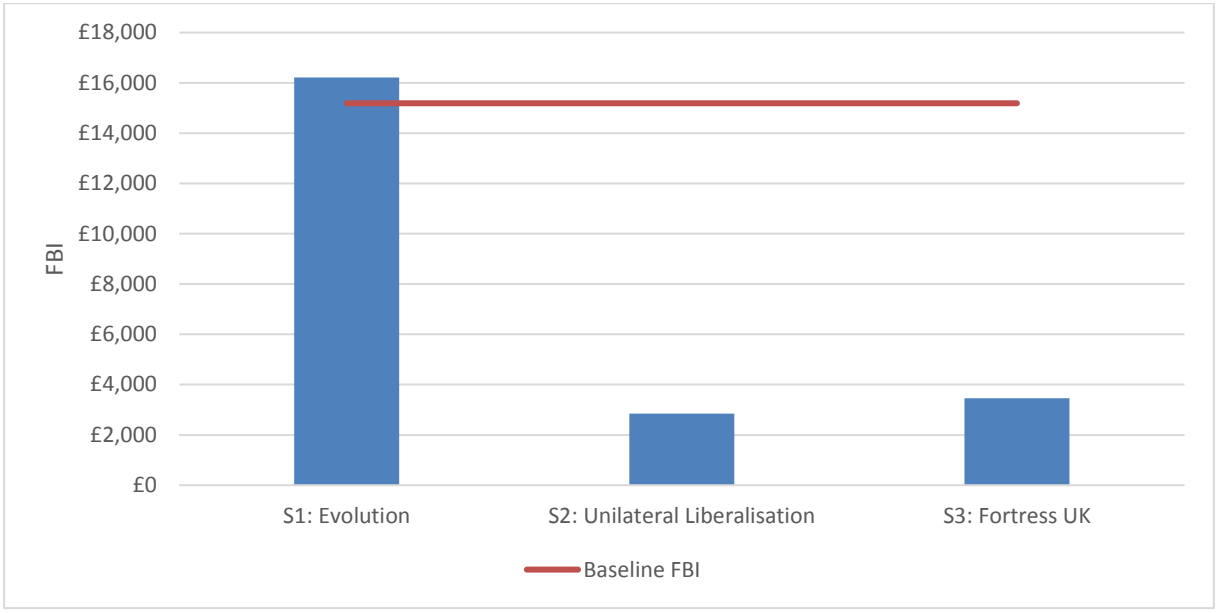



**Figure 5.18: Impact of the scenarios on FBI: Lowland sheep and beef**

Figure 5.19 presents the change in the components of FBI by scenario. The data behind the Figure show that there is a very marginal increase in production output under ***Scenario 1: Evolution***, the result of decreases in output from sheep being countered by a slightly larger increase in output from beef.

Comparison between the columns (and the underlying data) establishes that the loss of Pillar I payments (£15,963) is partially offset by increases in Pillar II payments under ***Scenario 2: Unilateral Liberalisation***, but production output decreases as output from the sheep enterprise falls considerably; under this scenario output from the beef enterprise also falls, but only marginally. Variable costs decrease slightly due to the reduction in the cost of complying with regulations while fixed costs increase slightly as labour costs go up.

There is only a marginal increase in Pillar II payments under ***Scenario 3: Fortress UK***, but the loss of Pillar I payments is made up by increases in the value of production output relative to the second scenario. Further examination shows that this increase is driven by higher beef output which

[26] Holdings on which cattle, sheep and other grazing livestock account for more than two-thirds of their total Standard Output (SO) except holdings classified as dairy. A holding is classified as lowland if less than 50% of its total area is in the Less Favoured Area (LFA).

compensates for lower sheep output, though the value of combined production output is only slightly higher than under the baseline. Variable costs are slightly lower than baseline due to lower livestock feed costs and despite higher casual labour costs, while fixed costs are slightly higher due to increases in the cost of regular labour.

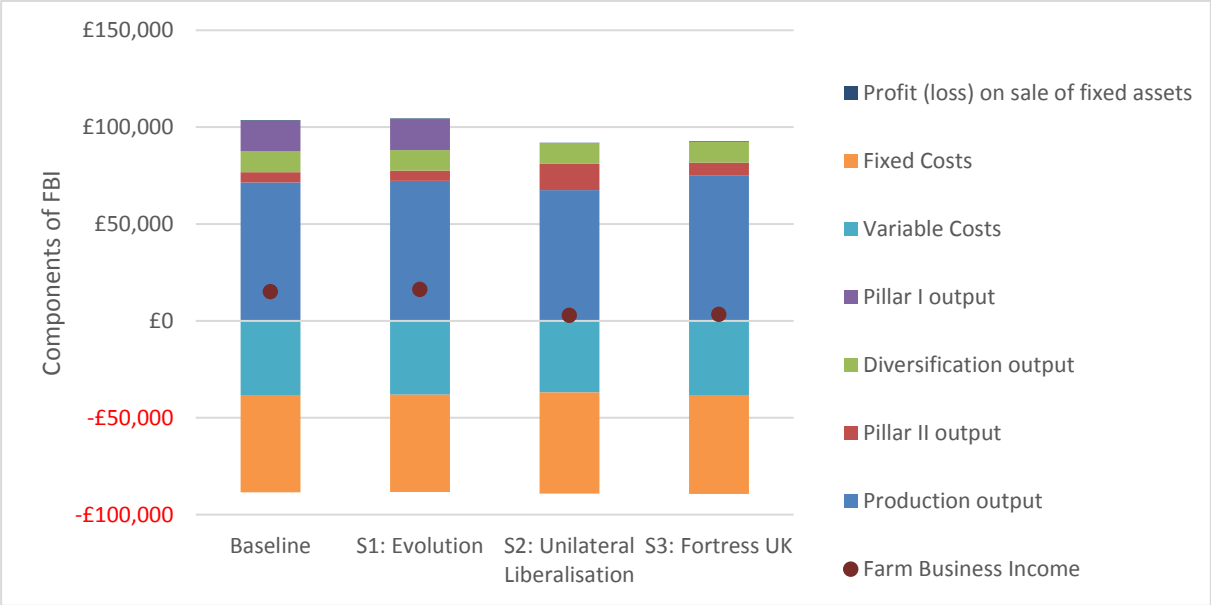



**Figure 5.19: Impact of the scenarios on components of FBI: Lowland sheep and beef**

Figure 5.20 shows the impact of the scenarios by farm size and performance level. Generally, FBI increases with scale under each scenario. However, ***Scenario 2: Unilateral Liberalisation***, is an exception where FBI is lower for large farms than it is for medium sized farms, reflecting a greater share of output from Pillar II support and diversification; large farms derive proportionally more of their output from the market and are thus more exposed to price movements.

As is often the case, FBI is negative under the baseline and all scenarios for the low performance group. FBI is also negative under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** for the medium performance group. FBI remains positive under all scenarios for the high performance group.

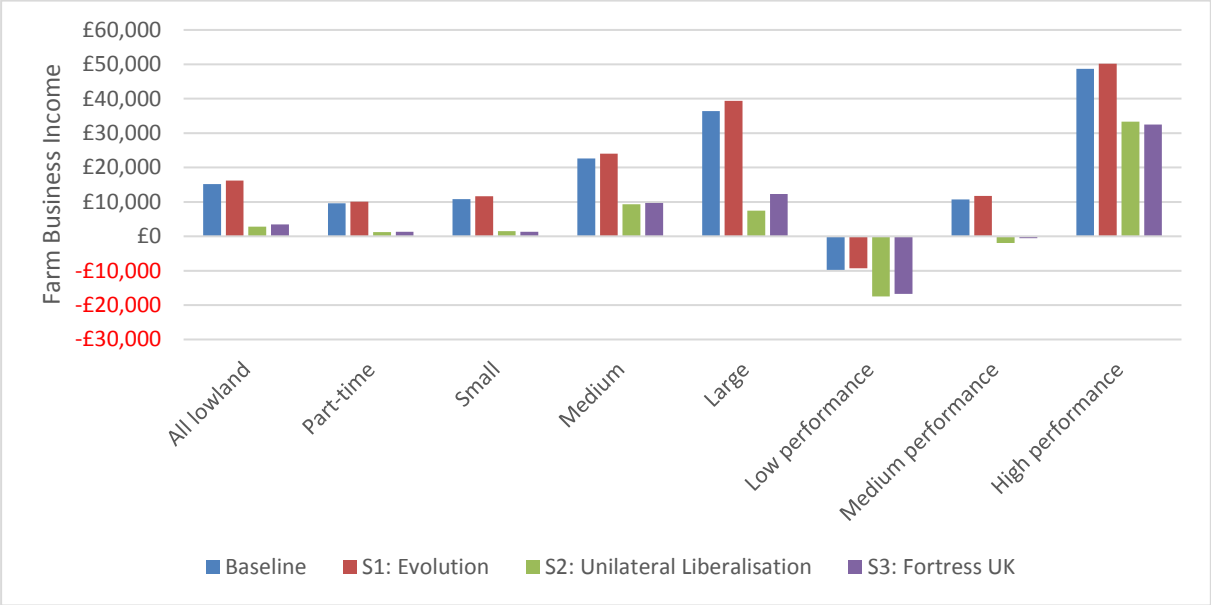



**Figure 5.20: FBI by farm size and performance level: Lowland sheep and beef**

### 5.6.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. If between 25% and 50% of additional Pillar II payments were to compensate for income foregone by following prescribed actions, FBI would become negative under ***Scenario 2: Unilateral Liberalisation***. In contrast, even if none of the additional Pillar II payments were genuinely additional revenue under ***Scenario 3: Fortress UK***, FBI would still be positive.

The beef enterprise contributes just over half of the total value of production output and as such is key to FBI; the sheep enterprise accounts for around a quarter of the total value of production and is therefore less important as a driver of FBI. Varying the price of beef by ±10 percentage points[27] would result in a ±23% change in FBI under ***Scenario 1: Evolution***, a ±132% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±109% change in FBI under ***Scenario 3: Fortress UK***.

Varying the price of sheep by ±10 percentage points[28] would result in lower percentage changes in FBI. Under ***Scenario 1: Evolution***, FBI would change by ±11%. The equivalent changes for ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** would be ±60% and ±49% respectively.

The impact of higher additional labour costs is not so important for LFA sheep and beef farms; neither is the impact of varying the reduction in regulatory cost savings.

[27] This equates to price changes of -5.45% to 14.55% under ***Scenario 1: Evolution***, -10.45% to 9.55% under ***Scenario 2: Unilateral Liberalisation*** and 11.45% to 31.45% under ***Scenario 3: Fortress UK***.

[28] This equates to price changes of -15.00% to 5.00% under ***Scenario 1: Evolution***, -30.04% to -10.04% under ***Scenario 2: Unilateral Liberalisation*** and -35.42% to -15.42% under ***Scenario 3: Fortress UK***.

### 5.6.3. Subsequent adjustments

#### 5.6.3.1. Scenario 1: Evolution

Under this scenario, we would expect to see a slight increase in beef farming in the lowland regions and a decline in sheep farming. Given that the results shown above suggest only a small increase in average FBI, many of the factors that are driving the sector at the moment will still be in play, though with a slightly reduced sense of urgency.

Nevertheless, farms can be expected to increase in size over time and there will still be a need to be amongst the best performers. Farms that are less efficient, more burdened with debt and with the least competent management will remain vulnerable. There will be a continuing necessity for all farms to understand the nature of, and then control, costs of production better than has been the case in the past.

UK retailers will remain keen to source UK beef and sheep products from lowland areas and this remains a key area of opportunity for UK farmers and affords some protection in the market, though retailers still have some concerns over the continuity of supply for these products.

Overall, ***Scenario 1: Evolution*** will mean little change for lowland sheep and beef farmers, although there may be an increase in beef production as sheep production declines.

#### 5.6.3.2. Scenario 2: Unilateral Liberalisation

Due to the reduced level of incomes following the change to support payments under ***Scenario 2: Unilateral Liberalisation***, there is likely to be a significant fallout from lowland farm numbers, especially from the sheep sector. There are grounds for thinking that responses to changed conditions will need to be quicker than in the past. Farmers unwilling or unable to adapt are likely to eventually be forced to stop farming. The sheep sector is more vulnerable than the beef sector, but there may generally be a move away from livestock to arable production where this is possible.

Farmers will be under pressure to consider a range of measures to improve the overall management of their herds/flocks, including paying more attention to areas such as feed conversion ratios, calving/lambing rates, fertility and mortality, etc. as well as better use of forage and other inputs. Being a low performer in this scenario puts the farm business at particular risk.

Farmers will need to look to reduce debt levels as quickly as possible. Banks are unlikely to be willing to lend to farms that are seen as mid or low industry performers and /or have no succession plan in place. Tenant farms might be seen as particularly at risk. Some farms might switch from beef and sheep farming to dairy production as this is perceived as being more profitable in the future, and there will be some switching from sheep to beef where this is possible.

There will be a drive towards more specialisation of production, as well as more farm diversification and the generation of off-farm income; there is also likely to be greater interest in Pillar II-type support. While these are often family run farms and there is less dependence on the use of paid labour, a move towards larger farms will see the increased use of machinery and mechanisation.

Overall, ***Scenario 2: Unilateral Liberalisation*** will see an acceleration of restructuring with the least efficient farms coming under increasing economic pressure. There is likely to be a switch away from sheep and beef towards other sectors, especially dairy, where this is possible.

#### 5.6.3.3. Scenario 3: Fortress UK

Under ***Scenario 3: Fortress UK***, average farm business income for this sector is again severely reduced, though slightly less so than under the previous scenario. Again, there will be implications for the size and structure of the sector, with many of the factors that come in to play in the second scenario also found here.

As in the second scenario, low and mid performance farms will be the most vulnerable to the changes under this scenario. Only those in the highest performance group will be capable of generating a positive FBI. There are grounds for thinking that surviving farmers will be required to adapt to changing market conditions more quickly than in the past. Rents for beef and sheep farms are likely to go down, especially for under achieving farms.

Beef and sheep production will remain concentrated in the traditional areas of activity. There might be some switching of production to the dairy sector and beef production might be increased at the expense of sheep where this is technically possible. Farmers will be forced to improve productivity overall and farm size is likely to increase.

Some UK retailers and foodservice players will still want to secure locally-based UK supply and will develop more dedicated supply chains to secure this. As a result, there will be more integrated supply chains and processors may need to provide some form of incentive to secure raw material supplies.

Overall, ***Scenario 3: Fortress UK*** will see similar, although less extreme, adjustments as likely under the second scenario.

## 5.7. Dairy

### 5.7.1. Initial impact

The baseline FBI for dairy farms[29] is £72,482 (Figure 5.21). This increases to £93,853 under ***Scenario 1: Evolution*** and to £96,629 under ***Scenario 3: Fortress UK***. However, FBI falls to £47,116 under ***Scenario 2: Unilateral Liberalisation***.

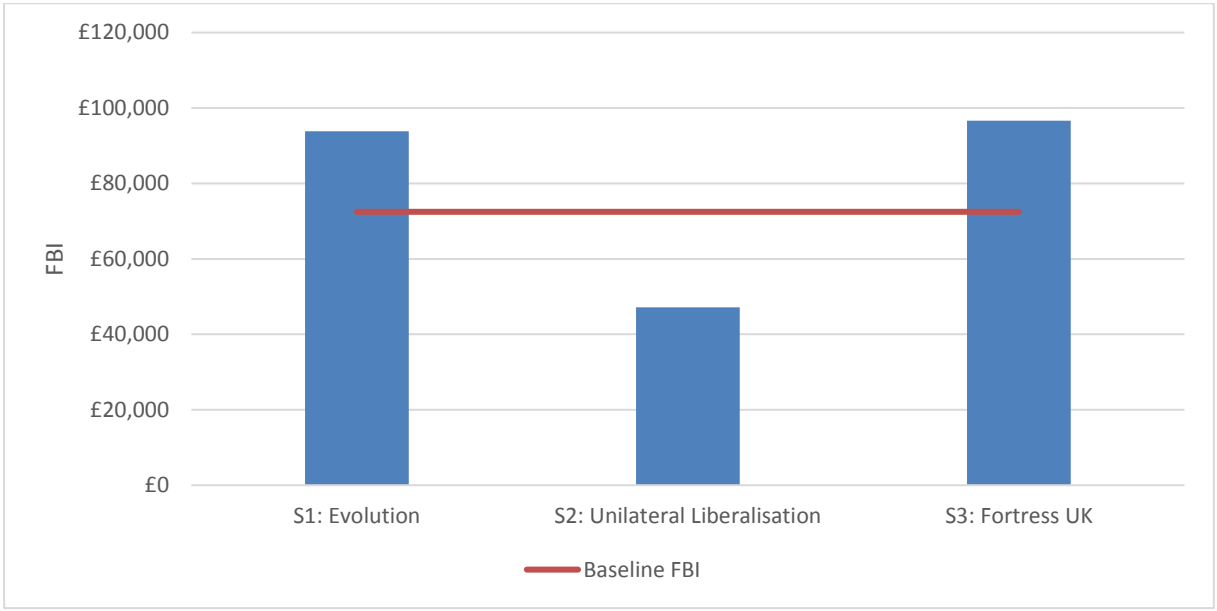



**Figure 5.21: Impact of the scenarios on FBI: Dairy**

The rise in FBI under ***Scenario 1: Evolution*** is driven by an increase in the value of production output as imports of dairy products become more expensive outside the single market allowing the domestic milk price to drift up (Figure 5.22). Production value increases further under ***Scenario 3: Fortress UK***, as all imports are faced with WTO MFN tariffs providing further protection for UK production leading to even higher domestic prices. This increase in the value of production is sufficient to compensate for an increase in fixed costs as the cost of regular labour increases. Variable costs decrease slightly as a result of lower livestock feed prices, despite a slightly higher cost for casual labour.

The impact of ***Scenario 2: Unilateral Liberalisation***, is different. Here, there is virtually no change in domestic milk price and hence only a very marginal change in the value of production output. Pillar I and Pillar II output account for relatively small proportions of total output for dairy farms, but the removal of Pillar I support, only a third of which is replaced by increased support under Pillar II, does contribute to the reduction in FBI. Variable costs are lower under this scenario as a result of the savings in regulatory compliance costs and lower livestock feed costs, but fixed costs are higher due to the increase in the cost of regular labour.

[29] Holdings on which dairy cows account for more than two-thirds of their total Standard Output (SO).

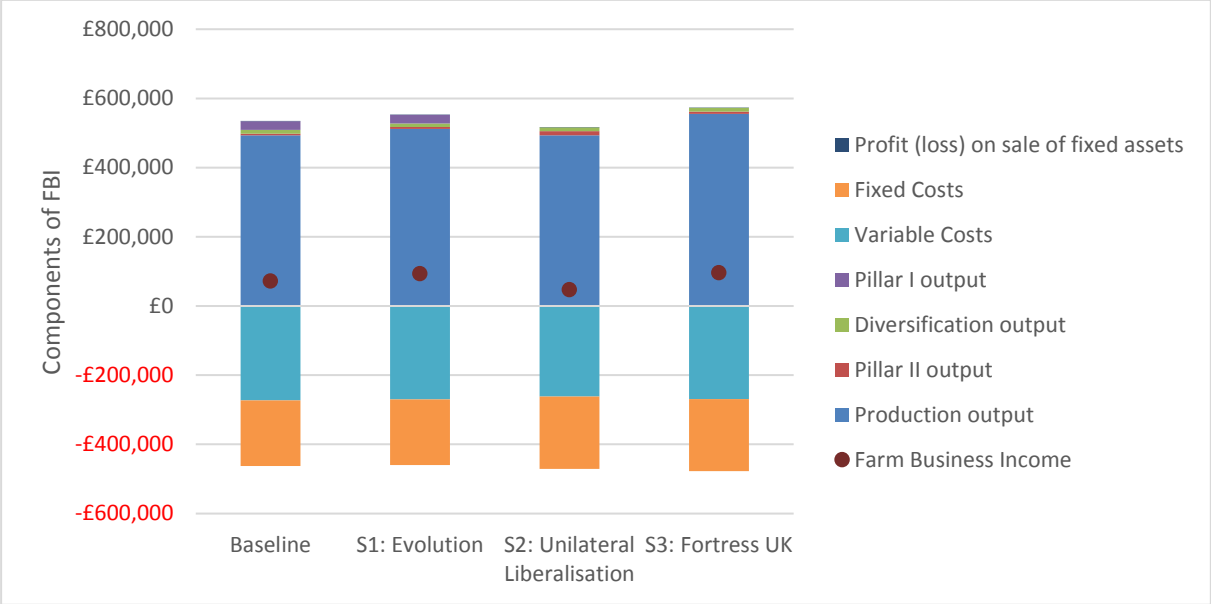



**Figure 5.22: Impact of the scenarios on components of FBI: Dairy**

The impact of the scenarios on FBI by farm size is similar (Figure 5.23). However, in terms of performance levels, FBI is negative under the baseline and ***Scenario 2: Unilateral Liberalisation***, and is only just positive under ***Scenario 1: Evolution*** and ***Scenario 3: Fortress UK*** as higher domestic milk prices are possible. FBI under the three scenarios for medium and high performance dairy farms follows the same pattern as seen for all dairy farms.

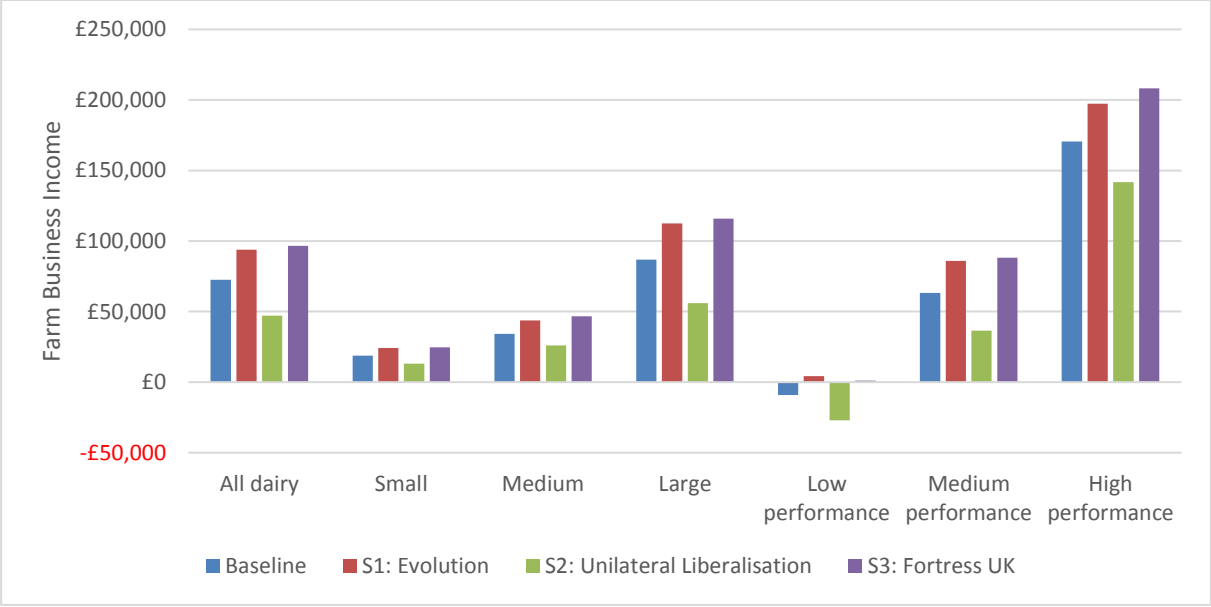



**Figure 5.23: FBI by farm size and performance level: Dairy**

### 5.7.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. Pillar II payments do not make an important contribution to the value of output on dairy farms, as a result, varying the proportion of additional payments made in the form of compensation for income foregone makes little difference to FBI under any of the scenarios.

Varying the price of milk by ±10 percentage points[30] would result in a ±43% change in FBI under ***Scenario 1: Evolution***, a ±42% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±85% change in FBI under ***Scenario 3: Fortress UK***.

The impact of higher additional labour costs is relatively unimportant in percentage terms for dairy farms given the high levels of FBI; the same is true of varying the reduction in regulatory cost savings.

### 5.7.3. Subsequent adjustments

#### 5.7.3.1. Scenario 1: Evolution

Under this scenario, those farmers who are on the so-called aligned contracts with major retailers will be best positioned to continue to invest in their farming operations, while those who are not will remain more vulnerable to volatility in overall market conditions. The key task for dairy farmers will still be to have a greater understanding of the true costs of production (the main driver of the business) and then have the ability to control these.

The multitude of farming system found in the UK dairy sector will largely remain, although there might be a further move towards more specialisation with the increased use of spring calving and use of robotics, etc.; this is already happening. High end retailers will encourage farmers towards outdoor systems of production, but the majority will want farmers to control costs of production and so there will not be an automatic move to outdoor systems; indeed, there might be moves to increase indoor production and development of higher yielding herds.

It is already challenging to find good quality labour for dairy farms and this situation will not fundamentally change under this scenario. The issues surrounding the availability of labour will act as a brake on the development of so-called super units. There will be no major change in the key geographic areas of dairy production in the UK.

Nothing will change in the dairy sector too quickly and any potential expansion in the sector to potentially replace UK imports of dairy products will be driven by the demands made by retailers and the ability of processors to expand capacity, and invest in this, as might be required.

[30] This equates to price changes of -6.03% to 13.97% under ***Scenario 1: Evolution***, -9.60% to 10.40% under ***Scenario 2: Unilateral Liberalisation*** and -2.09% to 22.09% under ***Scenario 3: Fortress UK***.

It is unlikely that there will be any expansion in the demand for liquid milk which has been subject of long-term decline in the UK. Any growth in the sector will therefore be driven by increased demand for products such as cheese, butter and ingredients which would help displace some of the UK's current imports, especially from countries such as Ireland, who will see their exports to the UK become more expensive.

UK retail support for liquid milk will remain high and standard/accreditation schemes such as Red Tractor will continue to set the minimum requirement for suppliers, although supermarkets will also look to raise the standards required by looking for additional attributes in terms of animal welfare, animal health and other sustainability credentials of their farmers. Animal welfare will still be seen as a key issue for farmers to address and there will be no slackening of these. Retailers will still drive the development of these in the future.

Overall ***Scenario 1: Evolution***, with its anticipated higher incomes for dairy farmers, is likely to lead to a generally positive environment for the dairy sector in the UK. Structural changes can be expected to be cushioned compared with the baseline of the current CAP.

#### 5.7.3.2. Scenario 2: Unilateral Liberalisation

Under this scenario, with the large reduction in subsidies resulting from elimination of Pillar I only partially offset by an expansion of Pillar II type support, there could be some radical changes to dairy farming in the UK. Low performing farms especially, regardless of size, will be under pressure and could easily end up, quite quickly, with serious financial difficulties and face bankruptcy and insolvency. The pressure to exit the sector will increase on the low performing herds. Even the more able farmers might consider exiting the sector when faced with the reality of the situation. Indeed, they might be the first to exit, as some others will continue to bury their heads in the sand. Banks are unlikely to lend to dairy farmers who do not have in place well developed business and succession plans.

Processors and retailers alike will want to protect their milk pools and avoid any sense of panic. This will see them look to strengthen the integrated nature of their supply chains. There would be an increase in the use of aligned contracts, especially in the area of liquid milk. With the likelihood of increased imports, UK dairy farmers will be more exposed than ever to global milk price volatility, and when/if prices go low, the traditional response of "tightening the belt further" is unlikely to be enough on its own. Farms of between 200 and 300 cows will feel the pressure of labour issues most of all. Some will choose to go down the robotic route and more skilled labour will inevitably be required – this however is already in short supply.

Farmers will be forced to make cost cuts across the board. There will be a move towards bigger farms, with more use of larger rotary-type parlours and not just the use of robotics. Farmers will find it more difficult to obtain credit with adverse knock-on impacts on the rest of the supply chain, such as vets, feed companies and other input suppliers. Cutting costs will see more farmers move to more grazing based systems (low input, low output), subject to the availability of land, and focus on keeping farming systems as simple as possible, especially with regards to the use of labour and machinery.

There will be less money spent on tractors and machinery. There will be less of an obvious push for really high yields and the use of high cost feed ingredients. There is likely to be a move to more shared farming agreements/arrangements and collaboration between farmers on a "needs must" basis. The highest performers may though seek to increase output to take advantage of scale economies.

While the regulatory burden on farms might be reduced, it is likely that these will be superseded by the demands made by processors and retailers for high standards of animal welfare with Red Tractor and other assurance schemes setting what are in effect minimum standards rather than legislation. UK consumers will still want to see dairy products being produced to a high standard.

Overall, ***Scenario 2: Unilateral Liberalisation*** looks like a very challenging outcome for the dairy sector which could lead to a permanent adjustment in its structure.

#### 5.7.3.3. Scenario 3: Fortress UK

While UK dairy farmers will continue to exit the sector, there will be less of an exodus from farming as might be seen under the second scenario. The overall outlook is also probably more positive than under the first scenario. There is likely to be a slowdown in the overall rate of exit of dairy farmers from the industry. With more milk being produced, there is a danger that farmers do not see the need to collaborate with others in the supply chain as they might need to.

Farmers are less likely to be forced out of the sector as a result of pure financial/economic pressures. The higher milk prices seen for UK dairy farmers is of course good for them, but less good news for consumers. Leading retailers will be looking for their supply chains to become ever more efficient so they do not have to pass on costs to shoppers unless absolutely necessary.

If UK imports are to be replaced, farms will need to expand and processors will need to have the appetite/willingness and ability to invest in new processing capacity. There is still no additional demand for liquid milk and the fate of the sector will be driven by the ability to replace imports of products such as cheese, yoghurts and butter. To do this, there will need to be investment in processing capacity by the leading players, many of whom are EU based and owned.

The UK dairy sector under this scenario might well see the development of new, greenfield dairy units in non-traditional dairy (arable) farming sectors. This might happen over a three-year period. This would be driven by the availability of land, cheaper feed costs, higher output prices, but with higher labour costs too, this would see the development of more automation in terms of feeding and milking systems. The really talented dairy farmers might be involved in the multiple ownership of units on different sites and the development of Dairy Farming Companies on these new units. These will be the farmers to lead any growth in UK production.

Additional external investment is likely as dairy farming is generally seen as being a positive sector to be involved with. There might be some farmers switching from beef/sheep and arable sectors as they will be considerably less profitable than in the past.

The issue of labour in this scenario is important. Paid labour is already difficult to attract and many dairy farms are already highly reliant on EU migrant workers. There will be a move to the use of more automation, more machinery and less dependence on the use of labour as a result. Farmers will look to simplify the management of the farm with, for example, more use of block calving systems, etc.; better management and the increased use of automation will come to the fore. Farmers who have excellent all-round management skills will do best of all.

Overall, ***Scenario 3: Unilateral Liberalisation*** is generally encouraging for the UK dairy farming sector, but maybe less so for the UK consumer faced by higher prices.

## 5.8. Pigs

### 5.8.1. Initial impact

Figure 5.24 shows that the baseline FBI for pig farms[31] is £46,067. This increases under all three scenarios to £68,708 under ***Scenario 1: Evolution***, £57,418 under ***Scenario 2: Unilateral Liberalisation*** and £205,354 under ***Scenario 3: Fortress UK***.

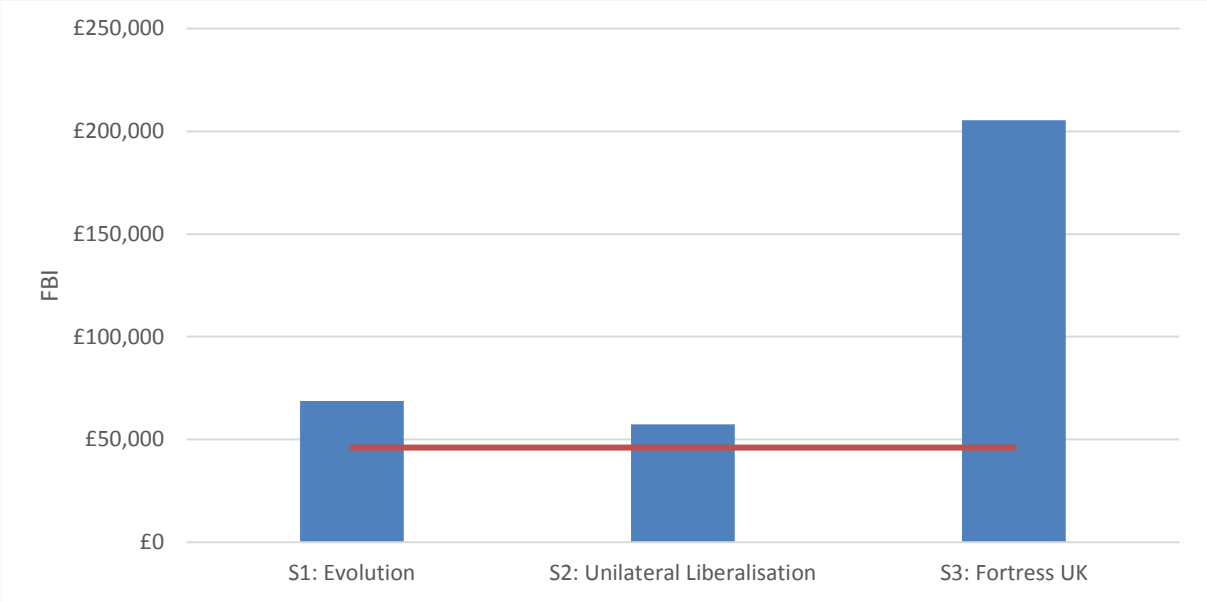



**Figure 5.24: Impact of the scenarios on FBI: Pigs**

Figure 5.25 shows that the increases in FBI are driven mainly by increases in the value of production output which results from higher UK market prices caused by the additional costs of imports. The role of public support under Pillar I and Pillar II is not an important factor in the pig sector, although of course the loss of £9,229 in Pillar I support should not be ignored. There are reductions in variable costs under ***Scenario 2: Unilateral Liberalisation*** from the lower burden of compliance with regulation and from smaller costs of livestock feed. Under ***Scenario 3: Fortress UK***, there is a minor increase in the cost of casual labour, but this is less than the reduction in livestock feed costs. There is an increase in the cost of regular labour under scenarios 2 and 3 which contributes to higher fixed costs.

The substantial rise in FBI under ***Scenario 3: Fortress UK*** is the result of a substantial increase the value of production output as prices rise behind the protection of WTO MFN tariffs. However, this initial outcome is before longer-term adjustments by pig producers can take place; furthermore, they would need to find a market for cuts not in demand in the UK, and this will place downward pressure on carcase prices. In other words, while consumers might be faced with substantially higher pork prices for cuts for which there is high demand, farmers may find that the higher prices for these cuts

[31] Holdings on which pigs account for more than two-thirds of their total Standard Output (SO).

are offset by an inability to attract reasonable prices for cuts for which there is little or no domestic demand.

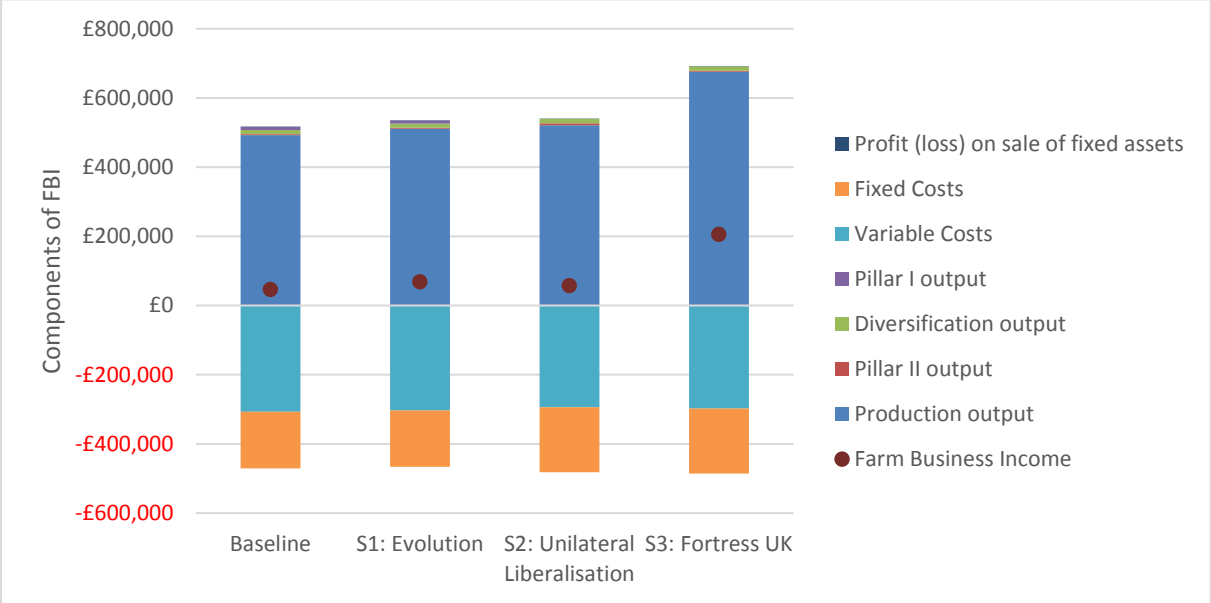



**Figure 5.25: Impact of the scenarios on components of FBI: Pigs**

The FBS data only permit an examination of large pig farms against all pig farms and of only medium and high performers (Figure 5.26). The impact of the scenarios on large pig farms follows the same pattern as for all farms. High performers have higher FBI under all scenarios than medium performers; however, under ***Scenario 3: Fortress UK***, there is a much smaller difference between the two groups as production output accounts for a larger share of the value of total output.

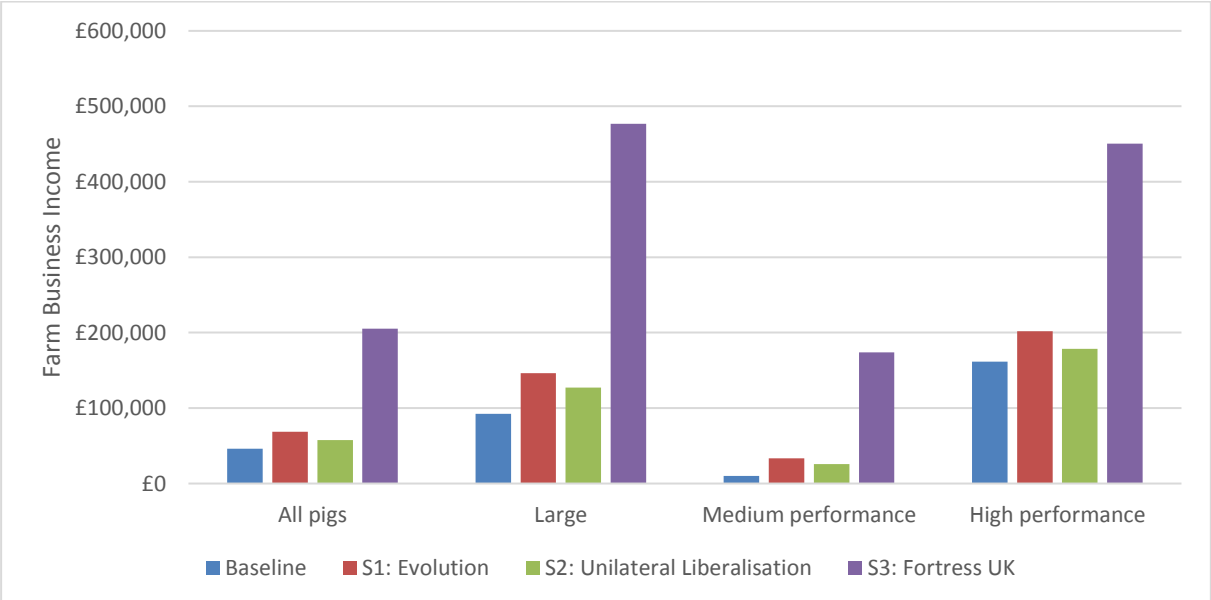



**Figure 5.26: FBI by farm size and performance level: Pigs**

### 5.8.2. Sensitivity analysis

Sensitivity analysis is presented in Appendix 1. Pillar II payments do not make an important contribution to the value of output on pig farms, as a result, varying the proportion of additional payments made in the form of compensation for income foregone makes little difference to FBI under any of the scenarios.

Varying the price of pigs by ±10 percentage points[32] would result in a ±65% change in FBI under ***Scenario 1: Evolution***, a ±78% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±22% change in FBI under ***Scenario 3: Fortress UK***. These are large changes which account for relatively modest changes in FBI given the magnitudes involved.

The impact of higher additional labour costs is relatively unimportant in percentage terms for pig farms given the high levels of FBI; the same is true of varying the reduction in regulatory cost savings.

### 5.8.3. Subsequent adjustments

#### 5.8.3.1. Scenario 1: Evolution

While farm business income increases moderately compared with the baseline under this scenario, there will still be a need for pig farmers in the UK to be at the top of their game if they are to thrive. It could be argued that the UK pig sector has already been through a huge period of structural change in the last 10-15 years. Pig production has been forced to become more efficient and organised over this period with a relative lack of CAP support and difficult periods of profitability. However, farmers will still need to invest in better/improved genetics, better housing and in ensuring high levels of feed efficiency, etc. to be successful.

Under this scenario, despite the increased incomes overall, an ongoing polarisation between the "best and the rest" in the UK sector can be expected. There will be a move towards gradually bigger units (the best pig farms are now often located on two to three sites), but overall pig farm numbers are likely to continue to fall. This is despite the fact that some arable farms might be tempted by the higher prices to switch to pig production; the opportunity to move into outdoor pig production might be limited by the availability of suitable land and the need to maintain biosecurity. Many pig producing units are already linked to other arable units even if they are contract-managed separately.

Any supply response to increased income will be affected by the fact that the UK pig sector has suffered from a prolonged period of under investment in terms of buildings and other areas of physical infrastructure. Attracting labour to the sector is already a key challenge; much of the current farm labour comes from other parts of the EU. Succession in terms of farm management is still a key issue for the future.

[32] This equates to price changes of -5.77% to 14.23% under ***Scenario 1: Evolution***, -3.23% to -16.77% under ***Scenario 2: Unilateral Liberalisation*** and 31.05% to 51.05% under ***Scenario 3: Fortress UK***.

The supply chain can be expected to remain in the control of a relatively small number of highly integrated players, and UK supermarkets will still look to source and stock UK pork products. They will also still insist on high standards of animal welfare which will be driven by a combination of statutory legislation and their own specific standards. Increases in welfare pressures will eventually lead to reduced antibiotic use leading to a reduction in daily liveweight gains. A healthier environment for pigs will lead to lower stocking rates. The trend towards outdoor based production systems will continue, though there is unlikely to be the development of new greenfield production sites.

Despite the modest rise in farm business income for pig enterprises under this scenario, the dual constraints of labour and advanced managerial skills and ability will see production not increase as much as might be expected. Producers are also wary of making large investments due to fluctuating prices. However, successful pig farm businesses in the UK are likely to set up new units on existing farms and/or buy others. They will see the opportunity for expansion, but attracting new entrants to the sector is likely to be a lot more difficult. Investment costs in pig production are relatively high, and it is difficult for new entrants to the sector to gain access to the required.

Overall, ***Scenario 1: Evolution*** will see increases in production, but limited by a lack of labour and advanced managerial skills.

#### 5.8.3.2. Scenario 2: Unilateral Liberalisation

The pig sector is less reliant on Pillar I and Pillar II support than many other types of farming. The overall outcome of this scenario is not very different from the first scenario, and this is generally quite a positive outcome for the sector. While feed costs may be cheaper, pressure for farmers to achieve high levels of technical feed efficiency will remain. This will require investment in areas such as better building design, disease control and better levels of stockmanship. Many of the other factors relevant to the first scenario will also apply here.

Overall, ***Scenario 2: Unilateral Liberalisation*** will see a similar outcome to that under the first scenario, although the incentive to increase production will be not be so strong.

#### 5.8.3.3. Scenario 3: Fortress UK

Under this scenario, there is a large increase in the level of farm business income for pig farmers. Pig production will still remain concentrated in the Eastern counties, with other concentrations in areas such as Wiltshire and Scotland. With such high levels of farm business income, it is likely that farmers will respond positively.

Such high levels of FBI might attract new investors to the sector and existing high performing producers would almost certainly seek an opportunity for expansion. This would all take time, and ongoing volatility in international market conditions and prices will make significant investment decisions difficult; the expansion of outdoor pig production might be limited by the availability of suitable land and the need to maintain biosecurity.

The issues of labour, skills development and management ability will still remain as key barriers to potential growth. Land availability is likely to be less of an issue. Planning and environmental constraints are not likely to be critical, especially in the more rural areas. Hygiene and disease control will still be big areas of concern, and there might well be a need to invest in more specialised buildings with better ventilation, etc. It may not be possible to simply re-use old buildings; modern pig buildings are sophisticated in their design and simply converting disused buildings might not be an option.

The sector will remain highly consolidated and clustered around the key processors in the UK. The existing key players will expand production and processing, and the trend towards outdoors production will continue, though this faces the constraint of finding suitable sites and where biosecurity can be safeguarded. Investment from farmers in the arable sector might well be a feature of this scenario as returns from the pig sector will look attractive. More vertical integration throughout the supply chain can be expected and all key stages of this will be operating under contract to each other. Farmers will operate to controlled protocols as set by the processors. Many of the other factors found in the other scenarios will also apply here.

Overall, ***Scenario 3: Fortress UK*** will see increases in production and new investment in the sector. Access to labour and managerial expertise will remain as key barriers to growth. Further consolidation of the supply chain is expected.

## 5.9. All farms

### 5.9.1. Initial impact

The all-farms assessment reflects the weighted composition of the farming types already described. It is included to provide an industry-wide impression of the impact of the scenarios chosen by the AHDB on business incomes.

The baseline FBI for all farms is £38,405 (Figure 5.27). under ***Scenario 1: Evolution***, this increases to £41,197, but FBI falls under ***Scenario 2: Unilateral Liberalisation*** to £15,401 and to £20,162 under ***Scenario 3: Fortress UK***.

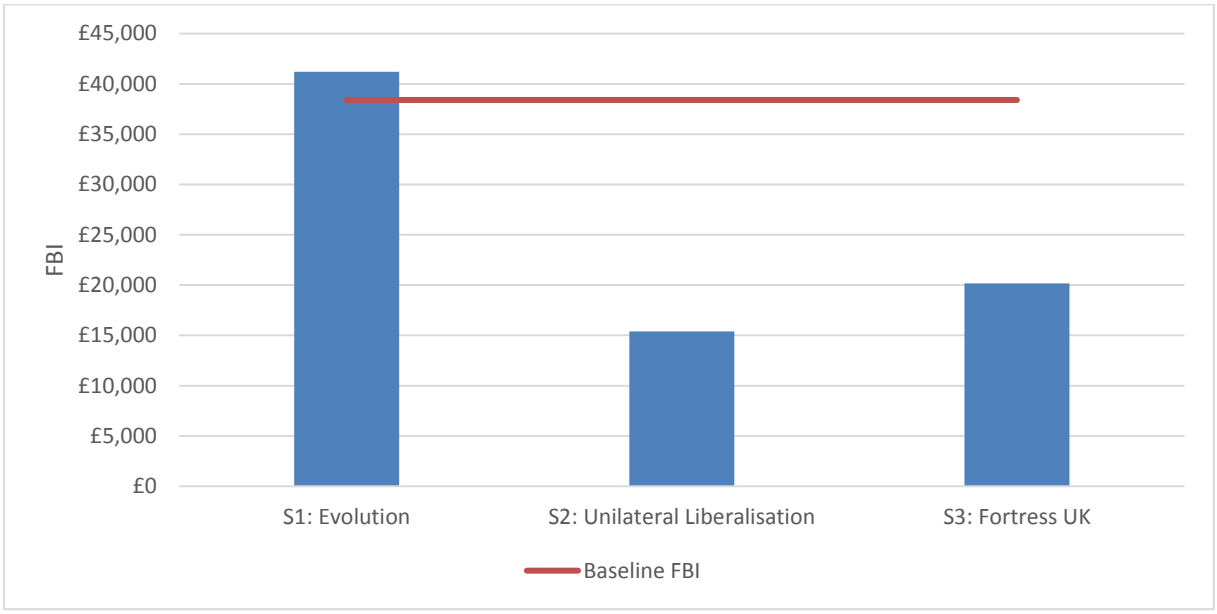



**Figure 5.27: Impact of the scenarios on FBI: All farms**

At the all-farms level, Pillar I support is an important driver of change in FBI under the different scenarios. The removal of this £24,696 payment under ***Scenario 2: Unilateral Liberalisation*** is partially compensated for by an increase in support under Pillar II, but this effect is more marginal under ***Scenario 3: Fortress UK***. The value of production output increases marginally at this aggregate level under ***Scenario 1: Evolution*** and increases more substantially under ***Scenario 3: Fortress UK***. Under ***Scenario 2: Unilateral Liberalisation***, there is a modest fall in the value of production output.

There is a minor decrease in variable costs under all Scenarios as a result of lower livestock feed costs; variable costs fall further under ***Scenario 2: Unilateral Liberalisation*** as the result of lower regulatory costs. An increase in the cost of causal labour results in a net increase in variable costs under ***Scenario 3: Fortress UK***. Increases in the cost of regular labour under ***Scenario 2; Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** result in higher fixed costs.


**Figure 5.28: Impact of the scenarios on components of FBI: All farms**

The impact of the scenarios on FBI by farm size generally follow the same pattern as the all farm group with FBI increasing with scale (Figure 5.29). However, FBI is lowest under ***Scenario 3: Fortress UK*** for the part-time (very small) and small farm groupings whereas in all other situations, FBI is lowest under ***Scenario 2: Unilateral Liberalisation***. This is the result of the importance of Pillar II payments to these groups.

For the low performance group, FBI is negative for the baseline and under all scenarios, while FBI is positive under all scenarios for the high performance group. The medium performance group experiences a negative FBI under ***Scenario 2: Unilateral Liberalisation***, despite lower regulatory costs and higher Pillar II payments, and this is only just positive under ***Scenario 3: Fortress UK*** as additional value of production output makes up for a smaller increase in Pillar II payments.

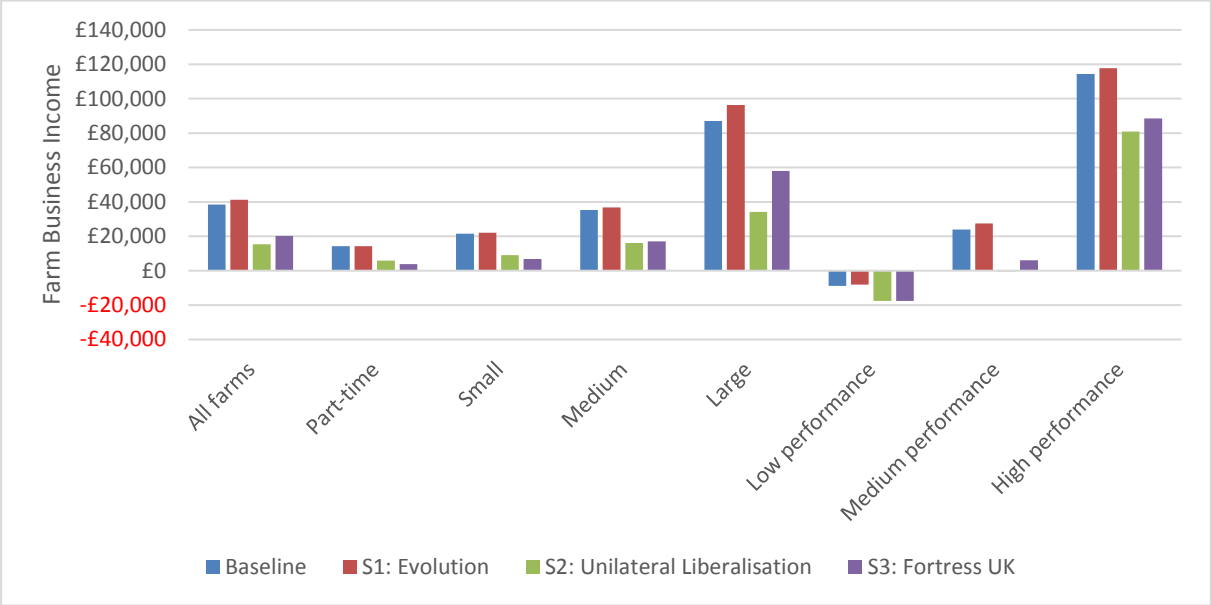



**Figure 5.29: FBI by farm size and performance level: All farms**

### 5.9.2. Subsequent adjustments

The subsequent adjustments likely at the all farm level will be an amalgamation of the adjustments for specific farm types discussed above, plus those made on farm types not examined in this report. However, there are some expected impacts which apply more generally and which are drawn out below.

#### 5.9.2.1. Scenario 1: Evolution

***Scenario 1: Evolution***, will result in a slight improvement to FBI at the all farms level; some sectors experience increases in FBI, for others, FBI will remain static or will decline marginally. This means that current trends are likely to continue, in some sectors with pressures for adjustment easing but in others, them increasing a little.

Under this scenario, it is therefore likely that consolidation into fewer and larger farms will continue. However, a group of smaller-scale and/or less efficient producers will remain in business serving niche, added value markets and often supported by off farm income. Over time, there is likely to be a polarisation in terms of farm size with medium-scale producers becoming less common.

Within this, there will continue to be adjustments in cropping patters to reflect prevailing prices and this is likely to result in reductions in feed barley and oilseed rape areas; sheep enterprises will be under increased pressure.

Changes in land prices can be expected to reflect shifts in FBI, i.e. the ability to pay rent, interest and other ownership costs. While at the aggregate level land prices should hold firm under this scenario,

there are likely to be regional differences according to the profitability of the type of agriculture that can be supported.

Overall, ***Scenario 1: Evolution*** will generally see a continuation of current trends in the industry.

#### 5.9.2.2. Scenario 2: Unilateral Liberalisation

Under ***Scenario 2: Unilateral Liberalisation***, UK agriculture will face considerable reductions in FBI at the aggregate level, although the impact by sector differs (considerably in some cases). Across the agricultural industry the pressure will be greatest on those farm businesses that are less efficient; because in some farming types the link between size and efficiency is rather loose, some large farms may look to reduce their size to control labour costs. Less efficient farmers will be considerable financial pressure and many will require off farm income to continue in business; there is also likely to be greater interest (generally, but especially for less efficient farmers) in Pillar II-type schemes to support income.

As well as having an impact on scale, increases in the cost of labour will prompt some farmers to examine the possibility of replacing labour with automation; others, mainly in the horticulture sector, are likely to move some operations to the EU where access to cheaper labour will be possible.

In addition, farmers are likely to critically examine the enterprise mix and will seek to reduce activity in sectors where prices are weaker. This means that there will be pressure on feed barley and oilseed rape area, as well as on sheep enterprises, especially in the uplands, and, to a lesser extent, beef. Given the relative lack of options, the structural impact of this is likely to be most severe in hill and upland areas.

Overall, ***Scenario 2: Unilateral Liberalisation*** will have a substantial negative impact on less efficient farmers. Larger farmers may reduce scale to limit labour costs, in some sectors production could even be relocated outside the EU to take advantage of cheaper labour.

#### 5.9.2.3. Scenario 3: Fortress UK

The impact of ***Scenario 3: Fortress UK***, falls between the other two scenarios at the aggregate level (although this masks considerable difference by sector as set out above). The likely adjustments under this scenario therefore also fall between those made under the other scenarios.

There will be increased pressure on less efficient farms, and many of these will require off-farm income and/or increased Pillar II-type support to remain viable. Under this scenario, scale will also help to protect FBI at the aggregate level and, as under the first scenario, there may be a "hollowing out" of farm size leading to increased polarisation between smaller and larger farms with a dwindling number of medium-scale operators. Within this, pressure on labour costs will prompt increased interest in automated solutions.

Overall, ***Scenario 3: Fortress UK*** will result in increased pressure on less efficient farms, although the adjustments that follow will not be as severe as under the second scenario. There will be increased interest in reducing labour costs, primarily through automation.

# 6. Conclusions

Before setting out our conclusions on the impact of the scenarios and the implications of these, the importance of the specifications within the scenarios should be acknowledged. Where these relate to policy there is a great deal of certainty; Pillar I payments are either made (Baseline and ***Scenario 1: Evolution***) or they are not made (***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK***). There is more uncertainty with respect to the cost of labour should access to migrant labour be restricted, and with respect to commodity prices that may result under each of the trade arrangements. For both of these, we recommend that further, more detailed work be undertaken. With respect to labour this should focus on the availability of non-migrant labour and the working conditions and level of wages required to attract UK workers.

With respect to prices, greater attention should be given to establishing appropriate comparators. As has been demonstrated, estimates of world beef prices (especially projections for future periods) differ widely, even between different projections produced by the same source, and this can lead to very different assessments of impacts at the farm level. When newer or more robust data become available, this means that revisions in impact assessments are inevitable as the quality of results improve. Generally, projections of prices far into the future are likely to be less trustworthy than current observations or those relating to nearer times.

When considering likely competition from imports, where possible attention should go beyond price and consider factors such as the characteristics of commodities produced outside the UK (are they really comparable in terms of quality, production characteristics, etc.), retailer/consumer attitude to imports from specific countries, transport requirements (port infrastructure, supply chain length, chill-chain, availability, etc.), availability of greater supplies from abroad, and likely exchange rate movements which can have a substantial impact on relative prices.

## 6.1. The relative impact of the scenarios on Farm Business Income

As would be expected from the definition of the scenarios, ***Scenario 1: Evolution***, under which Pillar I and Pillar II payments[33] are retained and there is no restriction on migrant labour, though there are additional costs of trading incurred by leaving the Single Market, implies the least change in Farm Business Income (FBI) to the *status quo* (baseline). Under this scenario, most farm types would see FBI retained or enhanced as the rising cost of imports will cause domestic prices to increase in sectors where the UK is a net importer (all except barley and oilseed rape). Only cereal farms would experience decreases in FBI (assuming that they made no longer-term adjustments to their business structure and/or management practices). This is because of the importance to the value of their production of barley and oilseed rape; prices of these would be expected to decline as UK exports would no longer be economically viable due to trade friction costs.

[33] Though the CAP and its Pillars would disappear under post-Brexit domestic agricultural policy, the widespread awareness of the different types of support offered under the two justifies their continued use in this Report.

The removal of Pillar I payments and their partial replacement with enhanced Pillar II-type support under domestic agricultural policy is a key driver of lower FBIs under the other two scenarios. ***Scenario 2: Unilateral Liberalisation*** is where Pillar I payments are removed and Pillar II-type payments increased to equal 50% of the total current Pillar I and Pillar II support, migrant labour is restricted to 50% of current levels for regular labour, the costs of complying with regulations is reduced by 5% and the UK unilaterally removes tariffs on all imports (UK exports would be subject to WTO MFN tariffs). Under this scenario, FBI would fall for all farm types, with the exception of pig farms. The impact of the removal of Pillar I payments is only partially compensated by increased Pillar II payments (and these are focused on certain farm types such as LFA sheep and beef), exacerbated by decreases in the value of sheep and beef production as lower priced imports exert downward pressure on domestic prices. Sectors with the least reliance on Pillar I support as a proportion of revenue (pigs, dairy and horticulture) are best protected from falls in FBI.

Under ***Scenario 3: Fortress UK***, Pillar I payments are removed and Pillar II payments increased to equal 25% of the total current Pillar I and Pillar II support, migrant labour is restricted to 50% of current levels for both regular and casual labour and all trade takes place with WTO MFN tariffs, with the exception of the existing TRQ for imports of New Zealand lamb. All farm types, with the exception of dairy and pigs, would see reductions in FBI compared to the baseline. However, for some farm types, FBI would be higher than under the second scenario (general cropping, lowland sheep and beef and horticulture) as the protection afforded by WTO MFN tariffs would allow domestic prices to rise, more than compensating for lower Pillar II-type payments.

Drawing the elements of the scenarios together shows the importance of policy decisions on direct support payments to levels of FBI for most farm types. This is especially the case with respect to Pillar I for cereals and with respect to Pillar II for LFA sheep and beef. Pillar I and Pillar II are less important for horticultural, pig and dairy producers. Sectors with a reliance on enterprises for which the UK currently has a net exportable surplus will see reductions in FBI. Sectors which have high labour requirements will be hardest hit by increases in labour costs; this will affect horticultural enterprises especially. Sectors which produce commodities for which the UK has a substantial import requirement will see FBI protected by higher domestic prices under ***Scenario 3: Fortress UK***; this will be especially the case in the pig sector, but also in the dairy and horticultural sectors. In the red meat sector, decreases in sheep prices will be balanced to some extent by increases in beef prices under the third scenario.

All of the impacts above will be affected to some extent by supply decisions taken by retailers and consumer preference and will be mitigated by the adjustments that farmers make.

## 6.2. The impact of the scenarios on Farm Business Income by sector

### 6.2.1. Cereal farms

- The 9% decrease in FBI seen under ***Scenario 1: Evolution*** is driven mainly by decreases in the output values for oilseed rape and barley, caused by the loss of export potential, which is not

compensated for by the smaller increase in the value of wheat output; the FBIs of farms relying on these two crops will be especially vulnerable. This scenario is likely to slightly increase existing structural trends in the cereal sector. There could also be a shift in production away from barley and oilseed rape and towards wheat and other crops such as potatoes and sugar beet where this is agronomically possible.

- The 81% decrease in FBI under ***Scenario 2: Unilateral Liberalisation*** is driven mainly by the removal of Pillar I payments (£37,439 per business) which is only partial offset by the increase in Pillar II payments. Decreases in the value of production output and increases in regular labour costs also have an impact, though reductions in regulatory costs provide some marginal relief for these changes. There is likely to be increased pressure on the less efficient farmers and there may also be downward pressure on farm size in order to reduce labour costs.
- Under ***Scenario 3: Fortress UK,*** the negative FBI results from a smaller increase in Pillar II support which provides less offset for the loss of Pillar I support, and both casual and regular labour costs increase. The value of production output also decreases relative to the baseline. There is likely to be severe pressure on the less efficient farmers and downward pressure on farm size in order to reduce costs of paid labour

### 6.2.2. General cropping farms

- There will be little change in FBI under ***Scenario 1: Evolution*** and as such, there is likely to be a continuation of existing structural trends. A shift in production is to be expected, away from barley and oilseed rape and towards wheat and crops such as potatoes and sugar beet where this is agronomically possible. The processed potato sector will become more profitable.
- The main driver of the 70% decrease in FBI under ***Scenario 2: Unilateral Liberalisation*** is the loss of Pillar I payments (£39,084), even though this is mitigated by increased payments under Pillar II; increased regular labour costs also have an impact, as do reductions in regulatory costs in the other direction. The profitability of processed potatoes is likely to be little changed with higher prices offset by higher paid labour costs. There will be increased pressure on the less efficient farmers and there may be see some downward pressure on farm size in order to keep paid labour costs under control.
- FBI under ***Scenario 3: Fortress UK*** is reduced by the loss of Pillar I support and the lower level of replacement under Pillar II, although the value of production output increases slightly, offsetting this to some extent; higher prices for processed potatoes offset high paid labour costs to result in substantially higher FBI. Additional casual and regular labour costs also contribute to the 60% decrease in FBI. There is likely to be some pressure on the less efficient farmers and some adjustment of cropping patterns with areas of potatoes and sugar beet likely to increase on average.

### 6.2.3. Horticultural farms

- Public support under the CAP does not form an important component of total output in the horticulture sector, so the loss of Pillar I makes little impact. All three scenarios feature an

increase in the value of production output, although FBI only increases under ***Scenario 1: Evolution*** (by 42%), which would appear to be a positive outcome for the horticultural sector.

- Under ***Scenario 2: Unilateral Liberalisation***, FBI declines by 12% as the increase in production is offset by increases in the cost of regular labour, despite a reduction in the costs of regulatory compliance. This scenario presents a number of major challenges to the horticultural sector, the most important of which will be finding a solution to the issue of labour availability and cost.
- Under ***Scenario 3: Fortress UK***, the 8% decrease in FBI results primarily from the increased cost of labour, which includes in this scenario not only regular workers, but the extra cost of casual labour too. This scenario is likely to be challenging for horticulture, especially for low and medium performers. Labour is the key issue to contend with. Being a large-scale growing operation will not be enough, being best in class and a high performer will be the key, regardless of operational scale. This might provide opportunities at a certain level for smaller and even some part-time farms, but the real challenge will be how the larger-scale, more commercial units solve the issues related to labour. Automation of picking and packing operations is clearly one way forward, but there will need to be a wider supply chain view of the future taken. Just solving the labour issue on its own might not be enough.

### 6.3. LFA sheep and beef farms

- Changes in the value of beef and sheep output offset one another under ***Scenario 1: Evolution***. There is likely to be little change to LFA sheep and beef farms, although some rebalancing away from sheep and towards beef is likely where this is technically possible.
- The loss of Pillar I payments (£19,482) under ***Scenario 2: Unilateral Liberalisation***, is almost entirely compensated by increases in Pillar II support. The key explanation for the 51% reduction in FBI here is the lower value of production driven by substantially lower sheep prices and fractionally lower beef prices. Higher regular labour costs have a larger negative impact on FBI than savings in regulatory compliance costs. This will result in marginal producers either leaving the sector or relying on off-farm income and Pillar II-type support. Sheep enterprises will be under the greatest pressure.
- Under ***Scenario 3: Fortress UK,*** FBI falls by 109% and becomes negative due to the inability of marginally increased Pillar II payments to compensate for the loss of Pillar I support. A decrease in the value of sheep production is offset by an increase in the value of beef production. The future prospects for the sheep and beef LFA producers look especially challenging under this scenario; only the most efficient producers will be economically viable without off-farm income.

#### 6.3.1. Lowland sheep and beef farms

- The 7% increase in FBI under ***Scenario 1: Evolution*** is the result of decreases in the value of output from sheep being countered by a slightly larger increase in the value of output from beef. This scenario implies little change for lowland sheep and beef farmers, although there may be an increase in beef production as sheep production declines.
- Under ***Scenario 2: Unilateral Liberalisation***, FBI decreases by 81% as the loss of Pillar I payments (£15,963) is partially compensated by increases in Pillar II payments, but production

output decreases as output from the sheep enterprise falls considerably. Variable costs decrease slightly due to the reduction in the cost of complying with regulations while fixed costs increase slightly as labour costs go up. An acceleration of restructuring is probable with the least efficient farms coming under increasing economic pressure. There is also likely to be a switch away from sheep and beef towards other sectors, especially dairy, where this is possible.

- Under ***Scenario 3: Fortress UK***, FBI decreases by 77% as the loss of Pillar I payments is mitigated by an increase in the value of beef output which offsets the lower value of sheep output. Adjustments can be expected to be similar, although less extreme, to those under the second scenario.

### 6.3.2. Dairy farms

- The 29% increase in FBI under ***Scenario 1: Evolution*** is driven by an increase in the value of production output as imports of dairy products become more expensive outside the single market allowing the domestic milk price to rise. This scenario is likely to lead to a generally positive environment for the dairy sector in the UK. Structural changes can be expected to be cushioned compared with the baseline of the current CAP.
- FBI falls by 35% under ***Scenario 2: Unilateral Liberalisation*** as there is virtually no change in the domestic milk price and hence only a very marginal change in the value of production output. Though Pillar I payments form only a relatively small proportion of the value of total output for dairy farms (£24,870), their removal accounts for the difference in FBI compared to the baseline. Variable costs are lower under this scenario as a result of the savings in regulatory compliance costs and lower livestock feed costs, but fixed costs are higher due to the increase in the cost of regular paid labour. This scenario presents a very challenging outcome for the dairy sector which could lead to a permanent adjustment in its structure.
- Under ***Scenario 3: Fortress UK***, FBI increases by 33% as the value of production rises further as all imports are faced with WTO MFN tariffs, providing further protection for UK production and leading to even higher domestic prices. This increase in the value of production is sufficient to compensate for an increase in fixed costs as the cost of regular paid labour increases. This scenario is generally encouraging for the UK dairy farming sector, but maybe less so for the UK consumer faced by higher prices.

### 6.3.3. Pig farms

- FBI increases under all scenarios, driven by increases in the value of production output which results from higher UK market prices caused by the additional costs of imports. The role of public support under Pillar I and Pillar II is not an important factor in the pig sector.
- Overall, ***Scenario 1: Evolution*** will see increases in production, but limited by a lack of labour and advanced managerial skills.
- Changes in variable and fixed costs under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** approximately cancel each other out. It should be noted that the carcass balancing trade is very important in the pig sector and while higher prices are likely to be possible for cuts in demand, an inability to extract value from cuts for which there is no domestic demand would

mean that the price rises seen here, and the consequential large increases in FBI, would be reduced, possibly considerably. The second scenario will see a similar outcome to that under the first scenario, although the incentive to increase production will be not be so strong. The third scenario will see increases in production and new investment in the sector. Access to labour and managerial expertise will remain as key barriers to growth. Further consolidation of the supply chain is expected.

### 6.4. Conclusions on farm size and performance level

It is generally the case that FBI increases with farm scale, irrespective of the scenario. However, there are some exceptions. Medium-size cereal farms would have higher FBI than large cereal farms under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** because large farms have higher paid labour costs, which are increased under these scenarios, and higher Pillar I payments, the loss of which has a greater impact on FBI. The same pattern is evident for Lowland sheep and beef farms with respect to ***Scenario 2: Unilateral Liberalisation***. It is not therefore the case that increased farm scale always results in more favourable FBI.

The picture is rather clearer with respect to performance level (ranked according to the farm's ratio of the value of output generated to the value of inputs used, including an imputed cost for the farmer's own labour). FBI for low performers is usually negative under the baseline and all scenarios (dairy farms under ***Scenario 1: Evolution*** and ***Scenario 3: Fortress UK*** are exceptions, as are horticultural farms under the baseline and ***Scenario 1: Evolution***). FBI for high performers is always positive under the baseline and all scenarios. For horticultural farms, FBI under ***Scenario 3: Fortress UK*** is proportionally lower for high performers than it is for the all farm group because of the high use of hired (paid) labour. The impact of the scenarios on medium performers is more varied with FBI positive for some farm types under some scenarios and negative in other cases. For cereal and LFA sheep and beef farms, FBI is negative for medium performers under ***Scenario 3: Fortress UK***. However, for Lowland sheep and beef and general cropping farms, FBI is negative for medium performers under ***Scenario 2: Unilateral Liberalisation***. FBI for medium performers is positive under all scenarios for pig and dairy farms. The clear conclusion with respect to performance levels is that high performers are better protected under any outcome.

### 6.5. Implications of the conclusions

The results in terms of the implications at the farm level for the various scenarios chosen by the AHDB carry lessons for both UK farmers and for organisations such as the AHDB that support the agricultural industry. As expected, there are substantial impacts on projected levels of FBI. Though these should not be interpreted as precise predictions (for reasons explained in the methodology) they are reasonable indications of where the greatest levels of financial pressure on farms will be felt, and to which farmers can be expected to respond by longer-term adjustments, such as structural change (including exiting the sector).

There are significant expected impacts from moving from the present situation, or its close approximation involving only higher trading costs (***Scenario 1: Evolution***), to the more extreme scenarios assessed here that involve both changed trading relationships and altered domestic support. Though for the industry as a whole incomes can be expected to fall in these situations, there are differences between farming types. Trade issues are relevant for all types (sometimes in different directions) and critical for a few. So too is the way that greater restrictions on migrant labour can be expected to affect labour costs, with the impact felt most strongly in horticulture. However, for most farming types, and thus the industry as a whole, these factors are of less importance than the postulated changes in domestic support arrangements.

The opportunities to influence outcomes or to mitigate them vary. Trading arrangements for agriculture after leaving the EU can be expected to be negotiated within the broader context of the general relationship between the UK and the EU, and the ability of farmers, even acting collectively, to influence the result is likely to be limited. However, the nature of domestic support in the UK's agricultural policy will be decided at national level (UK or devolved administrations) and can be expected to be more responsive to evidence and proposals. Awareness of the importance of the removal of direct income payments will be useful to both organisations such as the AHDB and to government, not least in their design of Pillar II-type schemes that are commonly seen as being easily justified (on public-goods/environmental arguments) and pragmatically useful in partially compensating for the withdrawal of Basic Payments. Similarly, a demonstration of the impact of increased labour costs resulting from restrictions on migrant labour should assist with the design of targeted measures to ease this specific problem.

There are also important messages to be conveyed to the agricultural industry by the AHDB and other organisations that support farmers. Perhaps the most significant is that, according to the evidence, high performing farms (in terms of their output/input ratios) are shown to be in a far stronger position to cope with the changes associated with the scenarios. This should focus attention on farmers knowing their relative performance (such as by using benchmarking) and on pursuing practical ways of improving output and containing costs. High performance is not necessarily associated with larger farms, and there is the possibility of improving performance across the size spectrum. Another general lesson is the importance of adaptation; the literature points to the proven ability of UK farmers as a group to absorb and adjust to shocks and pressures. Again, support organisations and governments need to promote this ability by identifying and tackling constraints; knowledge transfer and skills training are likely to play prominent parts in the assistance provided to farmers.

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# Appendix 1: Sensitivity analysis

This Appendix presents some sensitivity analysis for the key elements of the scenarios around which there is uncertainty, i.e. additional labour costs, prices and regulatory costs. The impact of additional Pillar II payments being in the form of income foregone (rather than genuinely additional income) is also examined.

Each sensitivity analysis is dealt with in isolation, i.e. only one variable is investigated at a time, all other variables being held constant within the scenarios.

- **Pillar II sensitivity.** It is assumed in our main analysis that all payments from an expanded Pillar II would be additional revenue, as opposed to being absorbed by income forgone in following the actions required by these payments. Our sensitivity analysis examines the impact of varying this assumption making proportions of additional Pillar II payments compensation for income foregone, thus reducing their contribution to FBI.
- **Labour cost sensitivity.** ***Scenario 2: Unilateral Liberalisation***, assumes that the cost of regular labour would increase by 50% as restrictions on migrant labour are imposed. A cost increase of 50% for both regular and casual labour was assumed under ***Scenario 3: Fortress UK***. There was no change to labour costs under ***Scenario 1: Evolution***, where migrant labour was not restricted. Our sensitivity analysis considers the impact of varying this labour cost increase on FBI.
- **Price sensitivity.** Changes in prices could result from shifts in supply or demand, use of different supply and demand elasticities, exchange rate movements, different costs of trade friction, different tariff rates, or some combination. Our sensitivity analysis considers the impact on FBI of varying the price change assumed under each scenario in 10 percentage point increments. For example, we have assumed that wheat prices increase by 2.29% under each scenario. Varying this assumption by ±10 percentage points means using price changes of -7.71% and 12.29%, i.e. 10 percentage points either side of the starting point.
- **Regulatory cost sensitivity.** Regulatory costs were reduced by 5% for several variable costs[34] under ***Scenario 2: Unilateral Liberalisation***. Our sensitivity analysis examines the impact of reducing these regulatory costs by 0% (i.e. no change) through to 10% in 1% increments.

## A1.1. Cereals

### A1.1.1. Pillar II sensitivity

The implication of varying our assumption that Pillar II provides additional income is tested below. These is no change in FBI under ***Scenario 1: Evolution***, where no change is made to public support. Under ***Scenario 2: Unilateral Liberalisation***, at least 50% of new Pillar II payments would need to be additional income to maintain a positive FBI. The impact is less severe under ***Scenario 3: Fortress UK*** where the additional income is considerably smaller, although this still reduces the already negative FBI

[34] Seeds; fertilisers; crop protection; other crop costs; veterinary fees & medicines; other livestock costs.

further. The steeper line shown in the Figure shows the greater importance of this assumption to ***Scenario 2: Unilateral Liberalisation***.

**Table A1.1: Sensitivity analysis of Pillar II support on FBI: Cereals**

| | 100% Income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £39,874 | £39,874 | £39,874 | £39,874 | £39,874 |
| **S2: Unilateral Liberalisation** | -£4,434 | -£1,327 | £1,779 | £4,886 | £7,992 |
| **S3: Fortress UK** | -£3,657 | -£3,078 | -£2,499 | -£1,920 | -£1,341 |

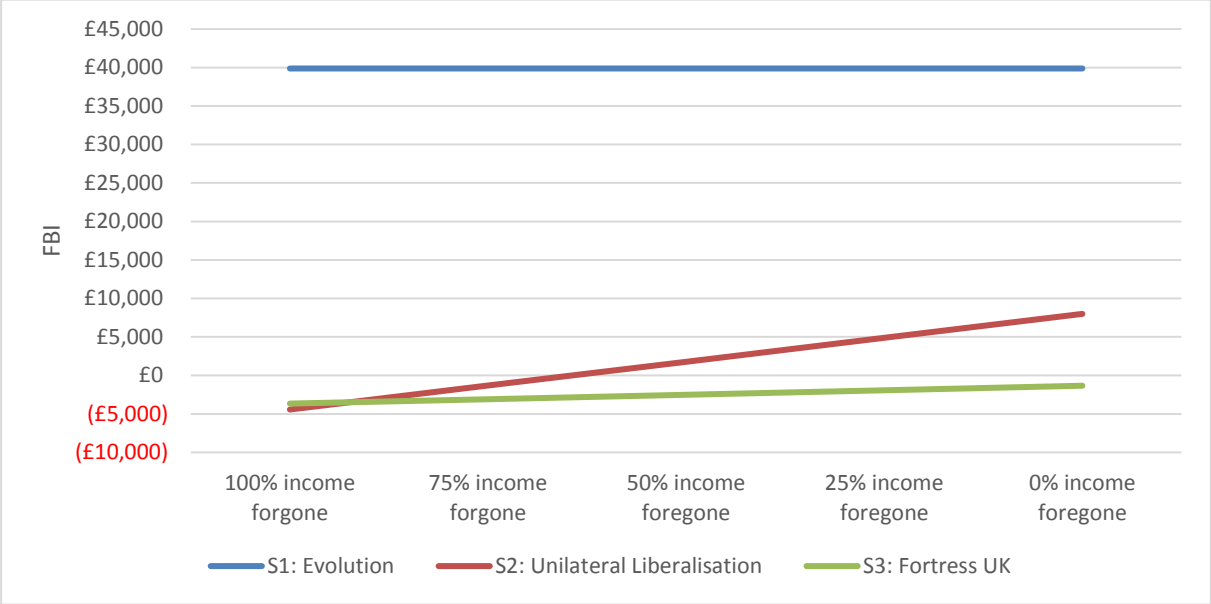


**Figure A1.1: Sensitivity analysis of Pillar II support on FBI: Cereals**

### A1.1.2. Labour cost sensitivity

The data below show the impact of different labour cost assumptions on FBI under each scenario. Under ***Scenario 2: Unilateral Liberalisation***, a change of ±10 percentage points in labour cost would result in a ±18% change in FBI. Under ***Scenario 3: Fortress UK***, a ±10 percentage point change would result in a ±121% change in FBI (the change is from a lower base). The assumption on labour is similarly important to these scenarios in absolute terms, although the importance is magnified in percentage terms under the third scenario where the change also applies to casual as well as regular labour.

**Table A1.2: Sensitivity analysis of labour costs on FBI: Cereals**

| | Change in FBI relative to labour cost change used | | | | | | |
|---|---|---|---|---|---|---|---|
| | 80% | 70% | 60% | Cost used (50%) | 40% | 30% | 20% |
| **S1: Evolution** | £39,874 | £39,874 | £39,874 | £39,874 | £39,874 | £39,874 | £39,874 |
| **S2: Unilateral Liberalisation** | £3,698 | £5,129 | £6,561 | £7,992 | £9,423 | £10,855 | £12,286 |
| **S3: Fortress UK** | -£6,220 | -£4,594 | -£2,968 | -£1,341 | £285 | £1,911 | £3,537 |

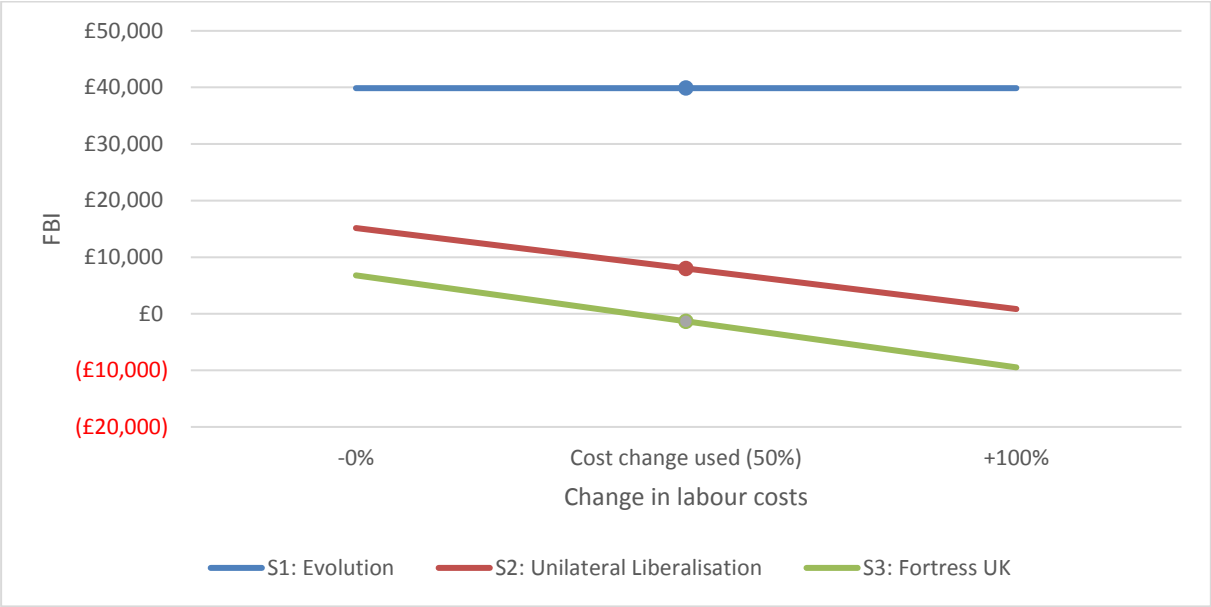


**Figure A1.2: Sensitivity analysis of labour costs on FBI: Cereals**

### A1.1.3. Price sensitivity

Wheat accounts for 40% of production output for cereal farms. The impact of wheat price on FBI under the scenarios is therefore substantial. The data below shows the impact of varying the wheat price on FBI under each scenario.

Under ***Scenario 1: Evolution***, a ±10 percentage point change in wheat price would result in a ±24% change in FBI. Such a change would result in a ±120% change in FBI under ***Scenario 2: Fitter Farmer*** and a ±714% change under ***Scenario 3: Fortress UK***. The assumption on price is equally important in all scenarios, but the impact on FBI is magnified under the second and third scenarios where FBI is much lower. A 10 percentage point reduction in the assumed wheat price would be sufficient to make FBI negative under ***Scenario 2: Unilateral Liberalisation***.

**Table A1.3: Sensitivity analysis of wheat price on FBI: Cereals**

| | Change in price used | Change in FBI relative to wheat price | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | **2.29%** | £11,137 | £20,716 | £30,295 | £39,874 | £49,453 | £59,033 | £68,612 |
| **S2: Unilateral Liberalisation** | **2.29%** | -£20,746 | -£11,166 | -£1,587 | £7,992 | £17,571 | £27,150 | £36,729 |
| **S3: Fortress UK** | **2.29%** | -£30,079 | -£20,500 | -£10,921 | -£1,341 | £8,238 | £17,817 | £27,396 |

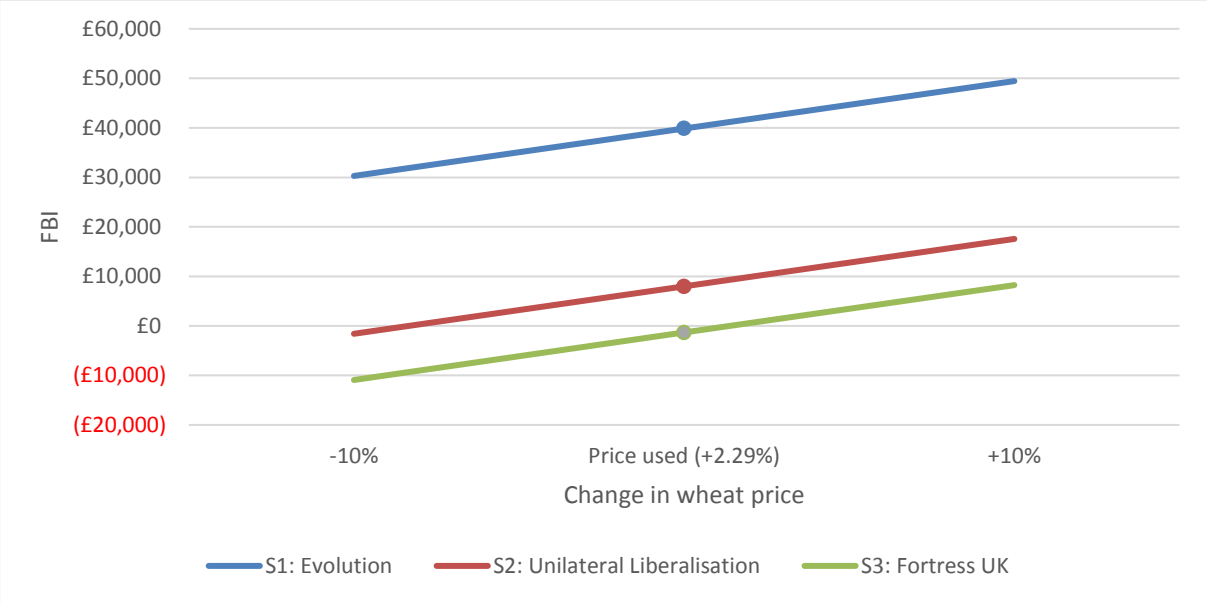


**Figure A1.3: Sensitivity analysis of wheat price on FBI: Cereals**

### A1.1.4. Regulatory cost sensitivity

The impact of varying the reduction in regulatory costs under ***Scenario 2: Unilateral Liberalisation*** is shown below. A ±1 percentage point change in regulatory costs would result in a ±10% change in FBI.

**Table A1.4: Sensitivity analysis of regulatory cost reduction on FBI: Cereals**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used (5%) | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £5,566 | £6,375 | £7,183 | £7,992 | £8,800 | £9,609 | £10,417 |

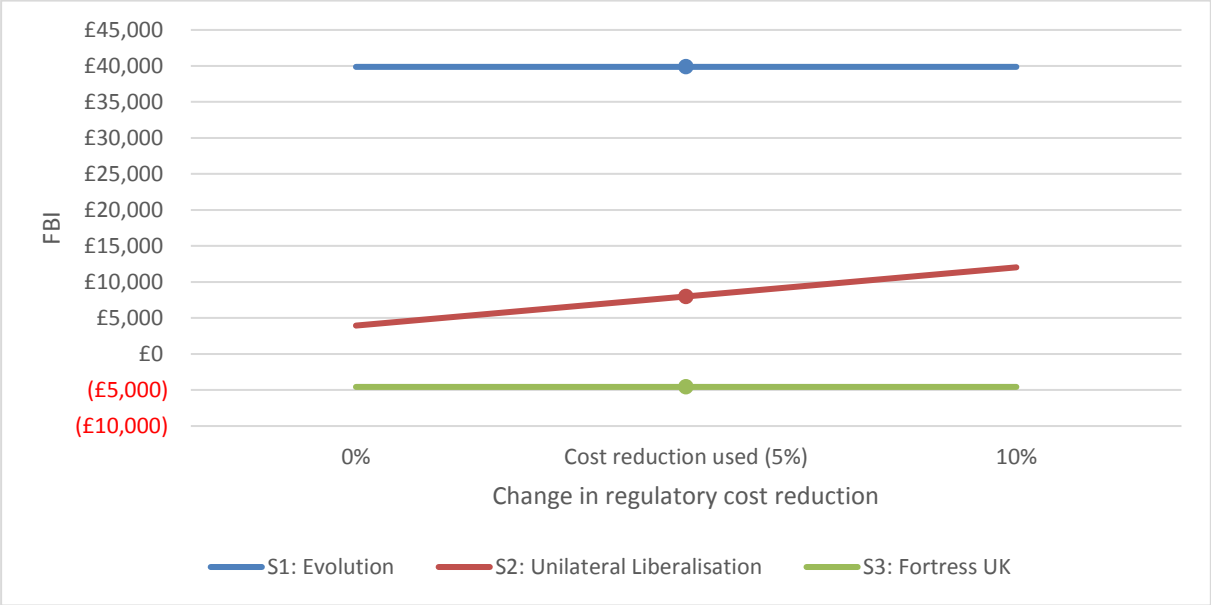


**Figure A1.4: Sensitivity analysis of regulatory cost reduction on FBI: Cereals**

### A1.1.5. Impact of UK having an exportable surplus of wheat

Although a five-year period was used to determine the average balance sheet for wheat, and this showed a small import requirement (equivalent to 2% of domestic use), the AHDB felt that situations in which the UK was a net exporter in wheat are likely to arise. To assess the impact of this situation, the model was run under the assumption that wheat production increased by 1 million tonnes resulting in an exportable surplus. Under all scenarios the imposing of trade friction costs and/or WTO tariffs, would make UK-produced wheat uncompetitive on export markets leading to a reduction of price of -4.51% (a higher volume of exportable surplus would result in a greater decrease in price to enable the surplus to be absorbed by domestic consumption). The data below shows that an inability to access export markets would reduce FBI under all scenarios. The additional decrease in FBI is most significant under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** where FBI is much lower and negative respectively.

**Table A1.5: Impact of UK having an exportable surplus of wheat on FBI: Cereals**

| | FBI wheat import requirement | FBI wheat exportable surplus |
|---|---|---|
| **Baseline** | £43,796 | £43,796 |
| **S1: Evolution** | £39,874 | £33,361 |
| **S2: Unilateral Liberalisation** | £7,992 | £1,478 |
| **S3: Fortress UK** | -£1,341 | -£7,855 |

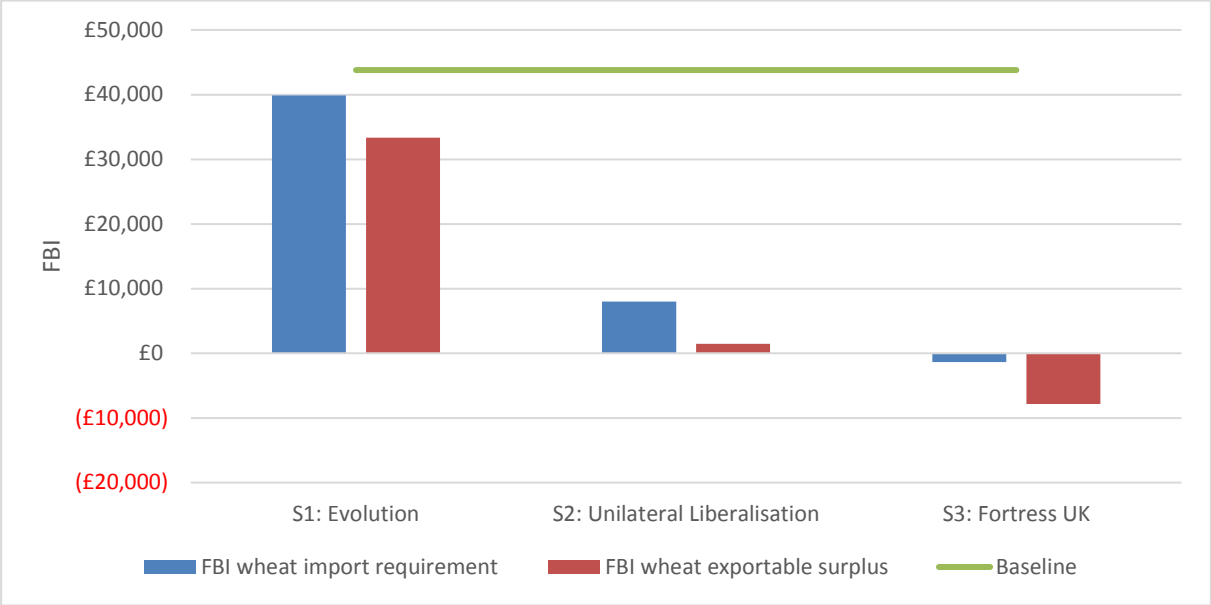


**Figure A1.5: Impact of UK having an exportable surplus of wheat on FBI: Cereals**

## A1.2. General cropping

### A1.2.1. Pillar II sensitivity

The implication of various proportions of additional Pillar II support being in the form of income foregone rather than as additional income is explored for general cropping farms below. There is no change under ***Scenario 1: Evolution***, where there is no change to public support. FBI would remain positive under ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK*** even if all new Pillar II output was in the form of income foregone, although under the second scenario, FBI would decrease by three-quarters. This assumption is most important under ***Scenario 2: Unilateral Liberalisation***, where Pillar II payments form a more substantial proportion of total output.

**Table A1.6: Sensitivity analysis of Pillar II support on FBI: General cropping**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £62,750 | £62,750 | £62,750 | £62,750 | £62,750 |
| **S2: Unilateral Liberalisation** | £4,146 | £7,729 | £11,312 | £14,895 | £18,478 |
| **S3: Fortress UK** | £22,038 | £22,706 | £23,374 | £24,042 | £24,710 |

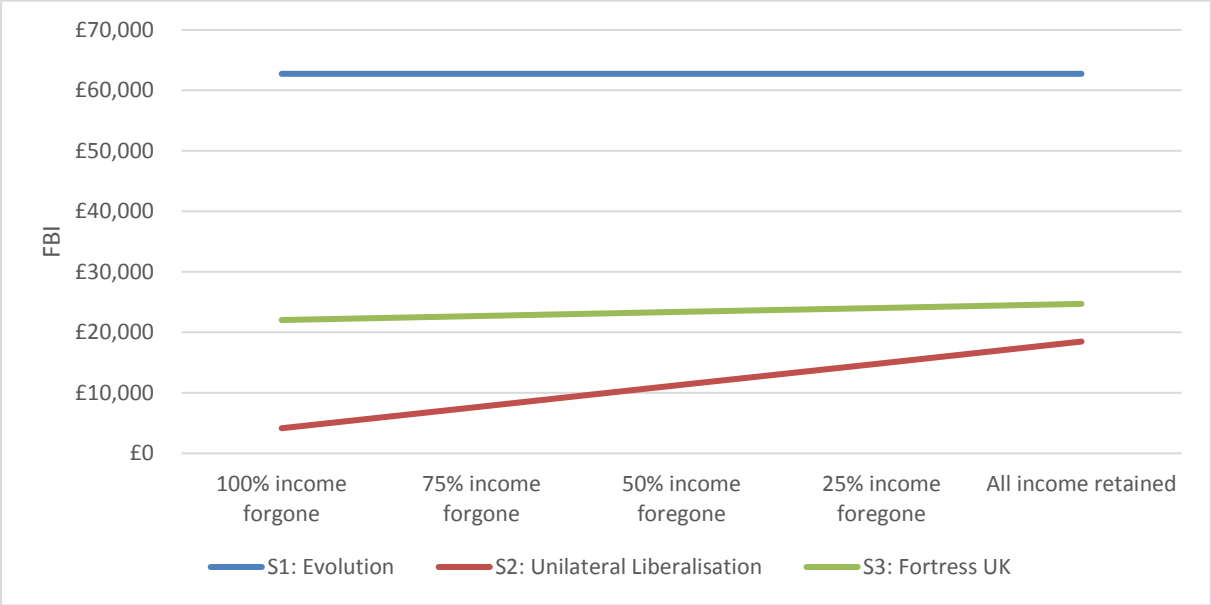


**Figure A1.6: Sensitivity analysis of Pillar II support on FBI: General cropping**

### A1.2.2. Labour cost sensitivity

The impact of making different assumptions about changes in labour cost is shown below. Labour is not restricted under ***Scenario 1: Evolution***, but under ***Scenario 2: Unilateral Liberalisation***, a ±10 percentage point change in labour costs would result in a ±23% change in FBI. Under ***Scenario 3: Fortress UK***, where casual labour as well as regular labour is restricted, a ±10 percentage point change in labour costs would result in a ±21% change in FBI. The fact that casual labour costs increase under ***Scenario 3: Fortress UK*** makes this assumption more important here.

**Table A1.7: Sensitivity analysis of labour costs on FBI: General cropping**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used (50%)** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £62,750 | £62,750 | £62,750 | £62,750 | £62,750 | £62,750 | £62,750 |
| **S2: Unilateral Liberalisation** | £5,718 | £9,971 | £14,225 | £18,478 | £22,732 | £26,985 | £31,239 |
| **S3: Fortress UK** | £8,832 | £14,125 | £19,417 | £24,710 | £30,002 | £35,295 | £40,587 |

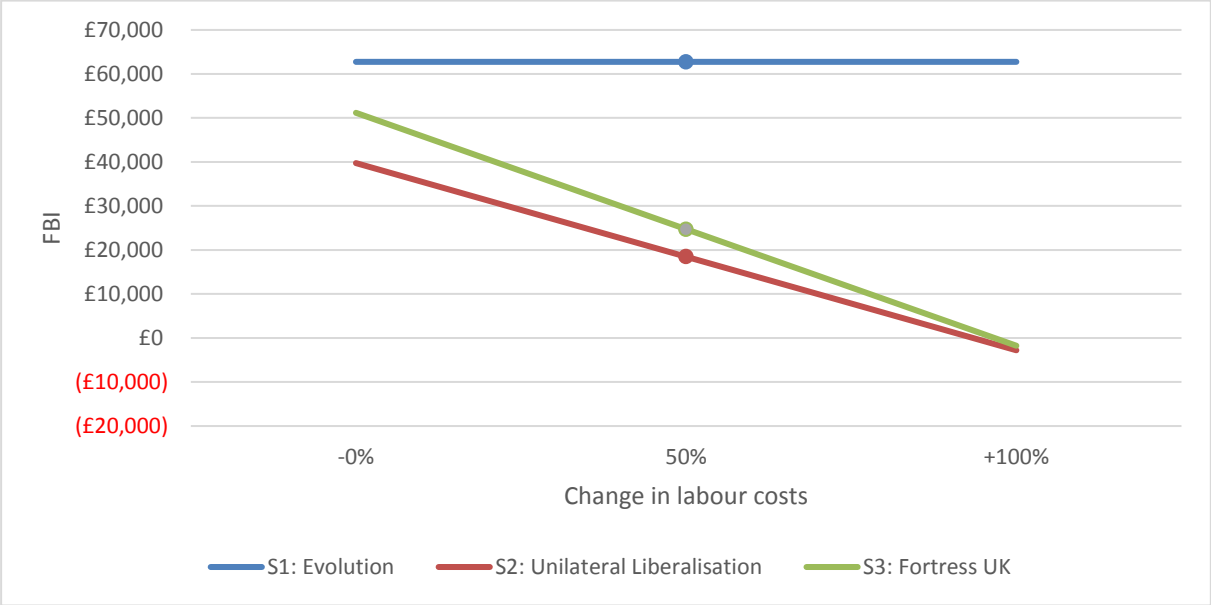


**Figure A1.7: Sensitivity analysis of labour costs on FBI: General cropping**

### A1.2.3. Price sensitivity

Wheat accounts for 21% of total production output in general cropping farms and the prices selected for wheat therefore have the most influence over FBI. A ±10 percentage point change in the price used for wheat would result in a ±13% change in FBI under ***Scenario 1: Evolution***, a ±44% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±33% change in FBI under ***Scenario 3: Fortress UK***. A decrease in the wheat price of between 20 and 30 percentage points would be sufficient to make FBI negative under ***Scenario 2: Unilateral Liberalisation***.

**Table A1.8: Sensitivity analysis of wheat price on FBI: General cropping**

| | Change in price used | Change in FBI relative to wheat price used | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | 2.29% | £38,559 | £46,623 | £54,687 | £62,750 | £70,814 | £78,877 | £86,941 |
| **S2: Unilateral Liberalisation** | 2.29% | -£5,712 | £2,351 | £10,415 | £18,478 | £26,542 | £34,606 | £42,669 |
| **S3: Fortress UK** | 2.29% | £519 | £8,582 | £16,646 | £24,710 | £32,773 | £40,837 | £48,900 |

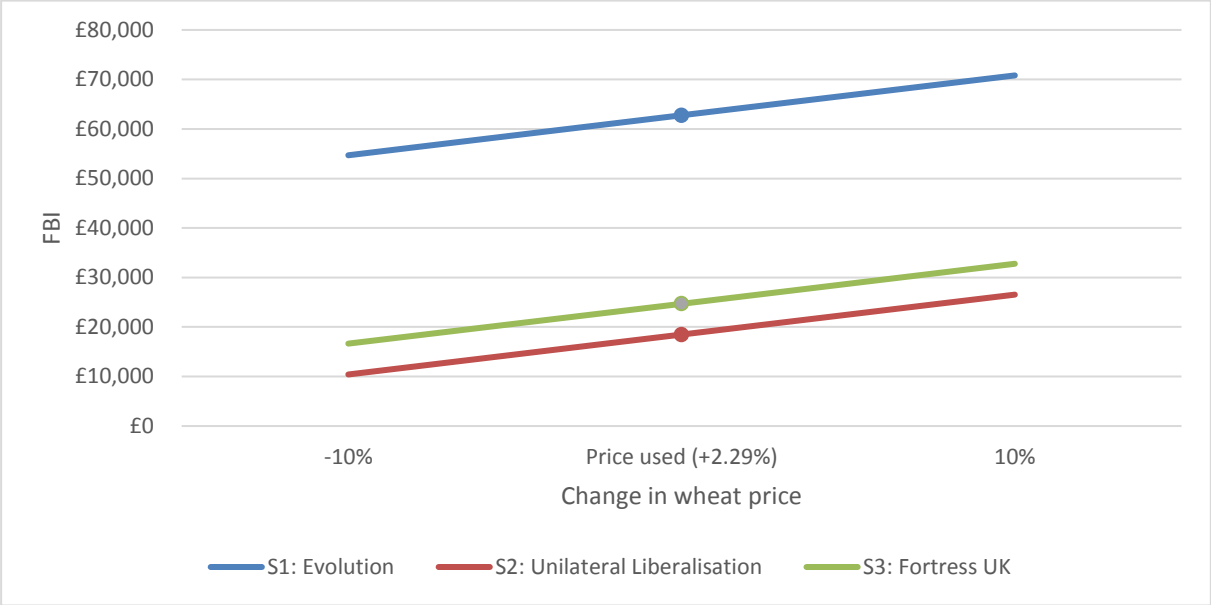


**Figure A1.8: Sensitivity analysis of wheat price on FBI: General cropping**

### A1.2.4. Regulatory cost sensitivity

The impact of varying the reduction in regulatory costs applied to certain variable costs is shown below for ***Scenario 2: Unilateral Liberalisation***. A ±1 percentage point change in the cost reduction would result in a ±6% change in FBI.

**Table A1.9: Sensitivity analysis of regulatory cost reduction on FBI: General cropping**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used (5%) | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £14,930 | £16,113 | £17,296 | £18,478 | £19,661 | £20,844 | £22,026 |

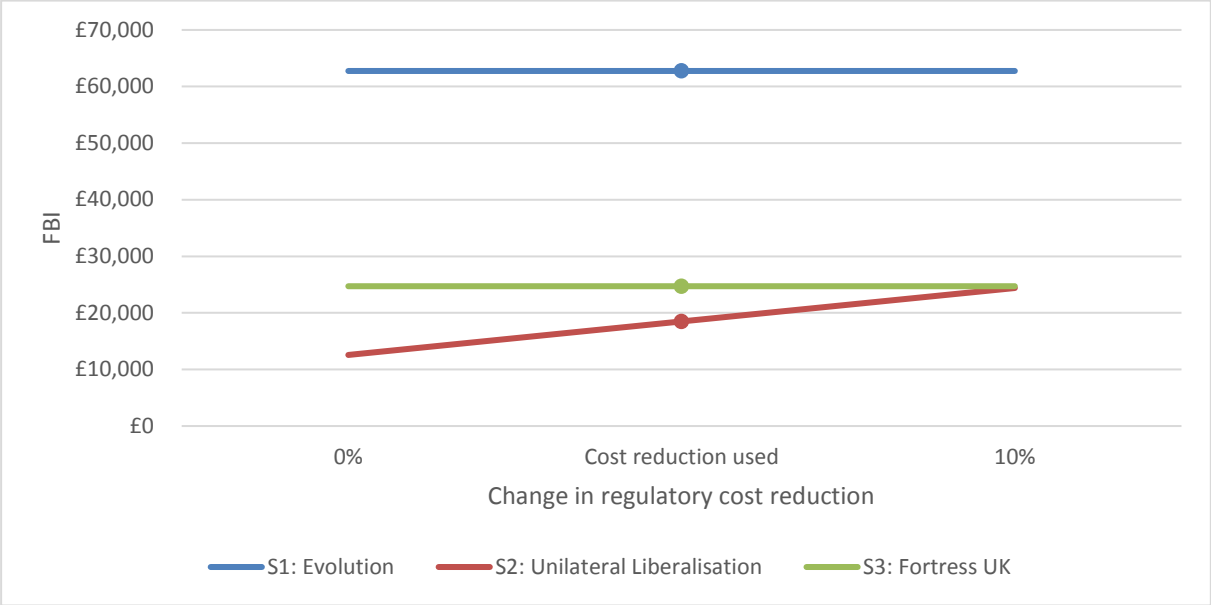


**Figure A1.9: Sensitivity analysis of regulatory cost reduction on FBI: General cropping**

## A1.3. Horticulture

### A1.3.1. Pillar II sensitivity

Pillar II support is not an important contributor to total output for horticultural farms. This is shown in the data below where varying the proportions of additional Pillar II support being in the form of income foregone rather than as additional income makes only marginal differences to FBI.

**Table A1.10: Sensitivity analysis of Pillar II support on FBI: Horticulture**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £47,733 | £47,733 | £47,733 | £47,733 | £47,733 |
| **S2: Unilateral Liberalisation** | £26,848 | £27,544 | £28,240 | £28,936 | £29,632 |
| **S3: Fortress UK** | £30,371 | £30,501 | £30,631 | £30,761 | £30,890 |

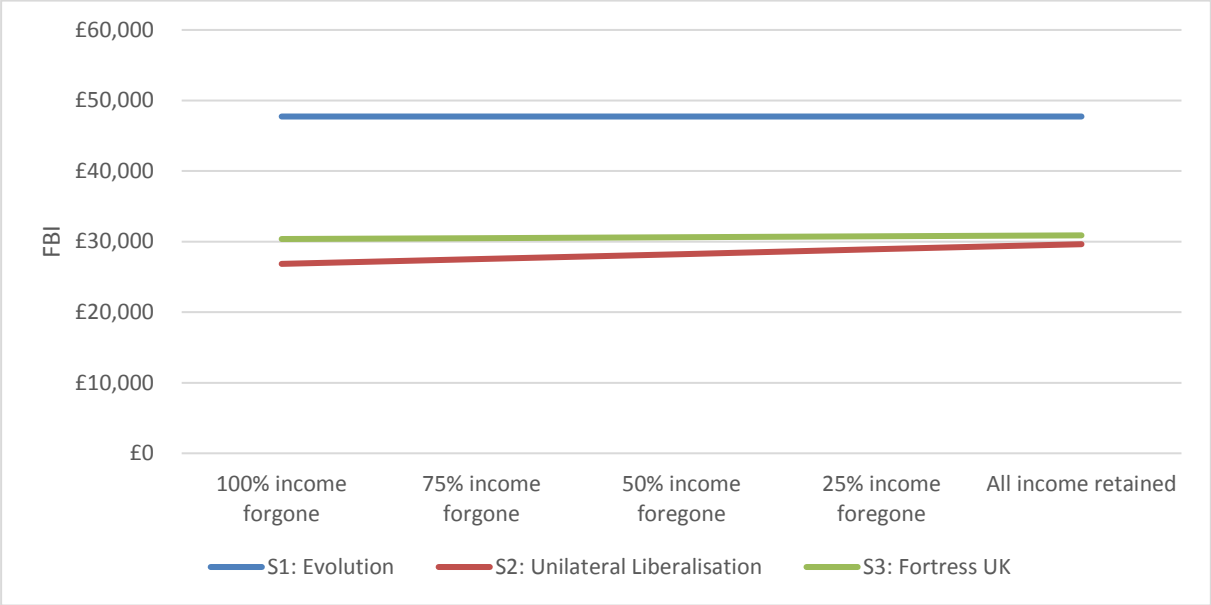


**Figure A1.10: Sensitivity analysis of Pillar II support on FBI: Horticulture**

### A1.3.2. Labour cost sensitivity

The data below show the impact of different labour cost assumptions on FBI under each scenario. Under ***Scenario 2: Unilateral Liberalisation***, a change of ±10 percentage points in labour cost would result in a ±21% change in FBI. Under ***Scenario 3: Fortress UK***, a ±10 percentage point change would result in a ±32% change in FBI. These changes are from relatively higher initial FBIs compared to some other sectors and so while the changes in percentage terms do not appear dramatic, these reflect large movements in absolute terms.

**Table A1.11: Sensitivity analysis of labour costs on FBI: Horticulture**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used (50%)** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £47,733 | £47,733 | £47,733 | £47,733 | £47,733 | £47,733 | £47,733 |
| **S2: Unilateral Liberalisation** | £11,153 | £17,312 | £23,472 | £29,632 | £35,792 | £41,952 | £48,112 |
| **S3: Fortress UK** | £1,017 | £10,975 | £20,933 | £30,890 | £40,848 | £50,806 | £60,763 |

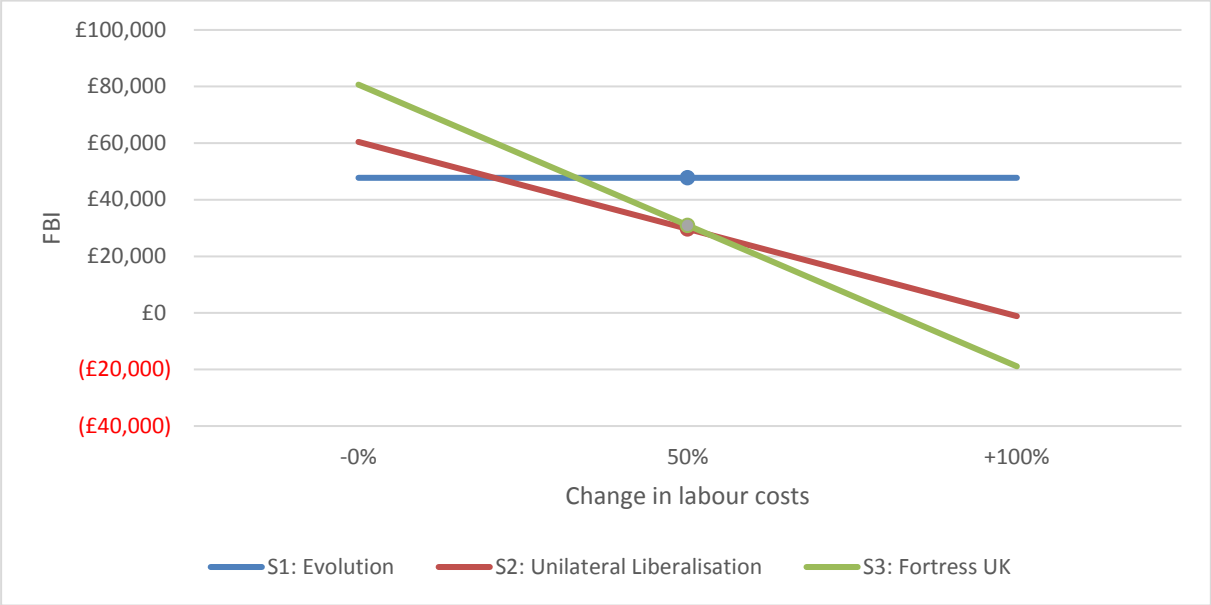


**Figure A1.11: Sensitivity analysis of labour costs on FBI: Horticulture**

### A1.3.3. Price sensitivity

Outdoor flowers, bulbs and nursery stock account for a quarter of the value of production output on horticultural holdings. The prices selected for this category of output therefore have the most influence over FBI. A ±10 percentage point change in the price used for outdoor flowers, bulbs and nursery stock would result in a ±16% change in FBI under ***Scenario 1: Evolution***, a ±26% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±24% change in FBI under ***Scenario 3: Fortress UK***. However, FBI would remain positive under all scenarios even with the selection of 30% lower prices.

**Table A1.12: Sensitivity analysis of outdoor flowers, bulbs and nursery stock price on FBI: Horticulture**

| | Change in price used | Change in FBI relative to outdoor flowers and bulbs price | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | 5.00% | £25,081 | £32,632 | £40,182 | £47,733 | £55,283 | £62,834 | £70,385 |
| **S2: Unilateral Liberalisation** | 8.00% | £6,980 | £14,531 | £22,082 | £29,632 | £37,183 | £44,733 | £52,284 |
| **S3: Fortress UK** | 16.96% | £8,239 | £15,789 | £23,340 | £30,890 | £38,441 | £45,991 | £53,542 |

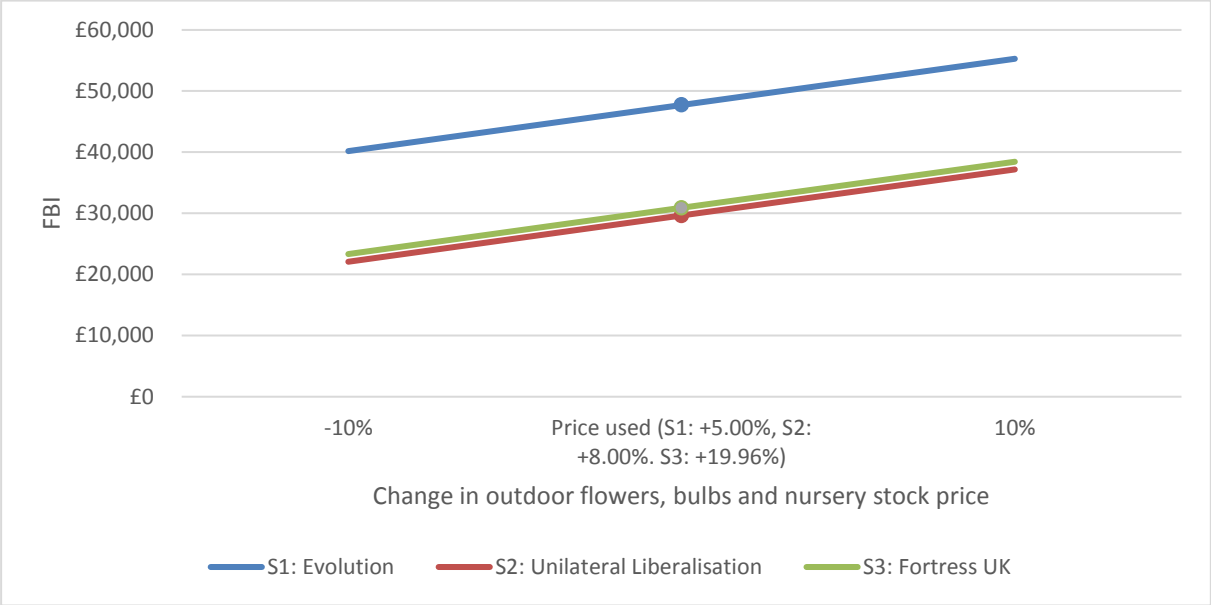


**Figure A1.12: Sensitivity analysis of outdoor flowers, bulbs and nursery stock price on FBI: Horticulture**

### A1.3.4. Regulatory cost sensitivity

The impact of varying the reduction in regulatory costs applied to certain variable costs is shown below for ***Scenario 2: Unilateral Liberalisation***. A ±1 percentage point change in the cost reduction would result in a ±4% change in FBI.

**Table A1.13: Sensitivity analysis of regulatory cost reduction on FBI: Horticulture**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £26,153 | £27,313 | £28,473 | £29,632 | £30,792 | £31,951 | £33,111 |

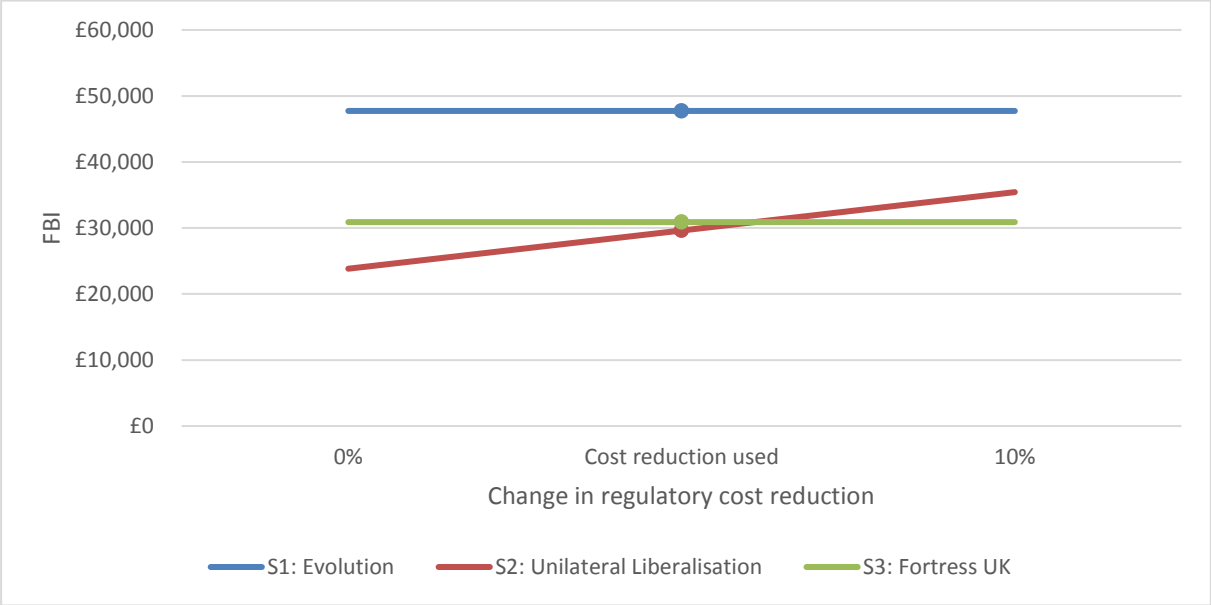


**Figure A1.13: Sensitivity analysis of regulatory cost reduction on FBI: Horticulture**

### A1.4. Less Favoured Area sheep and beef

#### A1.4.1. Pillar II sensitivity

As is shown below, if varying proportions of additional Pillar II support were to be made in the form of compensation for income foregone by following prescribed actions, the impact under ***Scenario 2: Unilateral Liberalisation***, would be substantial. FBI would become negative when between 25% and 50% of Pillar II support is made for income foregone. The already negative FBI under ***Scenario 3: Fortress UK*** would become progressively more negative.

**Table A1.14: Sensitivity analysis of Pillar II support on FBI: LFA sheep and beef**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £16,146 | £16,146 | £16,146 | £16,146 | £16,146 |
| **S2: Unilateral Liberalisation** | -£10,590 | -£5,971 | -£1,352 | £3,267 | £7,886 |
| **S3: Fortress UK** | -£4,853 | -£3,992 | -£3,131 | -£2,270 | -£1,409 |

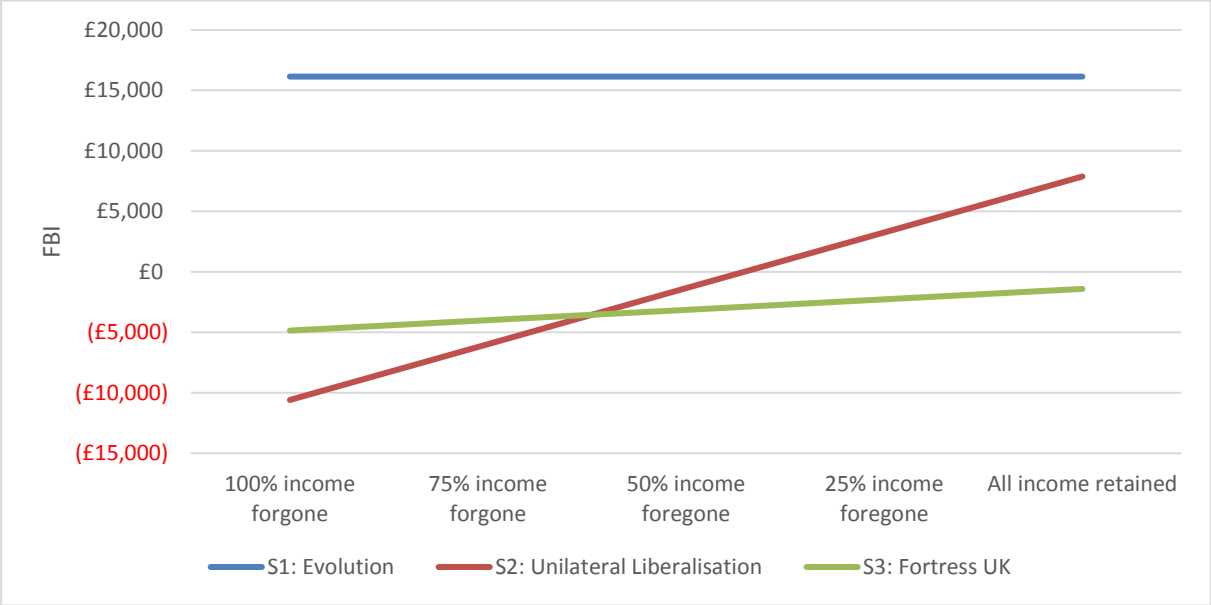


**Figure A1.14: Sensitivity analysis of Pillar II support on FBI: LFA sheep and beef**

### A1.4.2. Labour cost sensitivity

The impact of varying our assumption on the cost of labour is shown below. Under ***Scenario 2: Unilateral Liberalisation***, a ±10 percentage point change in the assumed cost of labour would result in a ±4% change in FBI. Under ***Scenario 3: Fortress UK***, where FBI is very low, a ±10 percentage point change in the cost of labour implies a ±32% change in FBI.

**Table A1.15: Sensitivity analysis of labour costs on FBI: LFA sheep and beef**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £16,146 | £16,146 | £16,146 | £16,146 | £16,146 | £16,146 | £16,146 |
| **S2: Unilateral Liberalisation** | £6,935 | £7,252 | £7,569 | £7,886 | £8,203 | £8,520 | £8,837 |
| **S3: Fortress UK** | -£2,779 | -£2,322 | -£1,866 | -£1,409 | -£952 | -£496 | -£39 |

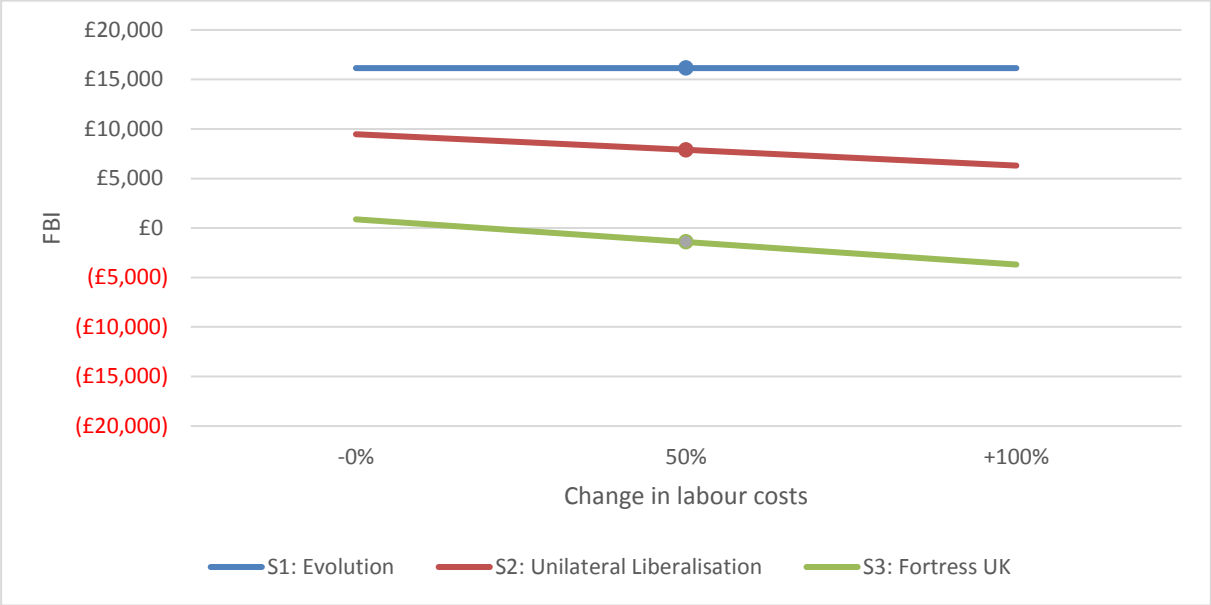


**Figure A1.15: Sensitivity analysis of labour costs on FBI: LFA sheep and beef**

### A1.4.3. Price sensitivity

On LFA sheep and beef farms, the sheep enterprise accounts for 48% of production output and the beef enterprise for 41%. The impact of varying the price assumptions used for both are examined below.

Under ***Scenario 1: Evolution***, the impact of varying the sheep price by ±10 percentage points would result in a ±19% change in FBI. Under ***Scenario 2: Unilateral Liberalisation***, this would result in a ±39% change in FBI, while under ***Scenario 3: Fortress UK***, a ±10 percentage point change in the sheep price would induce a ±218% change in FBI. Note that the progressively lower FBIs across the scenarios magnifies the impact in percentage terms.

**Table A1.16: Sensitivity analysis of sheep price on FBI: LFA sheep and beef**

| | Change in price used | Change in sheep price relative to price used | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | -5.00% | £6,917 | £9,994 | £13,070 | £16,146 | £19,222 | £22,298 | £25,374 |
| **S2: Unilateral Liberalisation** | -20.04% | -£1,342 | £1,734 | £4,810 | £7,886 | £10,962 | £14,039 | £17,115 |
| **S3: Fortress UK** | -25.42% | -£10,638 | -£7,561 | -£4,485 | -£1,409 | £1,667 | £4,743 | £7,820 |

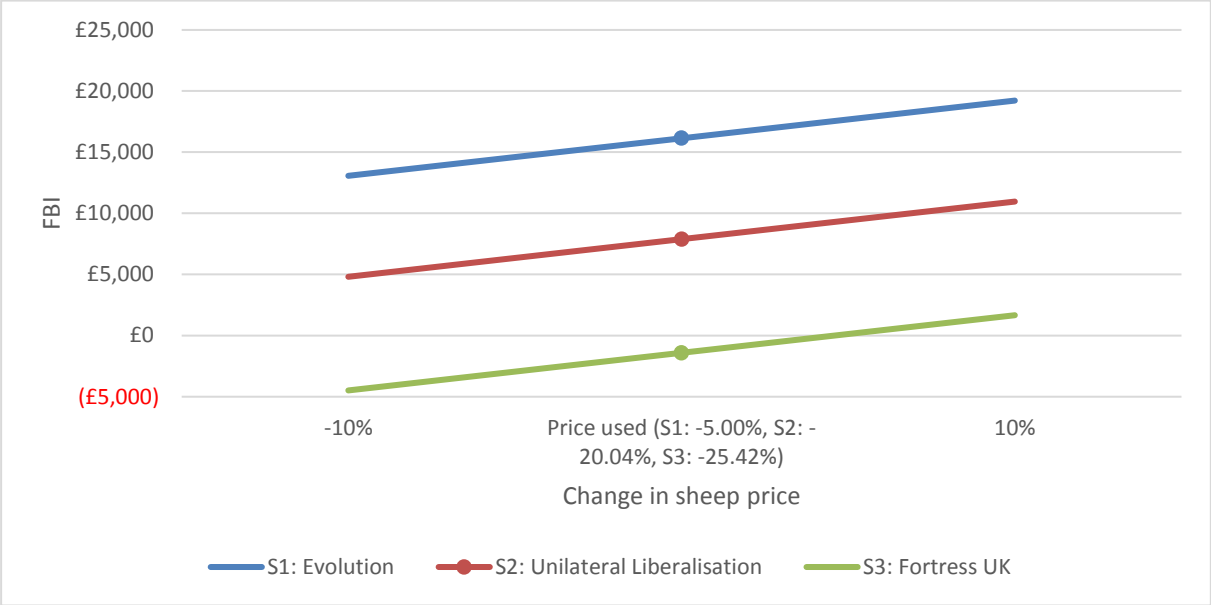


**Figure A1.16: Sensitivity analysis of sheep price on FBI: LFA sheep and beef**

The beef price has a less significant impact on FBI than the sheep price, but varying it still makes a considerable difference to profitability. A ±10 percentage point change in the beef price induces a ±16% change in FBI under ***Scenario 1: Evolution***. Varying the beef price by the same amount results in a ±34% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±188% change in FBI under ***Scenario 3: Fortress UK***. Again, the magnitude of impact in percentage terms is influenced by the starting level of FBI. Had beef prices been calculated using the same data as Berkum, *et al.* (2016), rather than the more recent estimates used here, FBI under ***Scenario 2: Unilateral Liberalisation*** would have been substantially negative.

**Table A1.17: Sensitivity analysis of beef price on FBI: LFA sheep and beef**

| | Change in price used | Change in beef price relative to price used | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | +4.55% | £8,212 | £10,857 | £13,501 | £16,146 | £18,790 | £21,435 | £24,079 |
| **S2: Unilateral Liberalisation** | -0.45% | -£47 | £2,597 | £5,242 | £7,886 | £10,531 | £13,175 | £15,820 |
| **S3: Fortress UK** | 21.45% | -£9,342 | -£6,698 | -£4,053 | -£1,409 | £1,236 | £3,880 | £6,525 |

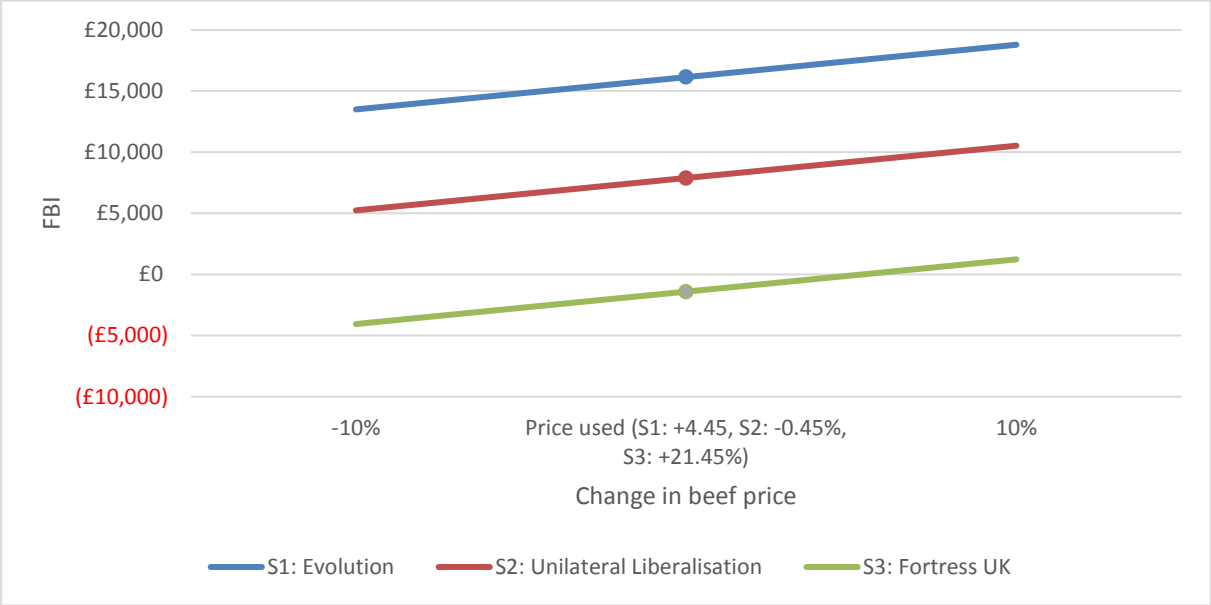


**Figure A1.17: Sensitivity analysis of beef price on FBI: LFA sheep and beef**

### A1.4.4. Regulatory cost sensitivity

The impact of varying the cost saving from reductions in regulations under Scenario 2: Unilateral Liberalisation is shown below. A ±1 percentage point change in these costs would result in a ±2% change in FBI.

**Table A1.18: Sensitivity analysis of regulatory cost reduction on FBI: LFA sheep and beef**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £7,382 | £7,550 | £7,718 | £7,886 | £8,054 | £8,222 | £8,390 |

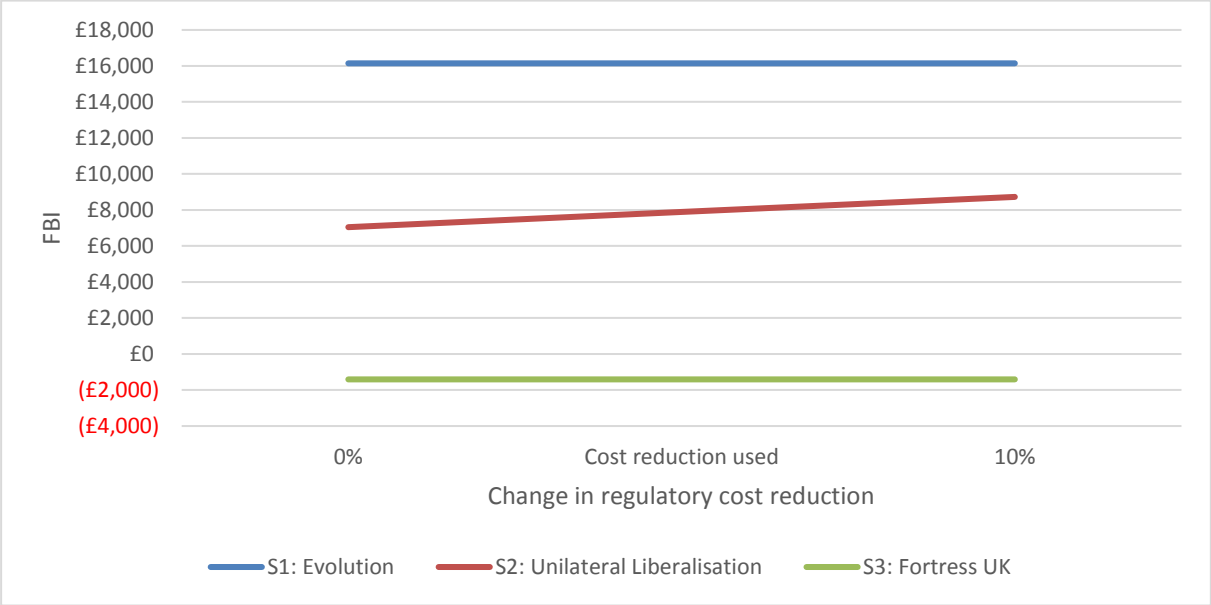


**Figure A1.18: Sensitivity analysis of regulatory cost reduction on FBI: LFA sheep and beef**

## A1.5. Lowland sheep and beef

### A1.5.1. Pillar II sensitivity

If Pillar II payments were in the form of compensation for income foregone by following prescribed actions, rather than as additional income, then FBI would be reduced. The impact of progressive increases in the proportion of payments made for income foregone is shown below. Under ***Scenario 2: Unilateral Liberalisation***, treating 25% of new Pillar II payments as income foregone would reduce FBI to almost £0, and further adjustments would render FBI negative. The impact is less severe under ***Scenario 3: Fortress UK*** and FBI would remain positive even if all Pillar II income was for income foregone. As the Figure shows, FBI under scenarios 2 and 3 starts from a similar level, but would be substantially different if all additional payments were for income foregone.

**Table A1.19: Sensitivity analysis of Pillar II support on FBI: Lowland sheep and beef**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £16,220 | £16,220 | £16,220 | £16,220 | £16,220 |
| **S2: Unilateral Liberalisation** | -£5,447 | -£3,373 | -£1,299 | £775 | £2,849 |
| **S3: Fortress UK** | £1,914 | £2,301 | £2,687 | £3,074 | £3,461 |

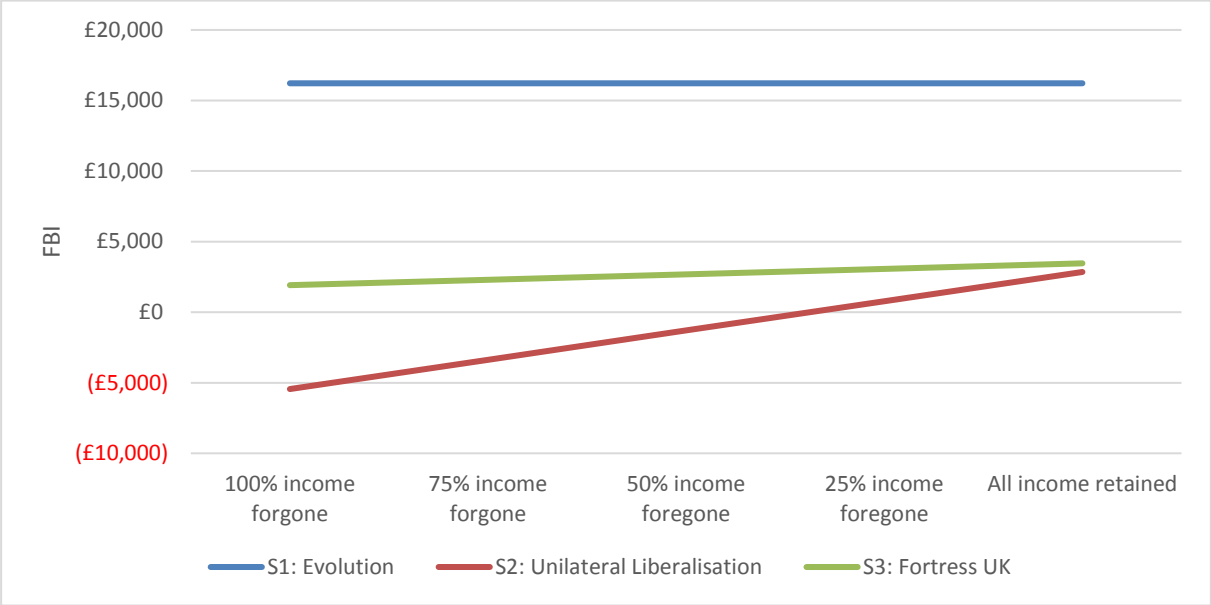


**Figure A1.19: Sensitivity analysis of Pillar II support on FBI: Lowland sheep and beef**

### A1.5.2. Labour cost sensitivity

The data below show the impact of varying the assumption on additional labour costs. A ±10 percentage point change in the cost assumed would result in a ±16% change in FBI under both ***Scenario 2: Unilateral Liberalisation*** and ***Scenario 3: Fortress UK***, although the magnitude of change would be greater under the third scenario as increases in labour costs would apply to casual as well as regular labour.

**Table A1.20: Sensitivity analysis of labour costs on FBI: Lowland sheep and beef**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used (50%)** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £16,220 | £16,220 | £16,220 | £16,220 | £16,220 | £16,220 | £16,220 |
| **S2: Unilateral Liberalisation** | £1,508 | £1,955 | £2,402 | £2,849 | £3,296 | £3,743 | £4,191 |
| **S3: Fortress UK** | £1,828 | £2,372 | £2,916 | £3,461 | £4,005 | £4,549 | £5,093 |

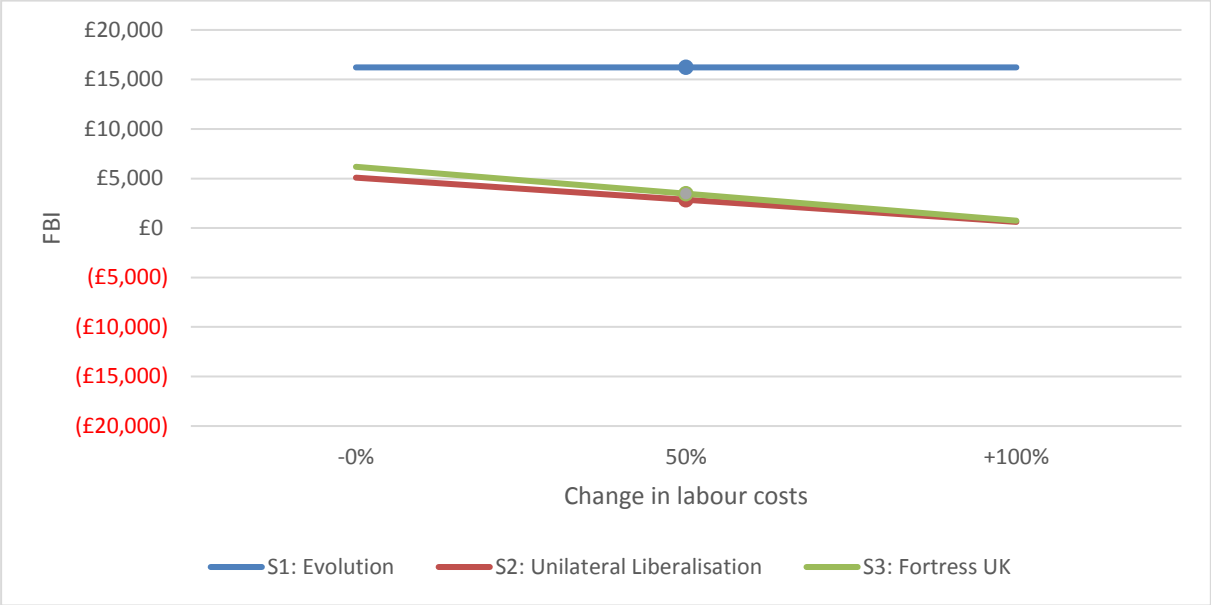


**Figure A1.20: Sensitivity analysis of labour costs on FBI: Lowland sheep and beef**

### A1.5.3. Price sensitivity

On Lowland sheep and beef farms, the sheep enterprise accounts for 24% of production output and the beef enterprise for 53%. The impact of varying the price assumptions used for both are examined below.

A change of ±10 percentage points in the sheep price would result in a ±11% change in FBI under ***Scenario 1: Evolution***, a ±60% change under ***Scenario 2: Unilateral Liberalisation*** and a ±49% change under ***Scenario 3: Fortress UK***. FBI would turn negative with a 20 percentage point decrease in the sheep price used under ***Scenario 2: Unilateral Liberalisation*** and with a slightly larger decrease under ***Scenario 3: Fortress UK***.

**Table A1.21: Sensitivity analysis of sheep price on FBI: Lowland sheep and beef**

| | Change in price used | Change in FBI relative to sheep price used | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | -5.00% | £11,123 | £12,822 | £14,521 | £16,220 | £17,919 | £19,618 | £21,316 |
| **S2: Unilateral Liberalisation** | -20.04% | -£2,247 | -£548 | £1,150 | £2,849 | £4,548 | £6,247 | £7,946 |
| **S3: Fortress UK** | -25.42% | -£1,636 | £63 | £1,762 | £3,461 | £5,159 | £6,858 | £8,557 |

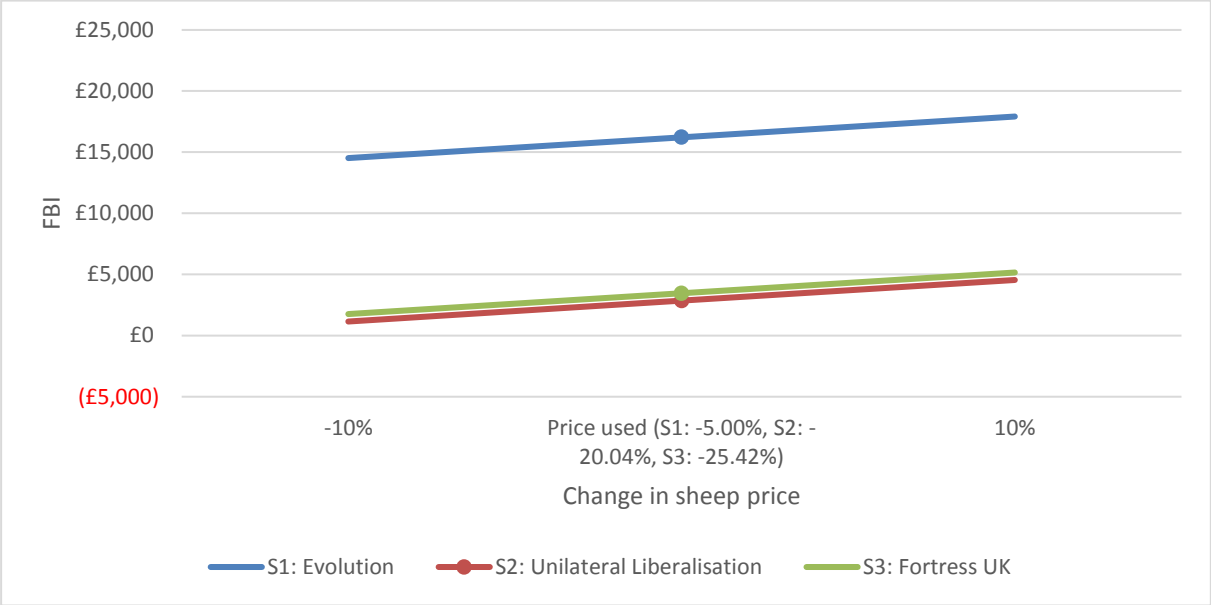


**Figure A1.21: Sensitivity analysis of sheep price on FBI: Lowland sheep and beef**

A ±10 percentage point change in the beef price used would result in a ±23% change in FBI under ***Scenario 1: Evolution***, ±132% under ***Scenario 2: Unilateral Liberalisation*** and ±109% under ***Scenario 3: Fortress UK***. FBI would become negative with a 10 percentage point decrease in the beef price under both the second and third scenarios. In the case of ***Scenario 3: Fortress UK***, a 10 percentage point decrease in the beef price used would still imply an increase in beef prices; the reduction in FBI here would result from the substantial price declines in the sheep price which the increase in beef price would no longer compensate for. Had beef prices been calculated using the same data as Berkum, *et al.* (2016), rather than the more recent estimates used here, FBI under ***Scenario 2: Unilateral Liberalisation*** would have been very substantially negative.

**Table A1.22: Sensitivity analysis of beef price on FBI: Lowland sheep and beef**

| | Change in price used | Change in FBI relative to beef price | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | +4.55% | £4,938 | £8,698 | £12,459 | £16,220 | £19,980 | £23,741 | £27,502 |
| **S2: Unilateral Liberalisation** | -0.45% | -£8,433 | -£4,672 | -£911 | £2,849 | £6,610 | £10,371 | £14,131 |
| **S3: Fortress UK** | 21.45% | -£7,821 | -£4,061 | -£300 | £3,461 | £7,221 | £10,982 | £14,743 |

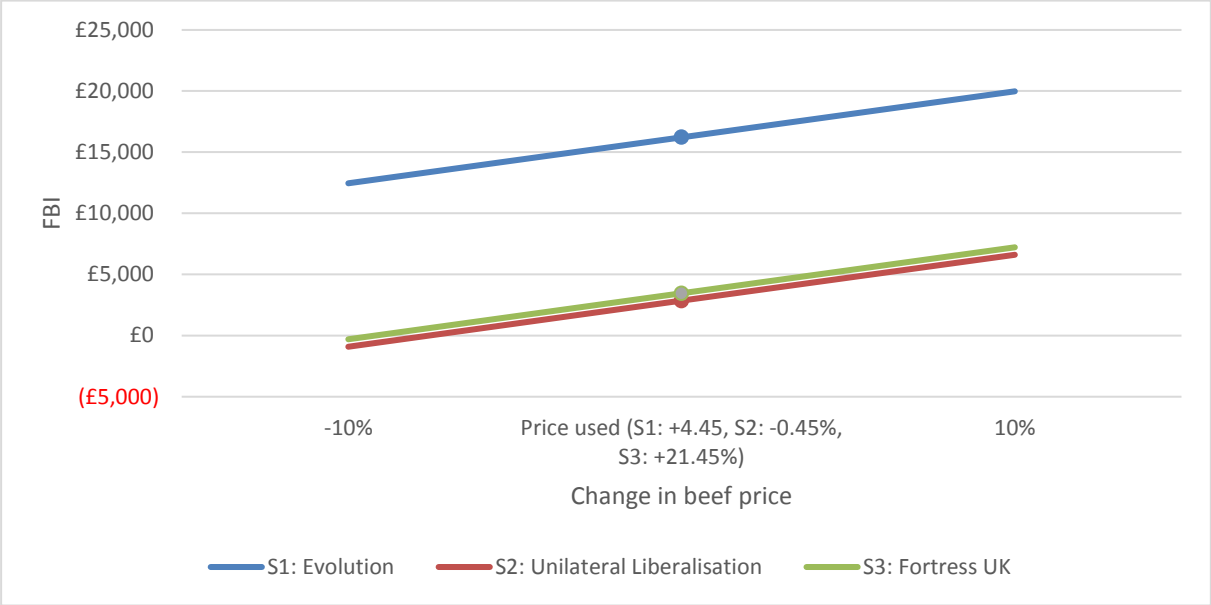


**Figure A1.22: Sensitivity analysis of beef price on FBI: Lowland sheep and beef**

### A1.5.4. Regulatory cost sensitivity

The impact of varying the cost saving possible through reducing regulation under ***Scenario 2: Unilateral Liberalisation***, is shown below. A ±1 percentage point change in the cost reduction would result in a ±6% change in FBI.

**Table A1.23: Sensitivity analysis of regulatory cost reduction on FBI: Lowland sheep and beef**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used (5%) | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £2,323 | £2,499 | £2,674 | £2,849 | £3,025 | £3,200 | £3,376 |

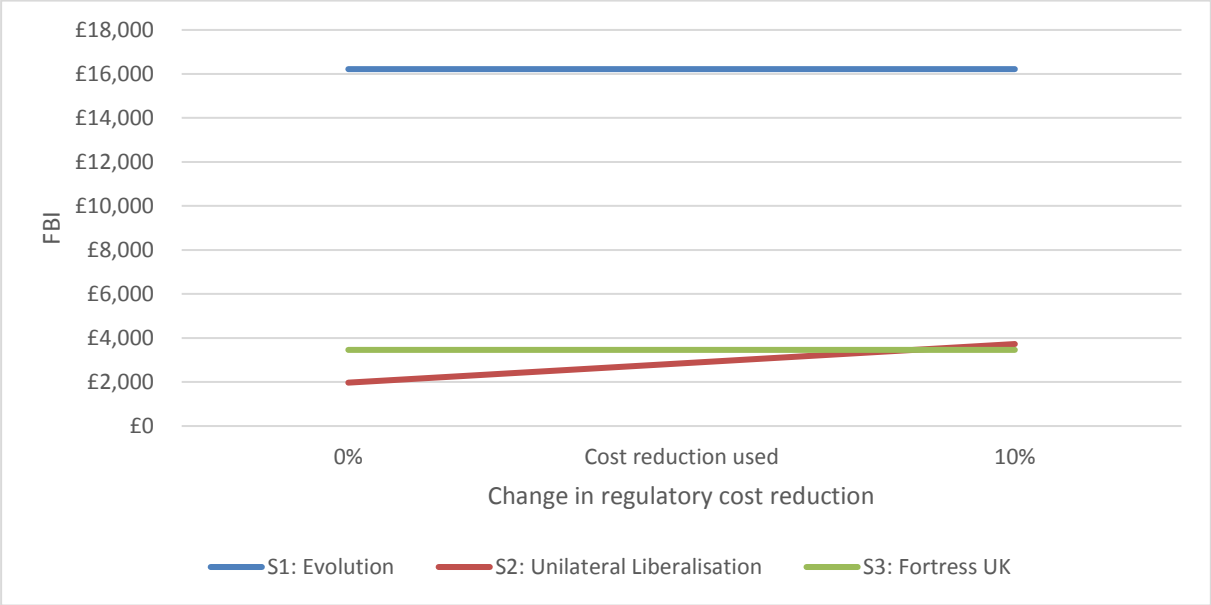


**Figure A1.23: Sensitivity analysis of regulatory cost reduction on FBI: Lowland sheep and beef**

## A1.6. Dairy

### A1.6.1. Pillar II sensitivity

Pillar II payments account for only a very small proportion of FBI (1% in the baseline) and, as a result, varying the proportion of new Pillar II payments made in the form of additional income or as compensation for income foregone makes little difference to FBI under the scenarios, although the impact is greater under ***Scenario 2: Unilateral Liberalisation*** where Pillar II is considerably expanded.

**Table A1.24: Sensitivity analysis of Pillar II support on FBI: Dairy**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £93,853 | £93,853 | £93,853 | £93,853 | £93,853 |
| **S2: Unilateral Liberalisation** | £39,347 | £41,289 | £43,231 | £45,174 | £47,116 |
| **S3: Fortress UK** | £95,181 | £95,543 | £95,905 | £96,267 | £96,629 |

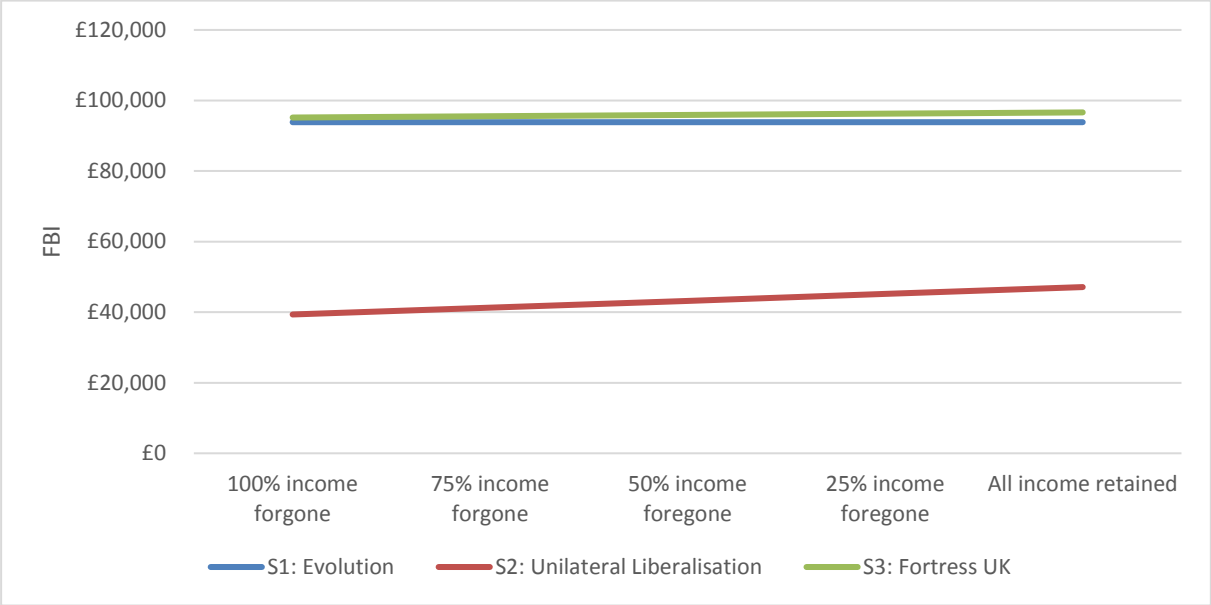


**Figure A1.24: Sensitivity analysis of Pillar II support on FBI: Dairy**

### A1.6.2. Labour cost sensitivity

The impact of varying the assumption on the additional cost of labour is examined below. The impact on FBI is greatest in percentage terms under ***Scenario 2: Unilateral Liberalisation***, partly as a result of the lower starting FBI. Here a ±10 percentage point change in the cost of labour would result in a ±9% change in FBI. Under ***Scenario 3: Fortress UK***, where causal labour as well as regular labour is subject to increased cost, a ±10 percentage point change in the labour cost assumption would result in a ±5% change in FBI.

**Table A1.25: Sensitivity analysis of labour costs on FBI: Dairy**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used (50%)** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £93,853 | £93,853 | £93,853 | £93,853 | £93,853 | £93,853 | £93,853 |
| **S2: Unilateral Liberalisation** | £35,122 | £39,120 | £43,118 | £47,116 | £51,114 | £55,112 | £59,110 |
| **S3: Fortress UK** | £82,828 | £87,428 | £92,029 | £96,629 | £101,229 | £105,829 | £110,429 |

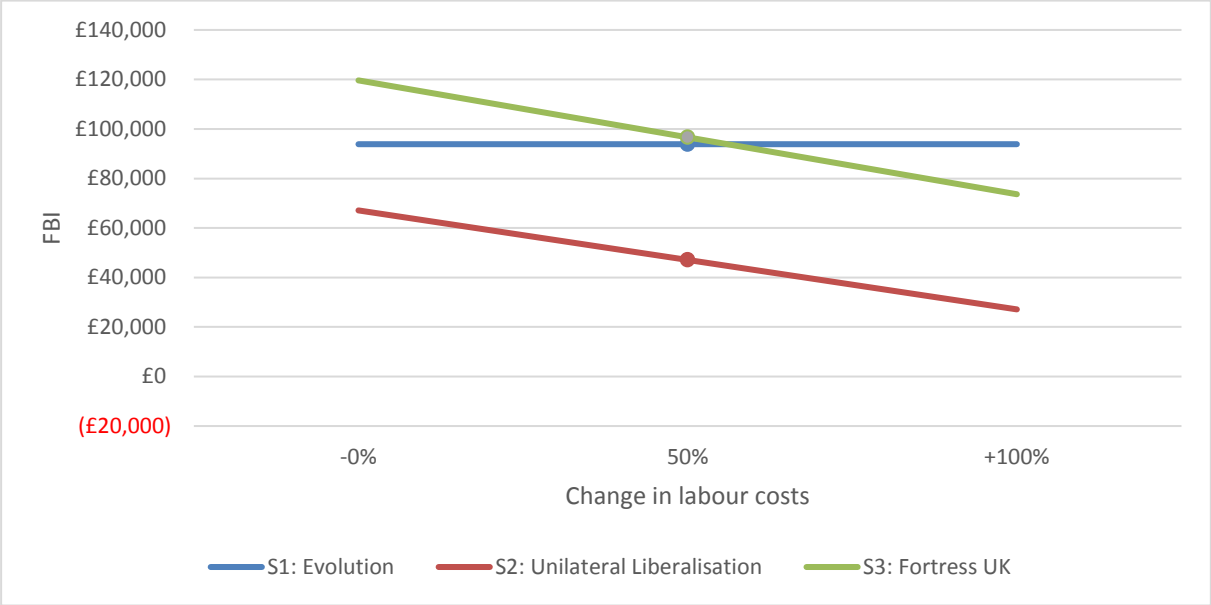


**Figure A1.25: Sensitivity analysis of labour costs on FBI: Dairy**

### A1.6.3. Price sensitivity

By definition, milk is the dominant output on dairy farms and changing the price assumptions used can be expected to have an appreciable impact on FBI. The impact of changing the price assumptions is shown below. A ±10 percentage point change in milk price would equate to a ±43% change in FBI under ***Scenario 1: Evolution*** and a similar change of ±42% under ***Scenario 3: Fortress UK*** (because starting FBI is similar). The lower starting FBI under ***Scenario 2: Unilateral Liberalisation***, means that a ±10 percentage point change in the milk price would induce a ±85% change in FBI.

**Table A1.26: Sensitivity analysis of milk price on FBI: Dairy**

| | Change in price used | Change in FBI relative to milk price | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | 3.97% | -£26,542 | £13,590 | £53,721 | £93,853 | £133,984 | £174,116 | £214,247 |
| **S2: Unilateral Liberalisation** | 0.40% | -£73,278 | -£33,147 | £6,985 | £47,116 | £87,247 | £127,379 | £167,510 |
| **S3: Fortress UK** | 12.09% | -£23,766 | £16,366 | £56,497 | £96,629 | £136,760 | £176,892 | £217,023 |

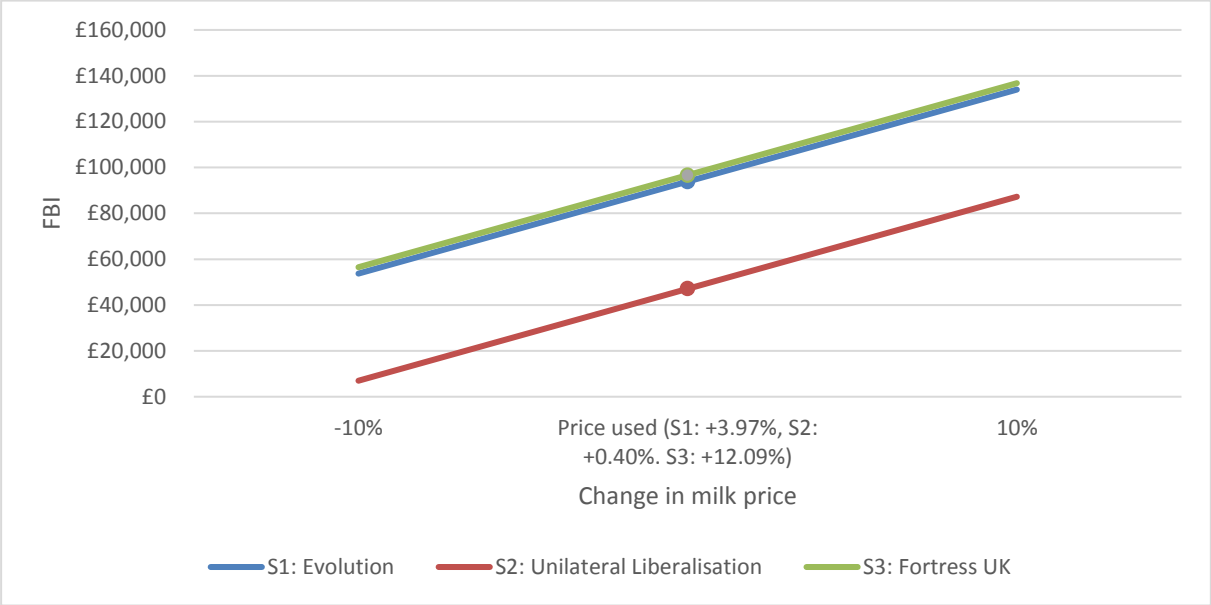


**Figure A1.26: Sensitivity analysis of milk price on FBI: Dairy**

### A1.6.4. Regulatory cost sensitivity

The impact of changing the regulatory cost saving under ***Scenario 2: Unilateral Liberalisation*** is shown below. A ±1 percentage point change in the saving possible would result in a ±2% change in FBI.

**Table A1.27: Sensitivity analysis of regulatory cost reduction on FBI: Dairy**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **Cost reduction used** | **6%** | **7%** | **8%** |
| **S2: Unilateral Liberalisation** | £44,451 | £45,339 | £46,228 | £47,116 | £48,004 | £48,892 | £49,781 |

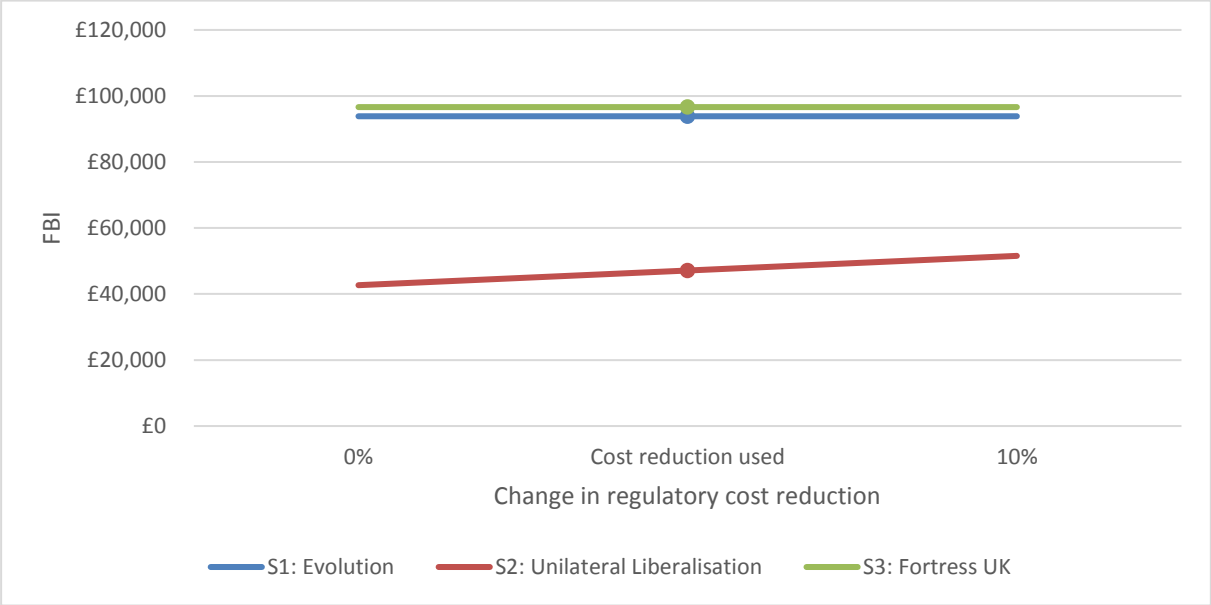


**Figure A1.27: Sensitivity analysis of regulatory cost reduction on FBI: Dairy**

## A1.7. Pigs

### A1.7.1. Pillar II sensitivity

As was the case with dairy farms, Pillar II payments account for only a very small proportion of pig farm FBI (<0.5% in the baseline) and, as a result, varying the proportion of new Pillar II payments made in the form of additional income or as compensation for income foregone makes little difference to FBI under the scenarios.

**Table A1.28: Sensitivity analysis of Pillar II support on FBI: Pigs**

| | 100% income forgone | 75% income forgone | 50% income foregone | 25% income foregone | All income retained |
|---|---|---|---|---|---|
| **S1: Evolution** | £68,708 | £68,708 | £68,708 | £68,708 | £68,708 |
| **S2: Unilateral Liberalisation** | £53,727 | £54,650 | £55,573 | £56,495 | £57,418 |
| **S3: Fortress UK** | £204,666 | £204,838 | £205,010 | £205,182 | £205,354 |

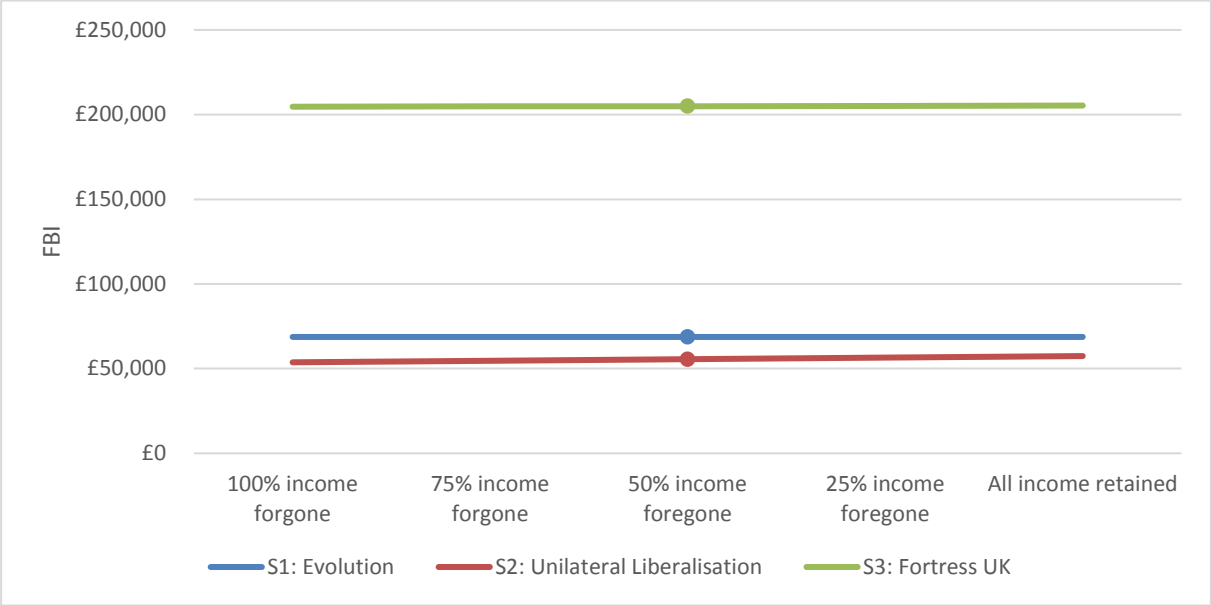


**Figure A1.28: Sensitivity analysis of Pillar II support on FBI: Pigs**

### A1.7.2. Labour cost sensitivity

The impact of changing the labour cost assumption is examined below. A ±10 percentage point change in the cost of regular labour would lead to a ±9% change in FBI under ***Scenario 2: Unilateral Liberalisation*** and a ±3% change in FBI under ***Scenario 3: Fortress UK***, where causal as well as regular labour costs will increase.

**Table A1.29: Sensitivity analysis of labour costs on FBI: Pigs**

| | Change in FBI relative to labour cost change | | | | | | |
|---|---|---|---|---|---|---|---|
| | **80%** | **70%** | **60%** | **Cost used (50%)** | **40%** | **30%** | **20%** |
| **S1: Evolution** | £68,708 | £68,708 | £68,708 | £68,708 | £68,708 | £68,708 | £68,708 |
| **S2: Unilateral Liberalisation** | £42,513 | £47,481 | £52,450 | £57,418 | £62,387 | £67,355 | £72,323 |
| **S3: Fortress UK** | £189,596 | £194,849 | £200,101 | £205,354 | £210,606 | £215,858 | £221,111 |

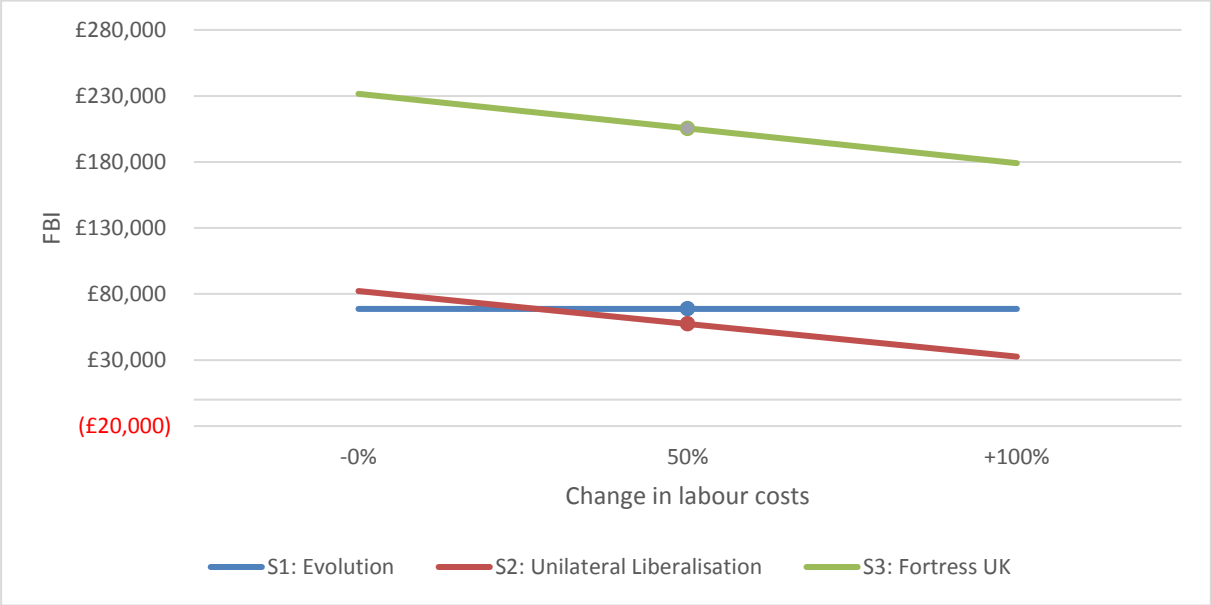


**Figure A1.29: Sensitivity analysis of labour costs on FBI: Pigs**

### A1.7.3. Price sensitivity

By definition, the pig enterprise is the most significant on pig farms. The impact of varying the price of pigs is examined below. Under ***Scenario 1: Evolution***, a ±10 percentage point change in the pig price would result in a ±65% change in FBI. Under ***Scenario 2: Unilateral Liberalisation***, a ±10 percentage point change in the pig price used would lead to a ±78% change in FBI. Under both of these scenarios, a decrease in price used of between 10 and 20 percentage points would result in negative FBI. Under ***Scenario 3: Fortress UK***, a ±10 percentage point change in the pig price used would result in a ±22% change in FBI (calculated from a much higher base).

**Table A1.30: Sensitivity analysis of pig price on FBI: Pigs**

| | Change in price used | Change in FBI relative to pig price | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | -30% | -20% | -10% | Price used | +10% | 20% | +30% |
| **S1: Evolution** | 4.23% | -£65,575 | -£20,814 | £23,947 | £68,708 | £113,468 | £158,229 | £202,990 |
| **S2: Unilateral Liberalisation** | 6.77% | -£76,864 | -£32,103 | £12,657 | £57,418 | £102,179 | £146,940 | £191,701 |
| **S3: Fortress UK** | 41.05% | £71,071 | £115,832 | £160,593 | £205,354 | £250,114 | £294,875 | £339,636 |

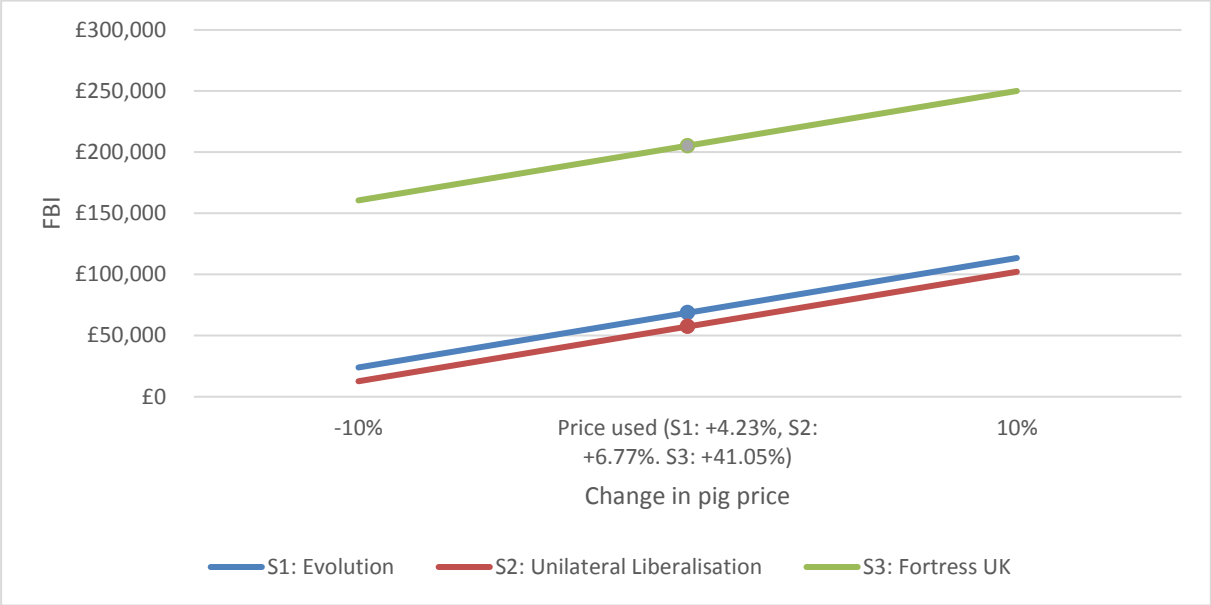


**Figure A1.30: Sensitivity analysis of milk price on FBI: Pigs**

### A1.7.4. Regulatory cost sensitivity

The impact of varying regulatory cost savings under ***Scenario 2: Unilateral Liberalisation*** is shown below. A ±1 percentage change in cost saving would result in a ±1% change in FBI.

**Table A1.31: Sensitivity analysis of regulatory cost reduction on FBI: Pigs**

| | Change in FBI relative to regulatory cost reduction | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | Cost reduction used (5%) | 6% | 7% | 8% |
| **S2: Unilateral Liberalisation** | £55,746 | £56,303 | £56,861 | £57,418 | £57,976 | £58,533 | £59,090 |

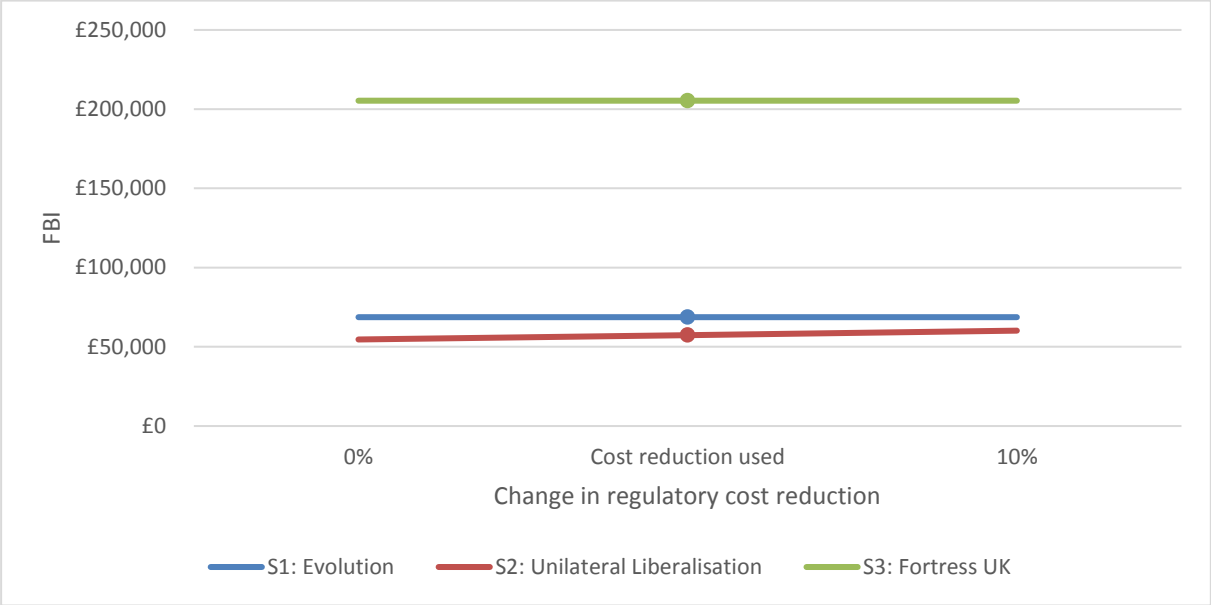


**Figure A1.31: Sensitivity analysis of regulatory cost reduction on FBI: Pigs**

# Appendix 2: Literature review

At an early stage of this research a literature review of the material available on the likely policy environments after the UK leaves the EU and the implications of them was undertaken. Some literature covers leaving the EU at an economy level, not focusing specifically on the agricultural sector or from specific angles. For example, some consider possible trade arrangements and their implications and migrant labour scenarios. While of interest, this project requires a more selective approach in which the impact on primary agriculture is considered.

The focus of this review is literature that includes material pertinent to the development of the range of scenarios facing agriculture that are of interest to the AHDB and their implication for farming output, income and structure, as set out in the terms of reference (ToR). Material encountered has been cross-referenced with the AHDB scenarios and the areas of impact specified in the ToR to develop our existing understanding of the key issues. In particular, these scenarios relate to various combinations of two factors.

The first factor is the sort of trade relationships between the UK and the EU (with implication for those with the Rest of the World (RoW)) that could emerge from the negotiations in the Brexit process. These carry implications for the prices received by UK farmers, some of the costs they face, volumes of output and subsequent net incomes of farm operators and their viability. Closely allied with trade are two further sub-factors that shape prices, costs and income - the exchange rate between the £ Sterling and other currencies, especially the Euro, and the availability and cost of migrant labour. Exchange rate changes can, and often do, overwhelm the relatively small cost differences (arising from comparative advantages and border taxes and trade facilitation costs) that determine the pattern and volume of trade.

The second factor is possible domestic agricultural policy, and in particular what may happen to the levels of Direct Payments (in particular Basic Payments) once the UK has exited from the EU and its Common Agricultural Policy. This topic is complicated by the fact that the devolved administrations may choose to apply different types of support post-Brexit, or to use different levels of the same support mechanism.

A critique is made of the studies encountered, including their methodological approaches, strengths and weaknesses, and the results they contain.

### A2.1.1. Sources of literature encountered

In terms of primary sector farming, significant reports have been produced by and for various organisations which contain insights into how trade policy might look and what this is likely to mean for the farming sector (though additional stages in the food chain may also be covered). Others have focused on domestic policy and in particular on the way that Direct Payments to farms may evolve. Some papers combine both trade and domestic policy expectations.

In addition, various papers have been produced by academics and industry bodies which have examined the implications of Brexit for the agricultural sector or specific sub-sectors. Of note here are the various papers produced by the AHDB itself, which provide additional information on the scenarios presented in the ToR. The CAP reform website operated by Professor Alan Matthews contains some useful papers, as do several other Brexit-related sites such as the UK Trade Policy Observatory. Professor Alan Swinbank has authored a number of useful papers.

Considerable information has been provided to the House of Commons and House of Lords Select Committees dealing with Brexit (the House of Lords has a sub-committee devoted to Brexit and agriculture). Evidence given to these Parliamentary bodies often duplicates the reports and papers mentioned previously, though the Committee system allows for a degree of scrutiny and follow-up of points of interest.

During the conduct of this study for the AHDB Defra was known to be working on sector-level modelling of Brexit (funding a FAPRI project with the other agricultural departments in the UK), though this was not put in the public domain until 16 August 2017, too late to influence the methodology applied here. In practice, where the present research and the 2017 FAPRI work overlap (the impact of alterative trading relationship on commodity prices), the results largely confirm the approach used by the present research for the AHDB, and where significant differences occur these can be explained by, for example, the use of different baseline data (see section 4.3 of the main report). The 2017 FAPRI work made no attempt to model the impacts at the farm level, or to build factors such as domestic policy or labour costs into its analysis, so its ability to throw light onto the scenarios set by the AHDB is limited. However, for completeness, the 2017 FAPRI is included in this literature review.

Earlier FAPRI results for the UK from modelling CAP reform scenarios (2009) are of relevance, as they consider the impact on prices of both trade liberalisation and the reduction of Direct Payments (which are assumed to have indirect links with production despite their decoupled nature). Independently Defra has published farm-level estimates of the impact on incomes of reducing Direct Payments, using FBS data averaged over five years (see below). Defra also held a one-day conference in association with the Agricultural Economics Society in February 2017 which considered the policy framework post-Brexit. Presentations made provided insights into the possible impacts of future policy choices. There is also a wealth of information in the specialist farming press covering Brexit in general and specific issues such as the importance of public support in farm incomes, the need to access labour, etc.

### A2.1.2. Findings on the scope of the literature

In terms of considering the impacts arising from the scenarios the literature is characterised by a small number that are of direct relevance and a long tail that are marginal. This outcome is reflected in Table A2.1 that deals with the more major items. It will be seen that all Brexit studies listed from 2016 and

2017 discuss possible trade effects on agriculture, and many employ scenarios, though only two (from NFU/LEI and FAPRI) contains quantified estimates of the impact on prices and output.

While discussion of domestic support is again common, only five use farm-level models to estimate the first-round implications for incomes of reducing or removing Direct Payments (of which that by Buckwell (2016) for the Worshipful Company of Farmers adopts the findings of Gardner (2015) in an early version of the Informa work). Defra's analysis is strengthened by being based on five-year averages at the farm level, using a sub-sample of the FBS and making use of access to data of individual farms.

On the issue of how farmers adapt to economic pressures and shocks, a very large literature exists going back many decades, though this is generic rather than linked directly to the likely impact on markets and incomes that might result from Brexit. For the present purpose, a few representative examples are sufficient to indicate likely responses. These are covered after the main body of literature. Consideration is given to the potential use of transition arrangements to facilitate adjustment.

Mention should be made of two further pieces of literature that, while being noted, have not been included in our review. First, in August 2017 a study for the Land Use Policy Group (LUPG) was published (Baldock *et al.*, 2017). Its focus was the land use and environmental consequences of Brexit rather than the impact on farm businesses and their incomes. It used scenarios, but the way these were devised and their level of complexity differed from other studies reviewed here. Each scenario reflected a certain conceivable direction of policy travel, bringing together different combinations of choice variables/drivers ranging over a panorama of plausible futures, but not assuming continuity with the present approaches and attitudes. There was no attempt to model independently incomes at the farm level, figures being adopted from earlier work by Berkum *et al.* 2016). Second, the study by Haverty (2017) on the impact of WTO Trading on the Northern Ireland beef and sheep meat industry, though containing elements of interest for post-Brexit conditions (such as scenarios of WTO-equivalence and open trade) and parallels in methodology with some other research (such as trade modelling simulation (GTAP analysis) to quantify the impact of WTO trading under two scenarios) was felt to be too restricted in its use of variables, types of farming and geographical specifics for detailed inclusion here.

Thus, the literature review needs to concentrate on those listed first, as these are the more capable of throwing light onto the AHDB scenarios, though the others generally have something additional to contribute of value. This is the order in which the literature is reviewed, though the bibliography is also presented in alphabetical order.

**Table A2.1: Scope of literature**

| Source | Author | Date | Scenarios relevant to this study | Trade effects on agriculture discussed / quantified | Direct Payments micro-models | Sectoral | General message |
|---|---|---|---|---|---|---|---|
| **FAPRI** | Moss, J. et al. | 2009 | 2 | Yes and quantified | No | Yes | Relates to changes outside Brexit, but similar scenarios |
| **FAPRI** | Davis, et al. | 2017 | 3 | Yes and quantified | No | Yes | Very similar impacts on prices to this research |
| **NFU/LEI** | Berkum et al. | 2016 (April) | 9 (3 trade & 3 Direct Payment levels | Yes and quantified | Yes | Yes | Scenarios produce a range of outcomes |
| **Informa(a)** | Gardner, B | 2016 (early) | 3 | Yes | Yes | Yes | Differential impacts across farming types |
| **Informa (b)** | | 2017 | 3 | Yes | Yes | Yes | Updated farm-level impacts from the above |
| **Yorkshire Agricultural Society** | Grant, W. (chair) | 2016 | 5 | Yes | No | Yes | Focus on other factors – labour and devolved administrations |
| **Rabobank** | Rabobank | 2017 | 3 | Yes | No | No | Changes in prices received by UK farmers and shifts in production suggested |
| **Worshipful Company of Farmers** | Buckwell, A | Feb 2016 | 2 implied | Yes | Yes (adopts Informa analysis) | No | Trade effects can be expected to affect prices, as will levels of Direct Payments affect income |
| **House of Commons** | House of Commons | 2016 (August) | None | Yes | No | No | Identifies areas of uncertainty and of opportunity |
| **House of Lords** | House of Lords | 2016 (December) | None | No | No | No | Considers possible UK-EU trading relationship in general terms |
| **House of Lords** | House of Lords | 2017a (March) | None | Yes | No | No | Considers impacts of tariffs, touches on immigrant labour |

| Source | Author | Date | Scenarios relevant to this study | Trade effects on agriculture discussed / quantified | Direct Payments micro-models | Sectoral | General message |
|---|---|---|---|---|---|---|---|
| **House of Lords** | House of Lords | 2017b (May) | None | Yes | No | No | Attention given to migrant labour and regulation |
| **UK2020** | Patterson, O. | 2017 | None | Yes | No | No | Opportunities. Migrant labour and regulations mentioned |
| **Food Research Collaboration** | Lang, T. and Schoen, V. | 2016 | 5 | No | No | No | Some focus on commodity details |
| **UK Trade Observatory** | Swinbank, A. | 2017 | None | Yes | No | No | Commodity prices could rise or fall dependent on trade arrangements |
| **Centre for Policy Studies** | Packer, R. | Jan 2017 | None | Yes | No | No | UK prices could rise or fall, depending on outcome of trade negotiations |
| **Bootle** | Bootle, R. | 2015 | 2 (of 7) | Yes | No | No | Agriculture not treated specifically |
| **British Retail Consortium** | British Retail Consortium | 2017 | 2 implied | Yes | No | No | Covers food consumers, but no mention of agriculture |
| **Defra** | Defra | 2016 | None | No | Yes | Yes | Only considers cuts in Direct Payments and their impacts on income distribution |
| **Selected publications on farmers' response to economic pressures and shocks** | | | | | | | |
| **MAFF** | | 1999 | n/a | n/a | | | Evidence for dynamic adjustment |
| **WRO** | | 2010 | n/a | n/a | | | Diversity of responses within farming to reducing support, with 28% carrying on as before |
| **CAS, Reading** | Harrison and Tranter | 1989 | n/a | n/a | | | Diversity of responses, with 29% making no change |
| **FMU, Reading** | Errington and Tranter | 1991 | n/a | n/a | | | Same diversity of responses as CAS (1989), but with fewer making no change as the financial pressure continued |
| **Blandford and Hill** | | 2006 | n/a | n/a | | | Summarises evidence of agricultural adjustment in many industrialised |

| Source | Author | Date | Scenarios relevant to this study | Trade effects on agriculture discussed / quantified | Direct Payments micro-models | Sectoral | General message |
|---|---|---|---|---|---|---|---|
| | | | | | | | countries, including USA and New Zealand. Policymakers have frequently under-estimated the ability of farmers to adjust |
| **Hill** | | 2010 | n/a | | | | Reviewed the need for transitional arrangements to accompany removal of direct income payments |

### A2.2. Main findings from the literature

While it is conventional to list conclusions at the end of a literature review, on this occasion the lessons learned for this AHDB study can be summarised at the outset.

#### A2.2.1. General points

- Sector-level models (as used by some of the prominent studies, such as that by LEI for the NFU (Berkum *et al.*, 2016) and FAPRI-UK (Davis, *et al.*, 2017) are dependent on the assumptions and coefficients built into them. Policy scenarios that represent large shifts (such as are represented by some of the scenarios put forward by the AHDB) and contain the potential to trigger structural changes are less suitable for modelling, and any results should be interpreted with caution. Davis, *et al.* (2017) make the point that some of the projected price changes go beyond the range of variation on which the FAPRI model is calibrated and note that this adds some uncertainty to their projections.
- Static analysis at the farm level of changes in support policy, prices and/or costs ignores the behavioural responses by farmers, who have a proven ability to adapt their production and businesses, including by both short-term adjustments and longer-term structural change, investment and innovation. Again, first round impacts should not be interpreted as the final adjusted position.

#### A2.2.2. Support under UK domestic agricultural policy

- It is widely assumed in the literature that Pillar I payments to UK farmers will be reduced or terminated post-Brexit (though assurances by the Conservative government indicate that they will be maintained to 2022).
- It is also widely assumed that Pillar II payments, encompassing agri-environment and other payments under the Rural Development Programme, will be at least continued post-exit from the EU.
- Both forms of support will be/are devolved responsibilities, and different patterns and levels may emerge in the constituent countries of the UK.
- Static analysis can easily show that removing or scaling back Pillar I payments would have significant impacts on Farm Business Income, and would be particularly damaging for certain farming types (such as LFA livestock farms).
- Defra's analysis on the initial impact of cutting the level of Pillar I payments on income distributions, based on averaging figures on individual farms over five years, shows a predictable shift towards lower incomes.
- There is evidence that there is a wide variety of responses at the farm level to economic shocks. However, the proportion of farmers who intend to 'carry on as before' in the face of economic signals declines with greater persistence of these signals, and more fundamental changes are explored.
- Policymakers have in the past frequently under-estimated the ability of farmers and their households, as a group, to adjust to economic shocks. Given adequate notice, transitional

arrangements, which may be advocated on economic, welfare or political economy grounds, may be unnecessary. However, experience in New Zealand points to the contribution that can be made by an exit package, financial advice and support to household consumption.

- Though Pillar I payments are nominally decoupled from production decisions, there are links that impinge on production decisions, so that removal of such payments could be expected to impact on output. Though more likely to affect sectors that are relatively large recipients of such payments, the extent of this output link is not well established.

#### A2.2.3. Labour costs

- Several studies have considered the implications of Brexit for the supply of labour to the UK agricultural industry, and specifically the way that the supply of migrant labour will be affected.
- It is widely assumed that restricting access to migrant labour will cause difficulties for agriculture, with the greatest impact likely to be seen in the horticulture sector. The impact of these restrictions is assumed to be reflected in the labour costs faced by agricultural businesses.
- Wages are not the only factor in attracting labour. A lack of available UK labour and the perception of difficult working conditions is likely to exacerbate the difficulties in replacing migrant labour with UK employees.
- The NFU-LEI study on Brexit (Berkum *et al.*, 2016), with its modelling of commodity prices and trade, did not include any movement of labour costs, an important gap especially with the horticulture sector. Labour cost changes were also beyond the scope of the FAPRI analysis (Davis, *et al.*, 2017).
- There is no direct evidence on the likely increase in labour costs. However, there is evidence on the impact of higher labour costs on output prices which can be used to estimate the implied increase in labour costs.

#### A2.2.4. Trade arrangements

- Leaving the EU Single Market (even though remaining in a Customs Union or Free Trade Area with the EU) will incur additional costs to trading, in the form of more border controls, checks on regulatory compliance, etc. For commodities that the UK imports, this will lead to a rise in market prices for UK farmers. *Ceteris paribus* this will lead to greater domestic production (replacing imports) and farm incomes will increase. [The quantity demanded in the UK will also be reduced by the rise in market prices.]
- Trading relationships that involve placing import taxes on trade coming into the UK from the EU will take this increase in market price a stage further, resulting in higher prices and higher incomes for UK farmers, further expansion in domestic production and reduced imports. A similar effect will come from raising existing tariff levels. [Note: this effect on prices will cease once imports have been reduced to zero.]
- Trading relationships that open the UK market for commodities that UK agriculture produces to low-cost suppliers will lower the market price received by British farmers, cause them to supply less, and put downward pressure on their incomes.

- Where the UK exports farm output to the EU, more impediments (border checks, etc.) or tariffs (if applied by the EU on goods from the UK) are likely to depress the prices received by UK farmers.
- Only the NFU/LEI study (Berkum, *et al.*, 2016) and Davis, *et al.* (2017) quantify price shifts in these scenarios, and they do so for a range of commodities. However, there is a lack of clarity in the description of the NFU/LEI methodology that suggests alternative approaches should also be employed, such as use of a range of possible price shifts or sensitivity analysis.
- Real markets are often far more complex than can be assumed in trade models, and additional factors (such as consumer preferences for credence attributes like place of origin) need to be considered. Similarly, many commodities are not homogeneous, including lamb which can be differentiated by age and specification and seasonality.
- Currency exchange rates, as between £ Sterling and the Euro, influence competitiveness. A change here can easily outweigh any cost advantage arising from comparative advantage.
- Some costs of production in the UK will be affected by trading relationships and can influence farmers' supply decisions and farm incomes.

## A2.3. Detailed literature review

### A2.3.1. FAPRI: Impact of HM Treasury/Defra's vision for the Common Agricultural Policy on Agriculture in the UK

FAPRI (2009) Impact of HM Treasury/Defra's Vision for the Common Agricultural Policy on Agriculture in the UK. FAPRI-UK Project. Moss, J., Patton, M., Zhang, L. and Kim, I. S. (Queen's University Belfast & Agri-Food & Biosciences Institute) and Binfield, J. and Westhoff, P. (FAPRI, University of Missouri). July 2009.

Though not related to changes associated with Brexit, but to an earlier set of CAP reforms, this FAPRI study of the impact on the UK contains important parallels in the scenarios it selected. These were linked to the paper '*A Vision for the Common Agricultural Policy*' which was issued jointly by HM Treasury and Defra in 2005.

#### A2.3.1.1. Scenarios

The FAPRI model assumes a baseline of policy that was an accepted view of reality at the time, including planned changes in milk quota, set-aside, import tariffs agreed under the Uruguay Round Agreement on agriculture, and macroeconomic assumptions on whole-economy growth rates. Important in the present context was the evidence-based assumption that Single Farm Payments had a production-stimulating effect (30% in the beef, sheep and crop models and 10% in the dairy sector).

Five scenarios were analysed that represent a progression, each being an addition to the one before. These were:

1. The implementation of the 2008 CAP Health Check.
2. In addition, adoption of the Doha Round WTO reforms.
3. In addition, full decoupling (of Direct Payments) across the EU.
4. In addition, further trade liberalisation (tariffs reduced to 4%, in line with those for other sectors).
5. In addition, phasing out of the Single Farm Payment (SFP) (between 2010 and 2014), but with the provision of equivalent funds for agri-environment measures.[35] It was assumed that the [agri-environment] measures funded had 70% compliance costs (that is, the costs of providing the specified environmental services) and that the residual retained by farmers had a zero impact on production.

The focus of interest here is the way that further trade liberalisation and reduction of the SFP impacts on prices (and production) in the UK. The provision of equivalent funds to support agri-environment schemes should be noted, as should also their phasing out by 2014.

[35] The text on p5 of the report is poorly drafted but this is the clear intention.

#### A2.3.1.2. Methodology

The tool used for analysis was the FAPRI model, and specifically its UK component (FAPRI-UK). The FAPRI-UK modelling system is a collaborative activity between Queen's University Belfast, the Northern Ireland Agri-Food and Biosciences Institute, and the Food and Agricultural Policy Research Institute (FAPRI) of the University of Missouri. It is integrated with the FAPRI EU model (GOLD) and therefore produced projections which were consistent with equilibrium in the EU and the rest of the world. The models comprise a set of econometric equations for the beef, sheep, dairy, pig, poultry, cereal and oilseeds sectors of England, Wales, Scotland and Northern Ireland. Results are based on this aggregate model; there is no recourse to using FBS results as a way of predicting the impact of price changes in the incomes of farmers. Projections relate to 2018.

#### A2.3.1.3. Results

Perhaps the most relevant findings concern the ways in which Scenario 4 (further liberalisation of trade) affect prices compared with Scenario 3, and in how removing Direct Payments and their replacement by agri-environment payments (phased out by 2014 - Scenario 5) alters the results. Appendix 2 of FAPRI (2009) gives results for the main commodities in terms of percentage changes in prices, production, numbers of animals (by country), domestic consumption and net exports.

Under Scenario 4, beef over-quota tariffs are reduced to 4% - this entails actual tariff cuts of 96%. Projected cattle prices in the UK fall; the average price for finished beef animals is 26% lower compared with the baseline. (This translates into a 9% fall in production by 2018 and a decline in suckler cow numbers in England of 23%, with somewhat smaller contractions in the other countries). A further small reduction in prices accompanies the removal of Direct Payments, and there is a further negative impact on suckler cow numbers (a further 3% decline in England, but 12% in Northern Ireland, which has been more dependent on such payments).

For sheepmeat, the average price for finished sheep and lambs is projected to be 12% lower under the freer trade Scenario 4 compared with the baseline. By the end of the projection period, ewe numbers in England were estimated to be 8% lower in England, 10% lower in Wales and Northern Ireland, and 12% lower in Scotland. Overall, sheepmeat production in the UK would be 8% lower in 2018 compared with the baseline. Sheepmeat exports would fall by 34% and imports rise by 3%.

For other commodities, the additional impact on prices of further trade liberalisation is relatively muted, either because the larger effects are associated with the reforms in earlier scenarios (dairy quota removal), or because the levels of tariffs before cuts are already low (crops). The negative impact of phasing out SFP is somewhat alleviated by the assumption that producers receive high agri-environment payments to compensate; the report concludes that, without such enhancements there would be a dramatic reduction in total farm receipts, which would trigger significant structural change.

The projected changes in prices are given in Table A2.2.

**Table A2.2: Impact of FAPRI scenarios on commodity prices in the UK**

| Scenario / sector | 1 Implementation of CAP Health Check reforms | 2 + Doha Round WTO reforms | 3 + full decoupling across EU | 4 + further trade liberalisation | 5 + phasing out direct payments |
|---|---|---|---|---|---|
| **Beef** | 0% | -8% | -6% | -26% | -25% |
| **Sheepmeat** | +1% | -5% | -4% | -10% | -9% |
| **Pigmeat** | 0% | -5% | -5% | -6% | -6% |
| **Poultry** | +1% | 0% | -6% | -9% | -9% |
| **Milk** | -6% | -10% | -10% | -12% | -10% |
| **Butter** | -3% | -18% | -18% | -20% | -19% |
| **SMP** | -7% | -5% | -5% | -7% | -6% |
| **Wheat** | 1% | -2% | -2% | -1% | -1% |
| **Barley** | 1% | -2% | -2% | -1% | -1% |
| **Rapeseed** | 0% | -1% | -1% | -1% | -1% |

The report also indicates that:

- The large projected decline in beef and sheep numbers would carry environmental implications (some mixed) and economic and employment impacts and consequential threats to social cohesion in rural areas.
- The impacts would be uneven, with marginal producers in upland areas experiencing greater contractions in output.
- Where additional imports are indicated, there is the assumption that these will be available from non-EU suppliers, and there will be some impact on world prices.
- Scenarios 4 and 5 represent significant departures from existing policy, and are inherently uncertain. Fundamental changes could lead to major structural changes that are difficult to capture within a modelling perspective.
- Care should be exercised in interpretation of projected impacts.

Though the context is different from Brexit, the FAPRI-UK model provides indications of the orders of change in prices and production that might be expected from trade liberation. There is a universal downward prediction in prices received by UK farmers, particularly affecting commodities where the level of tariff protection under the CAP is high. This has implications for the volume of UK production and imports.

### A2.3.2. Impacts of alternative post-Brexit trade agreements on UK agriculture: Sector analyses using the FAPRI-UK model

Davis, J., Feng, S., Patton, M. and Binfield, J. (2017) Impacts of Alternative Post-Brexit Trade Agreements on UK Agriculture: Sector Analyses using the FAPRI-UK Model. FAPRI-UK Project, Agri-Food and Biosciences Institute and University of Missouri. August 2017.

The FAPRI-UK model captures the dynamic inter-relationships among the variables affecting supply and demand in the main agricultural sectors of England, Wales, Scotland and Northern Ireland, with sub-models covering the dairy, beef, sheep, pigs, poultry, wheat, barley, oats, rapeseed and biofuel sectors. The UK model is fully incorporated within the EU grain, oilseed, livestock and dairy (GOLD) model run by FAPRI at the University of Missouri. The commodity sub-models are solved at the European level by ensuring EU-28 excess supply equals EU-28 excess demand in all markets (Hanrahan, 2001). The key price in each model was adjusted until equilibrium was attained at the end of the study period (2025).[36] The iterative equilibrating process continues until all product markets in all years are in equilibrium. Thus, within this traditional modelling system projected UK commodity prices were determined by equilibrium at the EU-28 level and tracked continental EU prices closely.

However, for the FAPRI analysis reported in this paper that quantifies the impacts on UK agriculture of alternative trade agreements following Brexit, the FAPRI-UK model has been updated to allow for the fact that after Brexit the UK and EU markets would no longer be fully integrated. Market clearing under this updating is thus at the UK level.

Three Brexit trade scenarios are examined (i) a bespoke Free Trade Agreement (FTA) with the EU; (ii) World Trade Organisation (WTO) default Most Favoured Nation (MFN) tariffs; and, (iii) unilateral trade liberalisation. These are compared against a Baseline in which the UK is fully integrated within the Single Market. The Baseline is not specified in detail, but it is assumed that the situation is as set out in Patton, *et al.* (2016); some of these assumptions have now changed in the real world (such as currency exchange rates, which may affect the pattern of trade, or world prices).

The scenarios differ only with regard to trade policy. Though corresponding quite closely with the scenarios specified by the AHDB in this respect, they do not incorporate other changes that form part of the AHDB's scenarios, such as reduced domestic support, restricted labour supply and easing the regulatory framework for farm businesses. In common with the approach used by LEI (see Berkum, *et al.*, 2016 below), where additional trade facilitation costs are incurred, these are assumed to be 5% under Free Trade Agreements and 8% in other arrangements (using the same evidence base). Furthermore, they are assumed to be symmetrical (that is, to apply in both trade directions, which may not actually happen).

[36] This implies the use of price forecasts up to and including 2025.

Outputs from the partial equilibrium modelling system provide projected changes at the sector level, including livestock numbers, production, consumption, imports and exports, and (important in this context) producer commodity prices. For production, disaggregation into changes seen in each of the UK's constituent countries is provided.

The authors acknowledge that the model contains simplifications, such as the use of a single tariff rate for each commodity, and uncertainties, such that changes under each scenario may be influenced by the evolution of world markets and exchange rates. They point out that some of the projected price changes within the scenario analysis go beyond the range of variation experienced historically and on which their partial equilibrium model has been calibrated. Nevertheless, the authors believe that the results indicate the broad directions of change in UK agricultural commodity sectors within each trade scenario.

The most relevant part of the finding for the present research comes from the estimates of changes in UK commodity prices and production in the three trade scenarios. These are summarised in the following table.

**Table A2.3: Percentage change in UK commodity prices, production and value of output under three alternative trade scenarios compared to the Baseline at the end of the projection period (2025)**

| | | Bespoke Free Trade Agreement with the EU | WTO Default | Unilateral Trade Liberalisation |
|---|---|---|---|---|
| ***Scenario definitions:*** | | • UK retains tariff and quota free access to the EU and EU retains tariff and quota free access to the UK<br>• UK maintains EU tariff structure to rest of the world<br>• 5% trade facilitation costs on UK-EU27 trade | • MFN tariffs applied to imports from the EU<br>• TRQs from 3rd countries retained<br>• MFN tariffs applied to UK exports destined for the EU<br>• No change in tariff structure for exports to the rest of the world<br>• 8% trade facilitation costs on UK-EU27 trade | • Zero tariffs applied on imports to the UK from both the EU and the rest of the world<br>• MFN tariffs applied to UK exports destined for the EU<br>• No change in tariff structure for exports to the rest of the world<br>• 8% trade facilitation costs on UK-EU27 trade |
| ***Commodity*** | | | | |
| **Beef:** | Price | +3% | +17% | -45% |
| | Production | 0% | +10% | -10% |
| | Output value | +3% | +29% | -50% |
| **Sheep:** | Price | -1% | -30% | -29% |
| | Production | 0% | -11% | -11% |
| | Output value | -1% | -38% | -36% |
| **Pigs:** | Price | 0% | +18% | -12% |
| | Production | +1% | +22% | -6% |
| | Output value | +1% | +44% | -17% |
| **Poultry:** | Price | 0% | +15% | -9% |
| | Production | 0% | +11% | -3% |
| | Output value | 0% | +28% | -12% |
| **Milk & dairy:** | Price | +1% | +30% | -10% |
| | Production | 0% | +7% | -2% |
| | Output value | +2% | +37% | -12% |
| **Wheat:** | Price | -1% | -4% | -5% |
| | Production | 0% | -1% | -1% |
| | Output value | -1% | -4% | -6% |
| **Barley:** | Price | -1% | -5% | -7% |
| | Production | 0% | -1% | -2% |
| | Output value | -2% | -6% | -8% |

In terms of the results, the ***Bespoke FTA with the EU*** (equivalent to our ***Scenario 1: Evolution***) incurs additional trade facilitation costs for cross-border administration paperwork (checking rules of origin for example), sanitary and phytosanitary inspections and delays at ports. The results indicate that producer prices within the UK domestic market increase slightly for commodities in which the UK is a net importer, e.g. beef and cheese, but decrease a little for commodities in which it is a net exporter, e.g. barley. While the directional impact on producer prices varies, across all commodities

the projected changes in prices are relatively small due to limited disruption to trade. Given the modest price changes, it is projected that changes in production and value of output are marginal.

Under the ***WTO default scenario*** (equivalent to our ***Scenario 3: Fortress UK***), the UK would fall back to WTO default MFN tariffs, at least in the short-run. Under this scenario, MFN tariffs are applied on UK exports to the EU and likewise imports from the EU to the UK. These MFN tariffs are in the main very high and hence, their imposition leads to significant adjustments in trade between the UK and EU-27, with projected significant impacts on domestic markets, with the direction of impact again depending on whether the UK is a net importer or a net exporter of the relevant commodity. Thus, in the dairy, beef, pig and poultry sectors producer prices and output values are projected to increase significantly. The authors point out that the positive production impact in the pig sector exceeds that in the beef sector, partly because the life-cycle dynamics of this sector mean that it is able to respond quickly to price changes.

For commodities in which the UK is a net exporter, lower producer prices are projected in the sheep, wheat and barley sectors (it should be noted that this report does not attempt to split the sheep industry into what appears to be quite distinct markets for young lamb consumed in the UK and older exported animals, and that wheat is shown to be in minor surplus in the Baseline, whereas data used for the our AHDB study puts it in small deficit). Here, the introduction of MFN tariffs diminishes the competitiveness and thus the volumes of UK exports to the EU, which leads to increases in available supplies within the domestic market. The negative price impact is particularly marked in the sheep sector due to the large quantity of lamb currently exported to the EU from the UK. The projected fall in price has a depressing impact on UK lamb production and thus on the value of output. The reductions in prices and output values in the wheat and barley sectors are more modest.

Under the ***Unilateral Trade Liberalisation scenario*** (equivalent to our ***Scenario 2: Unilateral Liberalisation***) tariffs on imports from the EU and the rest of the world are reduced, though exports from the UK face trading partners' MFN tariffs. The results indicate that the elimination of tariff barriers under this scenario has a depressing impact on UK prices and output values across all commodities. However, the extent varies across sectors depending on the closeness of UK prices to their world price counterparts in the Baseline. The downward impacts on prices and output values are particularly acute in the beef and sheep sectors since producers in other parts of the world are very competitive in these sectors (it should be noted that the relatively low world price in the FAPRI model is not found in later data from the Commission, so its conclusions concerning beef may not be valid). It is projected that radical unilateral trade liberalisation with zero tariffs leads to a large increase in imports in these sectors from the rest of the world, which exerts downward pressures on prices for farmers in the UK.

### A2.3.3. LEI Wageningen: Implications of a UK exit from the EU for British agriculture

Berkum, S. van, R. A. Jongeneel, H. C. J. Vrolijk, M. G. A. van Leeuwen and J. H. Jager (2016) Implications of a UK exit from the EU for British agriculture. Study for the National Farmers' Union (NFU), Warwickshire, UK. Wageningen, LEI Wageningen UR (University & Research centre), LEI Report 2016- 046. 52 pp.; 14 fig.; 12 tab.; 9 ref. (the NFU/LEI report).

This is by far the single most relevant report for the purpose of estimating the impact of the three scenarios specified by the AHDB in the present study. It predated the UK referendum on Brexit. LEI is internationally recognised for its development and use of models, both at the aggregate and microeconomic level. It is also responsible for the Netherland equivalent of the UK Farm Business Survey, though the LEI's farm-level survey uses a wider array of business and environmental variables and deploys them for a greater range of policy applications than happens in the UK.

#### A2.3.3.1. Scenarios

For its report to the NFU, LEI employed models at two levels to assess the impact of a number of scenarios comprising three types of trading relationships:

- Free Trade Agreement between the UK and EU.
- WTO default position.
- A UK Trade Liberalisation.

Each trade scenario is combined with three levels of Pillar I Direct Payments, at 100%, 50% and 0% of the baseline position; Pillar II payments are assumed to remain unchanged. Thus, there is a grid of nine scenarios. These are compared with the Baseline, which is essentially the *status quo* (of non-Brexit).

In somewhat more detail, the scenario of a ***Free Trade Agreement (FTA) between the UK and the EU*** implies an arrangement that is not as advantageous as the free access to the European Single Market that current membership of the EU confers. Border arrangements are required to deal with matters like country of origin. For this reason, it is assumed, based on literature cited, that additional transaction costs of trade of 5% would be incurred.

Next, as it is very implausible that an FTA between the EU and the UK would apply zero tariffs to all products for unlimited volumes of trade, in this scenario it was assumed that a Tariff Rate Quote (TRQ) applied on UK sheep and lamb meat, meaning the UK would be allowed to export the current (2014/2015) export volume to the EU at zero tariffs, and for it to pay the EU's external tariff for volumes beyond that quota. For commodities other than sheep/lamb meat, no tariffs will be applied in the UK's bilateral trade with the EU. This effectively implies for those products that the UK and the EU are one internal market where products can freely flow, subject to the necessary border arrangements mentioned above. It also implies that imports into the EU subject to the EU's TRQ regimes will remain to have an effect on the UK market, either directly (imports flowing through, e.g.

from Rotterdam into the UK) or indirectly (imports into the EU have price depressing effects throughout the EU+UK market as these add to the overall supply available); even if 'rules of origin' are specified, there will be some effects from lower priced EU products entering the UK markets.

Finally, in this scenario it is assumed that the UK will not face any effect of losing the preferential imports (under TRQ or otherwise) that it currently enjoys as member of the EU. For UK external trade with third countries, the UK continues to adopt the EU Common Customs Tariff (CCT) on extra-EU trade imports.

Under the ***WTO-default*** scenario, the UK leaves the EU and falls back to the WTO-default position, meaning that UK import/export trade falls under the WTO's non-discriminatory Most Favoured Nation (MFN) rules. Under this scenario, the EU applies its CCT (i.e. the MFN applied rates as agreed in WTO agreements) to UK imports, and the UK applies the same rates set by the EU's CCT to EU and 3rd party imports. Note that because UK imports are no longer subject to the EU's TRQ import concessions regime, the price level in the UK for products that benefitted from that regime is likely to increase since the UK is no longer able to import at zero (or low) duty through the EU's TRQ system.

Under this scenario, UK and EU legislation no longer necessarily run parallel, which also implies that mutual recognition of rules and measures becomes more costly. For that reason, under this scenario a trade facilitation cost mark-up of 8% (the upper limit of the average transaction costs, as mentioned in Donner Abreu, World Trade Organisation, 2013) is assumed.

Under the ***UK Trade liberalisation*** scenario, the UK reduces its tariff rates by 50% across the board. This is rather similar to the WTO default scenario (including 8% trade facilitation costs), with the only difference being that the UK and the EU have different border tariffs: the UK applies 50% of MFN tariffs to all imports including those from the EU, whereas the EU applies its CCT to UK exports to the Union. Such an approach is consistent with the position outlined in the 2005 UK Treasury Defra Vision document where it called for '*import tariffs for all sectors to be progressively aligned with the much lower level prevailing in other sectors of the economy*' (HM Treasury, Defra, 2005:4).

No TRQs are assumed. It should be noted that in case of a Brexit, the UK would most probably seek to negotiate separate FTAs with third countries like New Zealand and Thailand. However, this would take time for the UK government to negotiate and is very complex to model. Therefore, it was not included here.

#### A2.3.3.2. Methodology

To explore these scenarios at industry level the AGMEMOD model was used[37]. This is a dynamic, multi-country, multi-market, partial equilibrium model. It provides significant detail on the main

[37] LEI also has the MAGNET model, standing for the Modular Applied GeNeral Equilibrium Tool (Woltier and Kuiper, 2014) that covers the whole economy and sectors such as agriculture. This has been used to explore the impact on German agricultural trade of Brexit, using a scenario that put MFN tariffs on trade between the EU and UK; the result was a decline in the volume of exports of pig, poultry and dairy exports from Germany to the UK Mögliche (Base and Freund, 2017).

agricultural and processing sectors for all EU Member States and some EU neighbours, and was developed by an extensive network of economists collaborating across the EU. The model has been largely econometrically estimated at the individual Member State level. The model is extensively used for the analysis of the EU Common Agricultural Policy (CAP) at Member State level as well as for baseline projections. Each country model is based on a database of annual time series, covering, when possible, a period from 1973 to the latest available year. AGMEMOD's database includes balance sheets for all primary agricultural commodities and most food processing commodities, generally including prices, production, imports and exports, opening and ending stocks as well as food, feed and other consumption. Country experts collect and validate data from various sources, e.g. national statistics, Eurostat and FAO. The represented agricultural sectors differ across countries depending on their importance in the respective country. For each commodity in each country agricultural production as well as supply, demand, trade, stocks and domestic prices are determined in equations with econometrically estimated or calibrated parameters.

While the use of a formal econometric model gives the appearance of robustness, there are several caveats which ought to be borne in mind. The authors devote a section (4.5) to limitations of the analysis. Not least of these is that this model was designed to consider the EU as one bloc and therefore treats trade between the UK and the EU at the net level, i.e. it does not differentiate trade bilaterally between the UK and individual Member States. Horticulture is not modelled in detail because of data problems for the UK; rather, estimates are made to price changes based on the postulated impact of trade facilitating costs. Changes in labour costs resulting from restrictions on migrants are not taken into consideration, though these are known to be critical to incomes of horticultural businesses.

We understand from conversations with a government statistician that the AGMEMOD model is regarded as basically sound. However, there is some uncertainty over how the price implications of the various trade scenarios are reached, an important aspect in the context of this AHDB study. Close reading of the text (e.g. section 4.4.2 second paragraph) suggests that price changes are generated endogenously by the model. However, correspondence with Defra has indicated that this is not necessarily the case; rather, a combination of trade facilitation costs and price wedges were calculated exogenously and then inputted into the model as price shocks in each scenario. An alternative (and better) approach may have been to allow prices to solve the UK market balance in each scenario, but this did not happen because of time constraints. Support for the Defra contention comes from the finding that across commodities projected price changes are sometimes exactly the same or very close, not something that would be expected from a model containing fully simulating market-clearing UK prices. In the latter approach the price changes, particularly in the WTO scenario, would depend on the different supply and demand elasticities across the various commodities, as well as the different tariffs. In the WTO scenario, these projected price changes shown are indeed all clustered around the 8% figure used for the rise in trade facilitation costs. We have attempted to clarify this issue with the LEI authors; one says he does not know the answer (presumably he was not involved with the modelling part of the work) and no reply has been received the first-listed author. This uncertainty undermines our confidence in the NFU/LEI price estimates for the various scenarios and lends weight

to the need to consider alternative approaches, such as providing expert-led figures or, preferably, using a range of price changes that can be used to assess impacts.

With that in mind, we move to the next stage in the NFU/LEI methodology. The second level takes the outputs from the aggregate model for the UK, such as commodity price changes, and applies them to a farm-level model based on data from the UK's section of the EU Farm Accountancy Data Network (FADN); the latest year covered was 2013. These data were supplied by the UK's Farm Business Survey, though it is worth noting that the FBS database contains some additional variables and uses a slightly larger sample. With the given structure of accounts, the impact of changes in prices for farm products on farms belonging to various farming types can be readily calculated (though this is only a first-round effect). Changes in Direct Payments can also be reflected in changes in farm income. Access to individual farm data (not just group averages) meant that LEI was able to interrogate the data in various ways, including an exploration of indicators of farm viability in the face of the various scenarios.

Recognised limitations at the second stage include the assumption that farmers do not react to price changes (as they almost certainly will) or that part of these changes will be shared with suppliers of factors of production, such as shifts in land rents and prices. Furthermore, FADN accounts relate only to 2012/2013, before the impact of CAP reforms introduced for the period 2014-2020. Using only one year of data, rather an average across a run of years, means that the baseline reflects any peculiarities of that year, such as unusually high or low prices. There are a host of other potential factors that lie outside the analysis, including the consequences of changes in the £/€ exchange rate, changes in input costs (other than feed costs in the animal sector), cost of 'fixed' factors (such as land/rent prices), availability of labour, impact of uncertainty caused by Brexit, etc. (see Section 4.5).

#### A2.3.3.3. Results

In terms of results, the ***aggregate model*** indicates changes in price, production, use and net trade balance for 14 farm commodities (Table 5.2, showing, soft wheat, barley, rapeseeds, sugar, beef, pork, poultry, eggs, sheep, raw milk, butter, cheese, SMP and WNP). These assume that sufficient time elapses to allow a new equilibrium to be reached, with 2025 cited as the end-year; changes are with respect to the baseline of non-Brexit. Agricultural product prices are projected to increase in the FTA and WTO scenarios. These price increases have a positive impact on supply and farm revenue and income, but have a negative impact on domestic use and consumer (or user) expenditure. At the level of the society this implies a loss of consumer welfare. A UK Trade Liberalisation scenario significantly impacts on UK meat and dairy prices as current import tariff rates are higher for these products. Consequently, the overall effect of the Trade Liberalisation scenario is a price decline for animal products which leads to less meat and milk production in the UK. Due to lower levels of production in the livestock sector, less feed use will lead to an increase in the UK's net export position on barley and an improvement of the UK's net-import position on (soft) wheat. Due to less production and higher domestic use, the UK's net imports will increase for beef, poultry, butter and milk powder, whereas the trade balance for sheep meat will turn from positive into negative. The deterioration of the UK's net trade position is largely due to higher imports of a number of livestock products mainly coming from outside the EU due to the significant price difference between the EU and the UK. UK

prices for these products will tend to be lower than in the EU, making it difficult for the EU to be a competitive exporter to the UK.

The price changes due to Brexit from the aggregate model are then used as input to the farm-level analysis, using the structure of accounts taken from the UK section of FADN for the accounting year 2012/2013 (it should be recalled that these price changes relate to 2025). In terms of ***results at the farm level***, there is a positive impact on farm incomes in all sectors under the FTA and WTO default scenarios. Under the UK Trade Liberalisation scenario, the livestock sector will face price declines, and subsequently income is negatively affected.

The positive price impacts on farm incomes in the FTA and WTO default scenario from changes brought about by trade will be offset by the loss of Direct Payments where trade scenarios are combined with reduced agricultural support. Under the UK Trade Liberalisation scenario, the reduction of prices and income are exacerbated by the reduction of Direct Payments or their complete elimination. In case of the abolition of Direct Payments, a large share of farms will have negative income effects. Consequently, the viability of a substantial share (15-25%, depending on the scenario) of farms will be negatively affected by this policy change. Livestock sectors in particular are heavily dependent on direct income payments: 2012/2013 FADN data indicate that without these payments their income would be negative. Also, mixed farms and field crop farms greatly rely on Direct Payments for their income. Overall, two-third of the UK's farm income relies on Direct Payment support.

All UK regions would show, on average, a decline in farm incomes if the UK government were to fully abolish Direct Payments. A 50% reduction of subsidies shows more diverse results with better results under the WTO default scenario than under the FTA scenario. Again, the UK Trade Liberalisation scenario shows the most significant changes. Farm incomes decline in all regions, except for England-East where half of the UK horticultural farms are located and which are little affected by the reduction of Direct Income payments (the impact of potential loss of migrant labour was not considered). Farm incomes are most severely affected in Scotland under a UK Trade Liberalisation Scenario.

#### A2.3.3.4. Relevance to the study for AHDB

The NFU/LEI study generates quantitative results for scenarios, in particular the price changes that are estimated to arise from various trade relationships after Brexit. It uses a respected econometric model. Within the literature, it appears to be the only study that quantifies the trade relationships that others explore only verbally and qualitatively. However, its second-stage, microeconomic element has weaknesses, such as reliance on the FADN accounts for the UK for a single year. The potential for exploring changes associated with Brexit, such as costs of labour, are not exploited, though there is a valuable assessment of farm viability using the LEI's access to farm-level data that is not available to most external researchers.

### A2.3.4. Informa: Preparing for Brexit: What UK withdrawal from the EU would mean for the agri-food industry

Agribusiness Intelligence: Informa (2016) Preparing for Brexit: What UK withdrawal from the EU would mean for the agri-food industry. Revised and updated edition. Agra Europe, Informa UK Ltd, London. Note: an earlier version appeared as Gardner, B. (2015) Preparing for Brexit: What UK withdrawal would mean for the agri-food industry. Agra Europe Informa reports, London.

This study was first published in 2016, but in advance of the result of the UK referendum on Brexit. Updated versions were released post-referendum. The main author was Brian Gardner. The main elements considered are the changed trading relationship of the UK and the possible reduction in subsidies to UK farmers.

#### A2.3.4.1. Scenarios

While there is discussion of the possible trade arrangements that the UK might enter, these are not formally set out in a comparative way and there is no modelling of their impacts on farm prices or production quantities. No estimates of trade impacts are given.

In terms of possible reduction of Direct Payments in post-Brexit UK agricultural policy, three scenarios are presented and assessed against the three-year average figures for the FBS (years 2012-13, 2013-14 and 2014-15); these were provided by Dr Dylan Bradley, a member of the present team working on this study for the AHDB. The scenarios are:

- Complete abolition of any form of Direct Payment, with other key revenue streams unaffected (that is, from agri-environment payments, market returns and 'diversified' or off-farm economic activity).
- A 'Brexit scenario' in which revenue from Direct Payments is reduced by 50%, revenue from agri-environment payments increased by 10% (or by 30% in Less Favoured Areas), and other income streams left unchanged. No adjustment by farmers is included.
- As the second option, but also with production revenue reduced by 10% as compared with the 2012-2015 average figures. This is meant to '*roughly simulate the impact of a dip in commodity prices in a particular sector, thus showing the potential vulnerability of particular types of farm to such price fluctuations*'(sic) (p63).

#### A2.3.4.2. Methodology

The changes in subsidies and production revenue are assessed in terms of the impact on Gross Margin and Farm Business Income in a static analysis, using the average accounts structure of the three years 2012-13, 2013-14 and 2014-15. This approach does not allow for any adjustments by farmers as their response to the changes in subsidies or revenue.

#### A2.3.4.3. Results

Across the FBS the average Farm Business Income for these years was £29k per farm. Introducing the changes in support and revenue of the three scenarios implied respectively FBIs of £24.1k, £1.6k, £16.1k, and a loss of (-)£4.3k. Separate estimates were provided for farms falling in to the following types; cereals, general cropping, mixed, dairy, lowland grazing, and LFA grazing farms. Taking only the middle ('Brexit') scenario, the percentage reductions in FBI per farm were respectively 34.9%, 26.0%, 44.6%, 16.7%, 48.4% and 39.0%. The smallest relative fall - the impact on dairy farming (which also had highest average incomes per farm) - contrasted with the highest percentage fall in Lowland Grazing, where average incomes per farm were lowest.

### A2.3.5. Informa: Article 50: What now for food and agriculture?

Agribusiness intelligence: Informa (2017) Article 50: What now for food and agriculture? Agra Europe, Informa UK Ltd, London.

This publication provides an updated analysis of data at the farm level, taking the same three scenarios concerning changes to subsidies and revenue as the earlier version (Agribusiness intelligence: Informa, 2016). Years covered are 2013-14, 2014-15 and 2015-16. There is a similar analysis of six types of farming, with impact assessed on Gross Margin and Farm Business Income. The static analysis suggests that abolishing Direct Payments would result in negative incomes for mixed, lowland grazing and LFA grazing farms.

The rest of the publication is of only marginal relevance to this research. A central chapter is concerned with securing a Brexit agreement. The third chapter considers the post-Brexit trading arrangements that might be secured by the UK, though agriculture does not feature strongly. The fourth chapter, by Stefan Tangermann, reviews whether a 'hard' Brexit would be in the interest of the EU-27 food and agriculture sector, concluding that an arrangement that keeps the markets as freely open as possible would be rational, and that the exit of the UK could lead to budgetary pressure on the remaining members that could precipitate further CAP reform.

### A2.3.6. Yorkshire Agricultural Society: The implications of 'Brexit' for UK agriculture

Yorkshire Agricultural Society (2016) The implications of 'Brexit' for UK agriculture. Farmer-Scientist Network of the Yorkshire Agricultural Society (Chair, Professor Wyn Grant), Harrogate, North Yorkshire. January 2016.

This report, written before the referendum, examined the impact of Brexit in several areas, including migrant labour. It also covered the impact in relation to several specific issues such as the use of pesticides, GM technology and geographical indications.

#### A2.3.6.1. Scenarios

Five broad scenarios for trading relationships after exit are outlined, and the report states that each of these has different implications for farmers. These scenarios can be placed on a continuum ranging from the most integrated to the least integrated:

1. ***Customs union***. The members of a customs union (CU) fix a Common External Tariff (CET), and once this tariff has been paid imports from third countries are in free circulation and – as with products originating within the union – can move freely from one Member State to another. From a trade perspective, possibly the least disruptive option would be for the UK to withdraw from the EU, but retain the CU. Existing tariff arrangements, both with EU Member States and with third countries, would be maintained and there would be no need to renegotiate tariffs and concessions within the WTO. (This would not stop the members of a CU from restricting the import of agricultural products on legitimate health/environmental grounds.) If agriculture was included as part of this deal it would be relatively easy to negotiate and a good outcome for British farm exports. Such a deal would also be more acceptable to other members of the WTO. On the other hand, it does not differ that much from EU membership. However, if agriculture was excluded from the EU-UK CU, then this would be problematic. If agricultural trade was not included in the CU, or in any of the trade scenarios envisaged in options 2-4 below, existing MFN barriers would apply on trade between the UK and the EU (including the Irish border), as would be the case in scenario 5. UK lamb would face high tariffs entering France (38% of all lamb produced in the UK is exported to Europe: NFU, 2015: 4), as would Irish beef entering the UK.
2. ***The 'Norwegian solution'***, in which the UK re-joined the European Free Trade Area (EFTA) and remained in the European Economic Area (EEA). This would mean a continuation of the free movement of persons (a sensitive issue), capital, goods and services. The 1994 EEA agreement means that EU laws in areas such as employment, environmental policy and competition policy continue to apply, including those regarded as most burdensome by business. The CAP regime as such is not included in the EEA and, like Norway, the UK could have its own domestic farm policy. The Norwegian model is the solution that the report's authors believe the EU would be likely to try to achieve.
3. ***Switzerland model***. Switzerland is in EFTA, but not the EEA. EFTA is a free trade area rather than a CU like the EU. The UK was one of the original members. Switzerland has a series of

bilateral treaties or contracts with the EU negotiated on a case-by-case basis. There are 20 important agreements and 100 that are less so. Bilaterals I, signed in 1999, included an agreement on agriculture and Bilaterals II, signed in 2004, included an agreement on processed agricultural products. As with Norway, national agricultural policy can provide higher levels of support than does CAP to reflect the particular challenges that agriculture faces in terms of terrain and climate. These are static agreements, so protocols have to be added from time to time to update them. It is essentially a model of considerable integration without membership. It does not mean, however, that Switzerland is not bound by horizontal policies that cover more than one sector or policy area such as environment and competition. For example, its Agreement on the Free Movement of Persons means that it must introduce equivalent employment legislation to that in operation in the EU, including the Working Time Directive. The relationship between the EU and Switzerland has been under some strain and 'is not a template the EU wants to offer others. If the UK tried to withdraw on a Swiss-style arrangement, the EU would insist on 'wholesale UK adoption of future single market legislation and on UK acceptance of surveillance and enforcement mechanisms'; the 2012 report by the House of Commons Foreign Affairs Committee (cited in House of Commons Library, 2013: 17) was also not supportive of this arrangement.

4. ***A simple free trade area (FTA) agreement with the EU***. This is probably the UK's preferred option, but is unlikely to appeal to aggrieved EU Member States or to those Member States worried about their own Eurosceptic parties. A Member State such as France would be concerned about exports to its territory from the UK which was not constrained by the same set of rules. Such an arrangement would likely relate to tariff barriers, quotas and the like, on products originating within the UK and EU, without attempting to harmonise UK law on EU provisions (although some convergence on food safety, animal health and phytosanitary arrangements might be acceptable). Recent FTAs negotiated by the EU have not been as simple as this, e.g., that concluded with Columbia and Peru in 2012. Moreover, an agreement could take years to negotiate and ratify, despite the recent ECJ ruling that ratification would not be required at the national or local level. Proponents of an FTA argue that the EU has such arrangements with other parts of the world, but these are generally with developing and emerging countries and there is no precedent for such an agreement with a developed country that is a former member.
5. ***Trade under WTO rules***, the default option if the CU option is rejected, and agreement cannot be reached on a FTA in which the UK trades as MFN trade partners within the WTO system. The EU then would have little alternative than to impose its CET tariffs against UK products (on lamb to France for example). Equally, the UK would have to impose its MFN tariffs on imports from the EU (Irish beef, Danish butter, for example). A unilateral MFN tariff reduction scenario by the UK could be even more damaging for UK farmers. UK farm exports would still face tariff barriers entering the EU, but there would now be freer access for all suppliers to the UK market, which would inevitably drive down prices.

#### A2.3.6.2. Results

Despite the clarity with which these trade options are stated, there is no systematic presentation of the likely impact of each on the prices or incomes of UK farmers that might result. Likewise, while there is an awareness that there would be pressure on Pillar I payments to farmers (and a presentation

of their relative importance to farms of different types), these are not modelled. However, there is consideration of additional factors, such as the importance of immigrant labour to farms and differences between post-Brexit policies in the constituent countries of the UK, reflecting local needs.

### A2.3.7. Rabobank: Implications of a UK exit from the EU for British agriculture

Rabobank (2017) Implications of a UK exit from the EU for British agriculture. Rabobank, Amsterdam, March 2017.

This short study is by researchers based mostly in the Netherlands. The focus is on the implications for the food sector and agricultural supply industries rather than primary farmers, though the impact on these are covered indirectly via changes in market prices.

#### A2.3.7.1. Scenarios

Three scenarios are considered, which are fairly close to those put forward by the AHDB. These are:

1. ***Freezing today's trade flows***. This includes tariff-free import quotas at the level of current trade volume and import tariffs on additional trade.
2. ***The protectionist scenario***. Smaller tariff-free quotas then current trade volumes and import tariffs on trade outside quota.
3. ***The Great Global Britain Scenario***. No import tariffs on UK imports.

#### A2.3.7.2. Methodology

No models appear to be used to assess the impact of the alternative trade arrangement scenarios. A discursive approach is used, based on fundamental economics (though diagrams of supply and demand and the impact of tariffs on market are not given, they readily spring to mind). At farm level, nothing is quantified; the implications for farmers of price changes are suggested and the reduction in Direct Payments is mentioned in passing, but is not quantified.

#### A2.3.7.3. Results

Impacts are disaggregated into a number of commodity markets, not all of which are relevant to the AHDB work. These comprise: seafood, poultry and eggs, pork, beef, other animal protein products, fruit, vegetables and flowers, consumer foods, frozen potato products, beverages, tropical products (tea, coffee, etc.), oilseeds, grains and milling products, olive oil, dairy products, sugar and sugar confectionary, and fertilisers. However, there is no explicit farm-level analysis by farm type.

In addition to trade impacts, attention is given to how Brexit is expected to change labour availability and costs, movements in exchange rates, and direct income support to farmers. Analysis assumes that the UK is a net importer, so anything that impedes imports relative to the present position will raise prices on the domestic market

In terms of the impact on farmers:

- Under the first scenario, UK farmers benefit from a weaker pound and market growth in the UK.
- Under the second scenario, UK farmers benefit from stronger import protection (implying higher prices).

- Under the third scenario, UK farmers are losers because of stronger competition on the UK market (implying somewhat lower prices on the UK market).

Despite the limitation of the approach, the short report contains conclusions worth noting. Among these are the following:

- The post-referendum fall in the value of sterling (which is projected to go further) will be expected in the longer-term to push up prices on markets for commodities in which the UK is a significant importer. The GVA of agriculture will also increase, though costs of imported inputs also rise. It is calculated that a predicted 15% weakening of the £ by the end of 2017 (adding to the 10% at the time of writing) will result in a €1.5 billion addition to GVA, which is about half the total direct income support to UK agriculture.
- Migrant labour is of importance to agriculture, but Brexit will involve additional administrative burdens, and the fall in the value of £ will result in lower wages expressed in their home currency, and thus there will be reduced availability and pressure for increased wages to be paid by UK employers.
- With the departure of the UK from the EU internal market, trading will become more costly. Even in a customs union there will be additional border controls.
- For fresh products, increased costs of trade (on imports) will raise domestic prices, the degree depending on how consumption is affected.
- Globally traded agricultural commodities for which the UK is a net importer (such as meat, dairy products, frozen potato products, grains and sugar) mostly come from the EU. In the protectionist scenario, trade restrictions will reduce imports from the EU and other countries will be prevented from filling the gap (the implication is that prices will rise for UK farmers). In the free trade scenario, suppliers in the EU will be subject to strong competition from other countries, and these will probably take a larger share of the UK market. The implication is that UK farmers will suffer a decline in prices received.

### A2.3.8. Worshipful Company of Farmers: Agricultural implications of Brexit

Buckwell, A. (2016) Agricultural implications of Brexit. Worshipful Company of Farmers, London.

Allan Buckwell was formerly Professor of Agricultural Economics at Wye College (to 1999) and later a staff member of the CLA and IEEP. This report, written before the referendum, focused on the impact of the reduction/removal of public subsidy.

#### A2.3.8.1. Scenarios

Though scenarios are not used formally, on trade, Buckwell comments that '*The EU trade question is fundamentally a choice between remaining close to the EU single market, and therefore having to retain most EU existing regulation, or leaving the single market in order to allow some deregulation*'.

In terms of national agricultural policy, Buckwell concludes, after reviewing various official and other reviews, that the UK government will not walk away overnight from Direct Payments, though for how long these will continue and with what conditionality is uncertain (subsequently the government has given assurance up to 2022 but not beyond).

#### A2.3.8.2. Methodology

For considering the impact of trade arrangements on prices received and paid by UK farmers, the argument is discursive, without the use of models.

At farm level, when assessing the impacts of changes to Direct Payments, Buckwell simply draws on the comparative static impact analysis published by Gardner (2015), using Farm Business Survey data for the single accounting year 2012-13. (This analysis has been superseded in Agribusiness Intelligence: Informa (2016) and (2017).)

#### A2.3.8.3. Results

In terms of impact from trade relations, Buckwell continues '*Whichever the outcome, there will be more customs controls, and thus higher trading costs, than now on trade with the EU (both ways). These could depress farm prices and raise some consumer costs. If the UK then chooses lower protection levels on agriculture with the rest of the world this would also depress some UK farmer prices, but reduce consumer costs. Therefore together, farmers might face weaker prices, whilst consumer food prices, on balance, may not be much affected*'. Buckwell does not discuss the possibility that prices for farm commodities on the UK domestic market might rise as the result of border costs on goods being imported (c.f. the NFU/LEI report) or of tariffs on trade coming into the UK from the EU. No quantified estimates of the impact on prices, outputs or incomes are provided.

When assessing the impacts of changes to Direct Payments, based on Gardner (2015) and FBS data for the single accounting year 2012-13, the conclusion is that sudden termination of these payments would provide a '*fatal shock*' to many businesses, particularly in LFA grazing and Mixed farming group, though

there is great diversity of farms even within groups. However, Buckwell also acknowledges that withdrawal of such payments in likely to be phased, during which time farms will exercise coping strategies, and that adjustments will take place in related markets (specifically for land).

### A2.3.9. House of Commons Library: Brexit: impact across policy areas

House of Commons Library (2016) Brexit: impact across policy areas. Briefing Paper Number 07213, 26 August 2016.

This document provides a broad economy-wide examination of Brexit, but contains a chapter on agriculture which examines the main areas of uncertainty and the potential areas of opportunity.

Among the main areas of uncertainty are:

- levels of direct financial support and rural development funding after 2020;
- trade models and level of continued access to the Single Market, degree of protection from cheap imports;
- provision of market safety nets;
- access to labour;
- overall national farm policy and regulation and approach across the Devolved Administrations;
- food labelling requirements;
- pesticides and GM food and crops approval approach; and,
- what kind of future CAP UK farmers will be competing with as the policy is currently being simplified and will be reformed for 2021.

Among the potential areas of opportunity are:

- a simpler and more targeted approach to agricultural policy and support, incentivising farmers to UK priorities;
- potential for greater deregulation and innovation outside CAP;
- new trade deals;
- new agri-environment schemes, tailored to UK needs and environmental priorities; and,
- no disallowance fines for incorrect CAP payments.

There are no scenarios provided and no quantitative estimates. There is citation of Buckwell (2016), NFU/LEI (2016) and Agra Europe/Gardner (2015) mentioned above, but no further original work or estimation at industry or farm levels of the implications.

### A2.3.10. House of Lords: Brexit: agriculture

House of Lords (2017b) Brexit: agriculture. European Union Committee 20th Report of Session 2016–17 HL Paper 169. 3 May 2017.

This report is largely focused on the possible trade relationships in agricultural and food commodities between the UK and EU, and with the implications for trade between the UK and other countries. All this is explored at length, as is the process by which any new trading relationship can be reached, including setting WTO tariff schedules, the allocation of Tariff Rate Quotas, and splitting AMS between UK and EU quantities. There is also recognition that UK farmers are to a substantial extent dependent on payments from the CAP under Pillars 1 and 2, which are likely to be evaluated closely because of the competing pressures for national government funding. Pillar II spending that aims to correct for market failure seems to receive general backing in policy circles. However, ways of taking forward the differing policy aims of the four constituent countries need a resolution to be reached in the funding future arrangements for agriculture in the UK post-Brexit.

#### A2.3.10.1. Scenarios

There are no formal scenarios of the environment in which UK agriculture might find itself.

#### A2.3.10.2. Methodology

Only discursive approaches are used, based on evidence gathered from written and oral submissions.

#### A2.3.10.3. Results

No quantitative estimates are provided of the impact on prices or farm incomes, outputs or other business parameters. However, there are useful nuggets of information that can inform the present study. In particular, these apply to the use of migrant labour and the regulatory environment.

***Migrant labour***

The report points out that UK agriculture and food sectors are highly dependent on workers from the rest of the EU, not only seasonal, but also permanent ones. According to para 253, '*The exact proportion of EU labour is unknown, but it is clear that EU migrants make up a substantial proportion of the workforce across all agricultural sectors in the UK. Dr Viviane Gravey, Dr Brian Jack and Dr Lee McGowan from Queen's University Belfast told us: "Of the 80,000-seasonal workforce in horticulture alone, 98% are migrants from elsewhere in the EU." According to Dairy UK, "On average non-UK born [labour] accounts for around 11% of the processing workforce" in the UK dairy industry, while the British Egg Industry Council told us that approximately 40% of staff on egg farms and approximately 50% of staff in egg packing centres were EU migrants. We heard from the National Pig Association that, "one in five farms and businesses connected to the pig industry would struggle to survive without migrant labour", and from the British Poultry Council that, "of the 35,900 direct employees [in the British poultry meat industry] around 60% (21,540) are migrant workers". According to the BMPA, "around 63%" of the workforce of the British red and white meat processing industry are "from the EU27 countries (mainly, but not exclusively, central and eastern Europe)". In addition, attention*

*was brought to the overwhelming reliance of the sector on EU vets providing services in abattoirs, which are essential to ensure compliance with food standards and regulations*'.

The report concluded that the entire food supply chain will be adversely affected by any loss of access to that labour pool, some of it with a highly skilled nature. The evidence presented suggested that the agricultural sector is already struggling to fill vacant positions and that this challenge is being exacerbated by the uncertainty surrounding the UK's withdrawal from the EU. Clarification of the rights of these EU nationals to remain and work in the UK was seen as a priority. In the short-term, technology cannot materially reduce the UK's need for EU agricultural labour; nor is there sufficient local labour to address the shortfall.

***Regulations***

The House of Lords report contained multiple examples of witnesses citing regulations that they hoped would be less irksome post-Brexit. "*Burdensome*" EU regulations, included elements within the Water Framework Directive (on the grounds that it is complex and can restrict growth), the Nitrates Directive (as overly prescriptive and inflexible, imposing high costs to agriculture), and neonicotinoid restrictions (as not based on sound scientific evidence). Another example was the three-crop rule on cross-compliance for receiving Direct Payments, something that the Secretary of State, the Rt Hon Andrea Leadsom MP has already described as "*ridiculous*" and a candidate for "*scrapping the rules that hold us back*".

The report does not quantify the implied cost saving achievable by scrapping or modifying regulations. Furthermore, it points out that, '*any regulatory change will have to strike a balance between managing international obligations, consumer and public demands, costs for producers, and the conditions of any trade agreements*'. (Paragraph 175). '*Significant divergence between the regulatory frameworks in the UK and the EU, by creating non-tariff barriers, could make it more difficult to continue to trade agri-food products after Brexit. The scope for deregulation, while not negligible, may therefore be limited*'. (Paragraph 176).

### A2.3.11. House of Lords: Brexit: the options for trade

House of Lords (2016b) Brexit: the options for trade. European Union Committee 5th Report of Session 2016–17 HL Paper 72 December 2016.

As the title indicates, this considers the possible trading relationships between the UK, EU and other countries, including remaining a member of the customs union, membership of the EEA, and a negotiated Free Trade Agreement. It points out that agriculture and fisheries are outside the EEA Agreement, and EU and non-EU EEA states trade on the basis of bilateral treaties. Where these do not exist, the EU imposes tariffs on goods imported from non-EU EEA countries.

Agriculture is mentioned infrequently, and there is no specific discussion of the impact on UK markets for farm commodities.

### A2.3.12. House of Lords: Brexit: trade in goods

House of Lords (2017a) Brexit: trade in goods. European Union Committee 16th Report of Session 2016–17 HL Paper 129. 14 March 2017.

Agriculture is considered briefly within food and beverages, which is part of a general review of major UK sectors. The issue of dependence of UK agriculture on EU labour is discussed (paras 50-51, including evidence from the AHDB), as is that of tariffs on farm commodities (para 95-103). However, there is no use of scenarios or detailed assessment of the impact on prices or incomes received by UK farmers. A more detailed treatment is given in House of Lords (2017b).

### A2.3.13. UK2020 Foundation: UK Agricultural policy post-Brexit

Patterson, O. (2017) UK Agricultural policy post-Brexit. UK2020 Foundation, London.

This paper, by a former Conservative Secretary of State with responsibility for agriculture and cabinet minister who supported Brexit, identifies and comments on what are seen as opportunities for UK agriculture from leaving the EU and its CAP. There are no specific scenarios or estimates of impact, and the arguments are primarily discursive. However, Patterson is explicit about immigrant labour, and makes a proposal for allowing access while retaining control, as follows:

- '*There are an estimated 67,000 seasonal workers of non-UK origin, chiefly from Eastern European countries inside the EU, in UK agriculture. Assuming an end to the Free Movement of Labour, a new Seasonal Agricultural Workers' Scheme will have to be devised and put in place before the end of the current free movement arrangements. The last SAWS was removed in 2003 after freedom of movement was extended to Romania and Bulgaria, and had a limit of 21,250 people. The scheme included licensing schemes for business, ensuring that safety, workers' rights and welfare standards could be maintained, and any new scheme ought to be similarly constituted. There is precedent for the success of such approaches in the form of New Zealand's Recognised Seasonal Employer Scheme (RSES), first introduced in April 2007, which allows up to 8,000 workers – chiefly Pacific Islanders – into New Zealand on a seasonal basis. Unlike the British SAWS, the New Zealand scheme includes a Resident Labour Market Test, ensuring that employers take reasonable steps to recruit domestic workers into available positions. Employers under RSES are also required to pay the market rate for work being carried out to avoid a local workforce being undercut by immigrant labour, and must bear the cost of repatriation if a worker becomes illegal*'. This last condition has obvious implications for the way that labour costs might change after Brexit and would affect our modelling assumptions.

### A2.3.14. Food Research Collaboration: Food, the UK and the EU: Brexit or Bremain?

Lang, T. and Schoen, V. (2016) Food, the UK and the EU: Brexit or Bremain? Food Research Collaboration, London.

Written by Professor Tim Lang and Dr Victoria Schoen before the referendum, this report focuses more on the agri-food sector and the consumer position than on primary production.

#### A2.3.14.1. Scenarios

Part 2 of the report considers various possible trade relationship between the UK and EU after Brexit (in addition to the one of not leaving the EU, which was viable at the time of writing). These are as follows:

- ***'Norway'***, i.e., be a member of the European Economic Area, countries outside the EU but almost entirely working to the 'rules' of the EU. This is virtual EU membership without the participation. Norway controls its own farming and fishing sectors. It can negotiate trade deals, but only subject to what doesn't affect its EU trade.
- ***'Switzerland'***, i.e., have a formally negotiated bilateral agreement with the EU. This model is already in difficulty. It might be hard to sell to British business, but the public might like UK courts having primacy.
- ***Customs Unions***, i.e., emulate Turkey, with full access for goods, but not agricultural products or services. Turkey very much wants to join the EU. It currently has tariff free access to EU for goods but not for agriculture, services and public procurement.
- ***WTO only***, trade only on a basis set by the World Trade Organisation. This is the ultimate big trade club, but meanwhile, most of the world is moving towards either blocs like the EU or bilateral bloc agreements. This would be doing a 'New Zealand', low tariffs generally, but not for agriculture. It would be a 'going global but solo' approach.
- ***Free Trade Area*** with EU, Create a new customised, pick 'n' mix combination of features of the above, perhaps as Canada is doing. This would be uncharted territory and would take a lot of negotiation, and with 27 Member States unhappy about the UK's departure might be protracted, and is also TTIP-sensitive.

However, there is no analysis of the implications of these arrangements for the primary agricultural sector or for the prices of farm commodities.

Nevertheless, data presented on trade issues may be helpful as background information, such as the balance between domestic production and imports for important commodities. For example, in the table below (Table 7 in the paper) domestic production is greater than imports in all commodities shown except for fresh fruit, and exports are smaller than imports except for mutton and lamb. The paper also provides a handy illustration of the import duties applied to agricultural and other commodities.

**Table A2.4: Production and trade in various commodities (2014 provisional data)**

| | Cereals | Refined sugar | Fresh veg | Fresh fruit | Beef and veal | Pigmeat | Mutton and lamb | Poultry meat |
|---|---|---|---|---|---|---|---|---|
| **Production ('000 tonnes)** | 24,468 | 1,446 | 2,796 | 427 | 871 | 820 | 307 | 1,648 |
| **Imports from the EU** | 2,645 | 476 | 1,925 | 1,452 | 237 | 726 | 17 | 465 |
| **Total imports** | 4,018 | 1,175 | 2,179 | 3,614 | 324 | 737 | 112 | 495 |
| **EU imports as % of total imports** | 65.83% | 40.51% | 88.34% | 40.18% | 73.15% | 98.51% | 15.18% | 93.94% |
| **Exports to the EU** | 1,795 | 232 | 103 | 97 | 125 | 157 | 116 | 237 |
| **Total exports** | 2,471 | 326 | 118 | 99 | 134 | 219 | 117 | 331 |
| **EU exports as % of total exports** | 72.64% | 71.17% | 87.29% | 97.98% | 93.28% | 71.69% | 99.15% | 71.60% |
| **Total supply** | 26,016 | 2,295 | 4,857 | 3,942 | 1,061 | 1,338 | 302 | 1,812 |
| **EU imports as % of total supply** | 10.17% | 20.74% | 39.63% | 36.83% | 22.34% | 54.26% | 5.63% | 25.66% |

### A2.3.15. UK Trade Policy Observatory: World trade rules and the policy options for British agriculture post-Brexit

Swinbank, A. (2017) World trade rules and the policy options for British agriculture post-Brexit. Briefing Paper 7, UK Trade Policy Observatory, University of Sussex, Brighton.

This paper focused on the implications of Brexit on trade, but also considered the current and future roles of public support for agriculture. It points out that, while there is likely to be considerable pressure to reduce Pillar I Direct Payments, there are also advocates to using some of these funds to support agriculture in other ways, though it is aware that not all commentators are in favour of increasing Pillar II schemes. However, in addition to domestic policy, it describes the impact of trade policy on agriculture as 'critical', though it is far more concerned with UK/EU trade than with the opening up of trade with non-EU countries.

#### A2.3.15.1. Scenarios

No formal use is made of post-Brexit scenarios. Nevertheless, Swinbank points to the large range of potential trade policy scenarios for the UK's future trade in agri-food products with the EU, referring to his earlier work that identified a number of different tariff regimes (Swinbank, 2016)[38]. The range from no change in tariff barriers (by either remaining in the present Customs Union, if that were possible, or by negotiating a new UK-EU-27 customs union), to a free trade scenario involving the complete elimination of all tariffs as advocated by some economists.

#### A2.3.15.2. Methodology

This is entirely discursive, and with no quantitative modelling.

#### A2.3.15.3. Results

Swinbank concludes that if the UK adopts a free trade commercial policy, consumer prices (for sugar, beef, dairy products, etc.) would be lower than they might otherwise be. If, however, it adopts a protectionist policy, taking full advantage of the MFN tariffs inherited from its EU membership, and applies them to imports from the EU-27, food prices could increase. Irish beef, and Danish bacon, for example, would face hefty tariffs and would consequently be more expensive when on sale in the UK. The Food and Drink Federation points out that 70% of the UK's imports of food and non-alcoholic drink in 2015 (and 72% of its exports) were from the EU. Thus the reorientation of trade flows to take advantage of changed trading circumstances, could be substantial.

Other article by Swinbank involving this material include:

- Swinbank, A. (2017: in preparation) '*Brexit, Trade Agreements, and CAP Reform*'. EuroChoices.
- Swinbank, A. (2017) Brexit and some possible unforeseen consequences for third country exports of farm products. International Centre for Trade and Sustainable Development Opinion:

[38] Swinbank, A. (2016) '*Brexit or Bremain? Future Options for UK Agricultural Policy and the CAP*'. EuroChoices, 15(2): 5-9.

http://www.ictsd.org/opinion/brexit-and-some-possible-unforeseen-consequences-for-third-country-exports-of-farm

- Swinbank, A. (2017) '*Possible Options and Constraints Impacting the UK's Farm Trade Policy Following its Exit from the European Union ("Brexit")*'. Submission to the Trade Sub-Committee of the Australian Parliament's Joint Standing Committee on Foreign Affairs, Defence and Trade for its enquiry into Australia's trade and investment relationship with the UK: http://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Foreign_Affairs_Defence_and_Trade/tradewithUK/Submissions
- Swinbank, A. (2016) '*Possible options for UK farm policy after 'Brexit'; and four points for immediate action*'. Agra Europe online, 26 July: https://www.agra-net.com/agra/agra-europe/brexit/comment-possible-options-for-uk-farm-policy-after-brexit-and-four-points-for-immediate-action-21990.htm
- Swinbank, A. (2016) '*Brexit or Bremain? Future Options for UK Agricultural Policy and the CAP*'. EuroChoices, 15(2): 5-9.
- Swinbank, A. (2014) '*If the British left: Agricultural policy outside the CAP?*'. EuroChoices, 13(2): 36-9.
- Swinbank, A. (2013) '*How will a UK exit from the EU impact food and farming?*'. Agra Europe, No. 2551, 5 February: 9-10.

### A2.3.16. Centre for Policy Studies: Brexit, agriculture and agricultural policy

Packer, R. (2017) Brexit, agriculture and agricultural policy. Centre for Policy Studies, London.

This report by Richard Packer (Permanent Secretary at Ministry of Agriculture, Fisheries and Food from 1993 until 2000) covers crucial issues in the context of the Brexit negotiations, including access to labour and trade, as well as other issues such as the possible use of GM technology.

#### A2.3.16.1. Scenarios

There are no formal scenarios.

#### A2.3.16.2. Methodology

There are no models employed and no quantitative estimates, and thus no information that is of direct relevance to this study for AHDB. The strength of this publication is that it uses Packer's wealth of experience as a top civil servant in the UK government's agricultural department to draw out political realities in the process of negotiation of international trade deals and in settling the likely shape of domestic agricultural policy.

Extracts from Packer's summary of general relevance are as follows:

- The conditions of trade in agricultural goods and food is likely to feature prominently in the Brexit negotiations.
- In the event that the UK leaves the Single Market, negotiations on the rules for UK/EU(27) trade in agricultural goods and food will be needed. Given the UK's large trade deficit in agriculture and food with the EU(27), the Government will have a strong hand to deploy in this section of the negotiations.
- Post-Brexit the UK will be free to establish its own agricultural policy. However, in many respects – aside from common financing – the best agricultural policy post-Brexit will be similar to that applied at present.
- However, there will be scope for establishing better national rules in some policy areas such as GM, and also for simplifying the present, over-bureaucratic, system of payments to farmers.
- To avoid chaos, provision will have to be made so that the content of EU legal acts in force at Brexit continues to have effect immediately afterwards.
- The Government must push ahead now in seeking trade deals with non-EU countries, though these can only be signed after Brexit.
- The importance of the WTO to the UK will increase with Brexit. Ensuring the UK can participate fully and satisfactorily in the WTO from Brexit day requires energetic action now.

#### A2.3.16.3. Results

Though there are no quantified results, it is made clear that under certain circumstances prices to UK farmers could increase as the result of the imposition of taxes applied to imports to the UK from the EU, which are not applied if the UK remains in a customs union (section 4.1). In other circumstances

trade deals with countries such as Australia, New Zealand, Brazil and north America '*could drive down UK prices considerably*' for commodities such as beef, lamb and dairy products (Section 5.2). This could result, Packer notes, in claims by farmers for '*compensation*', principally in the form of continuation of Direct Payments, which might otherwise come under pressure.

### A2.3.17. Bootle: The trouble with €urope

Bootle, R. (2015) The Trouble with €urope (sic.). Nicholas Brealey.

This book, cited by Buckwell (2016) in his report for the WCF, is a general study of possible trade relationships between the UK and the EU; it is not specific to agriculture within these relationships.

#### A2.3.17.1. Scenarios

Bootle identifies seven options, of which No 6 is seen as the preferred one. These are:

1. Remaining as a full member of the EU.
2. Apply to join the European Economic Area (EEA) alongside Norway. This gives almost identical access to the single market as EU membership but at the 'costs' of applying most EU legislation (over which there would be consultation but no decision powers for UK) and contributing seriously to the EU budget.
3. Apply to join the EEA, but leave the single market (so single market rules would then only apply to exports to the EU) and the four freedoms. This is a midway position between Norway and Switzerland.
4. Replicate the Swiss arrangement, viz bilateral agreements with the EU giving access to the single market (for goods not services), voluntarily follow most EU rules and contribute to the EU budget.
5. Follow Turkey's example and join (actually, effectively remain in) the European customs union.
6. Negotiate a Free Trade Area (FTA) with the EU, but without all the constraints as accepted by the Swiss in their agreement. This is Bootle's favoured option. It would not, for example, include free movement of labour.
7. Seek no special deal with the EU and accept the same relations as currently exemplified by the USA. Note however that the EU and USA [were at the time of writing] well into the negotiations for TTIP which is essentially a Free Trade Agreement.

Though the last two scenarios are similar to two that are part of this study for AHDB, Bootle does not give special consideration of the agricultural sector or offer estimates for the impact on prices, output and incomes of farms.

### A2.3.18. British Retail Consortium: A fair Brexit for consumers: the tariff roadmap for the next government

British Retail Consortium (2017) A fair Brexit for consumers: the tariff roadmap for the next government. British Retail Consortium, London. April 2017.

The BRC's focus is on the impact of different tariff arrangements on consumer prices. The report highlights which products (including food groups) are the subject of high (low) tariffs, and therefore makes clear which sectors are likely have more (less) substantial impact on consumer prices from imports under different tariff scenarios. However, scenarios are only set out informally and there is no reference to agriculture.

### A2.3.19. Defra: The role of CAP payments in farm income

Defra (2016) The role of CAP payments in farm income. Methodology Note, Department for Environment, Food and Rural Affairs, London. May 2016.

This Note uses data from the Farm Business Survey (FBS) for England to show the relationship between Common Agricultural Policy (CAP) payments and farm incomes. It is a static analysis and only looks at this one factor – Direct Payments, excluding agri-environment schemes. A five-year matched dataset was used (1,294 farms) (2010/11 to 2014/15) and results have been weighted to reflect the 2014/15 FBS population. The average Farm Business Income (FBI) was calculated for each farm over five years, together with the average payment from the Single Payment Scheme (SPS). Distributions of farms were generated (by farm type). There is a predictable shift in the distribution when Direct Payments are halved or eliminated; in the latter case the numbers of farms with a negative FBI increases by a factor of more than three, though there are still more than one in ten farms generating an FBI of more than £75,000 (Table A2.5). Defra points out that these relationships do not make allowances for the adjustments and adaptations that farms would almost certainly make if these cuts were made and were continued at a sustained level.

**Table A2.5: Number of Farms within each average income group with different levels of SPS payments, England (average 2010/11-2014/15)**

| FBI Bracket | Including CAP direct payments | Excluding 50% of CAP direct payments | Excluding CAP direct payments |
|---|---|---|---|
| **Less than £0** | 5,900 | 10,700 | 20,600 |
| **£0 to £10,000** | 7,600 | 11,100 | 8,300 |
| **£10,000 to £25,000** | 13,200 | 11,400 | 10,800 |
| **£25,000 to £50,000** | 13,500 | 11,400 | 7,800 |
| **£50,000 to £75,000** | 5,900 | 4,200 | 3,800 |
| **Over £75,000** | 11,500 | 8,800 | 6,300 |
| **Total** | **57,500** | **57,500** | **57,500** |

### A2.3.20. AHDB 'Horizon' publications on Brexit

The AHDB has generated multiple publications relating to Brexit, listed on its website as follows:

- What will happen to Plant Health and Plant Protection Product regulations after Brexit? - 30 January 2017.
- What might Brexit mean for UK trade in beef and lamb products? - 17 January 2017.
- What might Brexit mean for UK trade in Cereal and Oilseed products? - 17 January 2017.
- What might Brexit mean for UK trade in dairy products? - 17 January 2017.
- What might Brexit mean for UK trade in horticultural products? - 17 January 2017.
- What might Brexit mean for UK trade in pork products? - 17 January 2017.
- What might Brexit mean for UK trade in potato products? - 17 January 2017.
- The impact of Brexit on protected food names - 6 December 2016.
- What might Brexit mean for UK trade in agricultural products? - 12 October 2016.
- The impact of Brexit on the UK agricultural workforce - 20 September 2016.
- Agricultural policy models in different parts of the world - 8 August 2016.
- How will Brexit affect the UK's trade outside the EU - 20 July 2016.
- What will an UK/EU trade relationship look like post-Brexit - 8 July 2016.

Most of these have relevance for this study. They fall into two groups, first those that are concerned with agriculture as a whole and, second, sector specific studies.

#### A2.3.20.1. Agriculture as a whole

What will an UK/EU trade relationship look like post-Brexit? - 8 July 2016 (David Swales, Head of Strategic Insight).

This outlines the options for a UK/EU relationship post-Brexit, based on work by Alan Matthews, and considers their various characteristics.

- The 'Norway' option
- The 'Swiss' option
- The 'Turkish' option
- The 'US/Canada' option
- The 'WTO' option

These obviously influence thinking about scenarios that form an integral part of the present study for AHDB.

Brexit: implications for agriculture & trade. Tom Hind, Chief Strategy Officer 2017.

- Illustrates the levels of tariff that the UK would have to pay on exports entering the EU in a WTO scenario.

- Specific mention of the sheep market, where loss of exports (which happen all year round) would be expected to depress the UK market, especially in the period September to November when exports currently are highest.
- Has focus on migrant labour (but in food sector rather than primary agriculture).

What might Brexit mean for UK trade in agricultural products? - 12 October 2016.

This publication covers all the major traded agricultural products. Its contents appear to be closely similar to that of the separate sector-specific publications listed below, and so will not be commented on here.

Agricultural policy models in different parts of the world - 8 August 2016.

The differing forms of agricultural policy in the USA, Canada, Australia, New Zealand and the EU are described, and those outside the EU are compared briefly with the CAP. The first-round impacts of potential cuts in direct payments to UK farmers, taken from the Defra (2016) Methodological Note is reproduced. This comparative study has relevance for the creation of the scenarios that form part of this study for the AHDB.

#### A2.3.20.2. Sector-specific AHDB notes

These follow an approach that is fairly standard. The introduction (mostly common to the range of notes) outlines possible post-Brexit trade relationship with the EU and the rest of the world. On the assumption that the UK leaves the Single Market, other possible scenarios are outlined.

One scenario is that the UK secures a Free Trade Agreement (FTA) with the EU, though the time needed to achieve this means that an interim arrangement has to be reached that allows free trade to continue immediately post-Brexit.

Another is that the UK would revert to trading with the EU on the same basis as other WTO members, with UK exports subject to EU import tariffs. Outside the Single Market, the UK would need to decide whether to impose import tariffs of its own, including on imports from the EU. This this could lead to higher consumer prices (and by implication higher prices for farmers).

A third scenario is where the UK allows wider access to the UK market, at least for some products, by reducing or removing tariffs or by using tariff rate quotas. Outside the Customs Union, the UK would be free to negotiate FTAs with trading partners of its choosing. The implication is that prices received by UK farmers would be under downward pressure.

Attention is given to the importance of technical barriers to trade, such as sanitary and phytosanitary measures (which are often difficult to deal with in trade negotiations) and the statistical problem in measuring trade flows resulting from transhipping, especially in Rotterdam.

The way that trade for each commodity fares under these alternative scenarios is discussed in general terms, under the headings. These include present imports to and exports from the UK, current tariffs and trade barriers, opportunities and threats.

A feature of many is that they reveal that the market for, say, sheep in reality comprises a number of distinct separate markets (for different cuts of meat, skins, offal, etc.). Each of these markets may be affected in different ways by the various trading relationship scenarios. Though important to traders, this level of consideration goes somewhat further than the present study needs. Our focus has to be the impact on the prices received by farmers (and volumes of output) and the way that these impact on incomes. However, it should be borne in mind that these farm-level effects will be affected by what happens in the various sub-markets in a way that reflects their relative importance.

Each section contains a panel summarising the main points 'at a glance' that are reproduced below:

Beef sector at a glance:

- UK is reliant on EU partners for processing beef carcases, especially cows, a challenge if it loses tariff-free access to the EU.
- EU tariffs currently prevent most beef imports from leading global exporters, but any opening up of the market could mean they provide increased competition for domestic producers.
- Some major beef exporting countries are currently affected by the EU ban on use of animal growth hormones.
- Beef import markets are gradually reopening, following BSE restrictions of the late 1990s and there may be opportunities to open up new markets more quickly.
- Lower value cuts and offal are a major opportunity for UK beef exports.

Sheep meat at a glance:

- The EU quota system for sheep meat imports allows New Zealand, in particular, tariff-free access and much will depend on how these imports are managed in future.
- The UK is by far the largest exporter of sheep meat in the EU, so tariff-free access to the EU market will be crucial to the sector's prospects.
- France is the UK's biggest customer for sheep meat, accounting for around half of exports.
- UK lamb struggles to compete on price outside the EU, but there are opportunities to position as a premium product.
- Cheaper cuts and offal may offer a market opportunity in Asia, the Middle East and emerging economies, subject to agreeing market access.

Pork sector at a glance:

- The EU currently supplies around 60% of domestic pork demand.
- Exports are important to add value to cuts unpopular with UK consumers.

- Tariff or quota limits on the volume of pork traded between EU and UK could mean sharp price movements, affecting demand.
- EU import tariffs could curb sow meat exports to the UK's main customer, Germany, seriously reducing the value of UK sows.
- Regulatory and trading agreements with individual countries on certain products may bypass need for complex FTA negotiations.

Dairy sector at a glance:

- The UK is reliant on imports of butter and cheese to satisfy domestic demand.
- Ireland is a key trading partner for the dairy sector, including as a major processor of UK-produced liquid milk, which often returns to the UK as finished product.
- Reduction or removal of tariffs could see more global competition in butter and cheese supply, with impacts throughout the supply chain.
- China and emerging markets in Asia, North Africa and the Middle East are the focus of global growth opportunities.
- Potential barriers to EU exports could hamper investment during trade negotiations.

In addition, under the 'Threats' heading it is pointed out that the eventual deal between the UK and EU will be key for the UK dairy industry, as the EU currently provides the home for the majority of UK exports. Any imposition of tariffs on UK exports to the EU could cause particular issues for the cross-border trade with Ireland, as large volumes of milk are exported from the UK for processing in the Irish Republic and any of the resulting product which returns to the UK may also be subject to import tariffs (which would almost certainly make this trade uneconomic). If the UK government decides to reduce or remove import tariffs it could open up the domestic industry to competition from outside the EU, notably New Zealand.

Cereals and oilseeds sector at a glance:

- Oilseeds and grains operate in a comparatively free-trading global complex.
- Exposure to global markets will increase if exports to the EU are subject to tariffs and/or non-EU imports into the UK are tariff-free.
- Market access relies on price competitiveness, specification and SPS measures.
- The UK's approach to GM, particularly imports, is a key factor.
- A proliferation of global companies within the UK industry means investment may suffer if other countries are more commercially attractive.

Horticulture at a glance:

- The UK is hugely reliant on imports to satisfy high consumer demand, as well as out-of-season products and produce that cannot be grown in the UK.
- Current EU tariffs on horticultural imports offer a degree of market protection, but not enough to deter non-EU imports. UK tariffs on imports could make domestic produce more competitive, but also raise prices for consumers.

- Any opportunities to expand production to displace imports may be tempered by labour availability and seasonal nature of production.
- There is uncertainty around continued collaboration and investment between UK producers and overseas partners.

Potatoes sector at a glance:

- This sector is separated into markets for fresh potatoes, seed potatoes and various processed products. Fresh potatoes are a relatively inefficient and expensive commodity to transport long distances, exports are a minor part of the industry and confined to a few traditional locations (e.g., Canary Islands). Seed exports are worth a similar amount to the UK as other fresh exports, with Egypt the main destination.
- Three-quarters of seed potato exports are to non-EU countries and EU agreements give tariff-free access to important markets.
- UK-produced processed frozen products are currently uncompetitive on price with EU imports, but the situation could change if tariffs are imposed.
- Crisps are a growth exports market, but currently trade is predominantly with EU countries and could be affected if tariff-free access is lost.
- Relationship with Israel will determine new season availability of fresh potatoes.
- Any additional phytosanitary controls imposed on fresh and seed potatoes could impact exporters' profitability.

### A2.3.21. Selected publications on farmers' response to economic pressures and shocks

MAFF (1999) Reducing farm subsidies – economic adjustment in rural areas. Working Paper 2 – A Discussion Document. Economic and Statistics Group, Ministry of Agriculture, Fisheries and Food, London.

Set in the context of Agenda 2000 and the prospect of reduced production-coupled payments, MAFF concludes that there is evidence of dynamic adjustment over the last 25 years that suggests UK agriculture is capable of significant restructuring (p29) to improve production efficiency. Adjustments would include switching production to those sectors with greater profitability, some rationalisation and increased farm size to exploit economies of scale, reduced fixed costs and greater diversification (p30). There would be implications for employment and the environment.

WRO (2010) A Survey of Farming Households in Wales. Wales Rural Observatory, Cardiff.

The main lessons from this study involving a large-scale survey (n=1,009, but a response rate of only 13%) of Welsh farms are that, first, the decision to stay in farming must take into account incomes that farm household earn from outside agriculture (narrowly defined) and that economic pressures and shocks elicit a variety of responses, some of which may be diametrically opposed and of which non-response is a major component.

This survey assessed the relative contribution of various income streams to Welsh farm households (including the importance of income from marketing farm commodities, the Single Farm Payment, from diversified activities and off-farm gainful activities) and explored their likely responses to a reduction in the SFP. 50% of farming households perceived that the market place was their principal source of income. The SFP was perceived to provide the largest proportion of household income for 14% of the sample, somewhat less than is indicated from the 2009 FBS (there may have been perception and coverage differences). Off-farm employment was the perceived principal income source for 15% of the sample and 41% had income from sources not connected to the farm or agriculture. Payments from agri-environment schemes were perceived to be the principal income source by 2%; 7% considered diversification to be their principal income source.

Qualitative analysis found that if, after 2013, policy changes were to result in reduced payments to farmers or required changes in farming practices, 28% would carry on with business as usual; 22% would not know what to do; 10% would sell up and leave farming; and the remaining 40% would pursue various strategies of diversification, cost cutting, agri-environment schemes, alternative enterprises and retirement. Resilience was associated with farm households that had above average levels of diversification, multifunctionality (provision of environmental services) and entrepreneurship. Having said that, 27% of farm households surveyed claimed that if the SFP was reduced, they were likely or very likely to leave farming (though the actuality of such a response may be rather different).

Harrison, A. with Tranter, R. B. (1989) The changing financial structure of farming. CAS Report 13, Centre for Agricultural Strategy, University of Reading.

This research related to the responses at the farm level in 1986/87 to a financial crisis affecting agriculture caused not by a cut in direct payments (which were not part of policy at the time), but by reduced market returns. It used a large postal survey (n=1,276) and demonstrated that:

- actual responses can differ from ones that are reported as intended;
- responses at the farm level differ widely;
- non-response ('carry on as before') is a characteristic of a large minority of planned reactions (29%);
- planned expansion of output as a way of coping with the income crisis was the intention of almost half of respondents (in contrast with what might be expected from simple economic theory);
- between a third and a quarter had reduced the amounts of inputs used, reduced machinery costs and reduced labour costs;
- few farmers were planning to retire or to take up some form of part-time farming;
- one in five was planning to expand the farmed area.

Harrison and Tranter point out that the survey revealed a remarkable lack of large-scale disruptive restructuring in either broad management or more narrowly financial terms.

Errington, A. and Tranter, R. (1991) Getting out of farming? Part two: The Farmers. Study 27, Farm Management Unit, University of Reading.

This can be seen as an updating and extension of the CAS study by Harrison and Tranter (1989) with a subsequent survey (1990) that corresponded to a later stage in the financial crisis affecting agriculture (in terms of aggregate income this reached its lowest point in 1991, followed by a rapid recovery). By this stage, many farmers had progressed from the initial adjustments to more radical actions. Though the types of responses were very similar to that found in the earlier work, the share of farmers that intended to 'carry on as before' was much lower (3.5% in contrast to 28.6%); this indicates that the greater persistence of the signal that change is necessary will increase the perception that farm-level adjustment should be made.

Blandford, D. and Hill, B. (eds) (2006) Policy Reform & Adjustment in the Agricultural Sectors of Developed Countries. CAB International, Wallingford.

This book contains accounts of policy reform and responses by agriculture in a wide range of developed countries, including Australia, New Zealand and the USA (the latter being particularly rich in basic data by which the adjustment process can be explored). Points of relevance are that:

- Famers are used to operating in the uncertain environment of agricultural markets and technology; other sources of income, such as off-farm income, pensions, etc., have different risk profiles and changes in these may elicit different responses. (This is of relevance to the present context of direct income payments and possible cuts in levels post-Brexit.)
- Adjustments are of different magnitudes and natures, ranging from marginal changes to input uses to major structural shifts, including capital reallocation and even exiting from the sector.
- Responses to any particular economic shock will be diverse and reflect a multitude of factors at the farm and farm household level. These factors determine the farm household's 'adjustment capacity'.
- Adjustment capacity is determined by factors such as physical and financial resources, labour attributes and management ability (which would include access to advice). Closely associated are the constraints on adjustment that apply. Because capacity/constraints differ widely, it is very difficult to predict how individual farmers and farm households will adjust to any given economic shock.
- Small shortfalls between expected incomes and actual incomes are more easily coped with than larger shortfalls. Access to savings or credit is one coping tool, and one that varies between individual farms.
- Incomes from outside the farm must be included in assessing a farm household's resilience and adjustment capacity.
- Income changes are likely to carry implications for land prices, and lower market prices will impact differently on different categories of farmer, benefitting some (who wish to expand) and reducing the economic status of others.

- The often-cited rapid removal of subsidies to agriculture in New Zealand from 1984 illustrated both the scope and ability of its farmers to adapt. The negative impacts on farm profitability were short-term and transitional in nature, and only about 1% of farmers were forced out (see evidence to the House of Lords 2016a). However, there were impacts on related sectors of the economy and land prices also changed.
- Adjustment was not instantaneous, and government assistance measures played an important role in supporting household family consumption. There was also a one-off exit package and provision of advice (see also House of Lords 2016a).

Hill, B. (2010) Review of transitional arrangements to facilitate policy reform and their possible relevance to dismantling of the Single Payment Scheme. Policy Review Paper for Department for Environment, Food and Rural Affairs, London.

This policy review was commissioned to specifically examine on the issue of whether government intervention should be used to assist in dismantling of the Single Farm Payment scheme. Its main conclusions were as follows:

1. Transition arrangements to assist with the effects of changes in agricultural policy may be justified on economic, equity and political economy grounds. The economic case for employing a transition arrangement - enabling change to take place quicker or more completely – is unlikely to be strong, so the main justification come from issues of equity (in particular, cushioning the negative impacts on farmers who had been led to believe that the previous policy was enduring) and political economy (by removing objections to change from agents that had the power to prevent it).
2. The OECD has reviewed adjustment options and strategies and concluded *inter alia* that adjustment programmes should: (a) not underestimate the proven ability of the sector to adjust unassisted; (b) be time-bound from the outset; (c) be decoupled from production and the reforms must be seen as irreversible; (d) include a component that encourages producers who cannot become competitive to leave the sector; (e) be consistent with general adjustment policies, and (f) be cost-effective, transparent and accountable.
3. A review was undertaken of transition arrangements that have been used in OECD countries, aiming at coverage of a wide range of mechanisms. Those encountered were grouped as: compensation (time limited) for income or revenue loss (income stream or lump sum) and for falls in asset values (land, quotas); other time-limited income payments, subsidies and welfare support; exit assistance; and, rural development actions.
4. While there are many assessments of the impacts of reforms of policy, there is very little information available on the effectiveness of the transition arrangements that accompany them. There is a significant problem in establishing the counterfactual, especially when the rationale for the arrangement rests with political economy.
5. When considering transition arrangements in the context of dismantling the SPS, questions should be raised as to whether any such measures are justified. This applies particularly if a termination or phasing out of the SPS is announced in time for competent entrepreneurs to adjust, though it would still be necessary to safeguard against environmental implications and hardship (where

national general systems already in place are inadequate). This option may encounter political objections.

6. A second option is to accompany the dismantling of the SPS with farm structural and rural development measures, including the enhancement of human capital and social capital and facilitating farm adjustment. Many of these are already in place as part of Rural Development Programmes. Related to the above, it would be possible to expand agri-environment payments, not only for purposes already in place, but also to assist overtly with achieving objectives relating to climate change.
7. A third option is to consider temporary, fully decoupled income payments. Though serving much the same function as SPS (assuming these were to be terminated or phased out), there could be presentational and practical advantages in targeting areas and cases where a clear welfare need is demonstrated.
8. A fourth option is to fully decouple the SPS by breaking the link to the occupancy of agricultural land, whereby the entitlement to an income flow could become a freely marketable separate asset. However, with the links to agricultural policy broken, such income streams become vulnerable to political criticism and erosion, with obvious implications for their lump-sum market value.
9. However, there is a clear conceptual link with the income bond associated with the name of Tangermann that essentially capitalises the value of payment entitlements. There are grounds for thinking that this has become more acceptable to farmers.
10. Finally, it is recognised that what appears to be a first-best solution to the dismantling of the SPS (announcing that it is being terminated or phased out) may not be politically realistic. Consequently, some of the other options may have to be used and their positive attributes stressed. However, these should adopt the principles of good policy advocated by the OECD (and others).

### A2.3.22. The issue of access to migrant labour

#### A2.3.22.1. The cost of labour in the scenarios

Two of the AHDS scenarios place restrictions on the amount of non-UK labour working in British agriculture; Scenario 2 restricts non-UK regular labour to 50% of current levels and, in addition, Scenario 3 restricts non-UK seasonal (casual) labour to 50% of current levels. Within this study the impact of these restrictions are assumed to be reflected in the labour costs faced by agricultural businesses. As will be shown below, there will be variation between farming types in their sensitivity to rising labour cost. In particular, the horticulture sector will be affected by changes in the cost of casual labour which comes predominantly from outside the UK. There is the distinct possibility that restrictions on migrant labour to meet seasonal needs will not be matched by more labour from the UK, an inelasticity that can be expected to result in a large increase in the wage rate paid.

**The current labour supply**

Several studies have considered the implications of Brexit for the supply of labour to the UK agricultural industry, and specifically the way that the supply of migrant labour will be affected.

The House of Common (2017) Inquiry found that around 20% of all regular full-time staff in agriculture were thought to be migrant labour, mainly from Romania and Bulgaria (the 'EU2' countries). In some sectors this reliance was much greater. As an indicative example, the Inquiry was told that 58% of members of the National Pig Association employ at least one migrant worker.[39]

In addition, this regular full-time workforce is supplemented by seasonal migrant workers performing both unskilled and, increasingly, skilled roles. According to House of Common (2017) no accurate figures exist of exactly how many seasonal workers are migrants to the UK, but it is evident that they are particularly significant in sectors such as horticulture and field-scale vegetables and fruit production. A large fruit and vegetable grower in south Herefordshire told the Inquiry that 94% of his seasonally employed staff, around 950 people, were from the EU2 countries. Similarly, the Association of Labour Providers estimated that 90–95% of the seasonal workers sourced for work in food processing and agriculture were from other EU countries, mainly Romania and Bulgaria. A best guess estimate is that there are around 75,000 temporary migrant workers employed in UK agriculture and horticulture. The NFU noted that this estimate is below the sector's annual 'need' of 80,000 seasonal workers and further below the expected demand of 95,000 by 2021. As a result, even before the UK's vote to leave the EU, the sector was still keen for the Government to take action to increase the supply of seasonal workers through, for example, the encouragement of migrant workers from non-EU countries.

Recent aggravating circumstances constraining the supply of migrant seasonal labour to UK agriculture were changes in the value of Sterling; increased living standards in Eastern Europe (the main source of foreign labour); uncertainty created by Brexit; the desirability of work in other growth sectors such as construction and hospitality; and a feeling among foreign workers of "not being welcome". Witnesses noted that the lack of labour was already impacting their businesses growth and without a labour supply the industry would relocate to other countries where it was available.

A similar picture concerning casual migrant labour in the horticulture sector is described in a report by British Summer Fruits (2017), the organisation that supplies some 97% of the berries sold by British supermarkets. Soft fruit growers employ around 29,000 seasonal workers a year, with around 95% coming from the European Union, primarily Poland, Bulgaria and Romania. If Brexit constrains the supply of labour from these countries, there is no guarantee that replacements from the UK population will be available. In many rural areas, where demand for seasonal labour is concentrated, unemployment is below 2%, and there would be a shortfall even if all these unemployed were engaged to replace immigrant labour. However, at national level, where unemployment is somewhat higher (4.9%), it is also found that around three-quarters of those who are registered as unemployed also claim disability or single parent benefits, which suggests they may not be able, or willing, to undertake physically demanding seasonal work. A number of unsuccessful attempts to work with job centres and

[39] Lang, Millstone and Marsden (2017), citing a Migration Observatory report (Rienzo, 2016) that in turn uses data from the UK Labour Force Survey, erroneously claims that 7% of 'elementary agriculture' relies on recent migrant workers. However, this is the proportion of such labour that is engaged in 'elementary agriculture'.

ex-prisoners have been experienced, suggesting that UK citizens are not willing to undertake this sort of work.

Part of the problem is the seasonal nature of the work. According to a comment in the Financial Times (2016), UK jobseekers are looking not for seasonal work, which for those on benefits may jeopardise their ability to claim, but permanent jobs. The conclusion must be that costs of production, in particular labour costs, are likely to rise as the result of any restriction on the supply of labour brought about by Brexit.

A possible conclusion from this literature is that a distinction should be made between the regular and casual labour markets. While related, they seem to have distinguishing characteristics which can be expected to carry though to supply elasticities and costs.

As the basis of its report, British Summer Fruits commissioned a survey by Anderson's (a business consultancy now responsible for an influential farm management pocketbook) leading to the Anderson's 'Brexit & Seasonal Labour Report'. This established a range of impacts of interrupting the supply of migrant labour for this sub-sector, including some of particular relevance to this AHDB study:

- prices for strawberries and raspberries will rise by between 35% and 50%;
- falling soft fruit consumption;
- less soft fruit being grown in the UK; and,
- soft-fruit growers going out of businesses

This reflects not only a tightening of the supply of labour, but also an implied rise in UK production costs and market prices for fruit. A number of newspaper articles have made similar points (for example Financial Times, 2016, Guardian, 2017), sometimes using anecdotal evidence from large-scale agricultural and horticultural employers of casual seasonal labour. The AHDB (2016) has also reported in this area.

**Wages and employment costs**

A consequence of constraining the supply of labour from other EU countries, especially to meet seasonal needs, is that costs faced by UK farmers and growers will rise, the extent reflecting the supply elasticity of labour and the derived demand elasticity for labour involved. The situation is represented in Figure A2.1. Domestic supply is shown as quite inelastic, for reasons discussed earlier.

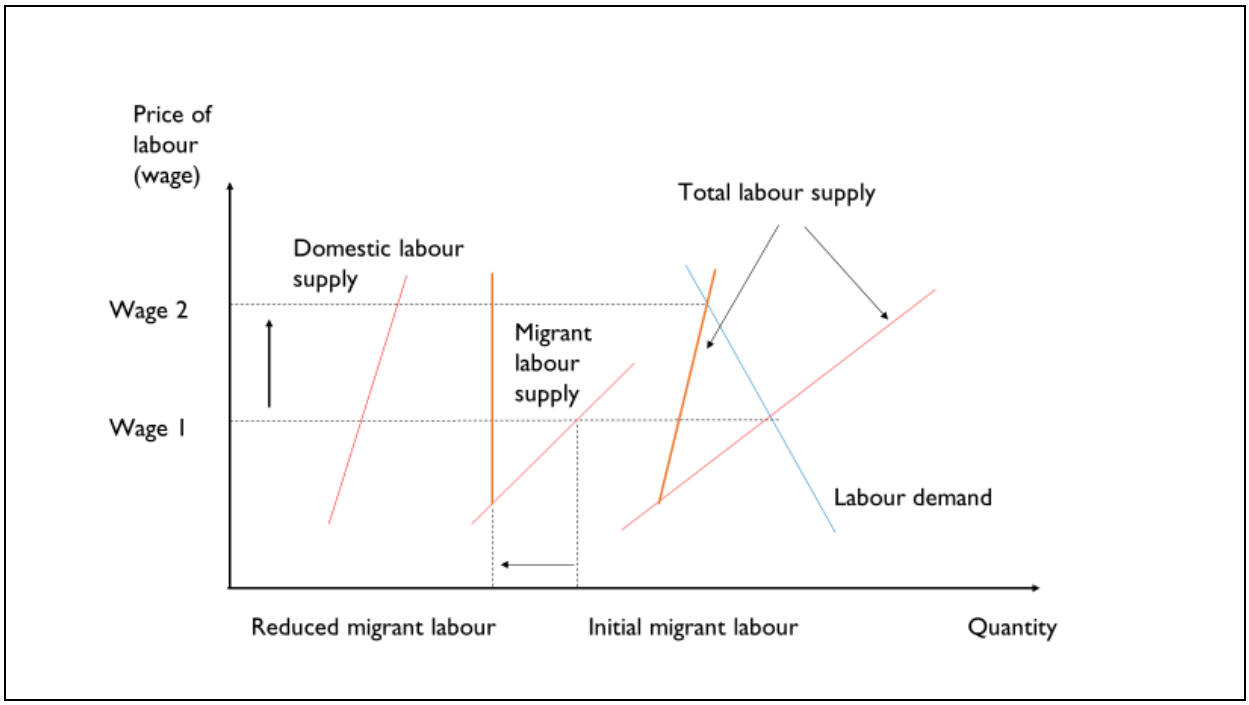


**Figure A2.1: Labour supply response as migrant labour is restricted**

Restricting the quantity of migrant labour creates a new supply curve for migrant labour that is completely inelastic beyond the point at which the restriction applies. The total supply curve for labour, which is a summation of domestic supply and migrant supply, becomes parallel with the (quite inelastic) domestic supply curve beyond the restricted quantity. The consequence is that the total supply curve intersects with the (derived) demand curve for labour at a higher price, which means that farmers will be faced with higher wage rates for labour, both domestic workers and migrant workers. Though the latter are restricted in terms of numbers, those that are employed are paid at a higher rate than if their access was not limited.

Economic principles point to the factors that determine the positions and slopes of the supply and demand curves being affected by the time period under consideration. In particular, over extended periods of time, the introduction of new labour-saving technologies (or those currently too expensive to use) can be expected to shift the derived demand curve to the left, leading to downward pressure on wage rates.

Though there is a tendency to under-estimate the ability of farmers to adapt, within the time period of this AHDB study, we have to assume that there will be a short to medium-term implication on the labour costs faced by UK farmers if restrictions on migrant labour are applied as part of Brexit. These costs must be expected to rise, which will carry implications for the net incomes of farmers.

Perhaps unexpectedly, the NFU-LEI study on Brexit (Berkum *et al.*, 2016), with its modelling of commodity prices and trade, did not include any movement of labour costs, an important gap especially with the horticulture sector.

The AHDB (2016) itself assumes there will be an impact on labour costs. Quoted by Migration Watch UK (2016), it recently noted that should the supply of migrant labour be restricted post-Brexit, 'wages are likely to increase in an attempt to make jobs more attractive to UK nationals'.

However, the precise uplift to wages does not appear to have been discussed in the literature. In this absence, resort has to be made to indirect evidence, such as anticipated rises in market prices resulting from increased labour costs or the sorts of premiums necessary to attract labour from alternative occupations. However, this impact arising from restricting migrant labour has to the separated from that caused by other factors. Migration Watch UK (2016) points out that the introduction of the National Living Wage will increase the cost of seasonal wages for grower businesses by 35% over the period 2016-2021, equivalent to an average annual rate of wage inflation of just under 7% a year (though the Financial Times (2016) quotes one large horticultural employer of migrant labour as already paying the National Living Wage, with its workers averaging £350 per week and £500 including efficiency bonuses).

The first method is illustrated by the remark from British Summer Fruits (2017) that it expects that prices for strawberries and raspberries will rise by between 35% and 50%. This is, presumably, in addition to the Brexit effect on labour supply. From this, and the known cost structure of production, it would be possible to estimate an implied shock to wages and employment costs.

The second approach requires information on the relative wages paid in agriculture and occupations from which it would need to be attracted. A 2013 survey of 1,300 agricultural workers by Farmers Weekly (quoted in Migration Watch UK, 2016) found that the average hourly wage in the agriculture sector was £8.74, around a third less than the overall UK average wage. Migration Watch UK (2016) comments that wage increases may encourage some of the 1.6 million people in the UK who are unemployed and some of the nearly 1.16 million part-time employees who are looking for more hours of work, to take up such roles. However, there are grounds (already discussed) for thinking that this transfer may not take place unless the differential is more substantial.

### A2.3.23. The issue of tariffs

Lawless, M. and Morgenroth, E., L., W. (2016) The Product and Sector Level Impact of a Hard Brexit across the EU. Working Paper 550. The Economic and Social Research Institute, Dublin, Ireland.

The debate on what the implications of trading in a post-Brexit scenario are hinges on what restrictions on trade will then apply, and in particular on the level of tariffs that will be imposed. The third scenario specified by the AHDB ("Fortress UK") involves the imposition of WTO tariffs on trade between the UK and EU. The WTO publishes tariffs registered with it by the EU for a large number of 'lines' of trade; some are specific and some *ad valorem*. According to Lawless and Morgenroth, these are likely to be those that are applied in both directions if the UK makes a hard Brexit and trade takes place under what is generally termed 'WTO rules'. However, for practical use within the assessment of

impacts at the farm level, these have to be translated into ones that relate to the commodities that farmers produce and appear in accounting systems such as used by the EU's Farm Accountancy Data Network (FADN) and its UK component, the Farm Business Survey. For example, different tariffs apply to the range of dairy products, but what is important in assessing the impact of imposing these tariffs on Farm Business Income is the effective change in the price of milk. Much effort can be involved in making this translation.

Lawless and Morgenroth (2016) report such calculated commodity (product-type) level tariffs, expressed in percentage terms, as part of their study of the implications of Brexit for trade flows between the UK and other EU countries. Though viewed from an Irish perspective, they can be expected to apply to imports into the UK and to exports made by the UK, both of which will affect the prices that UK farmers receive under the AHDB's scenario 3. Those with the highest rates are shown below; the prominence of agricultural commodities and foods within this group is clear, taking (with tobacco) the first eleven places.

**Table A2.6: Goods with implied tariffs over 10% and trade share**

| | Tariff rate UK to EU | Trade share UK to EU |
|---|---|---|
| Meat | 49.35% | 0.07% |
| Cereals | 45.71% | 0.18% |
| Sugars & confectionary | 42.00% | 0.21% |
| Tobacco | 38.14% | 0.47% |
| Processed meat & fish | 33.31% | 0.29% |
| Dairy, eggs & honey | 31.34% | 0.64% |
| Flours | 26.92% | 0.31% |
| Processed vegetables and fruit | 20.86% | 0.75% |
| Food residues & animal feed | 19.03% | 1.92% |
| Processed cereals | 15.11% | 0.35% |
| Other edible preparations | 14.44% | 0.24% |
| Cocoa & chocolate | 11.79% | 0.20% |
| Clothes (knitted) | 11.63% | 0.06% |
| Clothes (not-knitted) | 11.62% | 1.34% |
| Footwear | 10.35% | 0.27% |
| **Sum of trade shares** | | **7.28%** |

In estimating the impact on trade flows of changes in prices, the authors take a median demand elasticity of food products of -6.1 (based on findings by Imbs and Mejean (2016) who define their sectors at the ISIC 2-digit level); note this is a trade elasticity which reflects the easy substitutability of products from one country for those from another and is of a magnitude of some ten times greater than coefficients of demand elasticity based on consumption. There is no discussion of supply elasticity, which suggests that complete elasticity is assumed and price rises and the effect on quantities traded follow exclusively from the effect on demand.

In terms of the estimated impact on trade of applying the WTO tariffs, those sectors where the bulk of products attract low or zero tariffs have almost no change in their trade flows in either direction.

These include pharmaceuticals, paper and printed materials, while other sectors such as machinery and a range of metal-based products would decline by 10% to 20%. At the other end of the impact scale, the high tariffs combined with a relatively elastic price response result in food and clothing sectors all being hit extremely hard by a WTO scenario. After the two most affected sectors (knitted and non-knitted clothing), where trade both to and from the UK would fall by 99%, the next ten most affected sectors are all food-based, with falls of 68% for the dairy, eggs and honey sector and up to 95% for sugar and confectionary. Mostly import and export volumes are estimated to be affected similarly, but among cereals, while imports are shown as falling by about 60%, exports fall by about 90%; this difference is put down to the differing composition of the two flows (balance between wheat and barley, etc.). The authors point out that any country within the EU reliant on trade with the UK in these sectors will clearly be disproportionately hit if a WTO scenario is the default trade arrangement. Of course, this will be felt reciprocally by the UK.

Donnellan, T. and Hanrahan, K. (2016) Brexit: Potential Implications for the Irish Agri-Food Sector. FAPRI-Ireland Partnership, Agricultural and Farm Surveys Department, Teagasc, Athenry, Co. Galway, Ireland. ISBN: 978-1-84170-624-5.

Donnellan and Hanrahan (2016) provide an Irish perspective. Though not directly a study of Brexit as it affects UK farmers, the closely bound trade between Ireland and the UK in agricultural products across the only land border between the UK and an EU country makes this publication of relevance. Written before the outcome of the June 2016 vote was known, its focus is on EU-UK trade relations and their impact on trade between Ireland and the UK. It uses scenarios and compares them with the *status quo*, though these relate to the extent of trade destruction and diversion rather than those envisaged by the AHDB in the current study. A gravity model is employed in exploring the impact on trade. However, no attempt is made to model different UK domestic agricultural policies, though there is an awareness of the importance of this to the actual implications for Ireland.

Key points emerging are as follows:

- It is not possible to perform a rigorous economic modelling assessment of the implications of Brexit because the terms of Brexit are unknown.
- The UK has a very large trade deficit in agri-food products of the order of €21 billion in 2014. Over the next 10 to 15 years, UK agricultural production is anticipated to remain relatively stable. However, the UK's import dependence is likely to increase, given the strong rate of anticipated growth in its human population, estimated at close to 1% per year.
- Though agri-food trade is a relatively small share of Ireland's total trade, valued at about €10.7 billion in 2014, Irish agri-food exports to the UK represent about one-third of Ireland's total merchandise exports to the UK. Therefore, Brexit is a concern for the Irish agri-food sector.
- In 2014 Ireland exported €4.5 billion in agri-food products to the UK, primarily in the form of beef, dairy products and processed foods. Ireland's imports of agri-food products from the UK are also substantial, amounting to €4.1 billion in 2014, with imports of processed food, raw milk

for processing, alcoholic beverages and soft drinks being the most significant. Overall, this means that Ireland had an agri-food trade surplus with the UK of the order of €456 million in 2014.

- Brexit will have adverse consequences for the UK's trade with EU Member States, including Ireland. The extent depends on a range of factors. Of these, the UK's future trading relationship with the EU is the most important factor for the agri-food sector in Ireland. The UK might negotiate a trading arrangement that closely approximates a Free Trade Agreement (FTA) and this would be the most desirable outcome for Ireland. Administrative costs associated with trade with the UK would increase for Irish exporters even under an FTA. While the volume of trade might be relatively unhindered, the cost of doing business with the UK would increase.
- The most negative outcome for Ireland would result if the UK and the EU failed to negotiate the terms of the UK's exit. At that point, as World Trade Organisation (WTO) members, the EU and the UK, would only be obligated to offer each other Most Favoured Nation (MFN) status. This would result in the imposition of MFN tariffs on trade between the UK and the EU and would be expected to lead to a reduction in the level of trade between the UK and the EU.
- As a non-EU member, the UK would be free to negotiate deals with countries that already have a trade deal with the EU and countries that do not yet have a trade deal with the EU. This would be the least desirable outcome from the perspective of the Irish agri-food sector. This could increase the supply of agricultural commodities in Europe, with adverse consequences for EU commodity prices. The extent of the impact on EU agri-food exports to the UK would depend on the availability of competitive agri-food exports from counties outside the EU, and would also depend on consumer country of origin preferences, which are influenced by amongst other things, traceability, animal welfare, human health and sustainability concerns.
- Even if the UK and the EU resort to trade relations under MFN terms, agri-food sector trade between the EU and the UK is unlikely to collapse. As a net importer, the UK would need to continue to import agri-food products and would not be expected to pursue an agri-food self-sufficiency policy. However, there would be notable agri-food trade consequences for several EU Member States, concentrated in particular sectors. Ireland's beef, dairy and lamb exports would be affected. Denmark's pig and dairy trade and the Netherlands' exports of vegetable products would be affected. In Southern Europe, exports of wine from France, Spain and Italy would be affected, as would exports of olive oil from Greece.
- Other things being equal, if the UK is close to self-sufficiency in a particular sector, and if world prices are similar to EU prices, then Brexit would not be expected to significantly impact that sector. This would characterise the likely outcome of Brexit for the EU cereals sector. Conversely, other things being equal, if the UK has a substantial deficit in a particular commodity and if world prices are considerably below the EU level, then the greater the potential for an impact on EU prices. This would characterise the likely outcome of Brexit for the EU beef sector.