



Department
for Environment
Food & Rural Affairs

Assessing the impact of dual production systems on Agri- food trade and trade policy

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Environment
Agency



Forestry Commission



What are dual production systems?

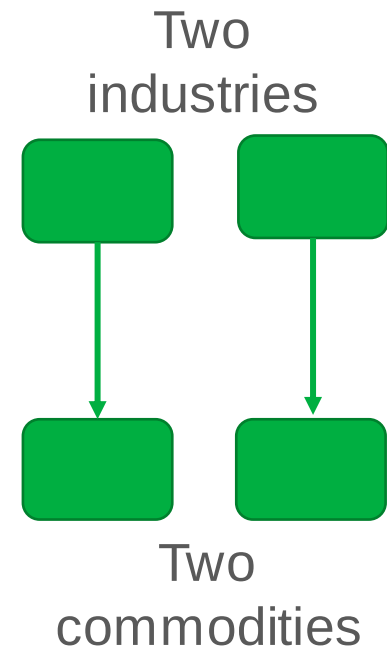
- Agri-food exporters, and exporters in general, are often required to meet different standards depending on their target market (domestic or export). Sometimes they will employ 'dual production systems'.
- Dual production systems, here, can be understood as one industry producing two separate commodities.
- Example: Australian farmers have set up a dedicated cattle herd segregation and processing system for producing hormone-free beef for European markets (Meat & Livestock Australia).
- Understanding the impact of these productions systems is important, as it could have implications for the ease at which exporters shift production to meet certain standards, and therefore there may be implications for impacts of trade policy.

How could we approach this?

Industry/ commodity	One Industry	Two Industries
One Commodity	Standard model.	Two industries producing the same commodity: This assumes that the two industries are separate but the commodity they produce is identical (not what we want here).
Two Commodities	One industry producing different commodities: the two outputs are different but compete for the same inputs.	Two completely separate industries producing different commodities.

Two industries, two commodities

- The first approach is simply to use SplitCom to separate cattle meat in three separate sectors:
 1. Hormone treated beef
 2. Hormone free beef
 3. Lamb
- Steps:
 - (Lots of) Data collection
 - Use SplitCom to split the GTAP sector both into separate industries and separate commodities



Data collection

For this analysis, the data collection involves two parts:

1. First, data is collected for splitting the old sector and commodity, e.g. red meat, into the disaggregated sectors and commodities e.g. into beef and lamb.
2. Step two is to split the new data for the chosen commodity (here we look at beef) into growth hormone treated and non-growth hormone treated.

However, both 1. and 2. are combined so that only one split is carried out when using SplitCom (but the data collection has two separate parts).

Data collection (1)

The data required for part 1 is as follows:

- Bilateral trade data to split the GTAP trade flows. Trade data comes from the BACI database which uses UN COMTRADE data and provides bilateral trade flows for more than 5000 products and 200 countries.
- Production data to split the GTAP input flows. Production data comes from FAOSTAT.
- Consumption data to split the uses of the GTAP commodity. Consumption data is more complex. Using data from the GTAP database, we apportion production, imports and exports using the shares from the above trade and production data. We then calculate *consumption = production – exports + imports*.

Data collection (2)

- Step 2 involves allocating the previously collected data to the hormone and non-hormone treated sectors.
- How is this done? Here is beef as an example.

Data collection (3)

How are the inputs split between new sectors? It is estimated that the cost increase from not using growth hormones is 7-8%.

Region	UK	EU27	USA	Australia	New Zealand	RoW
% of production that is hormone treated	0%	0%	66%	40%	0.01%	10%
Source	European Commission (2019)	European Commission (2019)	Congressional Research Service (2015)	Food Standards Australia (2011)	New Zealand Food Safety (2015-16)	Various

Data collection (4)

Bilateral trade – what % of trade flows are hormone treated? Set total exports of hormone beef equal to the hormone beef production shares, then set exports to the UK and EU equal to zero, and split exports among the remaining four countries according to their consumption shares.

Exporter (row) / importer (column)	UK	EU27	USA	Australia	New Zealand	RoW
UK	-	0%	0%	0%	0%	0%
EU27	0%	0%	0%	0%	0%	0%
USA	0%	0%	-	82%	0.01%	69%
Australia	0%	0%	77%	-	0.01%	26%
New Zealand	0%	0%	0.02%	0.01%	-	0.01%
RoW	0%	0%	18%	12%	0.01%	10%

Data collection (5)

How are the old uses split between the new sectors?

Region	UK	EU27	USA	Australia	New Zealand	RoW
<i>% of consumption that is hormone treated</i>	0%	0%	66%	40%	0.01%	10%

SplitCom

- SplitCom can be supplied with comprehensive data on splitting GTAP flows so the data is used in SplitCom to carry out the split.
- Assumptions:
 - Splitting inputs using production data assumes that each \$ worth of output of each new commodity uses the same inputs.
 - Each new commodity is only used as an intermediate input by itself so, for example all beef (new) used by cattle meat (old) is used by beef (new), and none of it is used by lamb (new).
- We now have new sectors including hormone/non-hormone sectors, which are entirely separate sectors.
- This new split database can then be used to run scenarios.

Illustrative scenario

- Negative productivity shock for the higher cost of production for hormone free beef – only where hormone beef is produced.
- Multilateral reduction in beef tariffs:
 - All regions
 - 25% tariff reduction on beef (both hormone & hormone free)
- What is happening to trade?

Illustrative results

<i>qxs[BeefHGP **]</i>	<i>Australia</i>	<i>New Zealand</i>	<i>USA</i>	<i>UK</i>	<i>EU_27</i>	<i>Rest of World</i>
<i>Australia</i>	0	0	-4.958	0	0	1.729
<i>New Zealand</i>	0	0	0	0	0	0
<i>USA</i>	2.598	0	0	0	0	-0.278
<i>UK</i>	0	0	0	0	0	0
<i>EU_27</i>	0	0	0	0	0	0
<i>Rest of World</i>	25.31	0	22.283	0	0	9.972

% change in real exports
of **hormone beef**

<i>qxs[BeefHGP free**]</i>	<i>Australia</i>	<i>New Zealand</i>	<i>USA</i>	<i>UK</i>	<i>EU_27</i>	<i>Rest of World</i>
<i>Australia</i>	0	-11.287	-8.092	30.686	28.271	18.397
<i>New Zealand</i>	17.186	0	30.938	72.09	78.919	33.737
<i>USA</i>	-13.461	-12.008	0	19.712	23.193	9.482
<i>UK</i>	22.734	24.748	29.138	0	-1.706	38.133
<i>EU_27</i>	22.634	24.647	29.033	-2.897	0	54.109
<i>Rest of World</i>	-12.726	-11.189	-7.251	-2.281	5.581	1.543

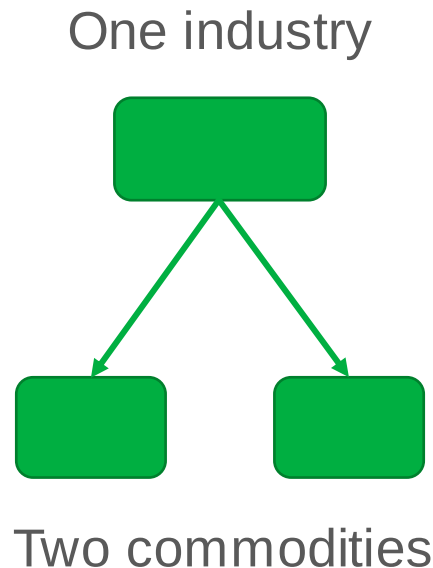
% change in real exports
of **hormone free beef**

<i>qxs[Beef**]</i>	<i>Australia</i>	<i>New Zealand</i>	<i>USA</i>	<i>UK</i>	<i>EU_27</i>	<i>Rest of World</i>
<i>Australia</i>	0	-0.97	-3.29	67.26	63.79	17.46
<i>New Zealand</i>	1.26	0	5.36	68.44	74.46	1.45
<i>USA</i>	1.93	2.33	0	60.6	63.46	12.87
<i>UK</i>	2.52	2.92	0.5	0	-7.3	1.34
<i>EU_27</i>	2.54	2.93	0.51	-7.99		13.17
<i>Rest of World</i>	2.48	2.87	0.91	29.2	38.99	3.7

% change in real exports
of **beef** (no hormone/
hormone free split)

One industry, two commodities

- This second approach extends the previous approach, by using the latest GTAP model version 7, which allows for multiproduction by use of a non-diagonal 'make' matrix.
- Where activities are producing multiple outputs, changes in the supply of a certain output depends on the overall level of output, as well as any shift in the mix of the commodities supplied by that sector.



Data collection

As above:

1. First, data is collected for splitting the old sector and commodity, e.g. red meat, into the disaggregated sectors and commodities e.g. into beef and lamb.
2. Step two is to split the new data for the chosen commodity (here we look at beef) into growth hormone treated and non-growth hormone treated.

However, both 1. and 2. are combined so that only one split is carried out when using SplitCom (but the data collection has two separate parts).

SplitCom & reaggregation

- The final data is used in SplitCom to carry out the split. We now have new sectors including hormone/non-hormone sectors. However, as before, they are entirely separate sectors.
- We aggregate the industries back together:
 - SplitCom uses GTAP model version 6 data, so we convert to GTAP model version 7 data
 - Using GTAP model version 7 allows for multiproduction i.e., one industry producing multiple commodities. We therefore have a single industry producing both 'hormone' and 'hormone free' beef.
- This can then be used to run scenarios.

Next steps

- Inclusion of the hormone free cost increase within the commodity split (only in countries that produce both) by using a scalar to reflect the extra costs.
- Look into the potential 'small shares issue' that may arise where hormone use is banned.
- Implement different scenarios, and compare to previous results.

Questions & Feedback

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