Rural innovation and the 'biologically derived' components of the Australian economy

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Overview

Biologically derived sectors cover the cultivation of animals, plants, fish, fibre, and the environments in which this takes place – land, soils, rivers, and oceans. The rural industries are the 'feedstock' (in Input-Output table terms) for a range of biologically derived value added. Biologically derived value-added is particularly important as the feedstock for creating value in several industry sectors –

- Manufacture of food products and beverages;
- Manufacture of textiles, wearing apparel, and leather goods;
- Manufacture of wood products and products of wood;
- Manufacture of paper and paper products;
- Construction;
- Wholesale trade;
- Retail trade;
- Accommodation and food service activities;
- Education; and
- Human health.

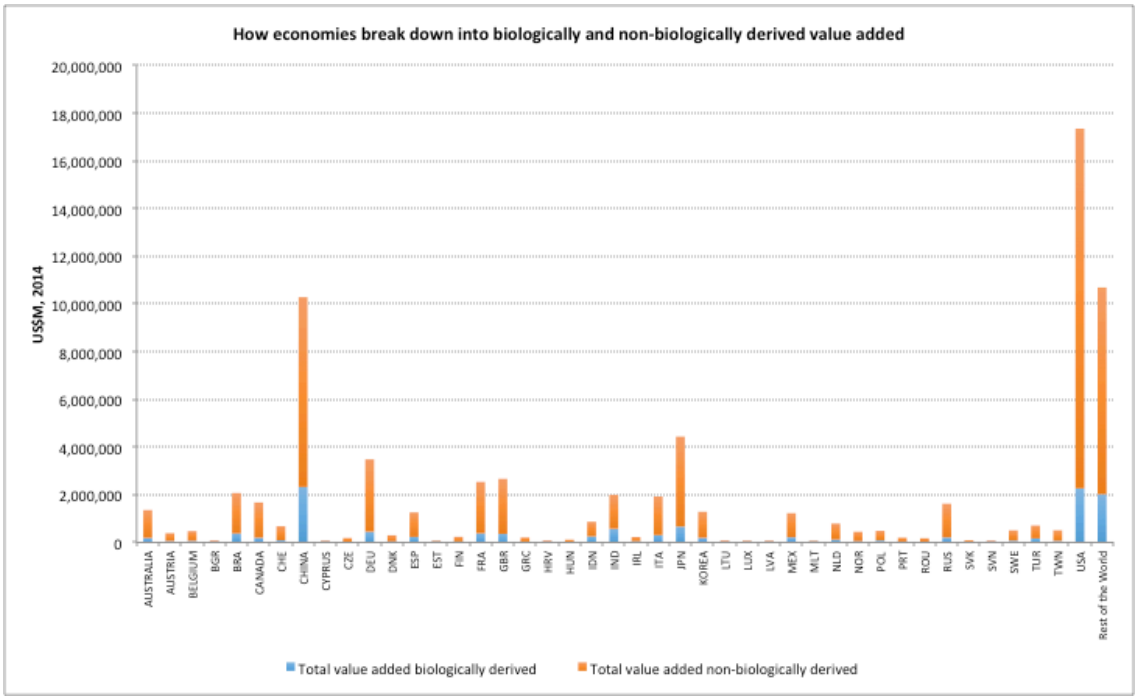
There is potential for the greater application of Australian biologically derived output and reuse to create additional value in these sectors - and potentially others. Also, as noted above, there is a clear affinity and potential at the nexus between biologically derived economic activity and the circular economy.

Australia's current share of globally biologically derived value added

Given the importance of biologically derived economic activity, especially in regard to strengthening the 'circular economy' in Australia, this Review has piloted new experimental estimates of the proportion of the national and global economy that can be classed as biologically derived. In order to do this, we analysed the new OECD Trade in Value Added (TiVA) datasets that capture the proportion of value added directly and indirectly in global final demand (i.e., 'flowed through' the entire global input-output structure). The initial impetus for carrying out this investigation was the following initial estimate in Figure 1.

This chart plots rough initial estimates of the biologically derived and non-biologically derived components of value added for all countries covered by the World Input Output Database. The calculations assume that the main downstream user sectors for biological inputs split value added contributions between biological and non-biological value flows on a 50:50 basis. The indicative results indicate that the biologically derived component of global value added is significant but much smaller than the non-biologically derived component. An additional analysis, not reported here, shows that (as would be expected) developing economies have a higher biologically derived value added share. However, as noted earlier, future innovation is likely to raise the biologically derived share of value added in advanced economies hence this pattern will evolve over time.

Figure 1: Initial estimates of the biologically-derived and non-biologically derived breakdown of value added, 2014



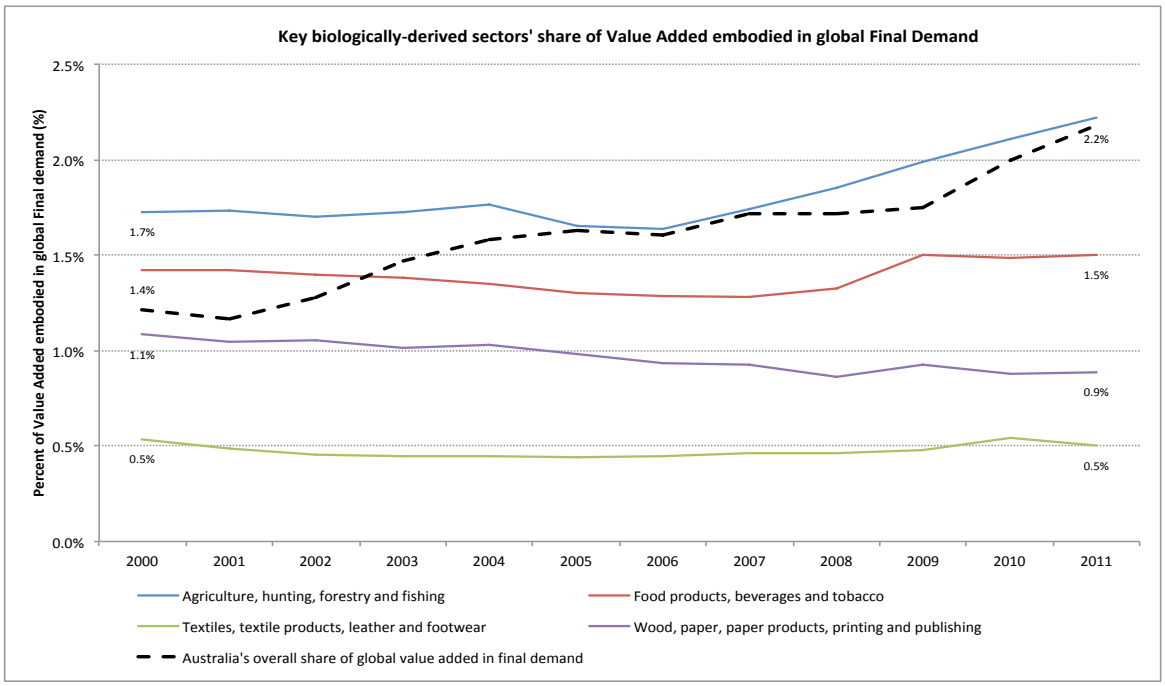
Source: Analysis of the World Input Output Database.

Given that these initial rough estimates indicated it may be useful to analyse value added in this way, OECD Trade in Value Added (TiVA) data were analysed in order to produce more robust estimates. Use of the TiVA data means that shares of biologically and non-biologically derived value added have been calculated by the OECD using sophisticated methods that flow-through each sector in each country's full contribution to global final demand.[1] This is the same calculation used in country-specific Input-Output analyses but on a much larger and harder to compute scale. The results tell us what each country's industry sectors contribute to global value chains – encompassing *all* production and *all* trade in the global economy. This means that all biologically derived value added is, in principle, being captured irrespective of particular details of exports, imports and production in each national economy.

Figure 2 contains a graph of Australia's (increasing) overall share of the value added in global final demand, together with the world total shares for four key biologically derived sectors (i.e., overall multi-country shares of biologically derived value-added contributions by feedstock sector). This shows us that Australia's overall national value-added contribution is broadly the same as the overall agricultural contribution made by all economies.

[1] The OECD TiVA results on have been adjusted by Howard Partners to reflect the proportion of each sector's inputs that are biologically derived (details are provided in the Appendix).

Figure 2: The biologically derived share of global final demand, 2000 to 2011



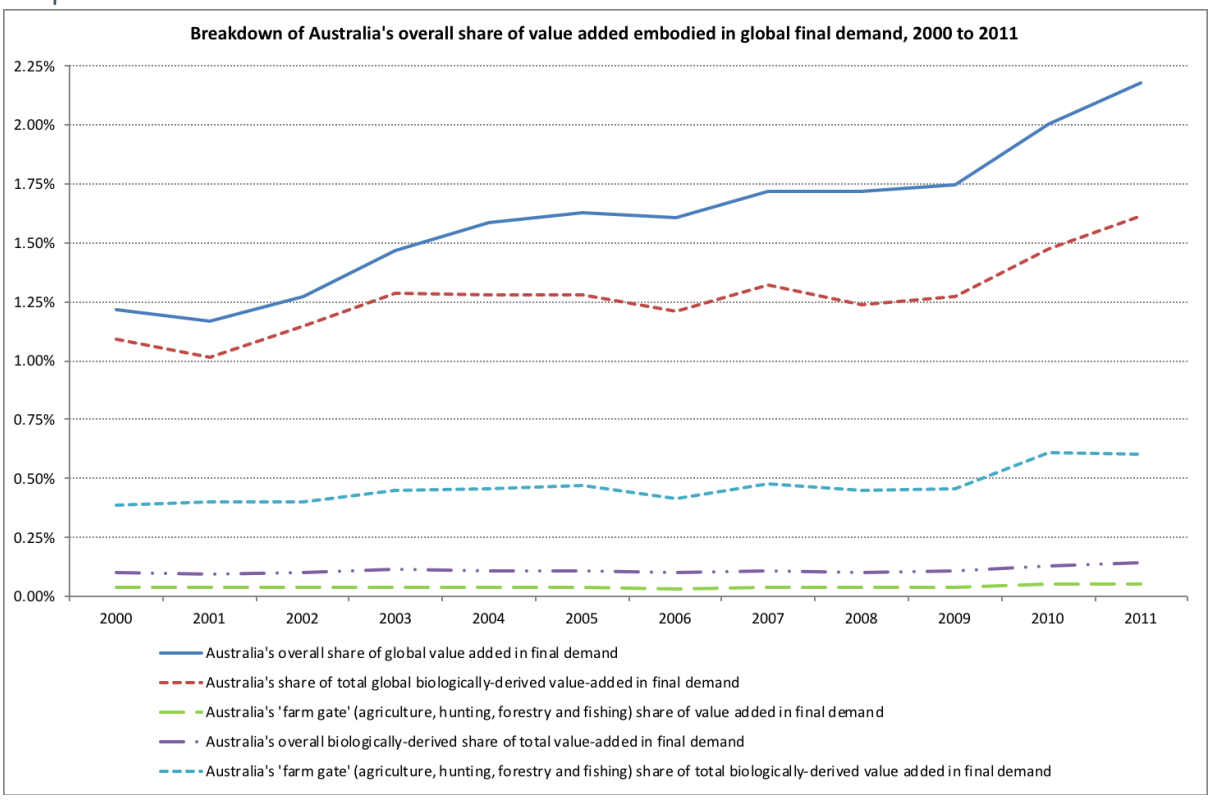
Source: Analysis of OECD TiVA data

Figure 3 provides a summary of how Australia's overall share of value-added embodied in global final demand relates to the total biologically-derived component created by all countries. This graph also plots the 'farm gate' contribution as both a share of all value-added embodied in global final demand and also the share of the biologically-derived component of global final demand. These are only broadly indicative estimates based on calculating the relative shares of the sectors in the OECD TiVA dataset identified in Figure 2 (though they do capture the full direct and indirect 'embodied' value-added contributions to global final demand). A more sophisticated analysis using raw global input-output datasets would produce more accurate (and up to date) estimates.

These results tell us that whilst our share of all value-added embodied in global final demand and our share of the biologically-derived component of this aggregate are both increasing, the increase in the share of global biologically-derived value added is not matching that of the overall total share of value added in final demand over this time period. This divergence is partly caused by the 'mining boom' era, which resulted in a strong non-biologically-derived (metallic) 'flow through' input from Australia into the rest of global production. As stressed in this Review, looking to the future it is likely that the biologically-derived share of global value added in final demand will increase in prominence - hence providing important export opportunities for Australia.

Crucially however, as this graph makes clear, the 'farm gate' component of the value-added embodied in global final demand is not *in itself* strong – rather it is the (crucial) 'feedstock' stage in a broader system of global value-added. Consequently, to limit innovation/industrial strategy support to the farm gate stage is likely to result in missed opportunities for Australia.

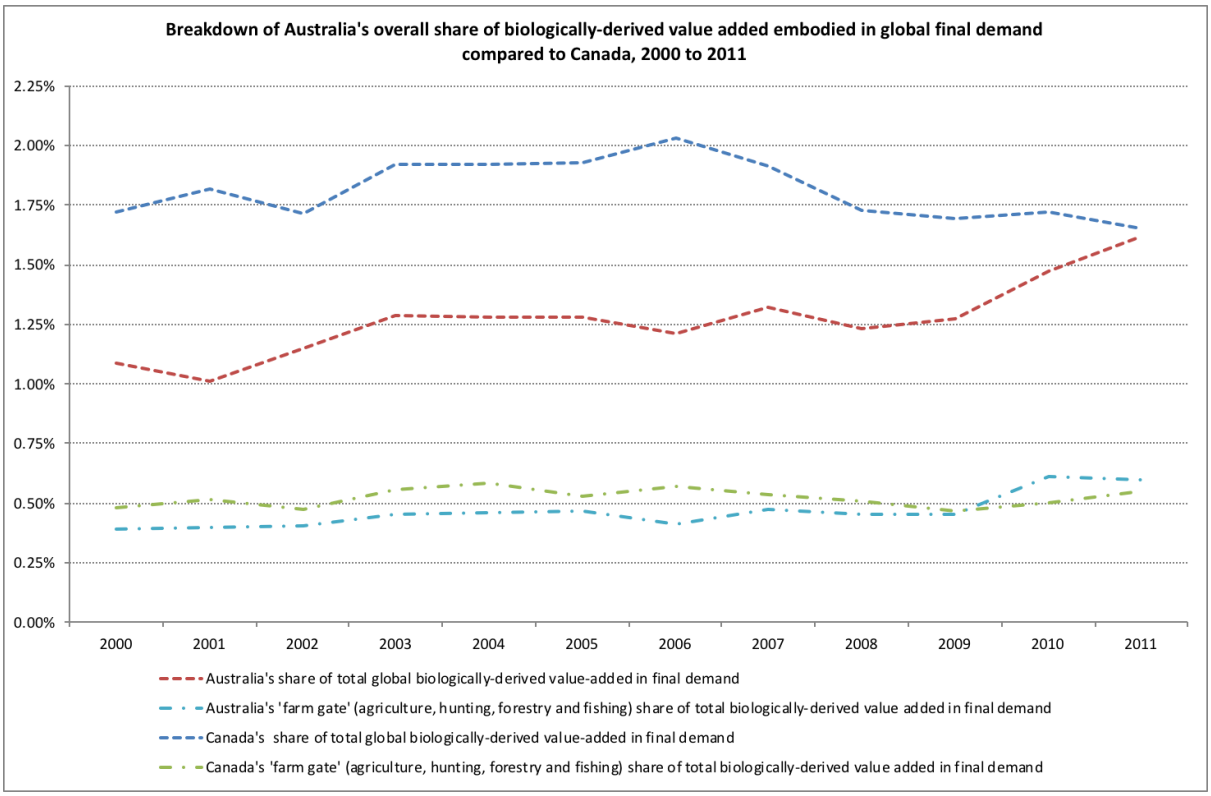
Figure 3: Australia's share of value-added embodied in global final demand and its biologically-derived component



Source: Analysis of OECD TiVA data

Figure 4 provides a comparison between Australia and Canada's performance in these terms. It tells us that Australia's share of overall biologically-derived value added embodied in global final demand has been increasing relative to Canada, and given the OECD TiVA data only extends to 2011, has probably now risen above Canada's share. The smaller 'farm gate' component increased above Canada's share in 2009. Since 2009, the increase in Australia's share of overall biologically-derived value added embodied in global final demand is associated with what happens 'after the farm gate' not up to the farm gate.

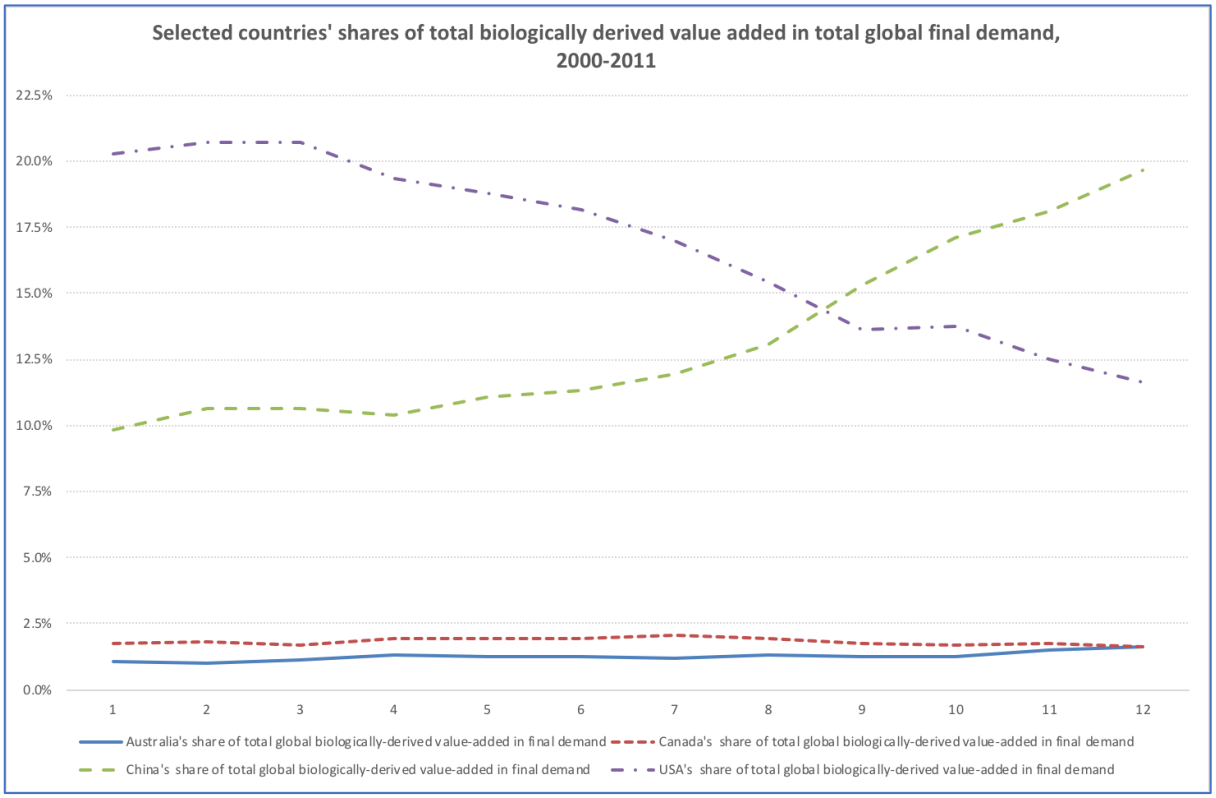
Figure 4: A Comparison of Australian and Canadian performance in shares of biologically-derived value added in final demand



Source: Analysis of OECD TiVA data

Figure 5 profiles the more general global trends in shares of biologically-derived value added in global final demand by picking out the performance of some key countries. What stands out is the way in which the USA and China have effectively 'swapped' their shares over the 2000 to 2011 time period.

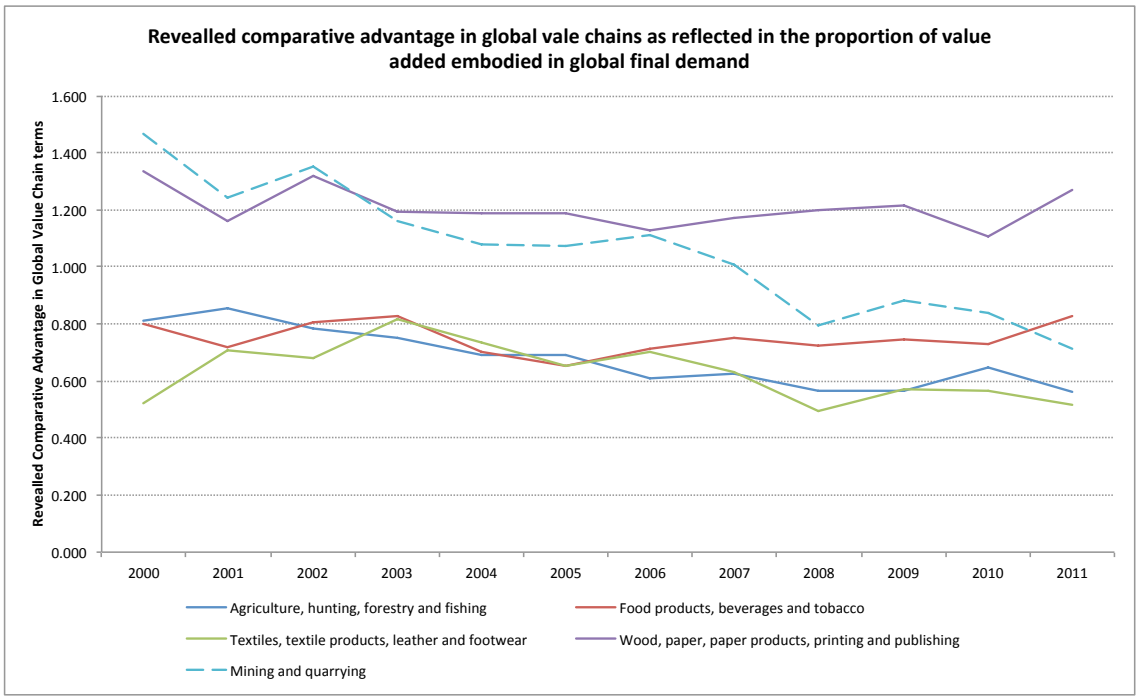
Figure 5: Changes in selected countries' shares of total biologically-derived value added in global final demand



Source: Analysis of OECD TiVA data

Figure 6 provides the results of calculations of the ratio of Australia's share of the value added embodied in global final demand for key rural sectors compared to our overall share of value-added embodied in global final demand. A ratio above 1.0 tells us that the sector concerned has a higher share than Australia as a whole and below one a lower share. Mining and quarrying have been added to this chart as a comparator. The results tell us that these rural sectors are broadly stable but that mining and quarrying have been declining (other 'downstream' economies are adding value to Australian minerals and metals exports).

Figure 6: Revealed comparative advantage for Australia in sector shares of value-added embodied in global final demand



Source: Analysis of OECD TiVA data

As stressed above, these are only crude indicative estimates carried out mainly in order to determine whether or not it is worthwhile using results from global input-output datasets to inform Australia's rural innovation/industrial strategies. As such, the results do suggest that it would be useful to build-up a more accurate and comprehensive picture of Australia's evolving role in the biologically-derived dimension of the global economy.