Referee's Report on

Research into the Impact of Pigmeat imports on the Australian Industry

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A. Estimating the effect of imported pigmeat on the Australian Industry

Work undertaken by Productivity Commission

The work involves two methodologies: vector autoregressive modelling, and linear regression modelling. The study focuses on the question of whether changes in the volume of imports or the price of imported pigmeat influence domestic production or domestic prices.

The variables used in the analysis are:

VAR model:
Import Volumes
Import Unit Values (as a proxy for import price)
Domestic production
Domestic prices
Feed wheat prices (major input to production)

Regression Model (an inverse demand function):
Pork, Beef and lamb production
Pork, Beef and lamb retail price

1. General Comments

This research is clearly limited by the time frames imposed on the study, and hence I am not sure that it is able to provide definitive answers to the questions of interest. What we have here is a partial analysis of one sector in a highly integrated broader sector. Medium and long terms trends in domestic consumption of (and hence demand for) pigmeat products will be dependent on aggregate demand (incomes, population), as well as movements in the mix of tastes / demand for different substitutes in the market (other meats and protein sources). Some kind of complete demand system for food items would be an ideal starting point for this analysis, with a multilayer structure that allows first determination of demand for meat as a share of total demand, and then second-stage estimation that models movements in the shares of different meats. This would give us a coherent picture of the demand side of the market.

So what can we infer from the data and the analysis we do have? The graphs in Figure 1 tell us a lot. First, adding domestic demand and imports, total domestic supply is clearly growing, from about 35 kilotonnes in 2000 to 48 kilotonnes in 2006. Notably, most of this growth in demand is met by imports, with only a small amount of growth in domestic production.

Secondly, Import price (proxied by import unit value) and domestic price are clearly tied to each other – they track at very similar values throughout the sample and show very similar short and medium term fluctuations. Note this has been the case since 1990, even though there were virtually no imports until the late 1990's. It is also

clear that prices show no upward trend over the past 16 years. This is despite the fact that feed wheat prices have increased significantly. Presumably with this increase in input costs but no increase in output price, the industry has been able to achieve efficiency gains in other areas, or has seen a decline in profitability over the period (or possibly both).

Without looking at any of the econometric analysis, we could draw some tentative conclusions about the questions at hand. These are tentative, based on cursory look at the data, but they give us a benchmark against which to assess the more sophisticated econometric analysis that will follow. First, prices. One would assume that in such a large global market there is an effective "world price", determined by global supply and demand functions. This price would be exogenous to Australia (since the Australian supply and demand are quite small in global terms). The import price would be most responsive to this notional world price. The close relationship between domestic and import prices suggests this price is also transmitted to domestic prices. If this story is at least partially true, the question of how imports affect domestic prices is quite clear: imports *per se* would have no impact on domestic prices (except perhaps in the short run). Domestic and import prices are determined by global supply and demand, and can be seen as exogenous to the Australian market.

Secondly, production. With the apparent growth in domestic demand, what seems to be clear is that domestic industry has not benefited from this growth. Almost all of the increase in demand has been met by increased imports. It is not clear from the data why this would be so: is it that domestic production was not able to respond to demand growth, so the shortfall was met by imports? Or was it that in some short run periods, imports were slightly cheaper in some areas, creating a partial shift from domestic to imported supply sources? Understanding these possible causal channels is crucial to the question of whether imports have had a detrimental effect on domestic industry, and it is not clear from this cursory look at the data just how the mechanisms are working.

2. VAR Modelling

2.1 VAR Specification and methodology

The methodology appears sound. It is not obvious whether variables were differenced or the VAR estimated in levels. I infer it was estimated in levels, which is definitely preferred. Ideally, a VAR with I(1) variables would be estimated using cointegration techniques, but I understand that this poses some challenges and the cointegration methodology can be quite sensitive to outliers, etc. The "next best" thing, and more robust, is to estimate in levels. A differenced VAR is clearly inappropriate, as it ignores possible long run relationships – it is underspecified and will lead to inconsistent estimation.

I agree that the time period of interest is 2000-2007, so suggest discussion should focus on this period almost exclusively.

2.2 Causality tests

The causality tests are a way of gauging whether particular sets of coefficients in particular equations are significant. I think there are two problems with relying on these tests. First, bivariate tests are not correct in a multivariate system. You cannot identify if X causes Y in a model that includes Z. A test of whether X causes Y is a test of the coefficients on X in the Y equation. But if X caused Z and Z caused Y, then these coefficients can be zero and yet X can cause Y via Z.

Secondly, we cannot discern the direction of causality from the test. It is surely important to know the direction of causality.

I would prefer this section to concentrate on the actual coefficients in Table A.4, for example. They tell the same thing, but also show coefficients and give a feel for magnitude of effects and significance – something that is only marginally significant is not as persuasive as something strongly significant. Looking at Table A.4, we see some clear things. First, look at prices: we find results quite consistent with the intuitive discussion given above: domestic price is influenced by nothing but its own lags. Import price is similar, although there is some (marginal) evidence of domestic prices influencing import price. With production, lag production is important, and there is weak evidence of other effects: imports (lag 2) may have a negative effect, and there is even weaker evidence of a positive effect of import price on production. This possible negative connection between imports and production is consistent with some of the discussion above. I realise this analysis is based on only one table of results, and other specifications are used; I am suggesting some further discussion of the results in this way would be of value.

2.3 Impulse Responses

The discussion of Figure 2 is of interest, and another useful way to explore the model estimates. It captures interactions of variables more completely. The notable thing about these figures is that effects die out to zero in less than two years: some effects may be apparent in the short run, but there is no evidence of long run impacts. With a VAR estimated in levels (not first differences), this need not be the case: it is possible some long run effects could have been sizeable. I would imagine this is important to the policy issues under consideration.

Note, however, there are some issues with interpreting these impulse response estimates (and the cumulative ones presented in the Table A.5); this is discussed in detail in Section 3 of Part B below.

2.4 VECM Estimation

There is very brief discussion of VECM results. VECM models can be sensitive to outliers, and with small samples, can be unstable. Having said that, a VECM is just a levels VAR with restrictions, and more explicitly captures long run relationships, so would be of some appeal or interest. There are suggestions in the discussion that there are stronger effects with VECMs. I would not be satisfied as a researcher with knowing that there are "contradictory" results here without seeking explanations and further study. There could be some quite important findings here that bear on the

central research question; I would urge more analysis of the VECM models or some variations, to try and disentangle this. For example, even two-step Engle-Granger cointegration estimates might shed interesting light on the long run relationships of interest.

3. Inverse Demand model

The inverse demands models are interesting, and while a relatively simple approach – linear regression – is taken, they provide some useful insights. The model lacks any dynamics / lag effects, but on the other hand, could be interpreted as capturing the long run cointegration effects.

These models only consider price effects, and results all seem to make sense. Clearly we have quite a different markets in the 1990s and post-2000, so the results estimating over separate time periods are the main ones to focus on. Both Tables 2 and 3 show that pre-2000, the Australian market was somewhat insulated from the world market, and other domestic factors are relevant: pork production has the expected negative effect, and there are some effects of other meat prices and production. Conversely, with the 2000-07 data, none of the domestic factors are relevant, and import price has a strong positive effect. This is exactly what our intuitive analysis of the graphs suggested.

4. Summary

Given the scope of the research, the econometric work here has been done quite well. The results are generally consistent with intuition and what appears clear from the raw data.

The main area where further work appears needed is with the VECM analysis or something analogous methodology. This is particularly the case with assessing effects on production, where no clear and consistent messages emerge. The question remains of why domestic production did not enjoy the benefits of a growing domestic demand, with virtually all the growth in demand being met by imports.

With prices, we have the additional evidence of the inverse demand model, and the message appears quite clear: opening up of the market has led to stronger price transmission from the world price to domestic price via the import price, and less influence of domestic market factors. It is interesting to note, though, that even in the 1990s domestic price followed a similar pattern to import prices, and showed no trend increase. The post-2000 estimation results suggest a stronger link to import prices, but no change in long term trend of flat price levels.