Estimating the Effect of Imported Pigmeat on the Australian Industry

A Report by the Productivity Commission

Referee's Report:

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This research investigates the effect of pigmeat imports on Australian prices and production using standard econometric techniques. The analysis is conducted in the context of the Vector Autoregressive (VAR) framework and the estimation of inverse demand functions. The findings of the paper suggest that there is no convincing evidence that pigmeat imports have lowered production and that the impact on Australian prices is on the whole ambiguous.

There are a number of comments that can be made with regard to the estimation methodology, strategy, approach and the interpretation of the results. These are as follows.

Comments on the VAR Analysis

1) The advantage of modelling within a VAR framework is that it is an encompassing framework which is general enough to accommodate a wide variety of theoretical macroeconomic relationships. Further, economically meaningful relationships can still be accommodated and general insights provided about these relationships.

2) The VAR analysis is based on quarterly data over the sample period 2000 – 2007. There are 5 endogenous variables, the order of the VAR is 2; this leaves 30 observations to estimate 10 explanatory variables. Given this very restricted dataset, the results should be treated with extreme caution and it is not surprising that, at times, the results are counter-intuitive and very sensitive. The VAR should be estimated using all the available data, unless there are obvious break points or changes in regime which cause a dramatic change in the dynamic evolution of the variables. Observing plots of the 5 variables, this does not seem to be the case.

3) The first main contentious issue in the paper surrounds the classification of the stationarity versus non-stationarity properties of each of the series. The are a number of points that can be raised:

    a. Firstly, unless there is a structural break in the data, the full sample period should be used to classify whether the series are I(0) or I(1) – especially given the limited data set.
    b. Secondly, some information criterion should be used (either AIC/SBC, for instance) to choose an optimal lag length – the results can vary quite a bit otherwise.
    c. Thirdly, it is not clear what is in the null and what is in the alternative of each of the ADF tests; for instance, is there a trend used? The inclusion of

the drift/trend should be justified on economic grounds and critical values will differ accordingly.

d. Fourthly, given that the empirical tests are ambiguous and there are many economic grounds as to one might believe that the series might be non-stationary, there are many other unit roots tests which should also be employed (e.g. Phillip-Hansen tests).
e. From a theoretical point of view, it makes sense that domestic prices are non-stationary, since one would expect shocks to prices to have permanent effects. Empirically, this is backed up by the finding of only weak evidence of stationarity for domestic prices. Further, there may be reasonable economic grounds to suggest that over the long-run, domestic prices and import unit values move together. If this is the case, then import unit values would also be I(1), and there would be a cointegrating relationship between the two series. This would tie down the dynamics of the model and perhaps provide more intuitive results. If import unit values are in fact stationary (although the evidence is tentative in the second sub-sample), one way to check this (over and above other unit root tests is to test whether the import values series is I(1). Given that import unit values are derived from the import values series, and that the import volume series is non-stationary, then there must be a cointregrating relationship between the latter two series. Either way, some judgement needs to be exercised regarding the economic properties and the resulting specification of the model.
f. Again, the sample period is too short to decisively say whether production is stationary or non-stationary. Details of the ADF tests are again needed (are they with or without trend), and again, economic judgement needs to be used and other unit root tests would be informative (as would a longer sample series, if available). The implications of a series being non-stationary versus it being stationary differ widely and would affect the interpretation of the results as well as policy recommendations.

4) The caveats to modelling in differences are unclear:
    a. Are the misspecification issues raised by Inder (1998) still relevant?
    b. Although long-run properties of the model can be lost through differencing, on the other hand, the specification of the model can be greatly improved if sensible economic arguments are used to assert priors on the long run dynamics between the levels of the series. Then, in the context of a VEC model which accommodates modelling in differences as well as economically meaningful relationships between the levels of the series, the analysis could provide far more intuitive results – as least with regard to the long-run.

5) Just reiterating this last point, If the VAR was specified such that it explicitly took into account specific and economically-justifiable long-run relationships, then it is likely that the results would be more intuitive as well as reliable when it is estimated over the full sample period (1990 – 2007). Then simple tests for structural stability could be used (e.g the Chow tests), although once again good judgement is needed in interpretation of the results given sample size limitations.

6) The difference between a VAR in levels and a VEC in levels is unclear.

7) Intuitively, the inference that imports unit values Granger causes imports seems problematic since one is a stationary variable and the other is a non-stationary variable.

8) One has to be careful in the interpretation of the impulse response functions. At the moment, throughout the paper, they are written as, for instance, "a 1 per cent increase in imports caused a 0.18 per cent decline in prices"; however, it is more accurate to say that "a general or 'system-wide' shock that causes imports to increase by 1 percent on impact, causes a 0.18 percent decrease in prices in the long run". This distinction is important because *direct* shocks unique to imports (called 'structural' shocks) are not identified in the analysis and hence it is a *general* shock to the economy that has been *scaled* such that imports go up by 1 per cent on impact. For policy purposes, this distinction can be crucial.

9) The cumulative impulse response functions show that a shock that causes imports to increase by 1% results in a 0.18% decline in prices. There are no standard errors or confidence intervals around this estimate – and hence it is difficult to say whether this decrease is statistically significantly different from zero. Moreover, this abstracts from the issue of economic importance (i.e. even if a number is statistically significant, it is important to discuss what the likely economic implications are of the size of the impact).

10) There are no diagnostic tests for the estimated VAR/VEC model and thus making it difficult to judge and provide further insights for improvements.

<u>Comments on the Inverse Demand Function Analysis</u>

1) There are no time subscripts on the model on page 2.

2) Economics should justify the choice of model. If the variables on the RHS of the equation on page 2 are dated at time *t*, then is seems that the VAR model nests the inverse demand model. The inverse demand model treats domestic prices as the dependent variable, and import volumes and domestic production (and other variables) as the independent variables. However, if there are (the reasonable) economic priors about prices, production and import volumes being *jointly* determined, for instance, then a VAR modelling framework is more appropriate (and will have some theoretical basis).

3) The stationarity and non-stationarity properties of the series in the regression model will have implications for the inference on causation in the model – again there needs to be knowledge about these properties in order to provide sensible conclusions.

4) Again, there are no diagnostic tests for the model – the properties of the residual would immediately reveal whether there is a non-stationarity problem.