Larue's assessment of the Purcell and Harrison report entitled "The Impact of Trade Liberalisation and Increasing Imports on Australian Pig Prices" - A reply

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Abstract

This paper is a reply to Larue [6] who critiques a Queensland Department of Primary Industries consultancy report made by the authors [9] on the effect of pigmeat imports on Australian pig prices. Despite criticising our methodology nowhere in his paper does Larue demonstrate that our results are incorrect. Larue's criticisms are noted and, in the main, rejected. We clarify some of the finer econometric detail.

Larue claims that we have not proved serious injury to the pig industry due to imports. However, Larue is under the misapprehension as to the nature of the report, mistaking the QDPI consultancy report for a submission to a Productivity Commission Inquiry on WTO safeguard action against imports. The actual submission to the Productivity Commission Inquiry [10] addresses all of Larue's concerns and demonstrates a clear and deletrious effect of imports on the Australian pig industry. We note that Larue actually comes out in support of the conclusions in our submission to the Productivity Commission.

1. Introduction

In response to producer concerns about the negative effect of imports on the Australian pig industry, the Australian Government instigated a Productivity Commission Inquiry into pigmeat imports, to determine whether WTO Safeguard action is warranted. Prior to the terms of reference being handed to the Productivity Commission the Queensland Department of Primary Industries asked the authors' to prepare a report [9] analysing the methodology used in an Industry Commission (the forerunner of the Productivity Commission) Research Report [5]. This Industry Commission report came to the conclusion that imports would not have a significant deleterious effect on the Australian pig industry. The report prepared by the authors [9] came to the conclusion that the methodology used in the Industry Commission Research Report was flawed, and consequently their conclusions were suspect. Further, the report prepared by the authors concluded that domestic producer prices were significantly and adversely affected by imports.

When the Productivity Commission was asked by the Australian Government to conduct a safeguards inquiry, the Queensland Department of Primary Industries asked the authors to prepare another report [10] to address the question of whether imports were causing serious injury to the Australian pig industry.

As part of the their submission to the Productivity Commission Inquiry the Canadian Government [7] requested that Bruno Larue, from the Centre de Recherche en Economie Agroalimentaire at the Université Laval, Ste-Foy, Quebec, conduct an assessment of the authors' original report [9]. Larue [6] was critical of the original report and concluded that the evidence presented in the report was not sufficient to provide evidence for safeguard action.

Unfortunately Larue has been misled by the Canadian Government as to the purpose and context of the authors' original report. It was never intended that the report provide evidence for safeguard action, only to highlight that the 1995 Industry Commission Research Report [5] failed to take into consideration all of the relevant factors. All of the criticisms highlighted by Larue have been addressed by the authors' actual submission to the Productivity Commission Inquiry [10].

In this paper we concentrate on addressing the critique of our econometric methodology and clarify some points of misunderstanding. Because Larue claims that simultaneous equation bias will affect our modelling results and that we failed to include inputs in modelling the production process we conduct some additional econometric modelling to demonstrate that these concerns do not change our

results.

2. Overview of the Larue Assessment

Larue [6] conducts an extensive critique of the authors' original paper. His basic conclusions are that the report failed to demonstrate serious injury caused by imports and the econometric methodology is flawed because it does not take into consideration the simultaneous equation bias that exists when simultaneously estimating demand and supply. He takes issue with the specification of our models for not taking inputs into consideration and questions the validity of imposing a structural break rather than endogenously determining its position.

Larue's paper is divided up into four sections, not including an Executive Summary and a Conclusion. After an Introduction he then reviews the literature on trade liberalisation and protection in his section 2 before giving an overview of our report in his section 3. In his section 4 he critiques our econometric methodology and model specification. We address the criticisms in each of his sections sequentially.

2.1. Introduction

After an Executive Summary, Larue, in his Introduction, outlines our reports' terms of reference and then concludes, on the basis of these terms of reference, that

> The purpose of the P&H report is to provide documented empirical evidence to justify a safeguard action [6, p. 3 para 3.]

This is incorrect, and nowhere in the terms of reference is this stated. The bulk of Larue's paper is designed to show that we have not provided such evidence, yet we do not dispute this fact. However, Larue's paper is largely irrelevant to our submission to the Productivity Commission Inquiry [10], which does present evidence to justify a safeguards action. Since we have used the same econometric techniques in both reports, and more importantly, expand on them, we will address his critiques of our econometric modelling.

2.2. Trade Liberalization, Adjustment Policies and Protection

Larue, in Section 2, [6, pp. 4-7] outlines the economic theory on trade liberalisation and protectionist policies. He quite rightly indicates that for a small

country an optimal tariff is near zero and protectionism of any sort is not welfare enhancing. We totally agree with Larue on this point, and we reject his implicit assumption that we are advocating protectionism. If anything, trade reform in Australia has not gone far enough. Our analysis suggests that Government policies, designed to increase competitiveness and open the economy to international trade, are actually having the opposite effect and inducing welfare losses. Larue actually agrees with the conclusion of our submission to the Productivity Commission Inquiry when he says

> It is conceivable that the problem perceived by hog producers might have more to do with domestic market failures than with import competition per say [sic] even though imports might exacerbate the effects of the market failures. [6, p. 8 para 1.]

It is comforting to know that Larue, and by extension, the Canadian Government, agrees with our submission to the Productivity Commission Inquiry.

Larue goes on to say that we do not "...have much to say about this [the market failures]"[6, p. 8 para 1.]. However, in our submission to the Productivity Commission Inquiry we concentrate on the idea that imports exacerbate the market failure. The question for the Australian Government, therefore, is whether they are willing to deal with the issue of domestic market failure and, if not, is there a case for countervailing measures for producers. If the Australian Government is willing to deal with the issue of domestic market failure, then is there a case for temporary assistance while the domestic market failure is addressed.

Larue briefly alludes to the Ricardo-Viner model of international trade [6, p. 5] when he highlights the problems of adjustment linked to factor mobility and price stickiness. We expand on the implications of this model in our submission to the Productivity Commission Inquiry [10, pp. 183-184] and state that both the Heckscher-Ohlin-Samuelson (HOS) and the Ricardo-Viner (RV) models of international trade demonstrate that there are gains to be made from trade liberalisation. In a HOS world there are distributional considerations to take into consideration when an economy is undergoing trade liberalisation, because there are losers as well as winners. In an RV world, with factor specificity, there are no distributional considerations in the functional sense but gross gains from trade need to more than compensate for the lost value of the specific factor and its discounted cash flow in order for a positive net gain from trade to be realised. Real economies are characterised by factor specificity, imperfect competition and increasing returns to scale (either at the firm or industry level, and internal or

external). In such a world it is appropriate to formulate the correct policies for that world.

Larue points out that our argument for no gains from trade [9, p 104] is wrong. We agree, and have already corrected this in our submission to the Productivity Commission Inquiry [10, pp. 182-183]. The gains from trade are positive, but there are inter-personal distributional questions to be answered.

Larue claims that our argument for positive externalities in pig production is poorly justified when we argue for subsidies and that there will be significant negative externalities in the form of pollution [6, p 6 para 2.]. We disagree. Unlike pig production in Europe and North America, the small scale of pig production and the highly distributed nature of production (spatial tapering for a public bad) would suggest that pollution problems are minor compared with European and North American piggeries. Larue rejects our contention that there are significant social benefits from having an industry such as pig production in rural areas. The Productivity Commission Inquiry has received numerous submissions that state otherwise; [1] is a prime example.

Larue [6, p 6 para 3.] suggests that we need to back up our allusion to strategic trade [9, p 110]. We do this in our submission to the Productivity Commission Inquiry [10, pp. 70-71, 187-188]. Larue claims that

> It is unlikely that this game theoretic argument applies in this case. There is nothing in the P&H report to document strategic interactions between Canadian and Australian firms. [6, p 6 para 3.]

We argue that the strategic behaviour is at industry level, rather than firm level. We suggest to Larue that the mere fact that he is criticising our report, on behalf of the Canadian Government, is evidence enough of strategic behaviour at this level.

2.3. An overview of the P&H report: What it does and what it should have done.

In this section of his paper Larue claims that because our report focuses narrowly on prices we cannot provide estimates of injury done to the Australian industry. Again, because the report was not designed to look at serious injury for safeguard actions we feel that this critique is a non-sequitur. He suggests that we needed to take an industry-wide perspective, and that by failing to do so we have insufficient

evidence to justify a safeguard action. These concerns are in fact addressed in our submission to the Productivity Commission Inquiry [10].

Larue suggests that a welfare analysis should have been conducted and a partial equilibrium model constructed to measure the welfare effects of imports on the Australian pig industry, but acknowledges that this would have been an ambitious project.

The approach taken in our submission to the Productivity Commission Inquiry has been to establish that imports have significantly depressed producer prices, and that this depression has not been due solely to other factors. Once this has been established we left it up to the industry to demonstrate what the effect of reduced prices has been on their profitability. This was outside the terms of reference of our consultancy for the QDPI. If the depression in producer prices has not been followed by a concomitant fall in input prices, then it follows that the welfare of producers has been adversely affected. The majority of the submissions to the Productivity Commission Inquiry has demonstrated the reduced profitability of producers. The only point of debate has been what has caused this reduced profitability. We believe that our submission to the Productivity Commission Inquiry has adequately addressed this point and that Larue's criticisms of our original report have been addressed.

Larue suggests that it would have been helpful to have discussed the structure of the Australian pig industry, and that our report is "lacking depth at all possible levels" [6, p 7]. This criticism suggests that no matter what we put into the report Larue would have been wanting more. As there are numerous reports which already discuss the structure of the Australian pig industry - for example the 1995 Industry Commission Research Report [5] and its associated submissions - we felt that it was unproductive to revisit well worn paths.

Larue asserts, and it is our contention in our submission to the Productivity Commission Inquiry [10] that the exercise of market power by middlemen, (i.e. retailers), is the most probable source of market failure, and that imports contribute to the depression in producer prices through the actions of such middlemen.

> If retailers exercise market power in their dealing with local pork suppliers, then the opportunity that retailers have to buy from foreigners contributes to the erosion of the bargaining power of local pork suppliers [6, p 8].

However, we disagree with his conclusion that "restricting or even banning imports would not solve this domestic problem."[6, p 8] As argued above, if the

Australian Government undertakes to address the problem of domestic market failure, then there is justification for temporary protection, whatever the form, while this market failure is addressed. Whether this temporary protection takes the form of safeguard action, subsidies or compensation, is irrelevant from the producers' point of view. Whether safeguard action is justified as a form of temporary protection is something that the Productivity Commission will have to determine. We believe that imports have depressed producer prices *through* the exercise of market power by middlemen - something that Larue believes as well [6, p 8]. Given the convergence of views we fail to see the distinction that Larue is trying to make.

Larue suggests that a simultaneous equation model of the industry would have been useful in demonstrating how imports have affected the Australian pig industry [6, p 8]. Not only have we addressed this point in our submission to the Productivity Commission Inquiry [10] by specifying VAR and VEC models, but the VAR model in our original submission did just this as well. Larue takes the view that a VAR model is not a good substitute for a structural equation model, even though it has been amply demonstrated that VARs, VECs, and ADL models are all encompassing models, that is, the structural model is a subset of the VAR etc. Sims' [11] critique of structural equation models is a valid rebuttal of the simultaneous equation approach.

2.4. Model Specification and Other Econometric Problems

In section 4 of his paper Larue claims that there is a lack of solid theoretical foundation for the specification of our models [6, p 9]. Unfortunately he seems to ignore the literature on encompassing models. We are interested in capturing the data generating process underlying the industry, not specifying an ad hoc model and seeing if the data fits this model. If we were interested in forecasting, rather than interpolation, his concerns would be justified.

Larue takes exception to our description of a "supply" model and spends a great deal of time debunking this description [6, p 9]. He goes on to suggest (correctly) that what we meant was a model that captured market equilibrium. We agree that perhaps it could have been clearer that we meant a model of equilibrium supply and demand.

Larue claims that the structural break model is not properly estimated as we have ignored the simultaneous equation bias. This is correct to a certain extent in that there is a *potential* for bias and has been acknowledged in our statement

> The ARDL model formulated in this section does not reveal the dynamic relationships which exist between prices and production [including simultaneous equation bias], nor the relative importance of particular prices or volumes in determining the movement of other prices or volumes. In order to investigate these issues we need to move to a modelling framework which takes into account the dynamic relationships between variables [9, p. 57].

Larue argues that simultaneous equation bias renders our modelling approach invalid. This would be true in the situation where supply and demand prices were equal, in which case it would not be possible to disentangle the demand or supply effects on price. However, in the presence of middlemen there is a marketing margin driving a wedge between producer and retail prices. Simultaneous equation bias will occur only if there is no divergence between retail and producer prices, but clearly there is. The data generating processes underlying retail and producer prices are completely different, and thus there is no simultaneous equation bias. There is then the issue of whether retail and producer prices are significantly correlated, thereby inducing a small level of bias. Not only is the correlation coefficient between retail and producer prices low (0.56401), but the econometric evidence presented in our submission to the Productivity Commission Inquiry [10] demonstrates significant asymmetric price transmission.

Further, simultaneous equation bias is true only if we do attempt to estimate demand and supply elasticities in a single equation framework, rather than estimating market equilibrium. We are only interested in estimating the impact of imports on the equilibrium quantities and prices, not on demand and supply.

In fact Greene [3, p. 592] shows that simultaneous equation bias is actually a misnomer, as the least squares estimator is inconsistent, not biased. Consistency is an asymptotic argument and since we are dealing with a finite sample the asymptotic properties of the time series would be poor anyway. As such, we are unsure whether a critique based on asymptotic arguments is really an issue. Inconsistency, or simultaneous equation bias, is a common problem which can be handled by instrumental variables - which we have done in the supplementary analysis below. The results do not substantially change.

It seems to us that Larue is only pointing out problems which we already acknowledge and address in both the VAR model of the original report and in the submission to the Productivity Commission Inquiry[10].

We reject the contention that the structural break model is not properly estimated. It is perhaps constructive to view our approach as being a sequential

one, rather than one of independent and disjointed events as Larue has obviously done. After determining what the order of integration is for each of the variables (Larue's critique of which will be addressed later), we then investigate if the data generating process (DGP) of the market equilibrium has changed since 1990. We do not include imports at this stage, as we are interested in whether or not the DGP has changed, not what has changed it, and imports were only allowed in after 1990. We are interested in factors affecting the market equilibrium, that is, prices and volumes. In this context it is appropriate to include retail prices as well as producer prices. It is also appropriate to include production; because there is no separate information on quantity supplied and quantity demanded, the production series can be viewed as equilibrium (or traded) quantities. We did not include inputs in the model for good reason. Changes in input prices will be reflected in changes in production. Since we have already included production data there is absolutely no reason to include inputs, unless the object is to estimate a supply function - which we cannot since we do not have the supply data available. From a practical point of view, the incorporation of extra variables in the model leads to a loss of degrees of freedom, retaining degrees of freedom is critical in the analysis due to the reliance on quarterly data.

Once it has been determined that a structural break has occurred after 1990 (note that we are not claiming that it occurred at 1990 - something which will be addressed later with reference to Kalman filters), we then attempt to determine what caused the decline in producer prices. Larue suggests that there are more appropriate tests for structural breaks, and we agree - again we will return to the issue of Kalman filters later. However, our analysis does not rely on the existence of a structural break. By putting imports into the model, with import levels being zero before 1990, this acts as a natural structural break and enables the quantification of the actual effect of imports on producer prices.

The first half of p. 10 of Larue's paper debunks the idea of a supply model incorporating demand variables, such as import prices. Again, we need to clarify that we are talking about a market equilibrium model. Therefore, in this situation Larue's criticism is unfounded. Larue goes on to question why we reported only one standard error confidence intervals for Canadian import volumes, and implies we were misrepresenting the true effect [6, p. 10 para 3.]. In fact, we do not report one standard error confidence intervals. Larue forgets that p-values are calculated for two-tailed tests, that is, 2.5% in each tail. Since we were interested in whether import volumes significantly *depress* producer prices we use a one-tailed test, putting all the probability (5%) in the lower tail. This is convention,

and taught in first level undergraduate statistics courses, and should have been apparent to Larue.

Larue critiques the VAR modelling in our report. This is because he has not understood what is being modelled. The variables in the model are of log-stationary form and the impulse-response functions reflect this. The variables in the ADL model are in levels form, and thus the results will appear to be different. The impulse-responses of the $I(1)$ variables, domestic prices and production, are stable in their stationary form - equivalent to what EMABA should produce if it used stationary variables. The impulse-response functions of the $SI_4(0,1)$ variables, import prices and production, are substantially less stable, taking quite a long period of time to return to their (stationary form) equilibrium. On reflection, this is probably due to either imports being partially integrated $SI_4(1,1)$ or even just $I(1)$ or the exogenous nature of the DGP for imports. The latter possibility is addressed in the VEC models in our submission to the Productivity Commission Inquiry. The problem of partially integrated series is a problem of the unit-root tests and one that the literature is only now coming to terms with.

Larue rebukes us for not placing confidence intervals around our impulse response functions. This is a valid point, one that we also hope that the makers of Microfit, the software package used, will address in their next version.

When we conducted VEC modelling for our submission to the Productivity Commission Inquiry, the apparent conflict in results between the ADL and the VAR models (including VECs) disappears, because the variables in the VEC model are in levels form and the interpretation of the impulse response functions are now consistent with the results from the ADL models. We concede that perhaps we should have highlighted in the original report why there was an apparent conflict between the ADL and VAR results.

Larue claims that our interpretation of unit roots is too strong [6, p. 11], and then goes on to point out a problem well known in the econometrics literature of a stationary process being indistinguishable from a unit root process in a finite sample. This is correct if the unit root is close to unity, in which case this is a question of confidence intervals and their associated critical values. Having taken the accepted critical values at 5% we do not accept this criticism. Perhaps he is trying to cast doubt on our finding of a permanent effect of a structural break in the DGP for producer prices. We back up our Perron additive outlier test with an ADF test on each part of the producer price series split at 1990 and both types of tests have come up with the same answer. Larue quotes Hamilton out of context and perhaps he should have read further:

> These observations notwithstanding, there are several closely related and very interesting questions that are answerable. Given enough data, we certainly can ask whether innovations have a significant effect on the level of the series over a specified finite horizon..... We cannot tell whether the data were really generated by [a unit root process] or a close relative of the form of [a stationary process], but we can measure whether innovations have much persistence over that interval.... One practical guide is to estimate the model both with and without the unit root imposed. If the key inferences are similar, so much the better. If the inferences differ, some attempt at explaining the conflicting findings...may be desirable [4, pp 446-447].

Both the Dickey Pantula procedure [2] for unit root tests and the estimation of the ADL, VAR and VEC models alleviates these problems and obviously Larue has not read our original report carefully enough.

Larue seems to imply we spend an inordinate amount of time discussing lag length selection [6, p. 11para 3.], and then states that unit root tests are very sensitive to lag length! It is precisely because of this problem that we did spend a great deal of time determining the correct lag length. He suggests a combination of techniques to determine lag length, something which we in fact used, and clearly state in numerous footnotes throughout the report.

Larue takes issue of the use of the DHF test for seasonal integration rather than the more popular HEGY test, stating that he

> ...do[es] not understand why P&H discusses it [the HEGY] test but do not implement it.[6, p 12.]

However, the reason is explained clearly in our report:

> The HEGY test has been shown by [51] [Osborne and Rodrigues 1998 [8]] to be asymptotically equivalent to the Dickey, Hasza, Fuller ... test (DHF), which is much simpler to implement and has readily available critical values for monthly as well as quarterly data [10, p. 32].

In other words, the tests give the same result.

Finally, Larue, quite briefly brings up the problem of structural break identification [6, p. 12 para 1.]. The issue at hand is whether a structural break has occurred at a particular period in time, or another period. This highlights the possibility of a transition period rather than a sharp structural break.

We chose 1990 as a structural break period for a clear reason. The question we were interested in answering was whether the introduction of imports, at an exact, and factually correct point in time has had an effect on the market DGP. It was important to determine whether the break at this point in time was significant - which it was.

A further point is whether the introduction of imports have led to a sudden break, or a transition period. The Chow structural break test does not tell us this, but it does indicate that *after* 1990 the DGP has changed. Irrespective of this, the structural break dummy does not play a role in the quantification of the effect of imports, a point that Larue overlooks. In the ADL model the structural break dummy is replaced by imports, hence any debate about a structural break shock versus a structural break transition period is irrelevant.

Larue's concern about whether the structural break is a shock or a transition, should be alleviated by our submission to the Productivity Commission Inquiry. In chapter 13 of the submission [10, pp. 151-154] we develop a state-space model using a Kalman filter that explicitly takes into consideration the transition matrix of the structural break caused by imports.

2.5. Conclusions

In his conclusions [6, p. 12] Larue reiterates that we have not been able to establish serious injury to the industry because we have not taken a whole industry approach. His interpretation of the industry is at odds with the official Government of Canada view, which wishes to restrict the definition of the industry to processors, under the bizarre argument that processors produce a like product because they source their inputs from either domestic or foreign sources! If the inputs are the competing products, then surely the producers of those inputs should be the ones on whom the test of serious injury is applied. Nevertheless, Larue is to be commended for taking a sensible economic approach to the problem, rather than taking a legalistic/political approach which has no basis in economic theory. Not only do we take an whole-industry approach in the VAR model in our original report, but our submission to the Productivity Commission Inquiry also takes a whole industry approach examining in great detail the interactions between prices and production at all levels of the marketing chain.

Larue claims that the results obtained from the models presented in our report yields conflicting results. However, the only inconsistency is in the interpretation of the VAR model, which Larue fails to understand properly. Our submission to

the Productivity Commission Inquiry presents an entirely consistent story, that of imports depressing producer prices irrespective of the modelling framework used.

Larue concludes that the empirical evidence in our original report is mixed and of poor quality and is insufficient to establish serious injury. Unfortunately Larue has been misled as to the purpose of the report, which was to establish that the 1995 Industry Commission Research Report [5] was based on flawed econometric analysis, not to provide evidence for serious injury. The empirical evidence presented in our original report presents consistent results when interpreted correctly. The consultancy report to QDPI was not designed to address the issue of serious injury, and the question of serious injury has been addressed in the actual submission to the Productivity Commission Inquiry.

Although Larue highlights some concerns with the methodology used, nowhere does he demonstrate that the results are incorrect. Having corrected for his concerns in our submission to the Productivity Commission Inquiry it is of interest to note that the same results have been obtained.

3. Modelling supply and demand relationships in the Australian pig industry

3.1. Accounting for simultaneous equation bias

This section reports further analysis designed to address Larue's concerns about simultaneous equation bias in our tests for structural breaks and our ADL models of market equilibrium. He is incorrect as the bias only results due to demand and supply prices and quantities being equivalent in equilibrium. This result only occurs under the assumption that marketing margins do not exist. When marketing margins exist supply is dependent on producer prices and demand is dependent on retail prices, clearly negating any simultaneous equation bias.

To address Larue's concerns about simultaneous equation bias we re-estimated the producer price ADL model as a 2-stage least squares (2SLS) regression with instrumental variables from 1984Q1 to 1998Q1. The results are presented in Table 3.1.

The results indicate that even taking into consideration the alleged simultaneous equation bias import volumes have significantly affected producer prices, depressing them by $10.71 \pm 0.4675 ¢/kg$ for every 1000 tonnes imported. It is interesting to note that this corresponds closely to the value obtained in the VEC model of the Australian pig industry in our submission to the Productivity Com-

Table 3.1: 2SLS estimation of producer price market equilibrium

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
$SBFQ$	-0.068936	0.13272[.606]
RPQ	0.37602	0.074690[.000]
$PPDQ$	-0.2116×10^{-5}	0.7861×10^{-6}[.010]
$CAMVQ$	-0.1071×10^{-4}	0.4675×10^{-5}[.027]
$CAMPQ$	-0.0069090	0.016336[.674]
α_0	100.7320	30.8346[.002]
T	0.36989	0.58239[.528]
Q_t^1	-28.8421	6.1941[.000]
Q_t^2	-22.0998	4.8344[.000]
Q_t^3	-7.6495	4.6022[.103]
R^2	0.79517	

mission Inquiry [10, p. 144] of $10.78 \pm 0.4697 ¢/kg$ for every 1000 tonnes imported.

The model in Table 3.1 exhibits significant serial correlation and heteroscedasticity. As indicated in Table 3.2 re-estimating it as an 2SLS ADL(1,1,1,1,1,1) model to eliminate the serial correlation and heteroscedasticity reveals that imports volumes still have a significant depressing effect on producer prices.

Further, we demonstrate in the submission to the Productivity Commission Inquiry that even taking a whole industry approach in a simultaneous equation framework still results in the conclusion that imports have significantly affected the Australian pig industry.

3.2. Accounting for inputs into the production process

Larue argues that we should have included inputs into the modelling framework. However, since we are modelling equilibrium prices and quantities, not supply and demand equations, the effect of changes in inputs, impacting through changes in quantities, are already incorporated. We demonstrate below that the even adding inputs into the modelling structure does not change the conclusions of our report, and in fact the coefficient of inputs is nonsignificant and thus it can be concluded that inputs do not play a role in the determination of equilibrium prices and quantities.

We formulate a VEC model of the Australian pig industry incorporating producer and retail prices (SPQ and RPQ respectively), saleyard prices for cattle

Table 3.2: 2SLS model of producer price ADL(1,1,1,1,1,1)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
SPQ_{t-1}	0.65035	0.12373[.000]
$SBFQ_t$	-0.086858	0.10577[.416]
$SBFQ_{t-1}$	-0.13084	0.11238[.251]
RPQ_t	0.5515	0.16517[.002]
RPQ_{t-1}	-0.49743	0.14612[.002]
$PPDQ_t$	-0.1205×10^{-5}	0.555×10^{-6}[.036]
$PPDQ_{t-1}$	0.138×10^{-5}	0.5946×10^{-6}[.026]
$CAMVQ_t$	-0.7240×10^{-5}	0.3794×10^{-5}[.064]
$CAMVQ_{t-1}$	-0.6479×10^{-5}	0.3752×10^{-5}[.092]
$CAMPQ_t$	0.034941	0.024697[.165]
$CAMPQ_{t-1}$	-0.022176	0.024353[.368]
α_0	25.9686	23.2217[.270]
T	0.3497	0.43671[.428]
Q_t^1	-25.1437	4.5866[.000]
Q_t^2	-9.7868	5.4533[.080]
Q_t^3	-0.59895	3.3899[.861]
R^2	0.92950	

Table 3.3: Johansen ML test for Cointegration

H_0	H_1	max-Eigenvalue	$\text{LR}_{Crit,0.05}$	Trace	$\text{LR}_{Crit,0.05}$
$r = 0$	$r = 1$	35.3198	37.0700	92.1398	82.2300
$r \leq 1$	$r = 2$	27.0695	31.0000	56.8200	58.9300
$r \leq 2$	$r = 3$	19.4549	24.3500	29.7506	39.3300
$r \leq 3$	$r = 4$	6.5329	18.3300	10.2956	23.8300
$r \leq 4$	$r = 5$	3.7627	11.5400	3.7627	11.5400

Table 3.4: Cointegrating vectors

CI vector	SPQ	$SBFQ$	RPQ	$PPDQ$	$FGBARQ$
β_1	0.0067842	-0.014068	-0.9155×10^{-3}	0.8917×10^{-7}	0.0021761
$\tilde{\beta}_1$	-1.0000	2.0736	0.13494	-0.1314×10^{-4}	-0.32076

cointegrating vector $= \beta_1$, normalised cointegrating vector $= \tilde{\beta}_1$

(SBFQ), production of pigmeat (PPDQ), prices for feed barley (FGBARQ) (in \$/tonne), import prices and volumes of pigmeat from Canada (CAMPQ and CAMVQ respectively), and 1^{st} to 3^{rd} quarterly seasonal dummies. We use quarterly data from 1984:3 to 1997:2.

The Johansen maximum-likelihood test for cointegration is carried out on a VAR(2) with unrestricted intercepts and trends with the $I(1)$ variables being SPQ, SBFQ, RPQ, PPDQ, and FGBARQ and the $I(0)$ variables being CAMPQ and CAMVQ. The likelihood ratio test for the maximal eigenvalue of the stochastic matrix indicates that no cointegrating vectors exist at the 5% level, one exists at the 10% level, and both the likelihood ratio test for the trace of the stochastic matrix and the SBC (not reported) indicate that one cointegrating vector exists. On balance the results indicate that the hypothesis of one cointegrating vector cannot be rejected (See Tables 3.3 and 3.4).

The results of the VEC(2,1) are presented in Tables 3.5 to 3.9[1].

The results are consistent with those of the VEC models estimated in our submission to the Productivity Commission Inquiry.

The analysis indicates that feed grain prices do not significantly affect any of the other variables in the VEC model and imports significantly affect producer prices (every 1000 tonnes increase in imports depresses producer prices by $14.46 \pm 4.159 ¢/kg$), retail prices (every \$1.00 increase in import prices depresses retail

[1]None of the equations indicate the presence of serial correlation or heteroscedasticity.

Table 3.5: ECM for pig producer price (SPQ)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
α_0	-98.6144	$42.3735\,[0.025]$
T	-0.87154	$0.47605\,[0.075]$
ΔSPQ_{t-1}	0.076096	$0.18413\,[0.682]$
$\Delta SBFQ_{t-1}$	0.21064	$0.14491\,[0.154]$
ΔRPQ_{t-1}	-0.034807	$0.20124\,[0.864]$
$\Delta PPDQ_{t-1}$	-0.5525×10^{-6}	$0.8095 \times 10^{-6}\,[0.499]$
$\Delta FGBAR_{t-1}$	-0.065800	$0.086427\,[0.451]$
ECM_{t-1}	25.0105	$9.6871\,[0.014]$
$CAMVQ_t$	-0.1446×10^{-4}	$0.4159 \times 10^{-5}\,[0.001]$
$CAMPQ_t$	0.026412	$0.017850\,[0.147]$
Q_t^1	-26.9851	$4.4304\,[0.000]$
Q_t^2	-14.4843	$8.5167\,[0.097]$
Q_t^3	6.9280	$6.6680\,[0.305]$
R^2	0.76001	

Table 3.6: ECM for cattle price (SBFQ)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
α_0	-84.8265	$52.7333\,[0.116]$
T	-1.1636	$0.59244\,[0.057]$
ΔSPQ_{t-1}	-0.34900	$0.22915\,[0.136]$
$\Delta SBFQ_{t-1}$	0.11168	$0.18034\,[0.539]$
ΔRPQ_{t-1}	0.023737	$0.25044\,[0.925]$
$\Delta PPDQ_{t-1}$	-0.4199×10^{-6}	$0.1007 \times 10^{-5}\,[0.679]$
$\Delta FGBAR_{t-1}$	0.13151	$0.10756\,[0.229]$
ECM_{t-1}	20.5184	$12.0554\,[0.097]$
$CAMVQ_t$	-0.8290×10^{-6}	$0.5176 \times 10^{-5}\,[0.874]$
$CAMPQ_t$	0.017201	$0.022214\,[0.443]$
Q_t^1	3.8529	$5.5136\,[0.489]$
Q_t^2	5.7081	$10.5990\,[0.593]$
Q_t^3	6.0544	$8.2982\,[0.470]$
R^2	0.30733	

Table 3.7: ECM for retail price for pork (RPQ)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
α_0	-36.1416	31.7116 [0.261]
T	-0.12714	0.35627 [0.723]
ΔSPQ_{t-1}	0.37918	0.13780 [0.009]
$\Delta SBFQ_{t-1}$	0.28170	0.10845 [0.013]
ΔRPQ_{t-1}	-0.16942	0.15060 [0.267]
$\Delta PPDQ_{t-1}$	-0.4118×10^{-6}	0.6058×10^{-6} [0.501]
$\Delta FGBAR_{t-1}$	-0.056187	0.064681 [0.390]
ECM_{t-1}	9.4036	7.2496 [0.202]
$CAMVQ_t$	-0.9939×10^{-6}	0.3113×10^{-5} [0.751]
$CAMPQ_t$	-0.025515	0.013359 [0.064]
Q_t^1	-2.0669	3.3157 [0.537]
Q_t^2	0.65986	6.3738 [0.918]
Q_t^3	7.7140	4.9902 [0.130]
R^2	0.58862	

Table 3.8: ECM for pigmeat production (PPDQ)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
α_0	3.27×10^7	8958004 [0.001]
T	247702.7	100639.3 [0.018]
ΔSPQ_{t-1}	-72589.1	38926.2 [0.070]
$\Delta SBFQ_{t-1}$	-66134.6	30634.8 [0.037]
ΔRPQ_{t-1}	-4653.7	42542.4 [0.913]
$\Delta PPDQ_{t-1}$	-0.11748	0.17114 [0.496]
$\Delta FGBAR_{t-1}$	26251.8	18271.2 [0.159]
ECM_{t-1}	-7075209	2047902 [0.001]
$CAMVQ_t$	2.6361	0.87929 [0.005]
$CAMPQ_t$	-6427.4	3773.6 [0.096]
Q_t^1	-4922630	936620.6 [0.000]
Q_t^2	1464119	1800483 [0.421]
Q_t^3	-354288.3	1409654 [0.803]
R^2	0.88931	

Table 3.9: ECM for feed Barley (FGBAR)

	$\hat{\beta}_i$	$S_{\hat{\beta}_i}$[p-value]
α_0	206.0147	67.4987 [0.004]
T	2.5058	0.75832 [0.002]
ΔSPQ_{t-1}	0.55705	0.29331 [0.065]
$\Delta SBFQ_{t-1}$	-0.65026	0.23083 [0.008]
ΔRPQ_{t-1}	-0.11282	0.32056 [0.727]
$\Delta PPDQ_{t-1}$	0.3541×10^{-5}	0.1290×10^{-5} [0.009]
$\Delta FGBAR_{t-1}$	0.14493	0.13767 [0.299]
ECM_{t-1}	-51.0338	15.4310 [0.002]
$CAMVQ_t$	-0.3209×10^{-6}	0.6625×10^{-5} [0.962]
$CAMPQ_t$	-0.040159	0.028434 [0.166]
Q_t^1	11.5415	7.0575 [0.110]
Q_t^2	17.3777	13.5667 [0.208]
Q_t^3	-3.4411	10.6218 [0.748]
R^2	0.44747	

prices by $2.5515 \pm 1.3359¢/kg$), and domestic production (every kg of imported pigmeat increases domestic production by $2.6361 \pm 0.87929kg$ and every $1.00 increase in import prices depresses production by 6.4274 ± 3.7736 tonnes).

The results indicate that production inputs do not play a significant role in determining market equilibrium. This does not mean to say that production inputs do not affect producer profitability but this is something that our submission to the Productivity Commission Inquiry does not address, preferring to leave it to the industry to demonstrate reduced profitability due to depression in producer prices.

4. Conclusions

In this paper we rebut the claims made by Larue [6] that our econometric modelling is invalid. Larue's criticisms are irrelevant, as he reviews a report which was not submitted to the Productivity Commission Inquiry on Safeguard Action, and was not designed to address this issue. The actual report submitted to the Inquiry [10] addresses all of Larue's concerns. Nowhere in his assessment does Larue actually demonstrate that our results are incorrect, only that there are some theoretical issues that need to be taken into consideration. Again, our submission to

the Productivity Commission Inquiry addresses all of these theoretical issues.

We note with interest that Larue actually comes out in support of the conclusions in our submission to the Productivity Commission Inquiry, which is that imports allow retailers to exercise market power and reduce producer prices.

Larue claims that our modelling results are subject to simultaneous equation bias. This is incorrect, as the divergence between retail and producer prices ensures that simultaneous equation bias does not exist. Further, the VEC and VAR modelling framework used in both the report Larue reviewed [9] and in the submission to the Productivity Commission Inquiry [10] corrects for any simultaneous equation bias. We demonstrate in this paper that using an instrumental variables approach to correct for simultaneous equation bias does not substantially change the results. Larue also claims that we did not take into account inputs into the production process, and that there was no theoretical foundation to justify our model structures. Our modelling approach is based on determining the actual data generating process underlying the variables under consideration, rather than imposing an ad-hoc structure.. As such our modelling approach encompasses the theoretical structures. Larue is correct in claiming a possibility of model misspecification by not including inputs, but we argue that since we are not trying to estimate supply, rather estimate market equilibrium, we do not need to incorporate inputs as their effect is transmitted through changes in production. To address the possibility of model misspecification we develop a model including inputs. We demonstrate that the results do not substantially change and that inputs do not have a significant role to play in the data generating process.

Larue takes issue with the apparent conflict in results between our ADL model and the VAR modelling framework. There is no conflict in results, as we have explained. We agree that perhaps we could have highlighted why the results were in apparent conflict. Finally, Larue takes issue with our tests for stationarity. He does not claim that our results are incorrect but only suggests that there are potential pitfalls. These pitfalls do exist, but our testing approach handles all of these issues. Larue read the wrong report and has not read it carefully enough.

In summary, although Larue's concerns about our original report [9] not demonstrating serious injury are valid, this is really irrelevant as the report was not designed to address this issue. Larue has been misled by the Canadian Government on this point. Larue's concerns about the econometric modelling are not valid, as he has failed to understand what we were modelling and the procedure we were using. Irrespective of Larue's concerns, nowhere in his assessment has he demonstrated that our results are incorrect.

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