Modelling Economy-wide Effects of Future Automotive Assistance

Work-in-progress technical workshop

On 28 April 2008, the Commission held a technical workshop to present some preliminary results and review the modelling undertaken for this study. Participants included representatives of the Automotive Review Secretariat, the Australian Government Treasury, and the Department of Innovation, Industry, Science and Research, as well as three independent referees — Philip Adams, Director at the Centre of Policy Studies at Monash University; Chris Murphy, Director at Econtech; and David Pearce, Director and Principal Policy Analyst at the Centre for International Economics. Dr Larry Cook, Lecturer in the Department of Economics at Monash University, also provided insightful comments.

Following the workshop, the referees provided written comments, which are provided below (a summary of these comments and the Commission's response is presented in appendix B of the report for this study). These comments were based on the preliminary simulations the Commission presented at the workshop. The Commission finalised its report on the basis of these comments and discussion at the workshop.

Economy-wide Effects of Car Assistance Options

Comments on modelling by Philip Adams, Centre of Policy Studies.

1. ***General comment on static versus dynamic policy analysis*** The comparative static framework leads to defensible assessments of the effects of car assistance options. However, by not using the dynamic facilities in MMRF the Commission leaves itself open to criticism of being "behind the times". Note too, that with time not explicit, explicit dating of exogenous shocks and endogenous outcomes is impossible, no satisfactory theory of investment is available, and no explicit allowance in the basecase for known events now and in the near future can be allowed for.
2. ***Argument for constant returns to scale on page 2.*** These are weak. I would suggest that a box be allocated to this very important issue. The box should contain evidence for and against the modelling assumption, and should conclude with the final assumption simply stated.
3. ***Database*** Definitions and sales splits described in Section 2 look sensible. However, the cost splits for intermediate inputs, appear problematic. For example, inputs of assembly in the components industry should be zero not just small. Extraneous information should be sought and utilised as much as possible to inform both the sales and costs splits and to check the core data – import penetration for assembly in final demand, export propensities, etc.
4. ***Current arrangements*** That the ACIS is more like a production subsidy than an import subsidy should be made clearer up front.
5. ***Simulation design*** A comparative-static long-run closure is adopted. In this closure, at the macro level to a good approximation:
    a. Private consumption (C) moves with HDI;
    b. Government consumption (G) moves with private consumption (C);
    c. Investment (I) moves with capital available for production (K);
    d. Employment (L) is fixed and the real wage rate (RW) is endogenous;
    e. Capital (K) is endogenous and the rate of return on capital (ROR) is exogenous; and
    f. Real GDP (Y) is put in place by what happens to L and K, with technology (A) held fixed.

    Given a capital share in GDP of 0.5, then (d), (e) and (f) imply (using lower case letters to signify percentage changes) $y = 0.5 \times k$. If HDI moves with GDP, then (a), (b) and (c) imply that (C + I + G) will typically increase (decrease) by more than Y. Thus if k is positive, then (X – M) will deteriorate.

    In my opinion, this is an unnecessary constraint on the simulations, and one that is difficult to justify. An alternative treatment, which also makes real consumption a better welfare indicator, is to have G fixed, and C determined to ensure that (X-M) is unchanged.

I would suggest that state/territory budgets be fixed at basecase levels via endogenous shifts in direct cash payments to local households. Using payroll tax rates to hold fixed budget balances can have unintended effects.

6. ***Exchange rate simulation*** As discussed in the workshop, this is not a simulation of the effects of a change in the nominal exchange rate. Instead, it is a simulation of the effects of the recent terms of trade improvement. I suggest that the description and interpretation be recast in this light and that the shocks be implemented in a way which is more consistent with current events (capturing the export shifts for bulk-commodities, for example).
7. ***Tariff cut simulation*** In my view the macro explanation on page 19 is not quite right. With the rate of return on capital fixed, in the long-run tariff cuts reduce slightly the real cost of capital. This causes substitution towards capital and away from labour. With labour fixed, capital and real GDP rise. The tariff cuts also increase imports. Exports increase, but not by much (see point (5)). Increased exports means a lower terms of trade, which mitigates the initial cut in the real cost of capital. The terms of trade decline also reduces the purchasing power of GDP by the share of trade (say, 0.3) times the percentage reduction in the terms of trade. Real consumption rises slightly, reflecting the net outcome of: the lower purchases price of imported vehicles; the increase in real GDP (and hence in real income); and the terms of trade decline.
8. ***ACIS simulation*** Comparing column 3 with column 2 in Table 11 reveals a number of puzzles:
    a. Why is the increase in real GDP in column 2 so much larger than the increase in column 3?
    b. In light of (a), why is the change in real consumption in column 3 larger than the change in real consumption in column 2?
    c. What is the "Exchange rate" row – real or nominal? What is the "Govt budget surplus" row with the Federal government budget balance fixed?
9. Answers to additional questions
    a. Are you aware of a recent review of export demand elasticities which would support the MMRF values of 5-ish? No. When faced with this perennial issue I would prefer the sensititivity approach as adopted in your paper.
    b. Are you aware of a good exposition of the trade/foreign capital part of the closure and its implications for results? There are many. I think, for example, that the explanation under point (5) above, cleaned up, would be sufficient. Alternatively, you could cite one of Peter's articles that look at the tariff issue with back-of-the-envelope models – chapter 2 of the MONASH green book is an obvious example.
    c. I would appreciate your comments on the choice of a welfare measure; in particular, given the closure (C/G = cste and (X-M)/GDP = cste), it seems that real private consumption might be ok, though a permanent trade deficit poses a problem in terms of permanent borrowing. It does. So I would suggest the old tried and true of G fixed and C moving to leave trade balance unchanged – see point 5 above.

d. I would appreciate your comments on the modelling of ACIS as part reduction in tariff (which has the potential of biasing producer choice of inputs in favour of imports) and part garden variety industry subsidy (since credits are tradeable, but at a 3% discount – this discount would have to bear the entire weight of the 'bias' argument of the tariff component). From what I heard at the workshop, the modelling of the ACIS as a pure production subsidy is probably the best way forward. The 3 per cent would appear to be a negligible part of the story.

e. Did you get Chris Murphy's point about ACIS and tariff simulation not being additive? No. The only way I could understand it was in the way that you have re-expressed it- he has transformed ACIS into a tariff equivalent and applied it in this way in his peculiar supply and demand diagram. More insights though would be available from his submission to the previous MVP inquiry in which the same issues arose.

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13 May 2008

Dear Patrick

REFEREE CONSULTANCY ON
AUTOMOTIVE ASSISTANCE REVIEW MODELLING PROJECT

This letter is my referee's report on the Automotive Assistance Review Modelling project.

Background

The Review of Australia's Automotive Industry (in the "Bracks letter") has asked the Productivity Commission to model the economy-wide effects of eight future assistance options. In response the Productivity Commission prepared a report on "Modelling the economy-wide effects of automotive assistance options" (preliminary PC Report).

Econtech was commissioned to contribute to a workshop on the preliminary PC report that was held on 28 April and to submit a 500-word referee's report – it has been necessary to ignore this limit to provide an adequate review. As part of the workshop Econtech gave a powerpoint presentation, the content of which which has been subsumed into this referee's report.

The preliminary PC Report was marked "confidential work-in-progress". As acknowledged by the PC at the workshop, it has some shortcomings and is incomplete.

The terms of reference for the consultancy require comments on "the quality of the modelling, including the appropriateness of the assumptions and modelling techniques and clarity of the written material". Assessing the quality of any conomic policy modelling report also requires considering some other issues. For example, it is important to verify that the modelling addresses the economic policy issues at hand to avoid the pitfall of 'garbage in - garbage out'. It is also important that the report's conclusions are supported by accepted economic principles so that an economic model is being used as part of an economist's toolkit rather than as a standalone black box.

Hence this review of the preliminary PC Report is divided into three sections as follows. This first section discusses the economic policy context. The second section reviews the modelling approach. The third section discusses the modelling results.

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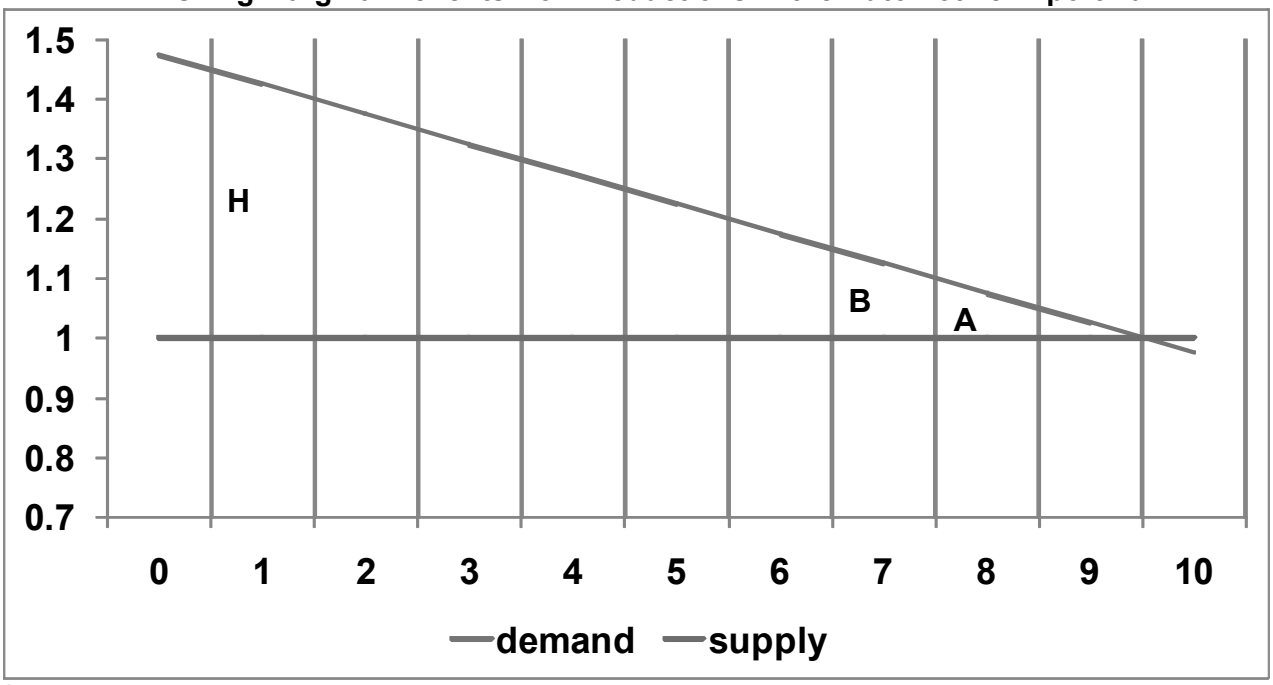
Economic Policy Context

As already noted, the Bracks letter asks the PC to model eight options for future assistance. These options should be put into their appropriate economic and historical contexts. Automotive import tariffs have been reduced from 45 per cent in 1988 to a planned rate of 5 per cent from 2010.

Chart 1 is designed to show the diminishing marginal benefits achieved through this program of tariff reduction. It does this by showing how the market for imported automobiles is affected as the tariff rate is reduced. The supply curve implies that imported automobiles are supplied to the Australian market at a given price normalised to unity. The demand curve implies that import demand rises as the price falls with tariff reductions.

Chart 1
Diminishing Marginal Benefits from Reductions in the Automotive Import Tariff



Notes:
Area 'A' = the allocative efficiency benefit from reducing the tariff from 10 to 5 per cent
Area 'B' = the allocative efficiency benefit benefit from reducing the tariff from 15 to 10 per cent
Area 'H' = the allocative efficiency benefit benefit from reducing the tariff from 45 to 35 per cent

Chart 1 can be used to show the welfare gain or marginal benefit of each five-percentage points downward step in the tariff rate. A cut in the tariff rate from 45 to 40 per cent, as occurred from 1988 to 1990, has a marginal benefit given by the area 'H'. A cut from 15 to 10 per cent, as occurred in 2005, has a smaller marginal benefit given by the area 'B'. Finally, a cut from 10 to 5 per cent, as planned for 2010, has an even smaller marginal benefit given by the area 'A'.

There are many caveats to this kind of analysis but it is nonetheless indicative. The basic textbook principle, as noted in Econtech's report to the PC for the 2002 automotive review ("2002 Econtech report"), is as follows.

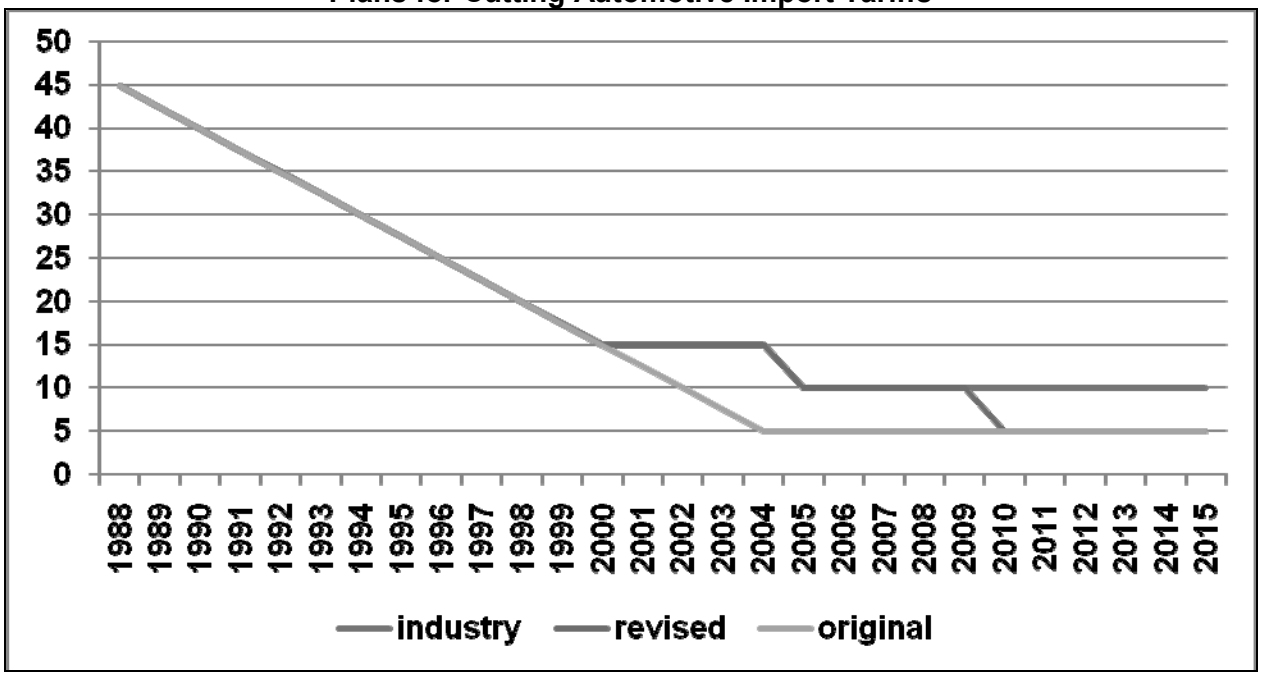
> There is diminishing marginal gains in allocative efficiency from reductions in assistance. If assistance is high, resources in the assisted industry are being used highly inefficiently at the margin, and a given reduction in assistance will provide a large gain in allocative efficiency. On the other hand, if assistance is low, resources in the assisted industry are being used less

inefficiently at the margin, and the same reduction in assistance will provide a smaller gain in allocative efficiency.

While there are diminishing marginal benefits from reductions in assistance, there are broadly constant marginal adjustment costs. Each reduction in assistance of a given size can be expected to lead to broadly the same shifts in productive resources, giving rise to the same adjustment costs. Under standard assumptions, optimally balancing the sustained but diminishing marginal benefits from tariff reductions with the ephemeral but constant marginal costs, implies that the rate of tariff reduction should slow as the target rate is approached.

Chart 2 shows that the current, revised program of tariff reduction broadly follows this principle. The 'original' plan was to reduce tariffs at a constant rate until the target rate of 5 per cent was reached in 2004. However, in a 'revised' plan, the rate of reduction in tariffs was slowed so that the target rate is reached in 2010. Apparently, 'industry' is now seeking that instead the tariff be frozen at its existing rate of 10 per cent. This is hard to justify, as ephemeral adjustment costs do not justify permanently exceeding the target tariff rate and thereby foregoing permanent benefits.

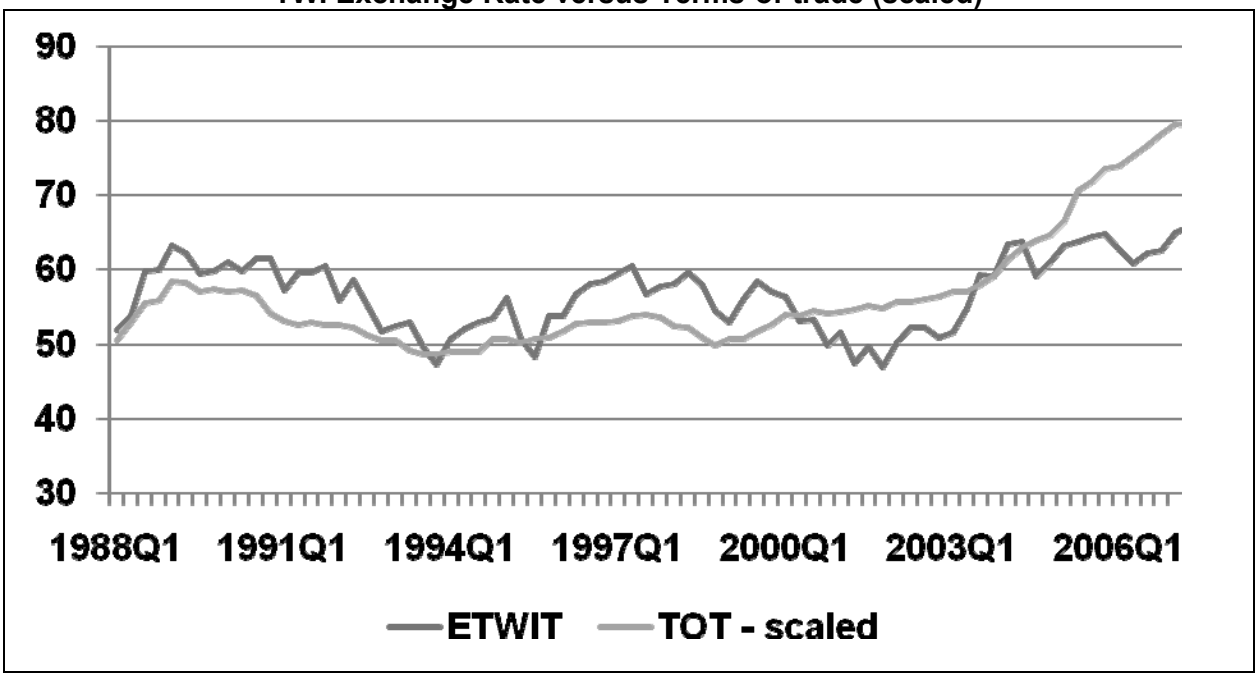
Chart 2
Plans for Cutting Automotive Import Tariffs



The local automotive industry is being adversely affected by the strength of the Australian dollar. However, the strength of the Australian dollar is in turn due largely to the strength in the terms-of-trade, as suggested by Chart 3. The terms-of-trade itself has been boosted by high commodity prices. Any policy discussion needs to be informed by a full understanding of the implications of higher commodity prices, rather than merely focussing on one of its consequences, namely a strong Australian dollar.

As can be seen using either Econtech's MM2 model or MM600+ model, higher commodity prices provide benefits in two ways. First, they provide a direct real income gain, as the same volume of commodity exports can be exchanged for a greater volume of imports. Second, they initially change the pattern of profitability across industries, giving rise to shifts in the industry pattern of employment, which provide further benefits by ensuring that labour is employed in its highest valued uses.

Chart 3
TWI Exchange Rate versus Terms-of-trade (scaled)



Employment shifts away from industries adversely affected by the higher Australian dollar. This includes import-competing industries such as the automotive industry, the TCF industry and other import-competing manufacturing industries. It also includes non-commodity export industries, notably the inbound tourism industry.

High commodity prices shift employment towards commodity-exporting industries. This includes mining and agriculture. This allows these commodity-exporting industries to expand to take full advantage of high commodity prices.

It follows that any policy response that attempts to block the shift in employment away from industries adversely affected by the higher Australian dollar will reduce the gain in real national income from high commodity prices. This is because such a policy response restricts the ability of commodity-exporting industries to expand. It makes even less sense to single out just one industry for special treatment, by providing the automotive industry with a higher rate of assistance beyond 2010 than is currently planned.

Modelling Approach

The preliminary PC Report uses the MMRF model, which is one of the suitable models that are available for such an exercise. The key features of the way in which the model is used are as follows:

- it is run in comparative static model, so it gives estimates of deviations between scenarios in the long run;
- it holds employment fixed, which is in keeping with the long-run nature of the modelling;
- it provides results for each of the eight states and territories;
- the automotive industry has been further development in the model to distinguish between its multiple products; and
- the baseline scenario is existing (2005-2010) policy; all reported effects are relative to this frame of reference.

One problem with the modelling approach is that there is no attempt to test the robustness of the modelling against some kind of benchmark. Modellers generally use some kind of economic analysis both as a check on their results and to cast light on the main economic mechanisms at work in their modelling.

There are several ways this can be done. The simplest way is a basic diagrammatic analysis as in Chart 1 of this report. Another way is through a tractable, mathematical model that captures the salient features of the economy-wide model that is being used.

The final way is through a model comparison exercise, applying the same shocks to competing models and analysing the similarities and differences in the results. The PC successfully applied this final approach in its 2002 automotive review. Econtech's MM600+ shares all of the features of MMRF listed above and in addition builds in product-level breakdowns for all industries, not just the automotive industry.

The lack of any attempt to cast light on the modelling using one of these methods gives the modelling approach an unfortunate black box character. This is exacerbated by the fact that the results appear to be non-standard in at least one important respect, as discussed below.

Model Simulations

In the Bracks letter, the Productivity Commission was asked to model the economy-wide effects of eight future assistance options. The letter nominates existing post-2010 policy under which the automotive tariff is reduced to 5 per cent and ACIS moves to stage 3 as its baseline scenario or reference point. The final scenario involves "increasing the exchange rate to $A/$US parity".

The preliminary PC report also models eight scenarios. However, these covers some, but not all, of the eight assistance options nominated by the Bracks letter. Instead, some of scenarios vary some of the economic assumptions in a useful sensitivity analysis.

The preliminary PC report also uses a different baseline scenario from the Bracks letter. Specifically, its baseline scenario is current 2005-10 policy. The decision to use a different baseline scenario needs to be highlighted to avoid possible misinterpretation of the results.

The final scenario requested in the Bracks letter does not make sense when simulated using MMRF. The Bracks letter implicitly assumes that the nominal, bilateral exchange rate is an input to the model whereas in reality the real, multilateral exchange rate is an output. Further, as argued above, the more meaningful question to consider is the economy-wide effects of the commodity price boom. These issues should be explained and an appropriate simulation performed. The current draft strangely does not explain these issues and incorrectly represents an MMRF simulation as exactly matching the request in the Bracks letter.

At the workshop, there was some confusion about the appropriate modelling of ACIS. This issue was considered carefully at the time of the 2002 automotive review but the corporate memory of this seems to have been lost at the PC. In broad terms, the best, simple way of modelling ACIS is as a production subsidy. This is because at least some payments depend on production levels. The fact that the payments are given in the form of import credits does not mean that ACIS should be treated as an import subsidy. The form of payment makes no difference to the economic impacts provided the import credits are tradeable and the supply of credits under the scheme does not outstrip demand.

The preliminary PC report claims that results for reducing assistance can be added together as follows. "Column [4] (cutting the tariff to 5 per cent and abolishing ACIS) can be obtained by adding columns [2] (cutting the tariff to 5 per cent) and [3] (abolishing ACIS)". The results for GDP and Consumption are summarised in Table 1. This table shows a consumption (welfare) gain of 0.03 per cent from cutting the tariff, 0.05 per cent from abolishing ACIS, and 0.08 per cent from doing both. It was further claimed at the workshop that this additivity result is true to three decimal places.

Table 1
Addition of Simulation Results

	GDP	Consumption
Column [2] tariff from 10% to 5%	0.06	0.03
Column [3] ACIS from stage 2 to zero	0.00	0.05
Column [4] both	0.07	0.08

The reported results conflict with the principle of diminishing marginal benefits from reducing assistance. In particular, if the tariff has already been cut to 5 per cent there should be a reduced benefit from abolishing ACIS and vice versa. Thus, the benefit of cutting the tariff to 5 per cent and abolishing ACIS should be less than the sum of the benefits of doing either. The 2002 Econtech report investigated this issue in some depth and established that the results from MM600+ do follow the expected pattern of diminishing marginal benefits from reducing assistance.

That the reported results from MMRF do not follow this principle means either that its results have not been accurately reported or the model has not been used accurately (e.g. solved to an exact non-linear solution) or there is an undisclosed problem with the model or its measure of welfare.

Recommendations

1. MMRF is used in a somewhat black box manner and to correct this some kind of benchmark analysis is needed both as a check on the results and to cast light on the main economic mechanisms at work.

2. The report needs to explain that it has used a different baseline scenario from that given in the Bracks letter to avoid possible confusion.

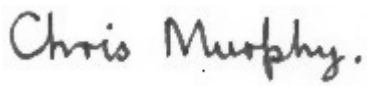
3. The report needs to establish from simulations that MMRF is consistent with the principle of diminishing marginal benefits from reductions in assistance. At present it implies constant marginal benefits (from additivity of gains), meaning that either the results have not been accurately reported or the model has not been used accurately (e.g. solved to an exact non-linear solution) or there is an undisclosed problem with the model or its measure of welfare. This needs to be cleared up.

4. The current simulation represented (incorrectly) as a shock to a nominal exchange rate should be replaced with an explicit shock to commodity prices and explained as such.

5. The report should be cognisant of the two modelling studies undertaken for the 2002 automotive review. Those studies considered similar shocks, including reducing the tariff from 10 to 5 per cent and reducing ACIS post-2010. This would avoid a number of pitfalls seen in the preliminary PC report.

If these recommendations are fully addressed in the final PC report, then the report should meet accepted professional standards.

Yours sincerely



Chris Murphy
Director

REPORT

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Automotive assistance modelling

Referees report

Prepared for the Productivity Commission

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Canberra & Sydney

2 May 2008

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Contents

1 *Introduction and summary*

Key findings

- **The overall modelling framework chosen is sound and is suitable for the simulations the Productivity Commission has been asked to undertake.**
- **It will be very important, however, for the Commission to clearly articulate the basis, strengths and weaknesses of the underlying assumptions made in establishing the model framework.**
- **Two particular aspects of the modelling — the treatment of the requested exchange rate simulation and the simulation of the proposed Green Car Innovation Fund — will need particular care in their final design, presentation and interpretation.**

This report presents a referees review of the initial economywide modelling of the effects of automotive assistance options undertaken by the Productivity Commission on behalf of the current Review of Australia's Automotive Industry.

This referees report is based on:

- the draft document containing background material of the key methodology and some simulations provided for a technical workshop on 28 April 2008;
- the presentations and discussions provided at the technical workshop on 28 April 2008; and
- the reviewer's working knowledge of the automotive industry and, in particular, the details of the MMRF model.

In providing this report, the reviewer has NOT:

- audited the underlying model database; or
- examined any computer (GEMPACK) input or output files.

Section 2 below provides some general comments on the overall modelling approach, while section 3 discusses the two specific issues noted in the summary above. I have constructed these comments to be complementary with (rather than repeating) points I know the other referees will make.

2 *The model and basic modelling approach*

MMRF

The choice of MMRF for the analysis is appropriate. MMRF is transparent and publicly available, and the main publisher (Centre of Policy Studies, CoPS) puts some considerable effort into disseminating understanding of the modelling framework as well of the software used to solve it.

Database updates

The procedure adopted by the Commission (in conjunction with CoPS), is appropriate and in parts is a standard procedure that has been adopted many times in previous Productivity Commission projects.

It should be noted, however, that the procedure is largely mechanical and as described appears to have little scope for original automotive industry data collection beyond that undertaken by the ABS in the construction of their 2001-02 input-output table. This makes it crucial to cross check the automotive industry detail in the model against independent, preferably industry based data.

Specific new parameters

The background material for the workshop did not present the parameter choices for the new disaggregated automotive industries. These parameters (in particular consumer demand elasticities, import substitution elasticities and capital labour substitution elasticities) need to be discussed and justified. The effect of the choice of these elasticities should also be tested through additional sensitivity analysis.

Comparative statics

The Commission has chosen to run MMRF in comparative static mode. While the reasons for this within the time constraints available are sound, it important to note that comparative statics brings its own challenges.

The timelessness of a comparative static simulation requires great care in the presentation of results, particularly when the actual time frames of policies are very much in the minds of the key stakeholders.

In undertaking comparative static simulations, particular care must be taken in the construction of the reference database against which simulations are compared.

Base year

The base year chosen for the analysis is 2005-06. While this represents the latest available data set, a question arises as to whether it is the best reference point for the policy simulations to be undertaken.

There are some significant post-2005-06 changes to the automotive industry which could be considered to be independent of the specific policy changes. There is no reason why these could not be embedded in the starting database

Choice of a welfare indicator and welfare decomposition

In the workshop, Professor Adams elegantly presented the idea that particular closure choices both determine particular results from the model and inevitably constrain the interpretation of those results.

In addition to these points, it is also important to note that closure choices (particularly the choice of a particular consumption function) constrain the ability to derive welfare measures from the simulation results.

Changes in real GDP ***do not*** provide a measure of the economic welfare effects on Australians of changes in policy. If the Commission wishes to avoid this confusion — which unfortunately regularly emerges from model results — it is important to construct and discuss an explicit welfare measure. With appropriate closure choices, real consumption can be used as such a measure.

It is also possible to provide a decomposition of any welfare effect into its key components (allocative efficiency and terms of trade) which assists considerably in the interpretation of the results.

Why has the optimal tariff effect gone away?

In the previous analysis of automotive assistance undertaken by the Productivity Commission, the 'optimal tariff' effect was quite prominent in some of the modelling results, including some sets of results from MMRF. In the current simulations, there is no evidence of an optimal tariff effect.

I have no criticism of this result, however some recent media discussions indicate that the optimal tariff effect is still in the minds of some commentators (prominently a former Productivity Commission commissioner) and so it may be important to make some comment on why this effect is no longer present.

It is, of course, a consequence of the allocative efficiency effect dominating the terms of trade effect, but the question arises as to why there is this relative dominance with the current database and parameter set.

The Commission has undertaken some sensitivity analysis of the export demand parameters in the model. However, the optimal tariff effect is not only determined by the choice of export demand elasticity, but also by import substitution parameters.

This point is, of course, closely related to the choice and decomposition of an appropriate welfare measure.

3 Specific issues

Modelling the GCIF

The nature of this policy is largely undefined and is in fact one of the items that the overall review aims to report on. This makes it extremely difficult to simulate the policy. Two points seems clear:

- it is not a simple production subsidy as it requires a particular form of production (green car);
- it appears designed to produce a new kind of product, not in the existing production mix (and therefore not in the database).

This means that modelling it as a simple production subsidy can only be very approximate.

Having said this, however, it is not at all clear from the modelling specifications provided to the Commission that the GCIF needs to be modelled in any detail at all. The GCIF is part of the baseline or reference case and no independent evaluation of the GCIF appears to be required.

Modelling exchange rate change

The Commission appears to have been asked to simulate a further appreciation of the nominal exchange rate. *MMRF cannot model the nominal exchange rate*. This creates an important question of interpretation for the Commission.

The workshop participants speculated as to the reasoning behind this simulation. I would recommend the Commission explicitly seek clarification of the actual propositions to be tested through this simulation; otherwise it will be impossible to meaningfully undertake.

The ***real*** exchange rate is an endogenous variable within MMRF. This means that it is possible to simulate factors that would lead to a real appreciation. The most obvious of these is a general improvement in Australia's terms of trade, but there are many others. Clarification on the purpose of this simulation will greatly assist in designing it.