

## II. EXCITING RESEARCH AT COPS SINCE 2007: THIRTY VIGNETTES



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## 1. Climate change & the carbon-tax: CoPS' modelling for Garnaut, Treasury and internationally

**Clients:** Federal Departments of Treasury, Climate Change, Prime Minister & Cabinet; State Treasuries; PWC; Deloitte; Ernst & Young; Frontier Economics; BlueScope Steel; NAB; Chevron and Woodside Petroleum; the Garnaut Review; CSIRO

**Researchers:** Prof. Philip Adams & Mr Kevin Hanslow

**Summary & impact:** The biggest hot potato in Australian politics over the last 5 years has been climate change. Kevin Rudd won the 2007 election promising carbon trading. Malcolm Turnbull lost the Liberal leadership by agreeing. Rudd lost traction in the polls and eventually the prime ministership by backing down from his climate-change policy. Julia Gillard promised no carbon tax but changed her mind. Tony Abbott is determined to make the carbon tax and Gillard's credibility the principal focus of the next Federal election.

Since 2008, major Australian studies on the economic effects of climate-change policies have been conducted by Garnaut and Treasury, each with various emission-reducing scenarios and with CoPS providing the central modelling analyses. On business-as-usual assumptions CoPS' modelling showed Australia's CO<sub>2</sub>-equivalent emissions rising from 528Mt in 2010 to 710Mt in 2030, Table 1. Australia's emissions are dominated by electricity generation and transport with agriculture also significant. The last column in Table 1 refers to a worldwide emissions trading scheme (ETS) in which Australia commits to restraining its emissions in 2030 to their 2010 level. CoPS showed that Australia could achieve the target in the last column at moderate cost in macro terms: no more than a 1.5% reduction in GDP phased in over 20 years. This is equivalent to 5 months of GDP growth, meaning that Australians would have to wait until May 31, 2030 to reach the standard of living they otherwise would have reached by January 1, 2030. But it is not macro effects that inflame the passions evident in the photo. People worry that the costs will not be spread equitably. CoPS results were disaggregated to 50 industries and 57 regions. This level of detail gives an evidence-based foundation for compensation packages.

Frequent reference in the press continue to be made to Treasury's greenhouse modelling. This refers to further Treasury applications using the



CoPS' model, now embedded in Treasury and supported by CoPS.

The expertise of CoPS in greenhouse modelling is recognised internationally. Our services are currently being used in the U.S., China, Taiwan, Brazil and Japan and our advice is sought widely.

Table 1. Australia's CO<sub>2</sub>-e emissions (Mt)

	Baseline		ETS policy
	2010	2030	2030
Electricity & other stationary fuel combustion,	279	332	285
Transport	85	117	103
Fugitive emissions e.g. from mining	36	70	41
Industrial processes	31	41	18
Agriculture	93	120	99
Waste disposal	19	23	6
Forestry	-15	6	-24
Total	528	710	528

Most of our greenhouse studies have ignored damage from climate change. They include the cost of mitigation, but not the benefits from damage limitation. Integrated Assessment Models (IAMs) deal with mitigation benefits as well as costs. CoPS is currently working with CSIRO in a project to build Australia's first IAM. Papers co-authored with the CSIRO arising from this work have been presented at MODSIM 2011 & AARES 2012.

**Publications:** Adams, P. (2007), "Insurance against Catastrophic Climate Change: How Much Will and Emissions Trading Scheme Cost Australia?", *The Australian Economic Review*, 40(4). 432-52.

Adams, P. & B. Parmenter (2012), "CGE modeling of environmental issues in Australia", in P. Dixon & D. Jorgenson (eds) *Handbook of CGE Modeling*, Elsevier, forthcoming.

Adams, P (2012), "Economic Aspects of Integrated Assessment Modeling", in Academy of Science, *Australia in 2050*, forthcoming.

## 2. Energy modelling for the White House and other branches of the U.S. government

**Clients:** The White House and the U.S. Dept. of Treasury, Commerce, Agriculture and Energy

**Researchers** Professor Peter Dixon, Professor Maureen Rimmer and Dr Ashley Winston

**Summary & impact:** In January 2010, Carol M. Browner (Assistant to President Obama on Energy and Climate Change) wrote to the Chairman of the U.S. International Trade Commission (ITC) thanking him for making available the services of Dr Fox and Dr Winston to work on the White House's submission to the Senate on the Waxman-Markey Bill about greenhouse gas emissions. In part the letter read

*"Quite simply, without their contributions, we could not have produced much of the analysis that we offered the Senate in the report."*

What is CoPS connection with this? Ashley Winston was out-posted from CoPS to the ITC. His contribution to the White House study was made with the USAGE model developed by CoPS. The White House letter (<http://www.monash.edu.au/policy/ftp/whitehouseletter.pdf>) is testament to the extraordinary level of influence that CoPS modellers are having on major issues in the U.S.

The work for the White House is part of an ongoing series of energy projects undertaken by CoPS for branches of the U.S. government. The first of these projects was commissioned by the U.S. Department of Commerce in response to President Bush's 2006 Energy Policy which called for a reduction in reliance on imported oil.

Commerce asked CoPS to project the effects of replacing 25 per cent of imported crude oil with domestic ethanol by 2020. Using the USAGE model we quantified four benefits. The first is the substitution of what by 2020 seemed likely to be a cheaper fuel (ethanol) for a more expensive fuel (oil). Realization of this benefit depends on the price of oil averaging about \$U.S.70 a barrel in the long run and on continuation of the downward trend in the cost of cellulosic ethanol. The second benefit is downward pressure on the world price of oil caused by a cut in U.S. demand. The third benefit is an improvement in the U.S. terms of trade brought about by a reduction in the U.S. import bill and a consequent reduction in exports with a resulting increase in their price. The fourth benefit is an improvement in farm incomes, causing a delay in the retirement of U.S. farmers.

Our analysis created interest from other departments. The U.S. Department of Agriculture commissioned us to extend the agricultural coverage of USAGE to draw out the connection between large-scale ethanol production and food prices. The U.S. Department of Energy commissioned us to link USAGE to their detailed electricity model, NEMS. Currently we are working on a second project for the Department of Energy concerned with the Renewable Fuel Standard which mandates levels for the use of ethanol and other renewable fuels in the U.S. over the next 10 years.

### **Publications:**

- Gehlhar, M., A. Somwaru, P. Dixon, M. Rimmer and A.R. Winston (2010), "Economywide Implications from US Bioenergy Expansion", *American Economic Review: Papers & Proceedings*, Vol. 100(3), May, 172-77.
- Dixon, P.B., S. Osborne and M.T. Rimmer (2007), "The economy-wide effects in the United States of replacing crude petroleum with biomass", *Energy and Environment*, 18(6), 2007, pp. 709-722.



### 3. Wars of the world in economic modelling: GAMS versus GEMPACK

**Client:** GEMPACK software used in over 600 sites around the world

**Researchers:** Professor Ken Pearson, Professor Mark Horridge and Dr Michael Jerie

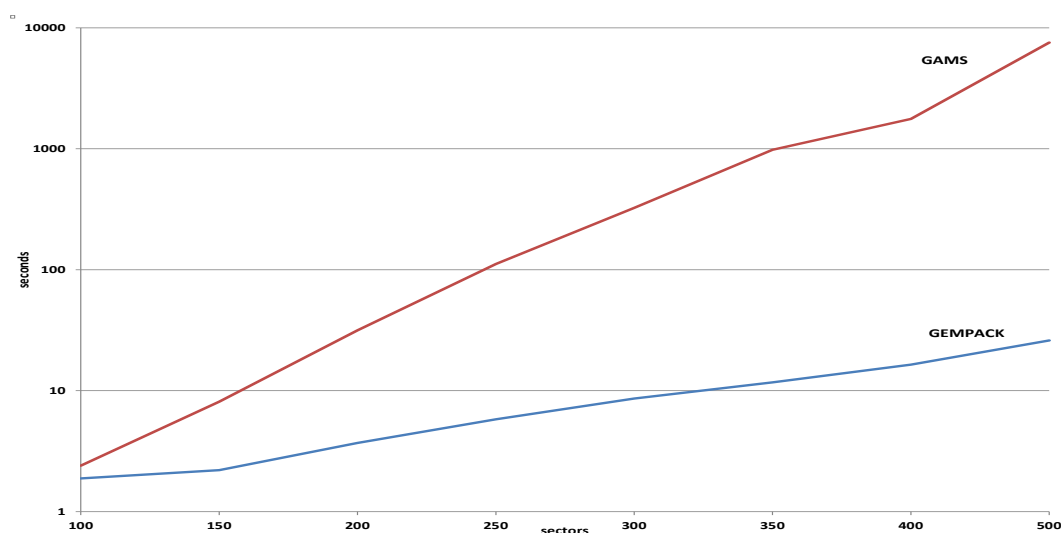
**Summary & impact:** Global financial crisis, illegal immigration, greenhouse-gas pollution and free-trade agreements are just a few of the topics analysed by economy-wide models. These models, known in economics jargon as computable general equilibrium (CGE) models, are large mathematical systems describing the interconnections between a myriad of economic actors. To solve them requires sophisticated software. On this issue the world is divided into two camps: the modellers who use GAMS software and those who use GEMPACK. Both software platforms are extensively used by governments and academics around the world: at any time there are around 10,000 active CGE modellers.

GAMS was developed by Alex Meeraus and other researchers at the World Bank and adapted for economy-wide modelling in the 1980s. In recent times the leading GAMS developer has been Tom Rutherford, originally from Stanford. GEMPACK was pioneered in the 1980s by Ken Pearson of Monash University's Centre of Policy Studies and its ongoing development at Monash has been led by Ken and his colleagues Mark Horridge and Michael Jerie.

In June 2011 Alex, Tom, Ken and Mark met at the World Bank in Washington DC to slug it out. Their two software platforms were set solution tasks on models of increasing size. The bout was conducted over 8 rounds. The verdict was a knock out win for Australia's GEMPACK which outperformed GAMS at 8 model sizes from 100 to 500 sectors. The time difference at high dimensions is so dramatic that a log scale was needed, when depicting time-taken versus number of sectors, in order to get the GEMPACK and GAMS times on the same graph (see Figure 1).



**Figure 1. Solution time (log-scale) versus size of model (no. of sectors)**



GEMPACK is used at more than 600 sites around the world including the World Bank, IMF, the Asian Development Bank, and numerous government departments and universities in more than 90 countries including U.S.A., China, Australia, Ireland, Germany, France, the Netherlands, Finland, Japan, Brazil, Vietnam, Malaysia, Taiwan, PNG.

#### **Publication:**

Horridge, M., A. Meeraus, K. Pearson and T. Rutherford (2012), "Solution software for CGE modelling", in P.B. Dixon and D.W. Jorgenson (editors) *Handbook of Computable General Equilibrium Modeling*, Elsevier, forthcoming.



#### 4. Unauthorized immigration in the U.S.

**Clients:** U.S. Department of Commerce; U.S. Department of Homeland Security; U.S. Department of Agriculture; Cato Institute

**Researchers:** Professor Peter B. Dixon and Professor Maureen T. Rimmer

##### Summary & impact:

In 2008 there were 8.3 million unauthorized foreign workers in the U.S. employed mainly in low-skilled occupations. On baseline trends this will reach 12.4 million in 2019. The U.S. Departments of Homeland Security and Commerce commissioned us to conduct simulations with our U.S. model, USAGE, on the effects of policies to reduce unauthorized employment in 2019 by 3.6 million, to 8.8 million. We looked at the effects of restricting supply via tighter border security and the effects of restricting demand via penalties on employers. Our simulations showed that these policies would inflict significant long-run costs on legal residents of the U.S. The most important of these was what we called the Occupation-mix effect. With less low-skilled migrants, the U.S. economy would be smaller with fewer jobs in all occupations. New legal entrants to the workforce would find reduced employment opportunities in skilled occupations (smaller economy) and increased opportunities in low-skilled occupations (vacancies created by reduction in low-skilled migrants). In this way the occupational-mix of legal employment would be slanted towards low-skilled, low-paid jobs.

Following this work, we were commissioned by the Cato Institute (a high profile Washington think-tank) to look at the effects of the opposite approach: increasing the number of low-skilled migrants via a guest worker program. Our work for Cato received widespread publicity including an editorial in the Wall Street Journal (Aug 19, 2009) and an article in Newsweek (Aug 31, 2009), as well as coverage in many leading provincial newspapers. We presented the research at a seminar (Aug 14, 2009) on Capitol Hill attended by over 100 Congressional advisers and media representatives. The seminar was televised and shown throughout the U.S. on C-Span.

Interest in our work continues while the U.S. government grapples to find a rational



approach to the illegal immigration problem. Recently we have completed a project for the U.S. Department of Agriculture on the role of unauthorized migrants in U.S. agriculture. With funding from Agriculture, this project is currently being extended to look at the implications of different approaches to immigration policy in the context of the U.S. recession.

##### Publications:

Dixon P.B. and M.T. Rimmer (2009), "Restriction or legalization? Measuring the economic benefit of immigration reform", *Trade Policy Analysis*, 40, Cato Institute, Washington DC, pp.24, available at <http://www.freetrade.org/node/949>.

Dixon P.B. and M.T. Rimmer (2010), "U.S. imports of low-skilled labor: restrict or liberalize?", chapter 5, pp. 103-51 in John Gilbert (editor) *New Developments in Computable General Equilibrium Analysis of Trade Policy*, Volume 7 of H. Beladi and K. Choi (series editors) *Frontiers of Economics and Globalization*, Emerald Publishing, UK.

Dixon P.B., M. Johnson and M.T. Rimmer (2011), "Economy-wide effects of reducing illegal immigrants in U.S. employment" *Contemporary Economic Policy*, Vol. 29(1), January, 2011, pp. 14-30.

Zahniser, S., T. Hertz, P.B. Dixon and M.T. Rimmer, "Immigration policy and its possible effects on U.S. agriculture and the market for hired farm labor: a simulation analysis", *American Journal of Agricultural Economics*, 2012, forthcoming

## 1. Modelling terrorist attacks to aid emergency management decision makers

**Clients:** Center for Risk and Economic Analysis of Terrorism Events (CREATE);  
U.S. Department of Homeland Security (DHS).

**Researchers:** Dr James Giesecke, Professor Peter Dixon and Professor Maureen Rimmer

**Summary & impact:** DHS was established in response to the 9/11 attacks. With other U.S. security, emergency management and public health agencies, DHS makes contingency plans for threat scenarios. Working with CREATE, a DHS-funded research centre at the University of Southern California, CoPS has investigated several of these scenarios.

Our first study was in response to a DHS and U.S. Treasury request for analysis of a shutdown of U.S. borders to movements of people and goods. Such a policy is a possible reaction to threats from a pandemic or international terrorism. Using CoPS' USAGE model of the U.S., we found that the cost of full border closure would be severe, with the possibility of a GDP collapse in the vicinity of 50%. Banning 'bottleneck' imports, like oil, contributes disproportionately to the policy's cost. However, drawing on inventories of these commodities, such as the Strategic Petroleum Reserve, alleviates the GDP impact by 8 percentage points. Exempting bottleneck imports from the ban alleviates the GDP impact by a further 30 percentage points. These results highlight the importance of selectivity and strategic commodity reserves, should border closure ever be contemplated.

Subsequently we examined specific threat scenarios. We began by developing a framework for modelling any U.S. sub-region as an individual economy. To our knowledge, the 400-sector models that can be generated in this framework are the largest and most flexible CGE models yet developed for U.S. regions. We used the new framework to generate a model of Los Angeles (LA) and applied it to two DHS Planning Scenarios: "*Chemical Attack-Chlorine Tank Explosion*" and "*Radiological Attack-Radiological Dispersal Devices (RDD)*".

In the short-run, the economic effects of such events are dominated by the consequences of business interruption. Longer-term, behavioral effects from heightened risk perceptions may generate significant ongoing economic costs.



The importance of business interruption and behavioural effects in determining the total economic costs of such events suggests a big role for policy intervention. Business interruption might be minimised by expeditious site clean-up, judicious application of environmental regulations, and effective communication of decontamination efforts. Prior planning to resolve potential conflicts among stakeholders could further lessen delays in getting business back to work.

Policy makers are already keenly aware of the importance of alleviating terrorism's adverse behavioural impacts, as is evident to all who have experienced the 'security theatre' of air travel.

Our terrorism research has created modelling capacity allowing us to extend our U.S. client base. A dynamic fiscal model for Florida is currently being built for the Florida Legislature via our regional modelling framework.

### Publications:

- Giesecke, J, W. Burns, A. Barret, E. Bayrak, A. Rose, P. Slovic & M. Suher. "Assessment of the regional economic impacts of catastrophic events: CGE analysis of resource loss and behavioral effects of an RDD attack scenario". *Risk Analysis*, forthcoming.
- Giesecke, J. (2011) "Development of a large-scale single U.S. region CGE model using IMPLAN data". *Spatial Economic Analysis*. 6(3): 331-350.
- Dixon, P., J. Giesecke, M. Rimmer & A. Rose. (2011) "The economic costs to the U.S. of closing its borders: a CGE analysis". *Defence and Peace Economics* 22(1): 85-97.

## 6. The Obama stimulus package

**Clients:** U.S. Dept. of Commerce, U.S. International Trade Commission

**Researchers:** Prof. Peter B. Dixon and Prof. Maureen T. Rimmer

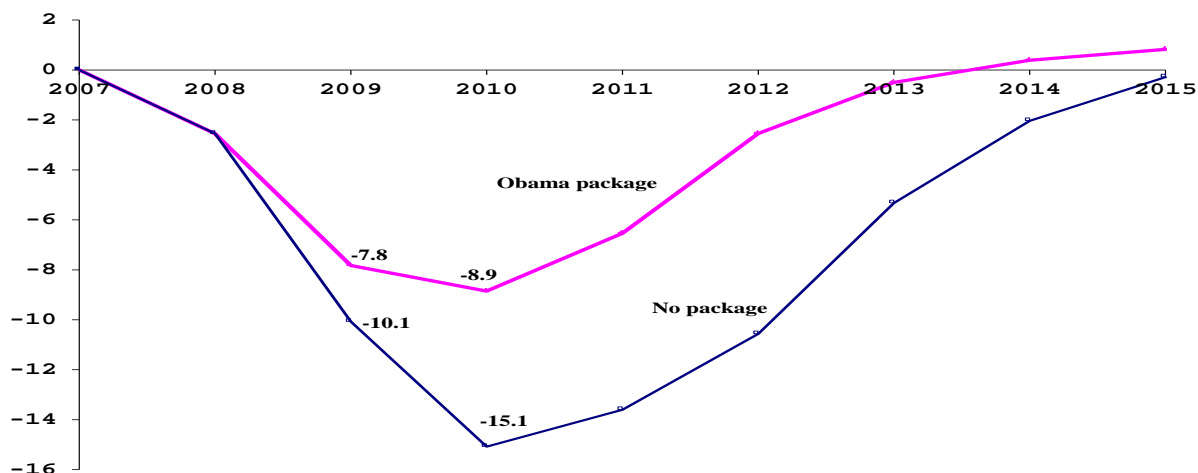
**Summary & impact:** In November 2008 it was apparent that the U.S. would slide into a serious recession in 2009. Newly elected President Obama proposed a Keynesian stimulus package. We were commissioned by the U.S. Department of Commerce and the International Trade Commission to model the likely effects.



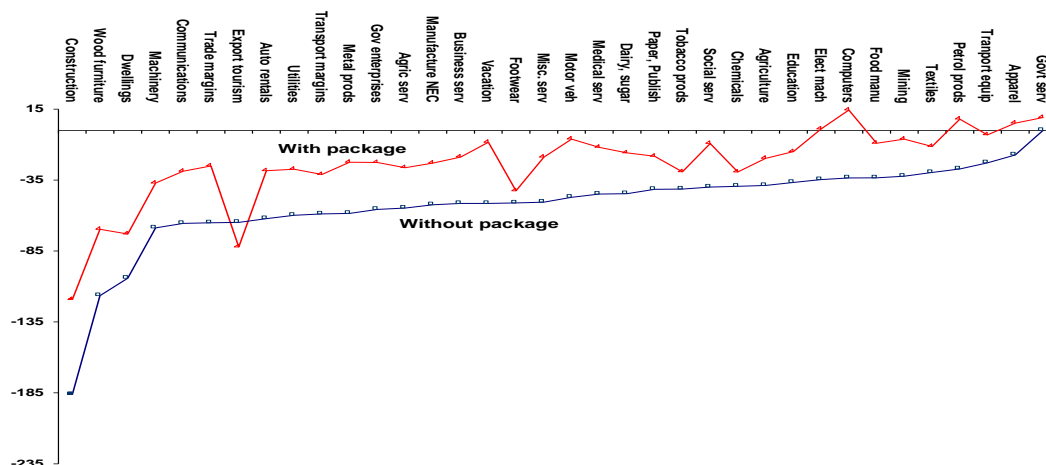
Main stream economists had severe doubts about the efficacy of Keynesian policies, and these doubts were reflected in political opposition to the package. However, our results in Figures 1 and 2 strongly supported the package. The area between the lines in Figure 1 shows the benefits at the macro level, summing to about 32% of one year's GDP. Figure 2 shows that the package strongly limits recessionary damage to nearly every industry. For example, it reduces the cumulated output loss to the construction industry from 186% of a year's output to 119%.

We are pleased to note that mainstream opinion has moved into line with our analysis ( see [http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV\\_cw5O9LNJL1oz4Xi](http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV_cw5O9LNJL1oz4Xi) ).

**Figure 1. Percentage effect of recession on real GDP with and without Obama package**



**Figure 2. Effect of Recession on industry outputs 2008-15, per cent of one year's output**



Publication: Dixon, P.B. and M.T. Rimmer (2011), "You can't have a CGE recession without excess capacity", *Economic Modelling*, Vol. 28(1-2), January-March, pp. 602-13.

## 7. President Obama's National Export Initiative

**Clients:** U.S. Department of Commerce, U.S. International Trade Commission

**Researchers:** Professor Peter B. Dixon and Professor Maureen T. Rimmer

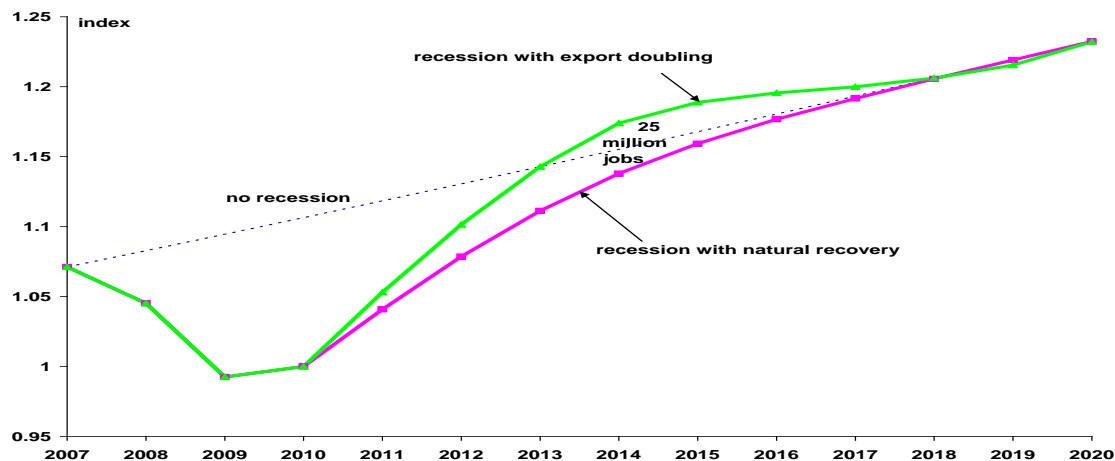
### Summary & impact:

President Obama's National Export Initiative (NEI) is targeted at doubling U.S. exports between 2010 and 2015. We were commissioned by the U.S. Department of Commerce to apply the USAGE model (developed at CoPS) to look at the effectiveness of different policies in achieving the NEI target and what this would contribute to lifting the U.S. out of the current recession.

Via USAGE simulations we found a package of policies (export promotion, cost reduction, information provision) that would achieve the NEI target. In the absence of these policies we estimate the total cost of the current recession at 70 million one-year jobs. This is the area between the USAGE no-recession business-as-usual path for employment from 2008 to 2020 and the USAGE path for recession with natural recovery (no new export-promotion initiatives). With the NEI policies the cost of the recession would be reduced to 45 million jobs. On this basis we estimate that doubling exports would generate 25 million one-year jobs (the area between the paths for natural recovery and export doubling in the figure below).



*Paths for U.S. employment*



Our report on the NEI was circulated in the U.S. Department of Commerce and presented by Professor Dixon to the Commissioners at the U.S. International Trade Commission. The report is playing two roles. First, it is providing policy people, who have a feel for how export promotion programs affect sales for specific products, with an estimate of how much policy effort will be required to achieve the NEI target. This is important in their budgeting and goal setting. Second, by demonstrating the benefits of successful implementation of the NEI in recessionary conditions, the analysis is helping proponents to argue for the program against alternative proposals.

### Publication:

Dixon, P.B. and M.T. Rimmer (2012) "Doubling U.S. Exports under the President's National Export Initiative: Implications of successful implementation" *Contemporary Economic Policy*, forthcoming.



## 8. Validating USAGE, a model for policy advisors in Washington DC

**Clients:** U.S. International Trade Commission and the U.S. Departments of Commerce, Agriculture, Homeland Security and Energy

**Researchers:** Prof. Peter B. Dixon, Prof. Maureen T. Rimmer, Dr Ashley Winston, Dr James Giesecke, Dr Glyn Wittwer, Dr George Verikios, Prof. John Madden, Mr Peter Mavromatis

**Summary & impact:** In 1999, CoPS undertook high-profile research opposing John Howard's GST, an activity that severely limited our short-term prospects for further Canberra-based projects. At the same time, the exchange rate dropped 49c U.S. per \$A. Putting these two factors together, developing a U.S. model to support sales of modelling services into the U.S. looked like a good idea. With initial support from Monash's Faculty of Business and Economics, CoPS undertook two years work to create the first version of the USAGE model (U.S. Applied General Equilibrium).

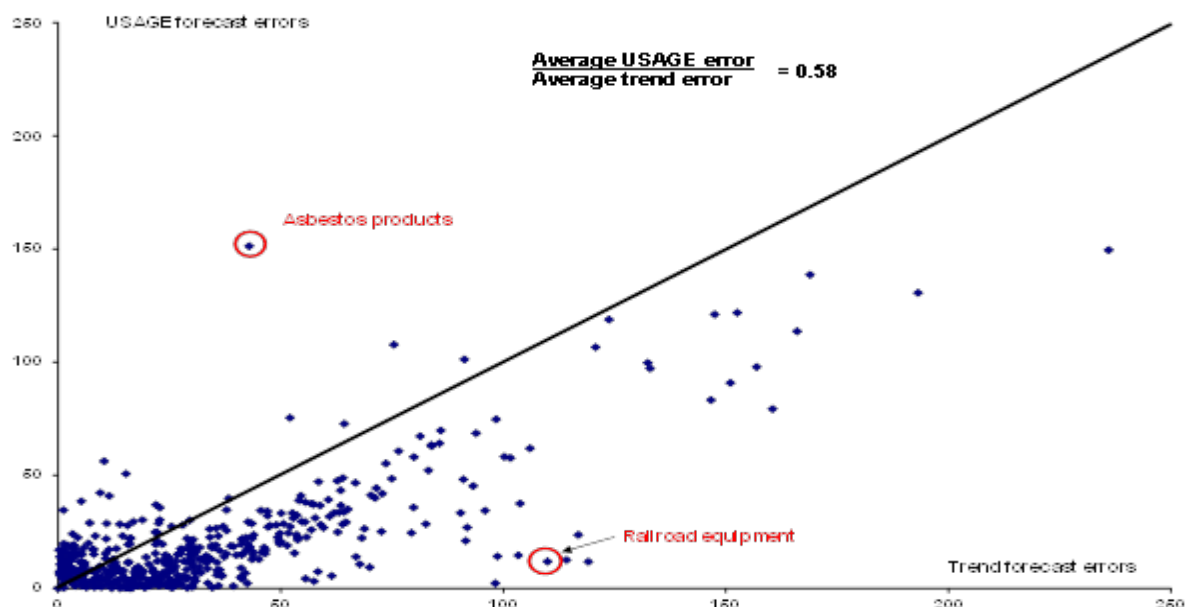
Interest in the model in Washington is mainly centred on applications. However, led by the U.S. International Trade Commission, policy departments of the U.S. government recognised that an economic model can survive only if it is continuously tested, updated and improved. Consequently, in recent years, CoPS has received a steady flow of funding from the U.S. government to support ongoing development and maintenance of USAGE. Perhaps the most important development project concerns validation: how do we know the model really works?

Figure 1 shows results from a validation test in which USAGE forecasts for 500 industries were generated for 1998-2005 using only data available in 1998. These forecasts were pitted against forecasts for 1998-2005 based on trends from 1992 to 1998. As shown in the figure, most of the industry dots lie below the 45-degree line, indicating that USAGE beat trend. The average USAGE error was only 0.58 times the average trend error.



Research is now continuing on outlier dots. Why did USAGE do so badly on Asbestos products? On the other hand, why did USAGE do so well in Railroad equipment?

**Figure 1. Percentage forecast errors for industry outputs, 1998-2005:  
extrapolated 1992-98 trend versus genuine USAGE forecast**



Publications: Dixon, P.B. and M.T. Rimmer (2010), "Validating a detailed, dynamic CGE model of the U.S.", *Economic Record*, 86(Special issue), September, pp. 22-34.

Dixon, P.B. and M.T. Rimmer (2012), "Validation in CGE modelling", in P.B. Dixon and D.W. Jorgenson (editors) *Handbook of Computable General Equilibrium Modeling*, Elsevier, forthcoming.

## 9. Mega sporting events: game over for the Olympics bonanza story

**Clients:** Department of Industry, Tourism & Resources, PWC, KPMG, Ernst & Young, Cricket Australia

**Researchers:** Professor John Madden, Dr James Giesecke and Professor Philip Adams

### Summary & impact:

When cities and countries are selected to host a mega sporting event such as the Olympic Games or the FIFA (Soccer) World Cup there is normally great rejoicing by their citizens. But is the mega-event host really a winner? Mega sporting events are generally highly subsidized affairs with taxpayers of the host city/state/country picking up a bill that can amount to billions of dollars.

CoPS researchers have been commissioned to model the economic effects of many of Australia's biggest sporting events, including: the 2000 Sydney Olympics, the bid for the 2018 FIFA World Cup, the 2003 Rugby World Cup, the Melbourne Grand Prix, the Australian Tennis Open and the Ashes series.



Because CoPS' modelling accounts for the various constraints on an economy, it does not project the very large economic benefits that proponents claim for mega sporting events. A recent CoPS study on the Sydney Olympics emphasizes the importance of avoiding sources of benefit overestimation such as assumptions that factor supplies are elastic, that public inputs are costless and that foreign tourism demands are strongly stimulated. As opposed to most other economic impact studies which are undertaken before the event, the CoPS study of the Sydney Olympics is an *ex-post* one. It first examines the question of whether the predicted impact on tourism actually materialized. It does this by conducting an historical simulation from 1997/98 to 2005/06 to assess the extent to which Olympics-induced awareness increased foreign demand for tourism in Australia. The historical results which are driven by observed values for economic variables, including tourism statistics, do not provide support for the presence of induced tourism. The CoPS researchers then conducted a simulation for a no-Sydney-Olympics counterfactual and estimated that the Olympics generated a real consumption loss for Australia of \$2.1 billion. In view of this estimate CoPS concluded that the Sydney Olympics did not bring Australia an economic boost although there may have been a substantial intangible benefit.

CoPS' mega-event studies have gained considerable attention. The Olympics study, for instance, has been reported in the UK in *The Times*, the *China Daily News* and *Crain's Chicago Business*. An SBS Insight program on the Rugby World Cup included an interview with CoPS' Deputy Director, Professor Madden. In 2005 Madden was engaged by the South African National Treasury to travel to Pretoria as an international expert advising on the economic effects of the 2010 FIFA World Cup hosted by South Africa.

### Publications:

- Madden, J.R. (2002), "The economic consequences of the Sydney Olympics: The CREA/Arthur Andersen study", *Current Issues in Tourism*, 5: 7-21.
- Madden, J.R. (2006), "Economic and Fiscal Impacts of Mega Sporting Events: A General Equilibrium Assessment", *Public Finance and Management*, 6: 346-394.
- Giesecke, J.A. and Madden, J.R. (2011), "Modelling the economic impacts of the Sydney Olympics in retrospect – Game over for the bonanza story?", *Economic Papers*, 30 (2):218-32.

## 10. Water buybacks in the Murray-Darling Basin

**Clients:** Murray-Darling Basin Authority  
Victoria's Department of Primary Industries  
NSW Office of Water

**Researchers:** Dr Glyn Wittwer, Prof. Peter Dixon  
and Prof. Maureen Rimmer



### Summary & impact:

The Water Act 2007 included provision of \$3.1 billion for buying irrigation water entitlements from irrigators in order to increase environmental flows in the Murray-Darling Basin. CoPS has devised a regional model of the Australian economy, TERM-H2O, which includes water flows to agricultural activities and a very detailed treatment of Basin regions. Whereas lobbyists have asserted that buybacks will seriously damage regional economies in the Basin, TERM-H2O shows that at least some Basin regions will benefit and none will suffer a noticeable reduction in economic activity.

Economic intuition tells us that in a buyback scheme in which water sales are voluntary, farmers should be no worse off. There are several complications in the story which are captured in TERM-H2O modelling. First, in the southern Basin, water is tradable between regions. Therefore, net trade in water should be accounted for in the calculation of regional incomes. By entering the water market as a buyer, the Commonwealth pushes up the price of water. This means that Basin regions through existing water holders may benefit via increased spending power. Second, although buybacks push up the price of water, micro theory predicts that if water scarcity increases (as it will with buybacks), the values of fixed factors (land) and sluggishly adjusting factors (vineyards and orchards) will fall. Third, there will be substantial movements in the Basin away from crops such as rice and towards relatively labour-intensive vegetable production, thereby diminishing job losses. In addition, some irrigable land will move from irrigation towards dry-land activities, so that increased dry-land output partly offsets decreases in irrigation output (Table 1).

**Table 1: Change in Murray-Darling Basin output due to buybacks relative to baseline, 2018**

Sector	Value (\$m)
Rice	-\$70
Vegetables	+\$24
All irrigation output	-\$403
All dry-land output	+\$231

TERM-H2O has become the preferred tool of the Murray-Darling Basin Authority for analysis of the economic impacts of the Basin plan, so much so that they have asked if it possible to purchase the model. This is a far cry from late 2010 when the then chair of the MDBA distanced himself from modelling undertaken by others, amid book-burnings in Griffith and general community unrest in the Basin in response to the MDBA's plan.

Media interviews by Wittwer include an appearance on Radio National's 'Bush Telegraph' in June 2009, ABC Victoria's 'Country Hour' and Riverland local ABC radio.

### Publications:

Wittwer, G. (2012) (editor), *Economic Modeling of Water: The Australian CGE Experience*, Springer, Dordrecht, Netherlands (213 pages).

Wittwer, G. and Dixon, P. (2011), "The economic impact of the buyback program", in Langford, J., Briscoe, J. and Taylor, N. (editors), *The Australian Water Project – Crisis and opportunity: Lessons of Australian water reform*. CEDA and Uniwater, Melbourne.

Dixon, P., Rimmer, M. and Wittwer, G. (2011), "Saving the Southern Murray-Darling Basin: the Economic Effects of a Buyback of Irrigation Water", *Economic Record*, 87(276): 153-168.

## 11. Confusing policy and catastrophe: buybacks and drought in the Murray-Darling Basin

**Clients:** Frontier Economics (for National Water Commission)

**Researchers:** Dr Glyn Wittwer, Dr Marnie Griffith, Prof. Peter Dixon and Prof. Maureen Rimmer

### Summary & impact:

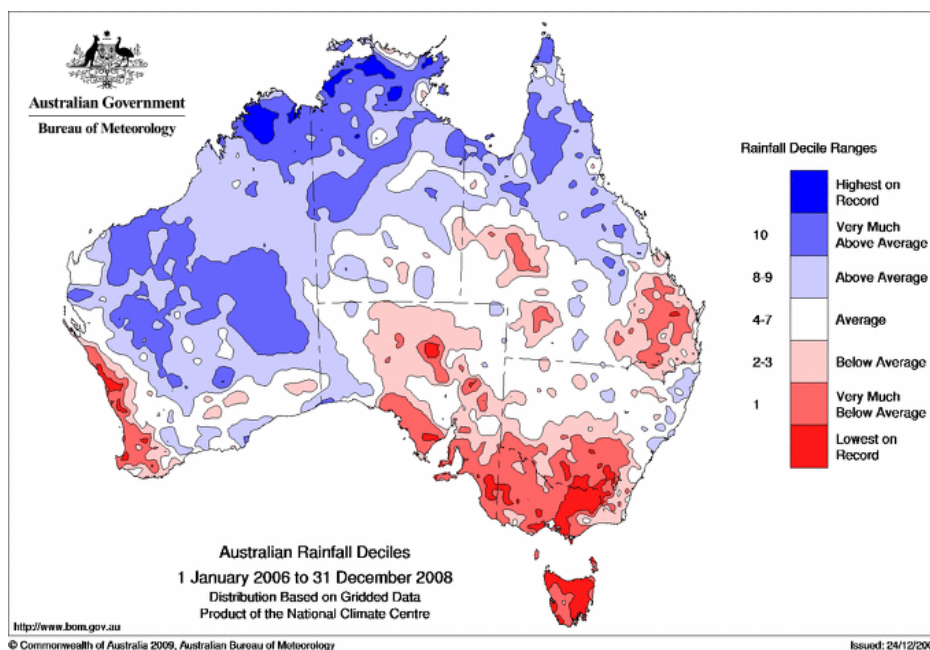
Drought has a dramatic impact on output and employment in farm regions. Any policy introduced during drought may become the scapegoat for drought-induced hardship. This was the case with water buybacks that commenced in the Murray-Darling Basin towards the end of a decade of recurrent droughts, culminating in record rainfall deficits between 2006 and 2008 in the heart of the Basin's Snowy Mountains catchment region (see map).

We need to be able to separate the impacts of drought and policy, if the policy is not to be hijacked by poorly informed lobbyists. Table 1 is a starting point for comparing drought and buybacks. It indicates that the impact of buybacks is second order compared with that of drought. Modelling by CoPS was important in restoring reason to the debate about buybacks, as rain returns to the Basin. Earlier, during the Murray-Darling Basin Authority's road show in 2010, there were book burnings and community unrest. Partly this reflected drought-induced stress and partly woeful communication by the Authority.

**Table 1: Estimates of direct impacts of drought and buybacks on MDB farming**

	Drought 2007-08	Full buybacks
Dry-land productivity	-20%	0
Available water: rainfall	-37%	0
: irrigation	-37%	-32%
Farmer compensation	No	Yes

Lobbyists have latched onto spurious multiplier analysis, but they have been caught out. According to them, ongoing buybacks will lead to ongoing job losses. Yet as buybacks continued, the Deniliquin rice mill reopened. Drought closed the mill and the return of rain led to its reopening. All the while, buybacks were unimportant for jobs at the mill.



CoPS modelling showed that on average over the last decade drought reduced employment in the Murray-Darling Basin by about 6000 jobs. Even with the return of normal seasons in future years, employment will be 1500 jobs lower than it would have been without the drought years. This is because drought has reduced agricultural investment and left the Basin with less infrastructure to support employment. By contrast, the CoPS' modelling predicted around 500 jobs being lost in the Basin in the long run as a result of fully implemented buybacks.

Media coverage of CoPS' study includes:

Morris, S. (2010), 'Jobs dried up in drought', *Financial Review*, 30 November.

[http://afr.com/p/national/jobs\\_dried\\_up\\_in\\_drought\\_XEuCC3FtarzbzI0ccCW8ML](http://afr.com/p/national/jobs_dried_up_in_drought_XEuCC3FtarzbzI0ccCW8ML)

### Publications:

Wittwer, G. (2011), "Confusing policy and catastrophe: buybacks and drought in the Murray-Darling Basin", *Economic Papers* 30(3): 289-295.

Wittwer, G. and Griffith, M. (2011), "Modelling drought and recovery in the southern Murray-Darling basin", *Australian Journal of Agricultural and Resource Economics*, 55(3): 342-359.



## 12. The economic impacts of new dams for urban water supply

**Clients:** Queensland Water Infrastructure (QWI); Connell Wagner

**Researcher:** Dr Glyn Wittwer

### Summary & impact:

Queensland Water Infrastructure (QWI) was set up in 2007 to deal with a water crisis in South-East Queensland. CoPS was QWI's first consultant. At the time, this corner of the state accounted for over 21% of national population growth, during a decade of recurrent droughts. Something had to be done. QWI's plans included a recycling plant, pipelines across the corner of the state to create a water grid, two proposed dams, Wyaralong and Traveston, and a desalination plant.

### Major water supply projects in South-East Queensland, 2007 to 2012

Project:	Cost (\$m)	Average annual yield (GL)
Western Corridor Water Recycling Project	2,500	80
Gold Coast desalination	1,200	45
Wyaralong dam	350	21
Hinze dam extension	395	6
Bromelton off-stream storage	40	5
Traveston (cancelled)	1,600	70
Pipelines	1,400	

CoPS was commissioned to model the economic impacts of the Traveston and Wyaralong dams separately. In the event of a continuation of relatively dry years, the welfare gains of each project would be substantial. But the marginal welfare impact of one dam would fall if the other dam were already in place. Modelling showed that with a return to years of more typical rainfall, the marginal benefits would decline. Wittwer (2009), written up after completion of the QWI consultancy, was scrutinised by QWI before submission. The article included a section on demand management, which is an important contribution of economists.

The water supply projects overlapped to the point where some projects may have had zero marginal benefit. For example, were all the dams, and both recycling and desalination necessary? Any underutilisation through overlapping reduces net benefits.

When the citizens of Toowoomba in the grip of drought voted against the use of recycled water for their daily needs, the \$2.5 billion water recycling plant was relegated to almost permanent underutilisation, supplying only coal-fired power stations. Premier Bligh later announced that recycled water will enter Wivenhoe dam when its level drops below 40% capacity.



At considerable expense, South-East Queensland urban water supply now appears to be drought-proof, despite Traveston dam being scrapped in November 2009. Amid the debate raging over dam releases on 12 January 2011, anyone who has studied historical rainfall data for the region would acknowledge that flood-proofing remains an impossible dream.

CoPS was also called on to model the economic impacts of Tillegra dam in the Hunter Valley in early 2008. Again, the study noted that a return to a more typical rainfall pattern would diminish the marginal welfare benefits of the project. About then the rain returned to northern New South Wales, diluting enthusiasm for the project, which was scrapped in November 2010.

**Publications:** Wittwer, G. (2009), "The economic impacts of a new dam in South-East Queensland", *Australian Economic Review*, 42(1):12-23, March.

Wittwer, G. (2012), "Urban Water Supply: A Case Study of South-East Queensland", Chapter 8 in G. Wittwer (ed.), *Economic Modeling of Water, The Australian CGE Experience*, Springer, Dordrecht, Netherlands.

### 13. The economics of disease and pest control in Australian agriculture

**Client:** Victoria's Department of Primary Industries; Plant Health Australia.

**Researcher:** Dr Glyn Wittwer

Starting in 2003, CoPS has undertaken projects on the costs and benefits of disease/pest control policies in Australian agriculture. Early studies were on exotically named diseases such as Karnal bunt in wheat, banana moko, sugar cane smut and plum pox.



Two recent studies concerned locusts and foot-and-mouth disease. A locust plague hit south-eastern Australia in the summer of 2010-11. Uncontrolled, this would have caused \$650m of direct crop losses. Taking account of indirect multiplier effects, CoPS modelling showed a total GDP loss of \$1b. Controlling the locusts and thereby avoiding most of the direct crop losses costs less than \$50m, but control programs have to be imposed by government. The CoPS study is strongly supportive of such action.

Whereas direct damage from a locust plague accounts for most of the national economic damage, the story with a foot-and-mouth outbreak is different. Indirect losses dominate. CoPS' considered a hypothetical outbreak that caused direct losses of \$90m in the cattle industry. In the absence of a reaction by our trade partners, multiplier effects might take the GDP loss up to \$150m. However, even a limited outbreak of foot and mouth can lead to a quarantine ban on Australia's beef exports. CoPS calculated the effects of a six month ban. This would leave a hole in Australia's export base, weakening the exchange rate and allowing exports of other products to rise. With additional volumes, the prices of these other exports on world markets would fall. Australia's spending power would drop and cause a reduction in employment. The employment loss would cost Australia about \$1b and the reduction in export prices would reduce spending power

by a further \$1.4b. In total the loss in real disposable income is \$2.4b.

CoPS also modelled a much worse foot-and-mouth outbreak, one which includes cattle, pigs and poultry, with a direct loss of \$690m. This time, with a 12 month quarantine ban, the loss of jobs and spending power causes a loss in real disposable income of about \$6b.

At the heart of these hypothetical scenarios is the justification for government spending, both on quarantine precautions and on combating outbreaks. In Australia's case there are substantial gains from maintaining vigilance at home.



As in our foot-and-mouth example, a prevailing theme of disease and pest control studies is that the quarantine responses often account for most of the welfare losses arising from outbreaks. Because of the huge losses involved for exporting countries, the imposition of quarantine bans is sometimes disputed in the WTO with exporting countries claiming that the bans are maintained for too long or applied too broadly.

Often there is a suspicion that bans go beyond quarantine concerns and are maintained as a form of industry protection. This is certainly a possible interpretation of Australia's permanent ban on imported bananas. This ban is good for the Australian banana industry but it is bad for Australian consumers, dramatically so whenever a cyclone destroys much of the local crop. It is also bad for our trade partners.

#### **Publication:**

Wittwer, G., McKirdy, S. and Wilson, R. (2005), "The regional economic impacts of a plant disease incursion using a general equilibrium approach", *Australian Journal of Agricultural and Resource Economics* 49(1): 75-89, March.

#### 14. TERM, a CoPS innovation: small-region dynamic modelling

**Researchers:** Dr Glyn Wittwer, Professor Mark Horridge and Dr Marnie Griffith

**Clients:** Various including those listed below between 2008 and 2012.

**Summary & impact:** Consultants often use input-output (IO) models to analyse the impacts of projects on small regions. These models do not include resource constraints. Thus they assume that regional economies can expand without local cost increases. This would be defensible if all factors were available to a region in perfectly elastic supply. However, even for small regions which can draw in resources from other regions, the elastic-supply assumption may come unstuck quickly. For example, the mining boom since 2005 has led to soaring house prices in remote parts of Western Australia. A CGE model with comprehensive resource constraints improves the realism and usefulness of regional analyses – it shows the impact of booms on local prices.



**Port Hedland house for \$970,000 in April 2008**

TERM (The Enormous Regional Model) is a multi-regional CGE model built at CoPS. Its master database includes 206 regions aligning with statistical sub-divisions. TERM requires census data, state accounts, national accounts, small-region agriculture data, mining data and data on international trade by port. In application, the database and dynamic baseline of TERM are aggregated in order to represent regions and sectors of interest. Examples of applications since 2008, in addition to the mining example above, include:

- productivity studies in agriculture (for Victoria's Dept of Primary Industries, 2011-12);
- the economic impacts of a hypothetical Perth airport curfew (for SKM, 2010);
- NSW fire brigade impacts on regional economies (for Deloitte Touch Tohmatsu, 2010);

- tourism in Far North Queensland (for Marsden Jacob, 2009);
- upgrades to Webb Dock in Melbourne (for GHD Meyrick, 2009);
- expansion of glass manufacturing in Adelaide (for Price Waterhouse Coopers, 2008);
- pulp and paper scenarios in rural Victoria (for Price Waterhouse Coopers, 2008);
- various infrastructure scenarios in rural Victoria (for Price Waterhouse Coopers, 2008).

Dynamic TERM includes a fiscal module which was used in modelling gambling tax scenarios for Price Waterhouse Coopers (2009). An important message was that given the narrow tax base of the states, it will not be easy to replace state government revenues from gambling taxes if there are substantial reforms to gambling legislation.

In summary, dynamic TERM is a versatile analytical tool that can be applied to any number of small-region studies. It has largely superseded small-region IO models.

#### **Publication:**

Wittwer, G. and Horridge, M. (2010), "Bringing Regional Detail to a CGE Model using Census Data", *Spatial Economic Analysis*, 5(2):229-255.





## 15. Labour market forecasting and workforce development

**Clients:** Commonwealth and State Government Departments responsible for employment, education and training.

**Researchers:** Dr Tony Meagher and Ms Felicity Pang

**Summary & impact:** In her address to the Committee for the Economic Development of Australia on February 1, 2011, the Prime Minister Julia Gillard offered the following view about the state of the Australian labour market:

“After three decades when unemployment was our major problem, we now face shortages of labour – a problem unmatched anywhere in the industrialised world. In the short term, the mining boom is placing huge strains on our labour market, compounded by the demands of flood recovery. But the ageing of the population will create even greater pressure over the next 40 years because it will create a yawning demographic deficit. It is vital that we unlock all the potential of our labour market.”

The Monash labour market forecasts, which have been produced by CoPS on a regular basis for more than fifteen years, take all these factors into account. However, it is in their application to education and training that the forecasts have proved particularly useful. Perhaps more than any other factor, education and training is the key to “unlocking the potential of the labour market”.

At the core of the Monash forecasting system is the MONASH computable general equilibrium model of the Australian economy. The adaptation of a modern, sophisticated CGE model to labour market forecasting has earned the Monash forecasts an international reputation for modelling excellence in the field. However, the usefulness of the forecasts to policy makers in the education and training bureaucracy stems not only from the quality of the CGE methodology but also from the large amount of detail embodied in various labour market extensions and from the user-friendly software developed to manage that detail. The forecasts go out eight years and cover 158 industries, 358 occupations, 7 qualification levels, 71 qualification fields, 24 demographic groups and 58 regions. Moreover they are coherent in that they are consistent with one another and aggregate into an identifiable, defensible view about the future development of the economy.

The extent to which a system for delivering policy advice can have an impact on decision making in government agencies depends not only on the

quality of the system but also on the political



context in which decisions are made. For a period in 2008-2009, it was politically untenable for subscribers to use the Monash forecasts until they had been revised to account for the effects of the GFC.

In response to this problem with subscribers, CoPS has designed and implemented a system for updating the labour market forecasts on a quarterly basis between major forecasting rounds. In this way, dramatic developments can be incorporated into the forecasts at short notice.

The Monash forecasting system is distinguished by its reliance on published data sources and modern CGE modelling techniques. In other countries, training agencies do not generally have access to equivalent modelling expertise, and rely instead on bureaucratic systems for collecting and collating informed opinion. Such systems are inherently cumbersome and are not as well suited as the Monash system for adapting quickly to changing circumstances. In the United States, for example, the Bureau of Labor Statistics commands a very large budget for labour market forecasting, but manages to produce a new forecast only every two years.

### Related Research Paper:

G.A.Meagher and Felicity Pang, “Assessing the Reliability of Labour Market Forecasts”, paper presented to the International Symposium on Employment and Skills Forecasting, University of Warwick, September, 2011.



## 16. Labour market forecasting and the two-speed economy

**Clients:** Various Commonwealth and State Government Departments responsible for employment, education and training.

**Researchers:** Dr Tony Meagher, Ms Felicity Pang and Professor Mark Horridge

**Summary & impact:** Australia is currently experiencing a once-in-a-century terms-of-trade and investment boom and an associated high exchange rate. These developments have resulted in significant structural change in the economy and prompted the following judgement by Tim Colebatch, economics editor of the Age (6 March, 2012):

“Australia has fractured into two economies. The (recent) growth is overwhelmingly in minerals development, in Western Australia, Queensland and the Northern Territory. The south-eastern states - Victoria, New South Wales, South Australia, Tasmania and the ACT – are now going backwards on some indicators, growing slowly on others. Australia has been a two-speed economy since 2005, but now the two speeds are 100km/h on one side of the country and 10km/h on the other”.

This kind of idea poses considerable difficulties for State government bureaucrats whose job it is to manage the allocation of training resources. In particular, they must decide the extent to which assessments like Colebatch’s apply to the labour market for which they are responsible. The Monash labour market forecasts provide them with some important guidance in this respect.

Software supplied with the forecasts allows the policy makers to identify which industries (or occupations or skill groups) make the most important contributions to differences in employment growth between the States. For example, in the most recent forecasts, employment in Western Australia is projected to grow by 14.98 per cent during the period 2010-11 to 2018-19. This is 3.67 percentage points more than the Australian economy as a whole. Of this, 1.46 percentage points (or about 40 per cent of the difference) are accounted for by the relatively large share of the Western Australian workforce employed in the rapidly-growing mining industry. However, 0.62 percentage points (or about 17

per cent of the difference) are accounted for by the manufacturing industry even though employment in that industry is projected to contract in Western Australia. In explaining the difference between aggregate growth rates, what matters is that manufacturing employment is projected to contract more slowly in Western Australia than it is in Australia as a whole.

Note that employment growth projected for



Western Australia, Queensland and the Northern Territory taken together is 18.84 per cent, as compared to 7.74 per cent for the rest of Australia. While the difference is considerable, it is well short of the factor of ten envisioned by Colebatch. This reflects the fact that the vast bulk of Australians work in the services sector where the effects of the boom are relatively muted.

Policy makers are continually confronted with the need to translate broad qualitative ideas like the “two-speed economy” into quantitative assessments of the future requirements of industry for skilled labour. The Monash forecasts facilitate this decision making by bringing sophisticated economic modelling techniques and up-to-date data to bear on the forecasting task. The impact of the forecasts in this regard is considerably enhanced by the suite of user-friendly software which accompanies the forecasts.

## 17. Labour Market Forecasting and the Monash-Warwick Alliance

**Clients:** The European Centre for the Development of Vocational Training (CEDEFOP)

**Researchers:** Dr Tony Meagher, Ms Felicity Pang and Professor Rob Wilson (IER, Warwick)

**Summary & impact:** The European Centre for the Development of Vocational Training (CEDEFOP) was established by the European Union in 1975 to support the development of European vocational-education and training policies and to contribute to their implementation. Since 1995, it has been based in Thessaloniki, Greece. In 2008, CEDEFOP initiated a project on *Forecasting skill supply and demand in Europe*, the overall aim of which is to develop a system for producing regular, detailed and consistent projections of future skill demand and supply across the whole of Europe. A tender to produce the forecasts for the first four years of the project was won by an international team led by the Institute of Employment Research (IER) at the University of Warwick. At that time the IER, together with collaborators at Cambridge Econometrics, had already been producing labour market forecasts for the United Kingdom government for many years.

At the core of the Warwick forecasting system is the E3ME model, a time-series econometric multi-sector (EMS) model that represents the current embodiment of a continuous line of research on economic modelling that originated with the legendary R. A. Stone in the 1950s. It is operated by Cambridge Econometrics and produces, *inter alia*, an integrated set of employment forecasts for 41 industries in 27 European countries. Its particular focus is on the long-term implications of policies related to energy, the environment and the economy (hence the E3 in its name). In the Warwick system, the E3ME model is supplemented by a labour market extension (the WLME) which elicits the implications of the industry forecasts for 28 occupations and 3 skill groups.

In 2010, CoPS was approached by the IER to explore the possibility of producing a hybrid EMS-CGE model for the CEDEFOP forecasting project. In particular, it was proposed that an alternative to the WLME be developed which describes the operation of markets for occupations and/or skill groups in the CGE tradition. Compared to the WLME, the Monash labour market extension (MLME) relies less on time series extrapolation and more on explicitly modelled economic behaviour. The Monash approach introduces a range of behavioural and technical parameters which offer more scope than the Warwick approach for modelling developments in the labour market which impact on occupations and skills rather industries. CoPS' exploratory work on using MLME as an alternative to WMLE was supported in 2011 by a grant from the Monash-Warwick Strategic Funding Initiative for Joint Research, an initiative that has culminated in the formation of a new global alliance between the two universities, as announced in February 2012 by Vice-Chancellors Ed Byrne (Monash) and Nigel Thrift (Warwick), pictured above.



An interface between E3ME and the MLME has now been successfully implemented for the United Kingdom, the Netherlands and Greece. It is expected that forecasts for the remaining 23 countries will be completed during 2012, and that a comparison between the merits of the E3ME-WLME and E3ME-MLME systems will contribute to the outcomes of the current CEDEFOP four-year program. It is also expected that the research will provide the basis for a joint Warwick-Monash forecasting proposal for the next CEDEFOP funding round.

#### **Related Research Paper:**

G.A.Meagher, Felicity Pang and R.A.Wilson, "Interfacing a CGE Labour Market Model with the E3ME Multi-sector Macroeconomic Model", (in preparation).

## 18. Population ageing and structural adjustment

**Clients:** Commonwealth Department of Innovation, Industry, Science and Research.

**Researchers:** Dr James Giesecke and Dr Tony Meagher

### Summary & impact:

The future effects of population ageing on the Australian economy have been widely canvassed in recent years, most notably in the three *Intergenerational Reports* produced by the Australian Treasury and in the *Economic Implications of an Ageing Australia* produced by the Productivity Commission. These reports are concerned mainly with the effect of ageing on the government's budgetary position. On the income side, they focus on how ageing affects labour supply and gross domestic product. On the expenditure side, they focus on how ageing affects various spending categories including education, health and aged care.

In 2008, the Centre of Policy Studies undertook a study designed to reveal the structural pressures implicit in the fiscal gap analyses of the Treasury and the Productivity Commission. The study considered the effects of population ageing on 67 skill groups, 81 occupations and 106 industries over the period 2004-05 to 2024-25. The simulations were conducted using the MONASH applied general equilibrium model of the Australian economy and compared two economies: a basecase in which population ageing takes place, and an alternative (counterfactual) economy in which the age structure of the population – insofar as it affects workforce participation rates, hours worked per week and consumer demand patterns - remains unchanged.

The CoPS simulations brought out the implicit labour-market assumptions underlying the Treasury's fiscal gap projections. They showed that for these projections to be realized, there would need to be considerable shifts in the occupational mix of employment. An obvious example is a shift from education towards health. Such shifts will require changes in the allocation of government training expenditures if they are to be achieved smoothly without sharp changes in relative wage rates.



While the importance of population ageing for employment related to education and health has been widely anticipated in other studies, some of the other structural results from the CoPS modelling are quite significant for aspects of the ongoing policy debate. For example, our results show that population ageing tends to create shortages of qualified tradesmen. However, the effects of population ageing will vary considerably within the category *tradesperson*. The induced pressure on the employment of *Structural construction tradespersons*, *Final finish construction tradespersons* and *Plumbers* is strongly towards excess demand, whereas that on *Mechanical engineering tradespersons*, *Fabrication engineering tradespersons* and *Automotive tradespersons* is strongly towards excess supply. Evidently, labour market policies predicated on ideas formed at high levels of aggregation are unlikely to apply satisfactorily at lower levels of aggregation.

Even more interesting is the tendency of population ageing to create excess demand for persons with *No post-school qualification*. This result sits uneasily with the almost universal policy emphasis on the need for a more highly skilled workforce.

### Publication:

James Giesecke and G.A.Meagher (2008), "Population Ageing and Structural Adjustment", *Australian Journal of Labour Economics*, 11 (3), 227-248.

## 19. Climate change mitigation, green jobs and training needs



**Clients:** Commonwealth Department of Innovation, Industry, Science and Research.

**Researchers:** Dr Tony Meagher and Ms Felicity Pang

**Summary & impact:** In October 2008, the Australian Treasury released a report on *Australia's Low Pollution Future: The Economics of Climate Change Mitigation*. As described in the first vignette, CoPS was the major contributor to the modelling underlying this report. The stature of the report can be gauged from an assessment by Dr Martin Parkinson, then the head of the Department of Climate Change but now the head of the Treasury. He declared that the report was “the most thorough, comprehensive and well documented modelling exercise ever conducted in Australia”. In the report, various scenarios were used to explore the potential economic effects of climate mitigation policy in Australia. While the projections were constrained by the availability of labour in the aggregate, they did not consider the possibility of skill bottlenecks.



In 2010, CoPS produced a supplementary report which used a CGE labour market extension to investigate more thoroughly the labour market implications of the Treasury report. The extension described the operation of 81 labour markets differentiated by occupation and imposed labour supply constraints for 67 skill groups differentiated by qualification. The main results were as follows:

- The effect of climate change mitigation on the occupational mix of employment will be small compared with changes arising from technology and other structural pressures.
- The transition to a more sustainable economy will not create a rash of jobs requiring special environment-related skills (green jobs). Hence concerns about the capacity of the education and training system to cope with the anticipated extra demand for green jobs are misplaced.
- When the emissions reduction target was made more stringent, the occupations which benefited most were those connected with *Forestry*. This industry is distinguished in that it is the only one for which emissions decline as its output increases.
- When a renewable energy target (RET) was introduced, employment tended to shift against occupations employed in the *Electricity* industry or in industries that are large users of electricity.
- The employment effects of carbon pollution mitigation have much more to do with the distribution of jobs between industries, occupations, skill groups and regions than with the aggregate number of jobs. However, in the analysis, the number of jobs created and destroyed due to climate change mitigation was much less than the number the economy has to cope with on a routine basis.

The result suggests that policies that rely on attributing the characteristic “green” to particular jobs are unlikely to produce the intended results; “greenness” is policy specific.

### **Related Report:**

G.A.Meagher and Felicity Pang, “Future Skill Needs of the Transition to a Low Emission Economy”, Report to the Department of Innovation, Industry, Science and Research, March 2010 (240 pp.)



## 20. Australia's 2005 national wage case and other industrial relations issues

**Clients:** Department of Employment & Workplace Relations and the Allen Consulting Group

**Researcher:** Professor Peter Dixon, Professor John Madden and Professor Maureen Rimmer

### Summary & impact:

Each year Australia has a national wage case which sets award wage rates for about 20 per cent of Australian workers spread across a wide range of occupations and industries. As had been the practice for many years, the 2005 national award wage case, known then as the Safety Net Review (SNR), was conducted in a legalistic process by the Australian Industrial Relations Commission (AIRC). The Commonwealth of Australia commissioned CoPS to analyse the effects of granting the Australian Council of Trade Union's (ACTU) request for a flat increase of \$26.60 a week for all award workers covered by the SNR. The Government wanted to know both the short- and long-run macroeconomic effects at the national level. They also asked CoPS to identify potential adjustment (or short-run) problems at the state level.

The wage increase requested by the ACTU translated into an average real wage increase for award workers of 4.2%. CoPS' modelling showed that this would cause a flow-on increase of 0.85% in non-award wages. Across all workers the average real wage increase would be 1.22%. In the short run, we calculated that this would reduce employment by 78,000 jobs. The CoPS' report showed that jobs would be lost in all regions and all industries, not just those with a heavy concentration of award workers.



CoPS was asked to assist the Commonwealth at the AIRC hearings. Professor Madden appeared before the AIRC full bench as the Commonwealth's expert witness. At the hearing, the ACTU advanced the well-known Card/Kruger study of minimum-wage workers in the New Jersey fast food industry in support of its claim that its requested wage increase would have no effect on jobs. CoPS' study was consistent with Card/Kruger as our simulations showed little effect on employment in service industries (like fast food) that face inelastic demand. However, CoPS was able to capture the general equilibrium effects of cost increases flowing on to industries with highly elastic demand.

CoPS' modelling for the wage-case study involved a methodological advance in regional modelling. Two CoPS models, MONASH and MMRF were linked. MONASH is a national model which separately identifies labour demand and supply using a form of search theory, and distinguishes between award and non-award wage rates. MMRF is a detailed multi-state model, but has a crude labour-market specification. Linking the two models allowed CoPS to exploit the strengths of the two models. The linking methodology was published in 2010 in *Regional Studies*, (A\* in ERA rankings).

After the 2005 case, CoPS used its linked system to provide similar analysis to Fair Work Australia which replaced the AIRC in 2006. We also worked with the Allen Consulting Group on a study of the Howard government's set of reforms that became known as Work Choices. Unfortunately, the Department of Employment and Workplace Relations suppressed our report, but that's another story.

### Publications:

Dixon, P.B., Madden, J.R. and Rimmer, M.T. (2010), "Linking national and multi-regional models: the effects of an increase in award wage rates in Australia", *Regional Studies*, 44:1369-85.

## 21. China-Australia Governance Program

**Client:** State Information Centre of NDRC, Beijing

**Researchers:** Dr Yinhua Mai, Dr Xiujian Peng, Prof. Philip Adams, Prof. Peter Dixon, Prof. Mark Horridge, Dr Michael Jerie, Mr Mark Picton, Prof. Maureen Rimmer, Dr Glyn Wittwer

**Summary & Impact:** The State Information Centre (SIC) in China is a central government agency under the supervision of the National Development and Reform Commission (NDRC). As an important economic forecasting think tank, it provides policy-oriented quantitative services and advice to senior policy-makers in the State Council, NDRC, and other macro-economic departments of the central government. In 2007, under the AusAID-funded China-Australia Governance Program, SIC commissioned CoPS to provide CGE modelling training for its staff and to build a dynamic CGE model. From 2007 to 2010, we: conducted three intensive CGE model training courses; provided a series of consultancies for SIC staff in Melbourne and Beijing; and built a dynamic CGE model of the Chinese economy, the SICGE model. SICGE has been used by SIC staff to analyse: rural-urban labour mobility, household income inequality and social security issues; the impact of liberalisation of state petroleum prices; China's GFC stimulus package involving subsidies on purchases of household appliances and cars; and transportation development and related energy demand. The governance program culminated in an international conference held in Beijing in April 2010. The papers are available in the proceedings cited below.

An interesting SICGE application by CoPS has been to estimate the size of rural surplus labour, that is the number of rural workers with close to zero marginal productivity. Whether China still has a pool of rural surplus labour is hotly debated in China. Many scholars argue that the persistent shortage of rural-migrant labour in manufacturing sectors in urban east-coast areas in recent years signals the drying up of the pool of rural surplus labour. They worry that the running down of the rural labour surplus could drive up labour costs and jeopardise China's competitive advantage in international markets and also reduce foreign direct investment in China.

Using SICGE, we conducted an historical simulation which showed that the size of the rural labour surplus declined from 120 million in 1997 to 59 million in 2005 because of strong demand for rural labour in rural non-agricultural activities and in urban sectors. If the growth patterns of agricultural output and labour productivity continue, then the rural labour surplus will continue to shrink significantly, leaving only 25.6 million rural surplus labourers by the end of 2015. However, if the government invests more heavily in agricultural infrastructure and thereby increases growth in ***Rural migrant labourers in urban manufacturing***



agricultural labour productivity, then rural surplus labour will not decline quite so quickly (less rural jobs) making more rural labour available for transfer into non-agricultural activities. Meanwhile, acceleration of agricultural labour productivity will reduce food prices. put downward pressure on the consumer price index and stimulate real household consumption.

#### **Publications:**

Mai, Y. and X. Peng (2012), "Estimating the size of rural labour surplus in China -A dynamic general equilibrium analysis", *The Chinese Economy*, 2012, forthcoming.

*State Information Centre and China-Australia Governance Program (2010), International Conference on the SIC-GE Model and Policy Simulations, Proceedings of a conference held on 15-16 April 2010 at the Beijing GuoHong Hotel.*

## 22. Building CGE modelling capacity for China

**Client:** Hunan University (Changsha, China)

**Researchers:** Dr Yinhua Mai, Dr Xiujian Peng, Prof. Peter Dixon, Prof. Mark Horridge, Prof. Maureen Rimmer, Dr Glyn Wittwer

### Summary & Impact:

Hunan University, which dates back to the Yuelu Academy founded in 976 A.D., is located in the historically and culturally renowned city of Changsha, capital of Hunan Province. In 2006 Hunan University commissioned CoPS to conduct a capacity building project in computable general equilibrium (CGE) modelling for China.

Between 2006 and 2008 we: ran two training courses; built the Monash-China-Hunan-University GE model (McHuge) of the Chinese economy; and assisted in the supervision of five Hunan PhD students. Subsequently, through AusAid, we were commissioned by the State Information Centre (SIC) in Beijing to further develop and apply Mchuge (next vignette). Among other things, our colleagues in Hunan have used Mchuge:

to analyse the development of China's textile industry under the pressure of reduced international demand, rising input costs and appreciation of the RMB;  
***Yuelu Academy at Hunan University***

to project the demand for energy by energy-intensive industries under different assumptions about energy efficiency;

to estimate the economic impacts of sharp rises in the prices of commodities such as oil and iron ore;

to work out whether a fuel tax should be levied at the retail, wholesale or production stage; and

to assess the effects of population aging and labour market reform.

In our own research we have applied Mchuge in an analysis of the economic impact of reform in China's household registration (*hukou*) system. The *hukou* system inhibits permanent migration of the rural labour force to urban areas. As a result, underemployment or disguised unemployment remains widespread in rural areas and agricultural wages are much lower than non-agricultural wages.

Our Mchuge simulations showed that a dismantling of restrictions that encouraged an extra 6.3 million workers (= 1.7 per cent of the rural labour force) to move out of rural employment and into urban employment would, by 2019:

- increase China's GDP by 0.36 per cent;
- increase consumption (combined public and private) by 0.31 per cent; and
- increase the real wages of rural workers, China's lowest paid workers, by about 5 per cent while reducing the real wages of low-skilled urban workers by about 15 per cent. Even with these wage changes, urban workers stay considerably better paid than rural workers.

**Publications:** Mai, Y., X. Peng, P. Dixon and M. Rimmer (2009), "The effects of facilitating the flow of rural workers to urban employment in China, *CoPS/IMPACT Working Paper No. G-188*, Nov., pp. 35, available at <http://www.monash.edu.au/policy/ftp/workpaper/g-188.pdf> (under consideration *Papers in Regional Science*).

Mai, Y., M. Lai, X. Peng and H. Xiao (2012), MC-HUGE: the Monash-China Hunan-University General Equilibrium model and its policy applications (In Chinese), Hunan University Press, forthcoming, 2012.





### 23. LNG project in Papua New Guinea

**Client:** Bank of Papua New Guinea

**Researchers:** Professor Peter B. Dixon and Professor Maureen T. Rimmer

**Summary & impact:** ExxonMobil commenced work in 2010 on an LNG Project in Papua New Guinea (PNG). Expenditures on setting up the Project are expected to total \$A12 billion and average annual export revenue in 2010 prices is expected to be \$A4 billion for the period 2013 to 2042. These are huge numbers for PNG which had GNP in 2010 of \$A10 billion and exports of \$A6 billion.



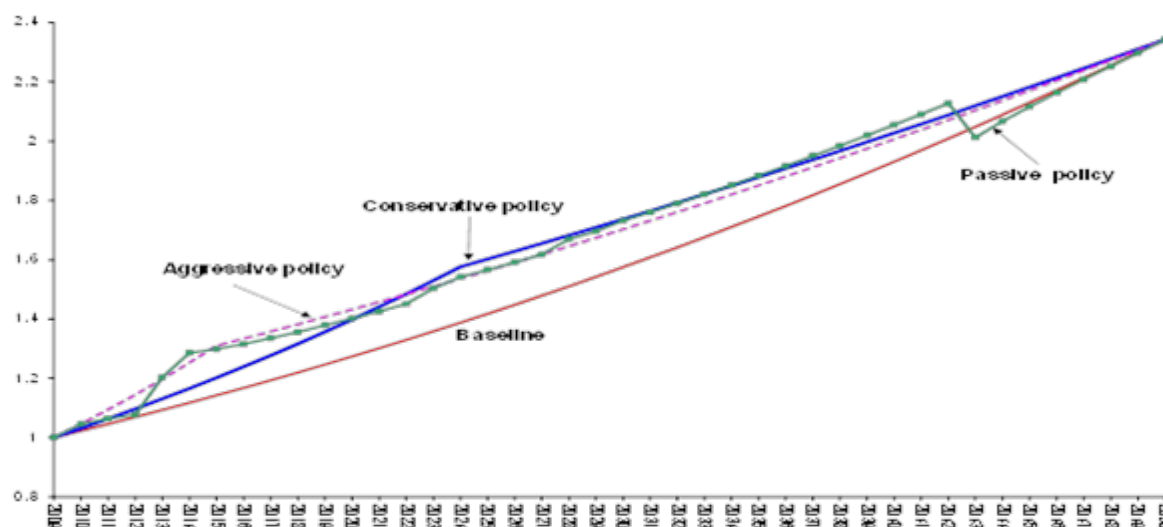
The Bank of PNG commissioned us to simulate the Project's effects on consumption, sectoral outputs, wages and other variables under three macroeconomic management strategies: a **conservative** strategy in which the government uses Project revenues to accumulate foreign assets during the early years of the Project and allows PNG's standard of living to rise only slowly; an **aggressive** strategy in which the government borrows against future earnings from the Project and allows PNG's standard of living to rise rapidly; and a **passive** strategy in which Project revenues are consumed as they accrue.

Under each of our three scenarios, the average LNG-induced increase in PNG standard of living is about 7 per cent, but the timing of the increases differs markedly (Figure 1). Under the conservative scenario, PNG initially adopts relatively tight fiscal policy, leading to increased national savings and accumulation of foreign assets up to 2024. Under the aggressive scenario, PNG adopts the opposite strategy. Fiscal policy is initially expansionary, leading to decreased national savings and accumulation of foreign debt. Under the passive policy scenario, fiscal policy is neutral, allowing LNG revenue to be spent as it accrues with no change in foreign assets/liabilities. A theme of our analysis was that economic adjustment problems associated with the LNG Project will be easier to handle if the conservative pattern of consumption increases is adopted.

While the LNG Project is significant for the PNG economy, care must be taken not to exaggerate its effects. In popular discussions, emphasis is often placed on GDP effects. For example an ACIL Tasman report predicts huge increases (e.g. 100 per cent) in GDP. However, the increase in GDP is not relevant. Attention should be concentrated on the effects on GNP and the consequent potential for increases in public and private consumption.

Our report is being used by the Bank to advise government on alternative macro policies and to help hose down exaggerated expectations within both the government and the financial community.

**Figure 1. Standard of living (measured by public & private consumption) under alternative policies for management of LNG revenues**



**Publication:** Dixon, P.B., G. Kauzi and M.T. Rimmer, "The effects on the PNG economy of a major LNG Project", *Economic Papers*, Vol. 29(2), June, 2010, pp. 143-155.



## 24. Economic impacts of large natural resource projects in Australia

**Clients:** Includes BHP Billiton, Hamersley Iron, Chevron and Woodside, Tasmanian govt.

**Researchers:** Prof. Philip Adams, Dr James Giesecke, Dr Glyn Wittwer and Dr Janine Dixon

### Summary & impact:

Large resource projects have large economic impacts, but not necessarily large benefits for the incumbent population. Take, for example, the proposed Olympic Dam expansion in South Australia. The mine is owned and operated by BHP Billiton. It is the world's fourth largest copper resource, the largest known deposit of uranium and also has rich deposits of silver and gold.



The proposed development involves the creation of a new open-pit mine that would operate simultaneously with the existing underground mine. The new mine would be built over several stages, with the existing smelter expanded and new concentrator and hydrometallurgical plants built on site to process some of the additional ore. Construction of the new facilities is expected to cost around \$19 billion over 10 years, and new production is valued at about \$4.2 billion (2011 prices) annually for the next 40 years.

The impacts of this development on the semi-arid region where it is located will be profound. The impacts on the state of South Australia will also be large – the mine's annual production is around 5 per cent of state GSP. But what about the expanded mine's economic benefit to the state and to the nation? Nearly all of the new production will be exported with some processing occurring on site. It is estimated that there will be around 4000 new jobs created by the development, with half requiring high-skill qualifications of the type that are in strong demand from Western Australian mineral producers. Profit is nearly five times the cost of labour, so much of the income returned from the new project is profit-dividend to the mine's owners. The Centre of Policy Studies (CoPS) was asked by the mine's owner and the state government to assess the final benefit. Our findings, which are confidential, suggest that the benefits are relatively small compared with the overall

scale of the new operation. We showed for the nation that the size of benefits diminished: the greater was the strengthening of the real exchange rate associated with the mine's new production; the more intense was the upward effects on skilled-wage costs brought about by the mine's ramped-up requirement for workers; the greater was the share of profits accruing to foreign share owners; and the lower was the extraction of taxation revenue via royalties and the new mining resource rent tax.

This appraisal was at odds with a number of earlier studies which showed huge economic benefits for the state and nation. These earlier studies employed input-output models which failed to account for supply-side constraints in the markets for labour of certain occupational types and for indirect effects working through the balance of payments (Dutch disease). Our modelling takes account of these factors and hence provides a more balanced assessment of the final economic outcome.

Because of these insights, CoPS modelling is now used routinely by state governments and, in some circumstances, by the Federal government, to provide economic assessments of resource projects. In 2011 we assessed two LNG projects in WA, one LNG project in QLD and three other mining projects in NSW and Vic. CoPS has also analyzed renewable resource projects, including native-forest harvesting in Tasmania

**Publications:** None yet available. We have supplied confidential reports to clients.

## 25. Optimal tariffs: why CoPS changed sides

**Client:** Lateral Economics, for their submission to the Bracks Inquiry

**Researchers:** Profs. P. Dixon and M. Rimmer

**Summary & impact:** In the 1970s Australian manufacturing was protected by tariffs that averaged 50%. Prominent economists advocated tariff reductions. They argued that there were losers as well as winners from protection, and that losses outweighed gains. However the winners, most notably Motor vehicles & parts (MVP), were clearly identifiable and advocated stridently that tariffs must be maintained to preserve jobs. Against this powerful lobby group, what was needed was a voice for the widely spread and less identifiable losers.

In 1975 the Australian government set up the IMPACT Project, in the now Productivity Commission, with the task of creating a quantitative tool for analysing protection: a tool that would identify losers as well as winners and calculate losses and gains. The IMPACT team (which eventually became CoPS) produced the detailed economy-wide ORANI model (a predecessor of MONASH) which was crucial in winning the tariff debate. Since the late 70s, Australia has followed an ambitious program of unilateral tariff reductions. The majority of imports are now subject to tariffs of 5% or less. However tariffs of 10% apply to MVP. In 2008, the government commissioned the Bracks Inquiry into MVP. This inquiry received advice from the Productivity Commission recommending continuing reductions in MVP tariffs.

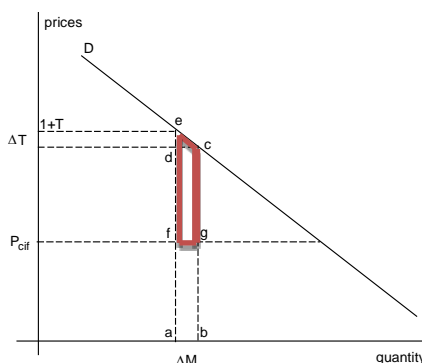
But the wheel turns, and CoPS has changed sides in the tariff debate. At the Bracks Inquiry, CoPS now opposed continuing MVP tariff reductions. Why was this? Reductions in tariffs have two opposing effects: positive *efficiency* effects which allow Australia to save resources by substituting export activities for import-competing activities; and negative *terms-of-trade* effects whereby Australia's welfare is deteriorated by importing more (driving up the price of imports) and consequently exporting more (driving down the price of exports).

Figure 1 shows the efficiency effects. A reduction in the tariff rate by  $\Delta T$  increases



imports by  $\Delta M$  and produces an efficiency gain of area  $ecgf$ . It is clear from the figure that efficiency effects are a reducing function of the tariff rate. On the other hand, terms-of-trade effects are not a reducing function of the tariff rate. So as tariffs are reduced there reaches a stage, at the optimal tariff, where a unilateral tariff reduction lowers welfare. Whereas 50% is well above the optimal tariff rate, 10% is considerably below. This explains why Australia should, along with most other countries, pursue tariff reductions in a multilateral framework: unilateral tariff reductions are no longer in Australia's best interests.

**Figure 1 Demand for imports**



**Publications:**

- Dixon, P.B. and M.T. Rimmer (2010), "Optimal tariffs: should Australia cut automotive tariffs unilaterally?", *Economic Record*, 86(273), June, pp. 143-161.
- Dixon, P.B. (2009). "Comments on the Productivity Commission's modelling of the economy-wide effects of future automotive assistance" *Economic Papers*", Vol. 28(1), March, pp. 11-18.
- Dixon, P.B. (2009) "Towards improving the conduct of policy modelling: a response to Gropp, Jomini and Salerian", *Economic Papers*", Vol. 28(1), March, pp. 25-26.

## 26. The H1N1 influenza epidemic

**Clients:** U.S. Department of Homeland Security via the CREATE Centre; Australia's National Health and Medical Research Council; and Risk Management Solutions

**Researchers:** Prof. Peter Dixon, Prof. Maureen Rimmer, Dr George Verikios & Dr James Giesecke,

**Summary & impact:** April 2009 saw the emergence of the H1N1 influenza virus in the U.S. By June 2009 it seemed likely that the U.S. would face an H1N1 epidemic in the winter of 2009-10, possibly as serious as those of 1957 and 1968 which killed 70,000 and 34,000 U.S. residents, or even as serious as the 1918 epidemic which killed 500,000 U.S. residents. Such epidemics are not only a medical crisis, but may have significant economic effects.

CoPS was commissioned by the U.S. Department of Homeland Security in June 2009 to quantify these economic effects. Drawing on work by from Johns Hopkins University, CoPS specified a hypothetical H1N1 epidemic in which 90 million people are infected in the first two quarters of 2010. Of these, 60 million show symptoms and about half this number seek medical attention, with 300,000 hospitalized and 16,000 deaths. CoPS calculated that over the 6 months of the epidemic, there would be: a 34% reduction in foreign visitors to the U.S.; a loss of 74 million work days associated with increased sick leave and absences from work by parents caring for sick children; a 2.4 per cent surge in demand for hospital and other medical services; and a 10 per cent cut in expenditures by households on leisure activities involving public gatherings. Using a quarterly version of USAGE (CoPS U.S. model), CoPS translated these shocks into effects on employment, GDP and other macro variables (Table 1).



**Table 1. Effects on the U.S. of an H1N1 epidemic that infects 90 million U.S. residents (%)**

Variable	Peak quarter	Epidemic year	Next year
Employment	-2.1	-1.3	0.3
GDP	-2.6	-1.6	0.2
Private consumption	-3.2	-2.1	-0.1
Investment	-4.3	-3.1	0.5
Exports	-4.7	-2.7	1.0
Imports	-5.7	-4.5	-0.3

Overall, the results for individual shocks indicate that the macroeconomic consequences of an epidemic are much more sensitive to demand-side effects such as reductions in international tourism and leisure activities than to supply-side effects such as reductions in labor input per employed worker. This suggests that demand stimulus policies might be an appropriate economic response to a serious epidemic.

Following our work on the U.S., CoPS was commissioned by the National Health and Medical Research Council to analysis the effects on the Australian economy of the actual H1N1 experience of 2009 and to contrast this with the effects of a more severe hypothetical epidemic. Then in 2010, we were commissioned by Risk Management Solutions to investigate the economic effects of a global pandemic. An interesting conclusion from this study is that global economic activity will be more strongly affected by a pandemic with high infection rates rather than high virulence rates.

### Publications:

Dixon, P.B., B. Lee, T. Muehlenbeck, M.T. Rimmer, A.Z. Rose and G. Verikios (2010), "Effects on the U.S. of an H1N1 epidemic: analysis with a quarterly CGE model" *Journal of Homeland Security and Emergency Management*: Vol. 7 : Iss. 1, Article 75.

Verikios, G., McCaw, J.M. McVernon, J. and Harris, A.H. (2011), 'H1N1 Influenza and the Australian Macroeconomy.' *Journal of the Asia Pacific Economy* (forthcoming).

Verikios, G., M. Sullivan, P. Stojanovski, J.Giesecke and G. Woo (2011)"The Global Economic Effects of Pandemic Influenza". 14th Annual Conference on Global Economic Analysis, Venice, June 16-18, 2011



## 27. Modelling capacity building for least developing countries: the case of Uganda

**Clients:** World Bank and the government of Uganda

**Researchers** Professor Philip Adams and Ms Louise Roos

**Summary & impact:** Poverty in the Least Developing Countries (LDCs) is pervasive: the number of people living in poverty has more than doubled over the past thirty years. This lack of progress towards poverty reduction is most noticeable in the African LDCs.

In developed and some developing countries, poverty reduction involves income transfers, social welfare systems and targeted job creation programs. But in situations of generalized poverty, where the available resources in the economy are barely sufficient to cater for the basic needs of the population, significant poverty reduction can be achieved only through economic growth.

Sustained economic growth requires a number of things, including good macroeconomic and microeconomic management. The Centre of Policy Studies (CoPS) has for many years been constructing economic models to aid economic management in Australia and other Developed countries such as the U.S. It has also exported its expertise to a number of developing countries, assisting in the building of economic models for Brazil, Vietnam, Indonesia, the Philippines, Egypt and Papua New Guinea.

Most recently, CoPS has been assisting in the building of modelling capacity in LDCs, notably Uganda, Ethiopia and Cambodia. Uganda has been a particular focus-of-effort. The Ugandan project, which is coordinated out of the UK by Oxford Policy Management, is funded by the Ugandan government using money provided, in part, by the World Bank. Its aim is twofold: to build a coordinated micro-macro modelling system with separate CGE, macro and income distribution components; and to train Ugandan government officials in the use and upkeep of the system. Up to now, policy making in Uganda has been almost totally *ad hoc*, with little statistical underpinning. CoPS' work is designed to make the process more structured and open to scrutiny. At the same time it is also encouraging increased effort by the Ugandan government to improve its statistical collection capability. By June 2012, CoPS will have run three training courses in the use of the new model. Each training course has been seven days in length and has been attended by around 25 government officials. The project has also led to the setting up of a modelling group within the Department of Finance, with a permanent staff of up to five officials. The intended purpose of the group is to provide core modelling support to a number of government departments and the Ugandan Central Bank.

The Ugandan project finishes at the end of 2012. The final component will be the delivery of a report examining the economic contribution of the country's newly discovered oil reserve. In value terms, relative to the size of the economy the reserve is huge. At its peak, oil is expected to contribute around 40 per cent to Uganda's annual GDP. Production is planned to begin in 2015 and to reach full capacity in 2020. The Ugandan government has already set up a Norwegian-style sovereign fund to manage the royalties and taxes flowing into government coffers from the oil project. These monies will be used, in part, to deal with the structural adjustments that the country will face as it moves from a base of subsistence-agriculture to one of export-mining. CoPS' modelling will be critical in quantifying the adjustment pressures in terms of regional and industrial allocation of resources, and in assessing the measures that the government might employ to mitigate these pressures..



**Publications:** None yet, project still in progress. A working paper has been produced:

Roos, L., P Adams and J. Van Heerden (2012) "Construction and updating of a Ugandan CGE database",

CoPS/IMPACT Working paper no. G-226 available at <http://www.monash.edu.au/policy/ftp/workpaper/g-226.pdf>.

## 28. The MyAGE Model of Malaysia

**Clients:** Malaysian Ministry of Finance

**Researcher:** Professor John Madden, Dr Nhi Tran, Dr James Giesecke, Dr Yinhua Mai and Dr George Verikios

**Summary & impact:** In 2009 the Malaysian Ministry of Finance (MoF) commissioned CoPS to construct MyAGE, a dynamic fiscal computable general equilibrium model of the Malaysian economy. Key concerns of MoF were: to obtain a state-of-the-art CGE model which contained all the features they required for their forecasting and policy analysis; to have the model fully documented; to receive sufficient training so that MoF staff could make full use of the model; and to have access to continued post-model-delivery support.

CoPS constructed both annual and quarterly versions of MyAGE containing a range of features designed to capture key characteristics of the Malaysian economy. The initial simulation updated the model's 121 industry database from 2005, the year of Malaysia's latest inter-industry data, to 2008. Forecasts were then undertaken for the years 2009 to 2011 as input to the 2009-10 Malaysian budget process. A feature of these forecasts was CoPS' modelling of the effects on Malaysia of the global financial crisis. The simulations accounted for substantial excess capacity and labour hoarding in Malaysian industry during 2009. These factors were gradually unwound in the forecasts for the following years and the model projected a V-shaped recovery.



A key component of the project was the successful transfer of the new modelling capacity to MoF. During the course of the project, CoPS collaborated closely with MoF to establish the economic questions that they wished to examine. CoPS gave five presentations to members of the Economic and International Division of the Ministry over the course of the project on the model's capabilities, the results of MyAGE forecasts and policy applications. Two one-week training courses were delivered at the Ministry's offices in Putra Jaya (pictured above) to 30 MoF staff. As part of the hand-over package in late 2010, MoF was provided with manuals explaining MyAGE's theory and database, how to conduct simulations for a range of applications and how to update the model's database.



The CoPS study team included two staff from the Econometric and Business Statistics Department at Monash Sunway (picture at left). The EBS staff added two ingredients to the project. First, they undertook estimates for some key Malaysian parameters. Second, having attended several CoPS courses in Malaysia and other countries, they were able to provide MoF with an on-the-ground first point of post-project support.

MoF were keenly aware that past model development projects by foreign providers had led to the new modelling capacity having only a short life due to lack of local expertise. There was a determination from both MoF and CoPS that the MyAGE project would leave a long-lasting economic-analytical capacity in Malaysia. There is good evidence that this will be the case. A member of MoF's staff commenced her PhD studies at CoPS in 2011. There was also a follow-up project in 2011 consisting of a further training course in Malaysia and analyses of several economic issues facing Malaysia, particularly the vexed matter of the country's extensive fuel subsidies. A further project for 2012 is currently under negotiation. Part of this proposed study is an analysis of sources of Malaysian economic growth, using the advanced historical modelling features of MyAGE.

**Related Report:** N. Tran, J. Madden, G. Verikios & J. Giesecke, "MyAGE: A Dynamic Computable General Equilibrium Model of the Malaysian Economy", Final Report for Ministry of Finance Malaysia, October, 2010.

## 29. Modelling economic change in Brazil

**Clients:** Inter-American Development Bank (IADB); São Paulo Research Foundation (FAPESP); University of São Paulo Research (Nereus - FEA - USP)

**Researchers:** Professor Mark Horridge and Dr James Giesecke

### **Summary & impact:**

The last 10 years has seen the birth of Brazil as a world power, in both economic and diplomatic terms. For the last 20 years the CoPS style of economic modelling has steadily gained traction in Brazil. Hence the CoPS approach is now widely known and appreciated in this important emerging country.



The CoPS-Brazil links began in 1995 with an approach by Professor Eduardo Haddad of Brazil's leading economics faculty at the University of São Paulo. Aided by CoPS researcher Dr Matthew Peter, Haddad and his team constructed BMARIA, a multiregional CGE model closely based on the Australian MMRF model. Over the years BMARIA variants have been used to analyse a variety of issues.

Links were strengthened by a 2002 one-year sabbatical stay at CoPS by Professor Joaquim Ferreira-Filho of ESALQ (Brazil's leading agricultural university). Since then Professor Ferreira has worked closely with Mark Horridge of CoPS to develop a sequence of models with far greater regional, sectoral and distributional detail than BMARIA. These models have been used to address several questions of world interest:

- Can Brazil supply increasing world demands for food and bio-fuel? Do these two demands compete?
- Brazilian income distribution has been most unequal, both within and between regions. Are such inequities reduced or exacerbated by freer trade and Brazil's recent export orientation? Will higher food prices outweigh the benefits of more farm employment ?
- Can Brazilian agriculture expand without chopping down the Amazon rainforest?

Model scenarios have featured in numerous conference presentations, and several journal publications. Academic exchange has continued, with 3 CoPS staff visiting Brazil, and several Brazilians visiting CoPS. Recent visitors have included 2 post-docs from CEDEPLAR, Brazil's center of regional economics, at the Federal University of Minas Gerais, where yet another Brazilian CGE model has been developed (again closely based on CoPS' TERM model of Australia).

### **Publications**

Horridge, J.M. and J.B. de Souza Ferreira Filho (2006), "Economic Integration, Poverty and Regional Inequality in Brazil", *Revista Brasileira de Economia* (Brazilian Economic Review), Vol. 60 (4).

Horridge, J.M. and J.B. de Souza Ferreira Filho (2005), "The Doha Round, Poverty and Regional Inequality in Brazil", chapter in T.W. Hertel and L.A. Winter (eds.) *Poverty and the WTO: Impacts of the Doha Development Agenda*, Palgrave Macmillan, pp. 183-217.

Horridge, J.M. and J.B. de Souza Ferreira Filho (2006), "The Doha Development Agenda: Distributional Impacts", *Review of Agricultural Economics*, Vol. 28(3), pp. 362-369.

Giesecke, J.A., J.M. Horridge and J.A. Scaramucci (2009), "Brazilian Regional Structural Adjustment to Rapid Growth in Global Ethanol Demand", *Studies in Regional Science*, 39(1), 189-207.

Horridge, J.M. and J.B. de Souza Ferreira Filho (2010), Chapter 13 (Brazil) in K. Anderson, J. Cockburn, and W. Martin (eds), *Agricultural Price Distortions, Inequality, and Poverty*, World Bank Publications, ISBN: 978-0-8213-8184-7, 528 pp., March 2010.



### 30. Building capacity for economic policy analysis in transition economies: Vietnam

**Clients:** United Nations Development Programme (UNDP); The World Bank  
Australian Agency for International Development (AusAID)

**Researchers:** Dr J. Giesecke, Dr N. Tran, Mr E. Corong, Dr G.A. Meagher & Ms F. Pang

**Summary & impact:** In 2008 CoPS developed a fiscal CGE model for Vietnam's Ministry of Finance, under a UNDP project aimed at developing public sector capacity for policy analysis. Early model applications focussed on the impact of Vietnam's 2009 fiscal stimulus package and reform of the value added tax (VAT).

The VAT work generated two papers outlining one of the most detailed models of indirect tax policy ever undertaken, a model that expresses the real world details of the VAT as legislated, not merely as it might be conceived in a textbook.

We show how Vietnam's VAT can be streamlined. Replacement of the present system by a single budget-neutral VAT rate for all commodities except rice (a staple for low-income households) with no discretionary exemptions, would increase household consumption in Vietnam by 0.2%, with little impact on welfare distribution. We also develop a new index of VAT compliance, one that is more comprehensive than the commonly used compliance measures in the pre-existing VAT literature. Applying the new measure to Vietnam, we demonstrate how the country's apparently low compliance rate can be traced to legislated features of the VAT regime, not low compliance as commonly understood. For tax authorities, who must efficiently allocate scarce VAT enforcement resources, this is an important finding.

Over 2009/10 we conducted two studies



for the World Bank. The first examined the consequences for Vietnam of climate

change and associated adaptation measures to 2050. The second examined Vietnam's policy interventions in its market for rice, the country's most important agricultural product. We showed that the removal of these policies would improve the country's welfare while maintaining a high level of food security.

Under a recent AusAID project, for Vietnam's Ministry of Labour (MOL), we extended the model's labour market and income distributional detail, and developed a linked micro-simulation model. We generated forecasts of employment by occupation and qualification, and outcomes for poverty and inequality. The project was concluded in Hanoi, with presentations at MOL attended by Australia's Ambassador to Vietnam.

Capacity building has been a major part of our Vietnamese work. Since 2008, we have presented six CGE training courses in Vietnam, each attended by approximately 20 researchers from both government and university sectors.

**Publications:** Giesecke, J. & N. Tran.

(2012), "A general framework for measuring VAT compliance rates". *Applied Economics*. 44 (15), May 2012, 1867-1889.

Giesecke, J. & N. Tran. (2010), "Modelling value-added tax in the presence of multi-production and differentiated exemptions" *Journal of Asian Economics*, 21 (2), 156-173.

Giesecke, J. & N. Tran. (2009), "Sources of growth and structural change in the Vietnamese economy, 1996-2003: A CGE analysis", *Asian Economic Journal*, June 2009, 23(2), 195- 224.

Giesecke, J. & N. Tran. (2009), "An economic analysis of Vietnam's fiscal stimulus package", *Vietnam's Socio-economic Development Review*. No. 58, June, 35-51.

Giesecke, J.A. & N.H. Tran. (2008), "Just how quickly has the Vietnamese capital stock grown over the past decade?", *Vietnam Economic Management Review*, 2(2), 31-44.