

# Impact Project

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Address to the Royal Society of Victoria on the Occasion  
of the Award of the Society's Medal for Scientific Research to  
Alan A. Powell and Peter B. Dixon for their contribution to the  
development of the IMPACT Project

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RESEARCHING A NON-EXPERIMENTAL SYSTEM: THE IMPACT  
MODELS OF THE AUSTRALIAN ECONOMY

by

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CONTENTS

7.	The following material closely follows the English version of Peter B. Dixon, "Alternativa ansatser i makroekonomisk politik: fallet Australien" ("Alternative Approaches to Macroeconomic Policy: The Australian Case"), <u>Ekonomisk debatt</u> , Vol.6 (1982), pp.397-401.	3
8.	Throughout all our calculations, we hold real government absorption constant.	4
9.	See W.M. Corden and P.B. Dixon, "A Tax-Wage Bargain in Australia: Is a Free-Lunch Possible?", <u>Economic Record</u> , Vol.56, No.154 (September 1980), pp.209-221.	6
1.	Abstract	3
2.	Preamble	4
3.	The Scope of Empirical Methods in Economics	5
4.	The Reasons for Using Formal Models	8
5.	Economic Models and Black Boxes	9
6.	Discriminating between Models	9
7.	An Example of Some Policy Results from the ORANI Model	11
8.	5.1 Analysis of alternative macro strategies by use of the ORANI model	13
9.	5.2 Summary	17
10.	Concluding Remarks	18
11.	Footnotes	19
12.	Figure	6
13.	Table 1	14

FOOTNOTES

1. In this section we borrow extensively from A.A. Powell, "The Major Streams of Economy-Wide Modelling", in J. Kmenta and J.B. Ramsey (eds), Large-Scale Macro-Econometric Models (Amsterdam: North-Holland, 1981), pp.219-264.
2. For a further discussion see Peter B. Dixon, "Economic Modelling, Ideology, Politics and Social Research", Australian Economic Review, (1) 1984, pp.3-4.
3. For further detail on the institutional history of the Project, see (i) G.A. Rattigan, The Impact Project (Canberra: Industries Assistance Commission, 1976); (ii) Alan A. Powell, The IMPACT Project: An Overview, March 1977, First Progress Report of the IMPACT Project, Volume 1 (Canberra: Australian Government Publishing Service, 1977), pp.1-55; (iii) Alan A. Powell and Brian R. Parmenter, "The IMPACT Project as a Tool for Policy Analysis: Brief Overview", Australian Quarterly, Vol.51, No.1 (March 1979), pp.62-74; (iv) Peter B. Dixon, Alan A. Powell and Brian R. Parmenter, Structural Adaptation in an Ailing Macroeconomy (Melbourne: Melbourne University Press, 1979), pp. ix-xi; (v) Alan A. Powell, "The Role of Labor Statistics in the Models of the IMPACT Research Project", Ch.7 in Dennis Trewin (ed.), Statistics in the Labor Market (New York: Marcel Dekker, 1983), pp. 129-132.
4. Peter B. Dixon, B.R. Parmenter, John Sutton and D.P. Vincent, ORANI: A Multisectoral Model of the Australian Economy (Amsterdam: North-Holland, 1982), pp.xvii + 372.
5. For a catalogue, write to : Mr M. Kenderes, IMPACT Project Information Officer, Industries Assistance Commission, P.O. Box 80, BELCONNEN, A.C.T. 2616, Australia.
6. B.R. Parmenter and G.A. Meagher, "Policy Analysis Using a Computable General Equilibrium Model : A Review of Experience at the IMPACT Project", paper presented to the International Institute of Forecasters, Fourth International Symposium of Forecasting, London, July 1984.

## 6. Concluding Remarks

Researching a non-experimental system requires rather large inputs of theory which must be kept as explicit as possible. This explicitness is needed because, relative to the experimental sciences, theory plays a rather larger proportionate role (vis à vis data) in the generation of results. Since the available factual evidence is scarce and is usually capable of being rationalized in several ways, it is only rarely possible to eliminate ambiguities. Clients of economic research, therefore, are required to make more substantial judgemental inputs than users of the outputs of most experimental sciences. Some clients of economic research naively suppose that the state of the art allows them to use economic models in the manner of black boxes; this approach is not justified by the state of development of the discipline, and is downright dangerous. The extent of unresolved theoretical differences between different applied economists in some cases is large; the reasons for the differences will never become apparent unless model builders routinely document their work in an exhaustive and open fashion. Regrettably, this has not always been the case in Australia.

It does seem possible to explain simply the results produced by nominally large and complicated models. ORANI is a non-linear model whose nominal equation count is numbered in millions; nevertheless, the principal mechanisms producing major policy insights can be explained in a straightforward way to a non-technical audience. We have demonstrated this for the analysis of different approaches proposed for the alleviation of unacceptably high levels of unemployment.

## RESEARCHING A NON-EXPERIMENTAL SYSTEM: THE IMPACT MODELS OF THE AUSTRALIAN ECONOMY

by

Peter B. Dixon and Alan A. Powell

### Abstract

In non-experimental sciences such as astronomy and economics, causal chains cannot be identified uniquely from finite amounts of data. At any moment of history there will be a number of competing hypotheses, any one of which might well have explained all of the observed facts. In choosing between the different rationalizations of the world offered by different economists, a client must necessarily base his judgement on the plausibility and internal consistency of the stories they tell. This is possible only if the economists' research is meticulously documented and if sufficient effort is made by them to ensure that all of the principal mechanisms generating any set of results are transparent. These requirements have been taken very seriously throughout the life of IMPACT, a project now almost a decade old, which has researched the structure of the Australian economy in some depth under the sponsorship of six Federal Government agencies and three universities. The success of the Project can be ascribed largely to the completeness and openness of its documentation. Examples of policy results obtained from ORANI (a model developed at IMPACT) are discussed. These relate to the potential effectiveness of aggregate demand stimulation, containment of real wage costs, and provision of additional industry protection, as means of alleviating an unacceptably high level of aggregate unemployment.

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Preamble

In this address we attempt an exposition of some of the fundamental strategic issues facing a scientist in a non-experimental social science. These issues are not well understood by the community nor are best practice procedures for dealing with them uniformly followed by economists. An inescapable fact of life in non-experimental sciences is the existence of a multiplicity of internally consistent, but different, rationalizations of any given body of factual evidence. Occam's razor is not usually sufficient to reduce the set of such rationalizations to a solitary element. Coexistence among those holding competitive theories is thus both inevitable and desirable. It is, however, confusing to clients.

In Sections 1,2 and 3 below we consider this problem in more detail. Given the state of the art and the costliness and/or impossibility of obtaining additional data which might discriminate between competing theories, users of research have no option but to take responsibility themselves for the selection of axiom sets. In Section 4 it is shown that a client of economic research has to be prepared to look inside the black box. It is what he finds there that will determine his choice among models. In non-experimental sciences the irreducible subjective element is therefore larger than in experimental sciences.

Entering a black box is unpleasant. No maintenance engineer would willingly attempt to do so without a manual written by the designer. Comprehension of the contents of the box depends on the quality and comprehensiveness of this documentation. Given that complete and accurate documentation is a precondition to their intelligent use, it is disappointing that many economic models are poorly documented. The success of the IHFACT Project, we believe, is in no small measure due to the relatively satisfactory state of the documentation of its models. In Section 5 we comment on the documentation of the ORANI model, prior to giving an example of its use to analyse a currently pressing policy concern; namely, the alleviation of high rates of unemployment. This discussion in Section 5 is largely self-contained. In Section 6 we offer concluding remarks.

stimulation in activity increase the tax base sufficiently to compensate the government for the reduction in the tax rate? This question is analysed in a paper that one of us (Dixon) wrote with Professor Corden. The conclusion was that a successful wage-tax bargain would increase the government's budget deficit. The increase would not, however, be disastrous and might be handled in a variety of ways; e.g., foreign borrowing and reductions in government spending. In round figures, we concluded that if take home pay per unit of labour could be fixed in real terms, then the government could cut taxes sufficiently to increase the demand for labour by 5 per cent at the expense of a two to four billion dollar increase in its annual deficit. This is not an overwhelming figure in relation to the Australian GDP of about \$200 billion.

5.2 Summary

The main points of the policy simulations that we have presented this evening are:

- (a) In Australia, it is highly doubtful if protectionism plays any useful role in macroeconomic policy. More likely, it merely shifts jobs from the efficient exporting sector to the inefficient import competing sector and at the same time adds to inflationary pressures.
- (b) Demand stimulation can create jobs, especially in the non-trading sectors. However, it adds to inflation and hurts the balance of trade.
- (c) Reductions in the cost of employing labour stimulate all parts of the economy, especially industries closely connected with international trade. However, reductions in the costs of employing labour are politically difficult to implement.
- (d) The required reductions in the costs of employing labour can be minimized by pursuing a combined Keynesian/neoclassical approach. This approach also has the advantage of providing the economy with a balanced stimulation.
- (e) The wage-tax bargain offers an approach to both reducing the costs of employing labour and to expanding aggregate demand. In obtaining trade union acceptance of the bargain, it would be necessary to emphasize that no employed worker would suffer a reduction in his take-home pay while job opportunities would be created for many unemployed workers.

It is doubtful whether we have any policy instruments that could be used to introduce wage reductions of this size.

One approach to minimizing the size of the required wage reductions is to combine Keynesian and neoclassical policy. For example, if we could increase real private absorption by 3.8 per cent and reduce real unit wage costs by 6.6 per cent, then according to column (4) of Table I we could achieve a 5 per cent increase in the demand for labour with no deterioration in the balance of trade and a significant reduction in inflationary pressure. (To obtain column (4), multiply column (2) by 3.8, multiply column (3) by 6.6, and add). Not only would the combined Keynesian/neoclassical policy minimize the required wage reduction, but it would also have balanced structural effects. Industries producing non-internationally tradeable goods would benefit from the Keynesian part of the package while the remaining industries would benefit from the neoclassical part. Detailed ORANI projections for the combined policy show an almost uniform stimulation of the entire economy.

How can we combine demand stimulation with reductions in the costs of employing labour? The trade union movement in Australia is inclined to argue that reductions in wages would reduce aggregate demand. This argument forgets that wage earners are not the only people who spend money. Reductions in wages could be expected to stimulate investment and consumption by capitalists. More importantly, the argument forgets that governments have available monetary and fiscal instruments which allow them to manipulate aggregate demand independently of movements in wages. Nevertheless, trade union opposition to wage reductions is a reality which must be taken seriously.

Perhaps the best hope for reducing the real costs of employing labour is via a wage-tax bargain. We start by recognizing that the cost of employing labour consists of two parts: what the worker takes home and various types of taxes (payroll tax and income tax). That is:

$$\begin{bmatrix} \text{Cost of employing} \\ \text{a unit of labour} \end{bmatrix} = \begin{bmatrix} \text{Take home} \\ \text{pay} \end{bmatrix} + \begin{bmatrix} \text{Tax} \end{bmatrix}$$

The hope is to convince the trade union movement to accept a pause in the rate of growth of take home pay. Rather than indexing pre-tax wages to the CPI which is the current custom in Australia, we would instead index take home pay. This would leave us free to reduce the real costs of employing labour by reducing taxes. The reduction in taxes would also contribute to the other half of the Keynesian/neoclassical package. It would put more money in the hands of employers, thereby stimulating investment and consumption out of profits. Of course, there is the inevitable question about what would happen to the government's budget deficit. Would the

## 1. The Scope of Empirical Methods in Economics

A former colleague at Konash (Brian Brogan) used to tell the following story, which one of us (Powell) found helpful in explaining to students the fundamental inferential continuum in a non-experimental science:

One Saturday evening around 10 p.m. a spaceship landed on the campus. Its extra-terrestrial crew were supplied with a life-support system which would give them 40 earth minutes outside their craft. They were to use their precious time to gather data on earth creatures for a report to their planet's Academy of Sciences. On the entire campus that evening, the only activity seemed to be in the experimental psychology laboratory.

A Master's student (with an overdue thesis) was measuring rodent capacity to adjust to different incentive systems. The extra-terrestrial visitors observed several rats, on several occasions, push a lever which activated a buzzer. Each time a rat did so, it would be fed a piece of banana by the graduate student. The visitors made notes and had returned to their spacecraft about the time the student had moved on to the phase of his experiment requiring the administration of electric shocks to slow learners. The visitors entered in their log: 'The planet Earth seems to be ruled by small, four-legged furry creatures. Much larger two-legged creatures serve them by dispensing food on demand'.

On the basis of limited observational evidence, of course, this conclusion was not silly. To have been able to rule it out definitively, a much longer observation span would have been needed.

The fundamental equation of research can be written:

$$\text{Theory} + \text{Data} \Rightarrow \text{Results}$$

Any given body of data (or facts), as we have seen, is capable of more than one rationalization. That is, we have:

$$\text{Theory A} + \text{Data} \Rightarrow \text{Results}$$

$$\text{Theory B} + (\text{Same}) \text{ Data} \Rightarrow (\text{Different}) \text{ Results}$$

would have been, the balance of trade is projected to have moved towards deficit and inflationary pressures are projected to have been intensified. A more detailed consideration of the ORANI results than is possible here reveals that protection hurts exporting activities. In Australia, these activities are mainly in the agricultural and mining sectors. An increase in tariffs on footwear, textiles, automobiles, etc., increases the consumer price index. This increases money wages (we have fixed real wages in terms of the CPI). Increases in money wages lead to further increases in the CPI and to further increases in wages. With a general rise in costs, export industries are particularly adversely affected because they are constrained by international competition from raising their selling price. Thus, they are caught in a cost-price squeeze. According to ORANI, this causes a contraction in employment in exporting activities sufficient to outweigh the employment gains occurring in the import competing industries. With regard to the balance of trade, the contraction in exports is sufficient to outweigh the contraction of imports.

The second policy approach, demand expansion, has, according to ORANI, a useful stimulatory effect on employment. However, it also has two adverse side effects. First, it intensifies inflation and second it leads to a deterioration on the balance of trade. Detailed ORANI projections show that demand stimulation increases imports and reduces exports. Not only are potential exports diverted to satisfying domestic demands but the cost increases associated with demand stimulation reduce output and employment in the export-oriented activities. Thus, demand stimulation has uneven structural effects. It favours industries producing non-internationally tradeable goods. It provides only minor encouragement to the import-competing sector and harms the export-oriented industries. It is clear that macroeconomic recovery cannot be based on Keynesian demand stimulation alone.

The final approach, wage-cost reduction, scores high marks with respect to all three major macroeconomic variables. It increases the demand for labour, it moves the balance of trade towards surplus and it reduces the consumer price index. There are, however, two problems. First, wage-cost reduction introduces structural biases. It has very favourable effects on the internationally tradeable goods sectors, especially exporters. Export prices tend to be determined in world markets independently of local costs. Thus, for exporters, cost reductions show up in increased profit and employment rather than in reduced prices. On the other hand, general cost reductions are not particularly stimulatory to industries producing goods which are not internationally tradeable. The second and more important difficulty with wage-cost reductions is how to introduce them. If we wanted to achieve a 5 per cent increase in the demand for labour by reductions in real wages alone, then according to Table 1, we would require a reduction of 9.7 per cent (5/514 equals 9.7).

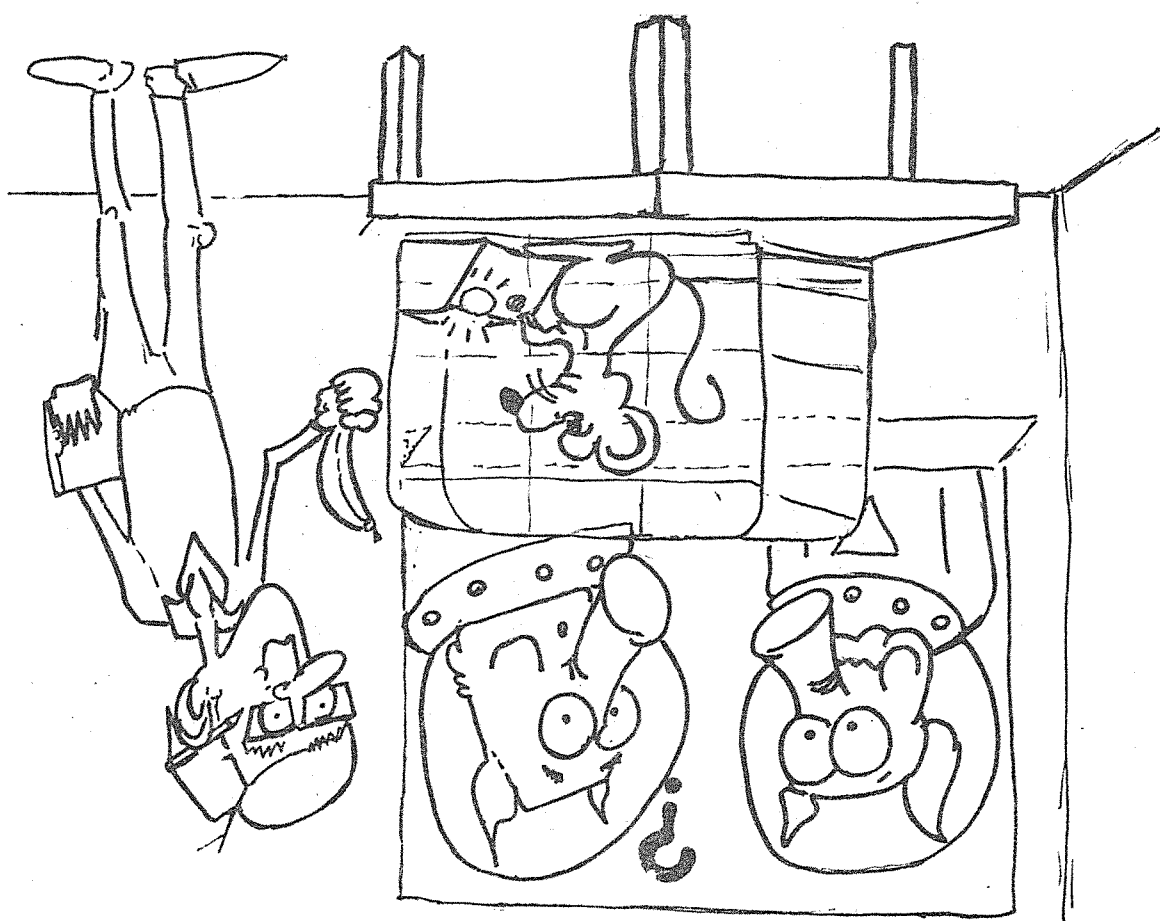


Figure 1 Extra-terrestrial visitors observing rat being waited upon by graduate student



Table 1 : Approaches to Macroeconomic Recovery : ORANI Projections<sup>(a)</sup>

Effect on	(1) a 25% increase in all rates of protection	(2) a 1% increase in real private absorption (Keynes)	(3) a 1% reduction in the real cost of a unit of labour (neoclassical)	(4) a 3.8% increase in real private absorption plus a 6.6% cut in the real cost of a unit of labour
demand for labour in hours	-0.001%	0.419%	0.514%	5.0
the balance of trade (100 ΔBT/GDP) <sup>(b)</sup>	-0.04 %	-0.53 %	0.30 %	0.0
the consumer price index	1.64	1.40	-1.28	-3.1

(a) These numbers were derived from Table 3.1 in P.B. Dixon, A.A. Powell and B.R. Parmenter, Structural Adaptation in an Ailing Macroeconomy, M.U.P. 1979. The effects of a 1% increase in private absorption were derived by subtracting the effects of a 1% increase in government absorption from the effects of a 1% increase in all absorption.

(b) The change in the balance of trade is expressed as a percentage of GDP.

Here, by 'results', we mean conclusions about the state of the world plus any decisions or actions taken as a consequence of the research investigation. In our example, the results might have included the conclusion that the appropriate earth power with whom to negotiate a treaty for landing rights for spaceships was the small four-legged creatures.

When two or more theories are consistent with a given set of facts we say that these theories are 'observationally equivalent'. The classic method of discriminating between such theories in the physical and biological sciences is to devise an experiment capable of generating new data which might be expected to falsify (i.e., to knock out of consideration) some or all of the competing hypotheses. In non-experimental disciplines, such as astronomy, economics and most of clinical medicine, this option is almost never open to us.

At any moment of history there will thus be a number of competing hypotheses, any one of which might well have explained all of the observed facts. In choosing between the different rationalizations of the world offered by different economists, therefore, a client must necessarily base his judgement on the plausibility and internal consistency of the stories they tell. This is possible only if the economists' research is meticulously documented and if sufficient effort is made by them to ensure that all of the principal mechanisms generating any set of results are transparent. These requirements have been taken seriously throughout the life of IMPACT, a modelling project now almost a decade old, which has researched the structure of the Australian economy in some depth under the sponsorship of some six Federal Government agencies and three Universities.

The models developed at IMPACT are documented in sufficient detail to allow independent hands-on use by policy analysts and scholars having no close links with the model builders. IMPACT models have been used by many Federal and state Government agencies and by academic economists in ten Australian Universities. This has been possible because these users were able to understand both the basic assumptions underlying the models and the principal mechanisms generating results obtained from simulations made with them. Of course, there have been those who found one or more of the axioms, mechanisms, or parameter values implausible: this has led to rigorous debate. To the extent that this focused research on substantive issues, it has been a healthy development and quite amicable to scientific progress.

return to full employment would require an extended pause in the growth of real wages.

Apart from the Keynesian and neoclassical philosophies on macroeconomic policy, there is the protectionist view. Not many economists are found in the protectionist camp. However, at a political level, protectionists in Australia argue that to save jobs, we must restrict imports by using tariffs and quotas. Otherwise the Australian footwear, textile, clothing and automobile industries (among others) will no longer be able to cope with competition from cheap foreign imports. According to the protectionists, vigilance in controlling imports is especially important in times of job scarcity.

How can we try to reach conclusions on these different approaches to employment creation? That is, how can we decide whether the appropriate policy in the present situation should be Keynesian (demand expanding), neoclassical (wage reducing) or protectionist (import restricting)? One method is by the use of economic models.

### 5.1 Analysis of alternative macro strategies by use of the ORANI model

The ORANI results shown in Table 1 are for two year response period. For example, in column (1) we see that a 25 per cent increase in protection is projected to increase the consumer price index by 1.64 per cent; that is, after about two years we would expect the consumer price index to be 1.64 per cent higher with the increase in protection than without it. In looking at Table 1, it is also important to keep in mind the ceteris paribus assumptions, that is, what is being held constant. In column (1) we are looking at the effects of increasing protection holding constant the real level of aggregate demand (or absorption) and the real cost of a unit (man-hour, say) of labour. In column (2) we are looking at the effects of increasing the level of real private demand holding constant the level of protection and the real cost of a unit of labour. In column (3) we are looking at the effects of reducing the real cost of a unit of labour holding constant the level of protection and the level of real aggregate demand. Thus, in column (1) we are concerned with the effects of protectionism alone as a macroeconomic policy. In column (2) we are concerned with the effects of Keynesian demand expansions alone and in column (3) we are concerned with neoclassical wage reduction alone.

The first implication from the results is that protectionism is not a useful approach to macroeconomic policy. Two years after the increase in tariffs, employment is projected to be slightly lower than it otherwise

## 2. The Reasons for Using Formal Models<sup>1</sup>

A model first and foremost is a device for organizing one's thinking. Complex entities, such as a communications network, a human body, or an economy, are not really amenable to detailed analysis except in a systems framework. A model of such a system provides a taxonomy to organize our knowledge about it. Without such a taxonomic device the accretion of knowledge is haphazard, and the inter-relationships between different parts of the system are likely to remain obscure.

In evaluating models we should keep in mind that 'there are horses for courses': the value of a model can only be assessed relative to the purpose for which it was constructed. A 'good' model is one which achieves the purposes for which it was designed. A tailor's dummy is a good model of the human body with which to display a suit; one would not use it to teach anatomy to medical students. Economic models are built for a wide variety of purposes. These include forecasting, policy analysis, and teaching.

Given a well-defined use for a prospective economic model, there exist the following general arguments in support of actually proceeding with its construction:

- (1) A formal model forces its builder to identify in a systematic, precise and explicit way the range of concepts necessary to address the issue in question.
- (2) Equally important, a formal model identifies the factual evidence (i.e., data base) needed to support analysis, and often leads to recognition of important gaps and inconsistencies in the available information.
- (3) Models improve communication. Although some effort is usually required to understand the language in which any particular model is constructed, of necessity any adequately documented model gives a clear statement of every assumption.
- (4) Models form the basis for formally articulated (as distinct from intuitive) knowledge, which can be taught and learnt.
- (5) Models provide a framework for learning from experience.

policies, the replacement of some direct taxation with indirect taxation, and the use of domestic procurement schemes in government purchasing.<sup>6</sup>

We have seen above that a policy maker cannot make intelligent use of an economic model unless he understands at least the crucial assumptions and principal mechanisms responsible for the results generated by it. If the assumptions and mechanisms were so complex that they could not be explained to a clientele having little or no technical expertise in economics, then the model would have little practical value as a tool for policy analysis. Fortunately we have found that in the case of ORANI, the principal mechanisms responsible for particular policy recommendations can be explained simply. We now submit this claim to empirical test.<sup>7</sup>

The main economic problem facing Australia and most other Western countries is unemployment. Recorded rates of unemployment in Australia have been above 5 per cent since 1974. Recently they have reached 10 per cent. When hidden unemployment is considered, then the under-use of the work force might be close to 15 per cent.

One surprising aspect of this problem, at least to us, is that our Government seems incapable of fixing it. When we first learnt economics, Keynes was king. Australia and many other countries had had continuous full-employment (say less than 2 per cent unemployment) since World War II. This performance was a spectacular improvement on the 1930's performance when unemployment in Australia averaged well over 10 per cent. The reason for this spectacular improvement, we were taught, was that Governments (following the prescriptions of Lord Keynes) had learnt how to prevent unemployment by careful manipulations of aggregate demand via monetary and fiscal policy.

It now seems doubtful that simple Keynesian policies were the key ingredient in the macroeconomic successes of the fifties and sixties. Our guess is that this success had much more to do with favourable wage movements. The fifties and sixties were a period in which wage increases in real terms tended to lag slightly behind the productivity increases associated with technical progress. In other words, employers were not required to increase the pay of workers at a faster rate than the workers were able to increase their output of goods and services. During the seventies and early eighties, especially in the periods 1973-5 and 1980-2, the rate of wage increase easily outstripped productivity increases. Many employers found that expansions in the size of their labour forces were no longer profitable.

Economists who emphasize the role of wages in the determination of employment are often labelled neoclassical. What they believe is that a

(6) Many issues of interest are not amenable to analysis in terms of a small number of relationships. Formal modelling may be the only practical way of handling the information load.

(7) Finally, the enormous intellectual effort which has gone into the theory of measurement over the last three decades would be largely lost outside the framework of formal models.

### 3. Economic Models and Black Boxes

Some experimentally based sciences have led to technologies which allow persons with little or no expertise in the relevant discipline to use models as black boxes. An example is the use of flight simulators to train airline pilots. The trainee need not understand the assumptions underlying the simulator's responses. This is because there exists wide agreement among aeronautical engineers as to the appropriate theory and modelling framework to use in designing the simulator's software. This consensus in turn reflects exhaustive experimental validation, via wind tunnel experiments and test flights, of the mechanisms incorporated in the software.

Economics is not remotely near the state of development which would justify computer models being used in this way. Indeed, as we have seen above, there is likely always to remain some ambiguity about the actual mechanisms operating in the economy: a policy maker who 'flies' the actual economy by using a model as if it were a flight simulator may find that he takes decisions which lead the actual economy to 'crash', even though the simulated economy (according to the model) is doing very well.

### 4. Discriminating between Models

We have seen from our fundamental research equation that the objective part of the evidence brought to bear on a problem (the data) is capable of many competing interpretations, and that the choice among observationally equivalent theories necessarily involves judgement and is,

therefore, subjective. How should such a judgement be made?

Any theory consists of a set of basic maintained assumptions (or axioms) and a set of derived propositions (or theorems). If there are no logical lapses, the theorems follow inexorably from the axioms. This does not establish their relevance to the real world. To do this, the observable consequences of the theorems have to be confronted with factual evidence. Let's consider two theories A and B, both of which have survived this confrontation with the available real world data. The only grounds for choosing between them is the plausibility of the assumptions and derived propositions. It goes without saying, therefore, that both of the latter (as well as evidence of their successful confrontation with the available data) must be properly documented if the client is to make a rational choice.

The need for complete technical documentation is recognized by most of the major model building groups in Australia, including the Reserve Bank, the Treasury/ABS and the IMPACT Project. Unfortunately, this need for complete technical documentation is not understood by some economic commentators and businessmen. Whereas sections of the media concentrated on alleged political and ideological explanations of the recent controversy surrounding the appointment of one of us (Dixon) to the Directorship of the Institute of Applied Economic and Social Research, we believe that the real issue was, in fact, the lack of adequate public documentation of IMP, an economic model developed over the last decade at the Institute with strong support from the Australian business community. Many commentators have remarked on the dramatic differences between policy prescriptions based on IMP and on IMPACT's ORANI model and understandably have been mystified about how to resolve these differences.

Consonant with our arguments above, a necessary first step in understanding the different policy results produced by the two models was to close the documentation gap which had plagued IMP since its inception. The programme initiated by the Institute's management in March 1984 for expeditious remedial work in the area of IMP's documentation founded when the builders of IMP chose instead to leave the Institute.<sup>3</sup> Without the necessary documentation, choice between IMP and other models will not be possible either objectively (on the basis of comparative performance of the models in their confrontation with the data) or subjectively (on the basis of the plausibility of explicitly stated axioms and propositions). Nevertheless, many clients (perhaps for commercial or political reasons) continue to opt for IMP. One fears that at least in some cases, the client has no interest whatsoever in the left hand side of our basic research equation. To put it bluntly, if you were to ask such a client which model he prefers, and if he were to answer candidly, he would reply "whichever model gives me the results favoured by my boss", be it a chairman of the

board or a Minister of the Crown.

A selective filtering by clients of economic evidence along the above lines is reminiscent of the practices routinely followed by lawyers on behalf of litigants. There is nothing immoral about this but it cannot be expected to lead to scientific progress. Whilst it is true that there may remain substantial subjective elements in the way that different economists perceive the world, the particular set of maintained hypotheses embraced by any economist aspiring to the status of a social scientist should not be generated by his predilections for particular policy results.

#### 5. An Example of Some Policy Results from the ORANI Model

The IMPACT Project was set up by Federal Government agencies in 1975 under the sponsorship of the Chairman of the Industries Assistance Commission. The aim of the Project was to improve the policy information system available to various government agencies whose domains of action overlapped in the following sense: the prosecution of a policy action taken in one of their respective areas (say manpower) could be expected to have consequences for the development of appropriate policy elsewhere (say tariffs). Once the official policy advisers had begun to perceive that the economy is a system, it became clear that nothing less than a comprehensive suite of models, structurally detailed and spanning the economy, would suffice.<sup>3</sup> The largest and best known of the subsequently developed IMPACT models is ORANI, a model of industry structure, international trade, and labour demand.<sup>4</sup>

The documentation of the ORANI model runs to well over 4,000 pages; of these, about 84 per cent describes theory, data bases, parameter estimates and computer systems; the remaining 16 per cent gives accounts of illustrative applications in the policy field. All of this documentation is publicly accessible, and much of it is freely available.<sup>5</sup>

ORANI has been used to analyse a great diversity of policy issues. Among others, these include the effects on industries, occupations and regions of the exploitation for export of mineral resources, changes in world commodity prices, changes in the exchange rate, changes in the pricing policy for domestic crude oil, subsidies to ailing industries, the movement towards equal pay for women, changes in tariffs, the adoption of home-price schemes for agricultural export commodities, changes in the costs of employing labour, the adoption of Keynesian demand stimulation