

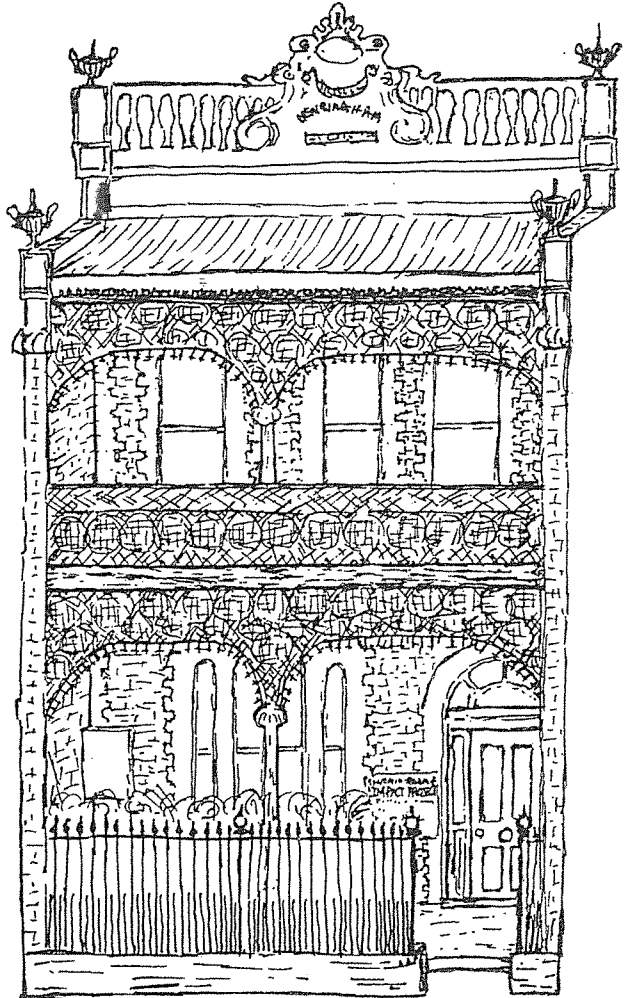
R05

# Impact Project

## Report

ALAN A. POWELL

A BRIEF ACCOUNT  
OF ACTIVITIES OVER  
THE PERIOD 1ST  
FEBRUARY 1982 TO  
28TH FEBRUARY 1985  
WITH A PROSPECTUS  
FOR  
FURTHER DEVELOPMENTS



IMPACT is an economic and demographic research project conducted by Commonwealth Government agencies in association with the Faculty of Economics and Commerce at The University of Melbourne, the Faculty of Economics and Commerce and the Departments of Economics in the Research Schools at the Australian National University and the School of Economics at La Trobe University.

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IMPACT PROJECT REPORT:

A BRIEF ACCOUNT OF ACTIVITIES OVER THE PERIOD  
1ST FEBRUARY 1982 TO 28TH FEBRUARY 1985,  
WITH A PROSPECTUS FOR FURTHER DEVELOPMENTS

BY

ALAN A. POWELL  
DIRECTOR

IMPACT PROJECT REPORT NO. R-05  
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*The views expressed in this paper do  
not necessarily reflect the opinions  
of the participating agencies, nor  
of the Commonwealth government*

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THE IMPACT PROJECT IS A COOPERATIVE VENTURE RESEARCHING  
THE STRUCTURE OF THE AUSTRALIAN ECONOMY. THE PROJECT IS  
SUPPORTED BY:

AUSTRALIAN NATIONAL UNIVERSITY  
BUREAU OF AGRICULTURAL ECONOMICS  
BUREAU OF INDUSTRY ECONOMICS  
BUREAU OF LABOUR MARKET RESEARCH  
DEPARTMENT OF ARTS, HERITAGE AND ENVIRONMENT  
DEPARTMENT OF IMMIGRATION AND ETHNIC AFFAIRS  
INDUSTRIES ASSISTANCE COMMISSION  
LA TROBE UNIVERSITY  
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THE PROJECT'S BASIC RESEARCH AND DEVELOPMENT UNIT IS  
HOUSED IN THE UNIVERSITY SQUARE PRECINCT, JUST OFF THE  
CAMPUS OF THE UNIVERSITY OF MELBOURNE, AT 153 BARRY  
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## IMPACT PROJECT REPORT

A Brief Account of Activities over the Period  
February 1st 1982 to February 28th 1985, with  
a Prospectus for Further Developments

by

Alan A. Powell\*  
Director

### 1. INTRODUCTION

I last issued a report of this type in February 1982.<sup>1</sup> The purpose of the present document is to brief the participating universities and Commonwealth agencies, and other interested parties, on developments in the project over the intervening period.

This report is organized as follows. A brief recapitulation of the aims of the project is given in Section 2. In Section 3 institutional arrangements (including staffing) are briefly sketched. Section 4 contains an overview of the work program. Prospective developments are discussed in the fifth and final section.

It should be emphasized that the report does not (except in passing) deal with the operational facility located within the Industries Assistance Commission (IAC) in Canberra. Rather, the coverage is confined to the basic research and development unit located on the campus at the University of Melbourne.

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\*I wish especially to thank Christopher Blampied and Mike Kenderes for their assistance in the preparation of this report.

## 2. AIMS OF THE PROJECT<sup>2</sup>

At the time of the Project's inception in 1975, the Chairman of the IAC, as Convenor of the participating Commonwealth agencies, issued a paper describing its aims in detail.<sup>3</sup> Other published material on the role of the Project appeared in 1977<sup>4</sup>, 1979,<sup>5,6,7</sup> and 1983.<sup>8</sup>

The major goal, then as now, was to improve the policy information system available to government, and to the public. The Project would do this indirectly, at arm's length from executive government, by improving the policy analytic tools available. The Project itself would not, in general, become involved in direct policy advice; rather it would upgrade the policy information system by work in the following areas:

1. data gathering and editing,
2. economic model building,
3. computer systems development,
4. training of personnel.

The Project's resources did not permit the gathering of primary data; the role of the Australian Bureau of Statistics (ABS) in retabulating and extracting data from already existing sources hence was crucial. The data files developed in the areas of industry structure, the labour market, and international trade, were designed to provide a summary of the available factual information pertinent to policy analysis in the various fields covered by the participating agencies. The withdrawal of the ABS

from the Project in 1978 meant a drastic scaling down of this work. This was unfortunate, as primary data collections have improved greatly in recent years.

The economic models (briefly described below) were to be policy-analytic in nature, designed to answer hypothetical questions such as:

1. How would the outputs of about 100 industry groups spanning the economy change as the result of a given change in crude petroleum pricing?
2. What impact would the policy change referred to above have on the employment demand facing about a dozen different occupational groups?

Above all else, the models were to recognize the interconnected nature of markets for commodities and factors of production. They were to provide a systematic basis for tracing, through input-output and other linkages, the passage of any given shock across the economy. The models developed should, either separately or when interfaced with each other, provide sufficient scope for in-depth analysis of policy in the several areas covered by the sponsoring agencies.

The main models developed by IMPACT are listed in Table 1, where a brief description of their scope is given. The major industry structure and labour force model ORANI, and population model BACHUROO,

TABLE 1

## DETAILS OF CURRENTLY AVAILABLE IMPACT MODELS\*

Name of Model [Major Focus]	Scope	Status of Computer System
BACHUROO <sup>9</sup> [Labour Supply]	Demographic projections by sex and by single years of age, by 4 marital status categories, based either on conventional demographic scenario writing or on economic scenarios which drive the demography via econometric modelling. Household formation, labour force participation.	Maintained on CSIRONET by the Bureau of Labour Market Research, Canberra.
ORANI <sup>10</sup> [Industry Structure, International Trade, Labour Demand]	The industrial composition of the economy, relative prices, international trade, and demand for labour, by about 110 industries and a dozen occupational groups. Routine disaggregation to State level available.	Maintained on CSIRONET by the Industries Assistance Commission and on University of Melbourne VAX computer by the University/Impact Research Centre.
ORANI-MACRO <sup>11</sup>	As for ORANI, but with feedback to, and from, the macroeconomic environment.	Available on VAX computers at Monash and Macquarie Universities.
SNAPSHOT <sup>12</sup> [Industry Structure, Technological Change]	A consistency framework for synthesising a picture of the future economy on the basis of detailed technological scenarios.	Maintained by Bureau of Industry Economics, Canberra.

\*SNAPSHOT is rarely used currently, ORANI in long-run mode<sup>13</sup> providing a superior alternative for most purposes.

are implemented using specially written software on the CSIRONET system. This ensures that access can be gained from some 109 computer nodes located throughout Australia.

Personnel training, it was envisaged, would take two forms. First, by assembling a team consisting largely of civil servants outposted from the participating agencies under senior professionals recruited especially for the Project, it was anticipated that in-house professional skills in the policy analysis field would be enhanced. At least in the case of the IAC (Impact's principal sponsor), this expectation has been substantially realized. Second, intensive training courses in the use of the models would be held from time to time. These would be open to the government, private, and academic sectors. Graduates of these courses would be in a position to use the models in their own professional situations. In fact, seven formally structured courses have been held up to the end of 1984; the number of economists with intensive hands-on training in the use of at least one of the models would be of the order of 200, most of whom would work in the public sector.

### 3. CURRENT STAFFING AND INSTITUTIONAL ARRANGEMENTS

#### 3.1 Participating Institutions

The Commonwealth agencies participating in the project during the triennium which will conclude at the end of June 1985 are the following:

Bureau of Agricultural Economics (BAE)  
Bureau of Industry Economics (BIE)  
Bureau of Labour Market Research (BLMR)  
Department of Arts, Heritage and Environment (DAHE)  
Department of Immigration and Ethnic Affairs (DEIR)  
Industries Assistance Commission (IAC)

The IAC, whose Chairman acts as Convenor, provides the secretariat for the Project. The University of Melbourne, and La Trobe University, participated throughout the triennium; the Australian National University joined the project in February 1984.

Under current arrangements, the work program is overseen by a Management Committee consisting of one representative of each of the participating institutions under the chairmanship of a representative of the IAC. The Committee meets quarterly. Only the Commonwealth agencies, which jointly are accountable for the expenditure of federal funds, vote on budgetary matters. The Director is responsible for all aspects of the research design and for the professional guidance of all personnel working on the Project.

### 3.2 Personnel

The staff of the Impact Research Centre consist of myself, five outposted IAC professional staff,<sup>14</sup> one secretary-stenographer, one clerical assistant (both Commonwealth financed) and a part-time data processing operator (University of Melbourne financed). Professor Dixon, Mr Parmenter, Dr Bonnell, Dr Meagher, and Mr Johnson, all of the Institute of Applied Economic and Social Research, have research interests which frequently overlap those of the Impact Research Centre. Apart from the last-named, these researchers were all located at La Trobe University during most, or at least a substantial part, of the period covered by this report, during which time they made major contributions to the work of the Project. Mr Parmenter acted as Director of the Project over the period March 1983 to September 1984. Mr P. Adams of the Bureau of Agricultural Economics was outposted to the Impact Centre for a period of 11 months concluding in June 1984.

Currently the principal contributors to the Impact Project at La Trobe University are Dr R. Rimmer and Dr K. Pearson; at the Australian National University the principal researchers involved are Dr A. Pagan and Dr P. Warr.

Outside the participating universities, close research links are maintained also with Professor K. Clements (University of Western Australia), Dr R. Cooper (Macquarie University), Mr J. Madden (University of Tasmania) and Dr K. McLaren (Monash University).

### 3.3 Academic Visitors

Academic visitors to the Impact Centre who participated in its work program included Professor K. Clements, University of Western Australia (December 1982 - January 1983); Dr A. Feltenstein, International Monetary Fund (March - August 1984); Mr P. Higgs, Harvard and La Trobe Universities (May - July 1983, May 1984 - February 1985); and Professor R. Harris, Queen's University (September 1984 and June 1985).

### 3.4 Graduate Student Participation

The Impact Project, by providing a set of tightly focussed research tasks embedded in an established research literature, has proved a fruitful source of topics for research students. The Impact Research Centre offers excellent data and computer facilities, whilst the full-time research staff contribute to an exciting professional environment for research training. One graduate student wrote in these terms of the arrangements for supervision of research students:

"The flexible arrangements which encourage graduate students working on appropriate topics to join the Impact team on a temporary (unpaid) basis enabled me to conduct the major part of my research at the Impact Project Centre, and to gain the benefit of many useful discussions with other team members ... I was given access to these resources and to the Impact data bank, on the understanding that my model would fit within the structure of the BACHUR00 model. Thus, although working



independently on my own project, my task was made easier because I could see the potential relevance of my contribution to the achievement of a broader overall, but well defined, objective ..." (Lynne Williams in the foreword to her Ph.D dissertation submitted to Monash University, September 1980).

Some highlights of graduate student activity over the triennium are now sketched.

In the summer of 1982-83 the University of Melbourne financed a Research Internship which was held by Mr M. D. Smith (of Monash University) under the supervision of Professor K. W. Clements (a visitor to the Impact Centre). Their collaboration led to an Impact Preliminary Working Paper on the incorporation into the ORANI parameter file of new econometric evidence on the demand for alcoholic beverages, and to a published paper.<sup>15</sup>

Dr A.H. Tulpulé's (Melbourne) doctorate on the labour/leisure choice was conferred in mid-1982.<sup>16</sup> A third publication on occupational mobility, based on Dr L. S. Williams' (Monash) dissertation, appeared in the international literature during the same year.<sup>17</sup> Two papers on regional economic modelling, based on Dr L.H. Liew's (Monash) Ph.D. thesis, appeared internationally during 1984.<sup>18</sup> (This thesis was awarded the gold medal and Prize of the Regional Science Association for the best thesis in regional science submitted in Australasia.) Early in 1985 Mr P.D. Adams submitted a Masters thesis on the short-run behaviour of the

agricultural industries in ORANI to the University of Melbourne.<sup>19</sup> Mr T.C. Chew received his Master's degree from La Trobe in 1984 for a thesis on the effects of structural change on the labour market.<sup>20</sup> (In 1984 this thesis was awarded the annual prize for the most outstanding thesis in labour market research by the Bureau of Labour Market Research.) Dr S.M. Bonnell received her doctorate from the same University in the same year for a dissertation on aspects of labour costs and employment behaviour in Australia;<sup>21</sup> some related research by Dr Bonnell and Professor Dixon was reported during 1983 in the Economic Record.<sup>22</sup>

Mr P.J. Higgs is a doctoral candidate at Harvard University and (during 1985) a staff member at La Trobe University. His joint paper on the scope for tariff reform created by a mining boom appeared in Australian Economic Papers during 1984.<sup>23</sup> Under support from the Australian Wool Corporation, he currently has in preparation a monograph on the impact of outside stresses on the Australian agricultural sector. Mr M. Siriwardana will shortly submit a Ph.D thesis on a computable general equilibrium model of Victoria, 1880, to La Trobe University. Mr John Shannon, a doctoral candidate at the ANU under Dr A. Pagan, is spending 1985 at the University of Melbourne, where he will participate in the Computable General Equilibrium (CGE) Workshop run jointly by the Impact Research Centre and the Institute of Applied Economic and Social Research. Mr Shannon has worked with Dr Pagan on the sensitivity of ORANI policy simulations to values of behavioural parameters.<sup>24</sup> Another participant in the CGE Workshop is Mr Peter Wilcoxon, a doctoral candidate at Harvard University, whose visiting research appointment has

been financed under a University of Melbourne Research Development Grant, the purpose of which is to facilitate the integration of the research interests of the Ritchie Research Chair with those of the Department of Economics generally. Mr Wilcoxon is working towards the integration of modern theories of corporate investment into a Johansen-style CGE Model. A tabular summary of graduate student activity associated with the Impact Project is given in Appendix 1.

#### 4. OVERVIEW OF THE WORK PROGRAM

The work program is first discussed in terms of the models. Then follow discussions of the activities of the Basic Research and Development unit in professional interaction and assistance involving other agencies. The latter discussions are organized under three sub-headings: Training Courses, Seminars, and Interactions with Other Research Programs.

##### 4.1 ORANI

###### (i) Development

The successful completion of a second full cycle of development of the ORANI model was signalled by the publication of a major monograph in 1982.<sup>25</sup> Extensions of the model completed since this documentation of standard ORANI include:

- (a) the development and testing of a version of ORANI better suited to long-term analysis than the standard version;<sup>26</sup>
- (b) the completion of work on full short-term macroeconomic closure of the model, and the documentation of the effects of a tariff shock on the ORANI-MACRO system which incorporates such closure;<sup>27</sup>
- (c) the development of a new method of regional disaggregation of ORANI results<sup>28</sup> (this method is a compromise

between the data-hungry 'bottoms-up' approach and the parsimonious 'tops-down' approach;<sup>29</sup> at the expense of a feasible augmentation of the data required by the 'tops-down' method, the new hybrid successfully captures many of the advantages of the (infeasible) 'bottoms-up' approach);

- (d) the successful development of special-purpose versions of ORANI targeted on specific industries/questions (e.g., the dairy industry<sup>30</sup> and the introduction of a wine tax<sup>31</sup>).

Other major developments which do not involve respecification of ORANI's structural form include:

- (e) a new, analytical, method of sensitivity analysis for ORANI results;<sup>32</sup>
- (f) the evaluation of ORANI's sensitivity to the values assumed for the elasticities of demand confronting major exports;<sup>33</sup>
- (g) the development of new, highly efficient, computer code, allowing the transfer of ORANI on to university VAX (and possibly other relatively small) computers;<sup>34</sup>

and

- (h) the 'typicalization' of the agricultural sector of ORANI's supporting data base.<sup>35</sup>

Major revisions of the ORANI data files were carried out cooperatively with the staff of the IAC in Canberra. A data base for 1977-78 was completed and documented.<sup>36</sup> This data base incorporates feature (h) above; thus the behaviour of agricultural industries in simulations made with the new data base are not subject to the risk of the idiosyncrasies which can be induced by a set of industry accounts which pertain to a year of drought, of abnormally high or low profitability, or to a year characterized by an unusual configuration of commodity prices.

#### (ii) Applications

Many applications of the ORANI model were carried out during the triennium. About three dozen examples of institutional uses are given in Appendix 3; they cover a broad canvas, ranging from a Defence Department interest (1982) in the effects of a disruption of overseas shipping, through a wide range of IAC reports (e.g., iron and steel (1983), fertilizers (1982, 1985), dairying (1983)), to various state government sponsored studies (e.g., workers' compensation (1984) and electricity pricing (1983) in Victoria, the effects of a wine tax on South Australia (1983)). The composition of the institutional users listed in Appendix 3 is as follows: Federal Government: 11 agencies + 2 committees of enquiry; State Governments: 5 agencies in 3 States; private sector: 3 industry associations plus one corporation. Not listed in Appendix 3 are applications made by academic researchers in at least seven universities.

A systematic review of applications of ORANI was presented by Parmenter and Meagher<sup>37</sup> at the 1984 International Symposium on Forecasting. This material will not be repeated here. Like Appendix 3, their review necessarily gives only partial coverage: ORANI is a public access model and consequently the model builders cannot be aware of all of the applications made with it.

ORANI now occupies a leading position in the policy modelling field. This is evidenced by the interest taken in the model at invited presentations to international conferences of modellers in London (Ontario) (1980 and 1982), Laxenburg (Austria) (1980), San Diego (1981), Stockholm (1982), Canberra (1983), London (U.K.) (1984), New York (1984) and Sopron (Hungary) (1984). The model was also the subject of a lecture to the Chinese Academy of Social Sciences (1983).<sup>38</sup>

#### 4.2 BACHUR00

##### (i) Development

The BACHUR00 model reached a stand-alone capability for the projection of the population and labour force in mid-1982.<sup>39</sup> The model may be unique in the extent of the provisions made to allow demographic events to be influenced by economic variables. Family and household formation, fertility, and female participation in the labour force, all are specified in such a manner that econometric models can influence projections. Whilst provision is made for such linkage between demography and economics, its use is not mandatory. Thus BACHUR00 can be used as a conventional demographic projection facility.<sup>40</sup> Its maintenance by the

Bureau of Labour Market Research on the CSIRONET computer network enables the model to be accessed publicly (not possible with the ABS facility).

The loss to the Project of key personnel Dr D. Sams and Ms P. Williams in 1983, plus a reassessment of institutional priorities, forced developmental work to be curtailed in the third quarter of that year.

Relative to the original blueprint, elements missing at that stage were equations to specify the number of hours supplied by part-timers and the occupational disaggregation of the labour supply (although Impact had done work in both these areas).<sup>41</sup> Also missing were econometric equations to explain the labour force participation of males. Whilst work on a method for the integration of BACHUROO into a combined ORANI-MACRO-BACHUROO system is fairly advanced,<sup>42</sup> weaknesses in the data base and in the econometric models so far available, plus a shortage of suitable personnel, make this integration premature.

At the time of their leaving the Project, the principal researchers on BACHUROO summarized the strengths and weaknesses of the model as follows:

### Strengths

"Firstly, the population projection algorithm (including the two sex marriage model) provides consistent and integrated demographic projections at a high level of disaggregation.



Secondly, the use of model schedules for fertility, marriage, remarriage, divorce and death rates enables the large information requirements of the population projection algorithm to be supplied and controlled easily.

Thirdly, the econometric model of fertility, marriage, divorce and female labour force participation provides some insights into the relationship between demographic and labour force behaviour and the economic environment, although the success here is somewhat qualified.

Fourthly, the econometric model of household formation provides a detailed and tightly structured model which relates changes in the state of the labour market and the level of income from different sources to the expected income of each demographic group. Expected income is then used to determine the headship rate of the demographic group, and, when combined with the population projections, the number of households.

Fifthly, the computer implementation of the Facility provides a flexible, easy-to-use tool for the generation and analysis of projections and for the analysis of historical data."

Weaknesses

Firstly, the current treatment of fertility does not provide an integrated approach to economic-demographic modelling. The link between the econometric model and the population projection algorithm for fertility would be better achieved via the use of age and birth order specific confinement rates for married women and age specific confinement rates for unmarried women applied to the appropriate populations at risk by age, marital status and birth order. These age specific rates could be approximated by model schedules to enable the econometric model to control fertility behaviour via a small set of parameters.

Secondly, the econometric model of fertility, marriage, divorce and female labour force participation, needs improvement. The development of a more tightly integrated model of the relationships between the economic environment and demographic behaviour is essential. More explicit use of microeconomic theory, especially of constrained utility maximization, is required to improve the specification of the existing "new home economies" relationships in the model.

Thirdly, the current model of labour force participation is inadequate. It is essential to develop a behavioural model which systematically covers at least eight age groups for each of men, married women and unmarried women and provides a sound structural representation of the labour market choices faced by each demographic group."<sup>43</sup>

## (ii) Applications

As detailed in Appendix 3, the BACHUR00 model has been used to project the population and labour force for an IAC analysis of structural change, to project the number of households for a State housing authority, and to erect population and workforce projections for a major study of immigration sponsored by the Committee for Economic Development of Australia and the Department of Immigration and Ethnic Affairs<sup>44</sup> (ORANI also being used in the last-mentioned study).

### 4.3 Training Courses

Residential training courses on the use of the ORANI model were held in November of 1982 and 1984, and on BACHUR00 in November 1982 and September 1983. Details are given in Appendix 4.

These courses involve a large number of contact hours per day and a staff student ratio of about 1:4. Students receive not only a rigorous theoretical grounding in the model concerned, but also obtain hands-on experience in the preparation of simulations and in policy report writing. Attending courses run during the triennium were students from some eight federal agencies, seven State government departments (representing four States), and nine tertiary educational institutions. In many cases, graduates of these courses have gone on to publish policy analyses based on their subsequent independent use of the models (see, e.g., references [1], [5] and [6] in Appendix 3).

#### 4.4 Seminars

The Impact Project has held regular seminars over the years. In 1984 a new workshop in applied (computable) general equilibrium modelling was initiated by Mr Parmenter (then Acting Director). The programmes of the workshop for 1984 and for the first part of 1985 are included here as Appendix 5. These seminars serve two functions:

- (i) to enable Impact researchers to obtain feedback from their Project colleagues, and from other interested professionals, on new research initiatives and on current work in progress;
- (ii) to enable visitors in the relevant fields to communicate new developments to Impact and other reseachers.

The seminars also serve as a useful focal point for cooperative and interactive research involving personnel from two or more institutions (not necessarily located in the same city). The workshop series is cosponsored by two other academic units at the University of Melbourne within the Faculty of Economics and Commerce (see item (e) in Section 4.5, following).

#### 4.5 Interaction with Other Research Programmes

The basic research and development unit continues on a day to day basis to respond to requests for technical information from the research arms of several Commonwealth and State Government agencies. Some cases of closer research associations are now mentioned.

(a) CREA: The Centre for Regional Economic Analysis was set up at the University of Tasmania with joint State/Federal funding in 1980 and commenced full scale operation during 1981. The original proposals for the establishment of the Centre envisaged that it would interact with the Project and in particular that it would employ ORANI for economy-wide modelling onto which would be grafted additional specifically Tasmanian detail. In fact these arrangements have proceeded as anticipated. An ORANI-TAS model, exploiting the newly developed hybrid method of regionalizing a national economic model (see item (c) in Section 4.1 above), has been developed for specifically Tasmanian policy analysis.<sup>45</sup> Two members of the ORANI team, Dr K. Pearson and Dr R. Rimmer, are currently in consultation with the Centre about its software for ORANI and ORANI-TAS computations. Mr. J. Madden of CREA, visits the Impact Research Centre from time to time (most recently in February 1985). CREA working papers have made extensive use of the ORANI model.<sup>46</sup>

(b) IIASA: Since mid 1980 the International Institute of Applied Systems Analysis at Schloss-Laxenburg, Austria, has taken a keen interest in the Impact Project. This interest has spanned three areas: (i) general equilibrium modelling methodology; (ii) modelling of demographic-economic

interactions and (iii) development of agricultural sector models. With respect to the first of these, Professor Dixon was invited to address the specialist Taskforce on General Equilibrium Modelling held by IIASA in Sopron, Hungary, in August 1984. In the demographic area, Ms P. Williams (then of Impact) and Dr A. Rogers of IIASA are the co-authors of one of the 30 papers selected for presentation at the International Conference on Forecasting Regional Population Change and its Economic Determinants held in Virginia in May 1982 under the auspices of the American Statistical Association and the U.S. Bureau of the Census.<sup>47</sup>

(c) U.W.A.: During 1983 and 1984 the Impact Centre cooperated with a research group at the University of Western Australia led by Professor K.W. Clements. This group was researching the impact of mining developments on the Western Australian economy, and was also keen to develop a specifically Western Australian version of ORANI, ORANI-WA, for general policy purposes. The Impact Centre assisted UWA in gaining access to standard ORANI computer systems through the facilities then available in Nedlands, and cooperated on the development of an ORANI-WA model.<sup>48</sup> Some further improvements to the data base are required before ORANI-WA becomes operational for policy analytic work.

(d) ANU: The Australian National University, as noted above in Section 3.1, has been a participant in Impact since February 1984. This formal change of status brought to fruition a period of cooperation involving, on the ANU side, mainly Dr P. Warr, Dr P. Lloyd (now Professor Lloyd, at the University of Melbourne) and Dr A. Pagan. On the Impact side, the main collaborators were Mr B. Parmenter and Dr R. Rimmer. Among topics

researched were the impact on less developed countries of Australia's trading policies<sup>49</sup> and the structural effects of the adoption of a 'buy Australian' procurement policy by government.<sup>50</sup>

(e) IAESR: The Impact Research Centre maintains a close working relationship with the Institute of Applied Economics and Social Research at the University of Melbourne, directed since early 1984 by Professor P.B. Dixon, who has been the Impact Project's Associate Director during the period covered by this report. The IAESR and the Department of Economics at the University of Melbourne are cosponsors of the Workshop in Computable General Equilibrium Modelling.

#### 4.6 Honours

Prize-winning theses by Dr Liew and Mr Chew have been mentioned above in Section 3.4. In 1984 Professors Powell and Dixon were the joint recipients of the Royal Society of Victoria's Medal for Scientific Research. This award was made in recognition of their contributions to the development of the Impact Project.

#### 4.7 Review of Current Documentation

Over the period covered by this report, one major monograph and 72 other papers, reports, and computer manuals were issued publicly by the Project, a total of about 3,500 pages of documentation. Most of these are listed in Appendix 2.<sup>51</sup> An analysis of their content is given in Table 2.

TABLE 2  
PROFILE OF RECENT IMPACT DOCUMENTATION\*

Topic/ Model	Data	Method/ Expositions	Applications	Computer Manuals	Sub Totals
ORANI	743	892	382	255	2272
BACHUR00	62	384	242	142	830
Model Interfaces/ Interfaced Models	0	87	27	0	114
Other	5	263	0	0	268
Sub-Totals	810	1626	651	397	3484

\* The entry in the table is the number of pages from the total set of documents listed in Appendix 2 and in end note 51. The period covered by the table is 1st February 1982 through 28th February 1985.



Some 32 Impact research documents were published (or accepted for publication) independently of the Project during the triennium.<sup>52</sup> The composition of this documentation is shown in Table 3.

TABLE 3  
IMPACT PROJECT RESEARCH DOCUMENTS INDEPENDENTLY PUBLISHED  
February 1982

Item	Where Published?		Sub-Totals
	Locally	Overseas	
Monographs		1	1
Journal articles			
published	5	6	11
accepted for publication	1	1	2
Chapters in books			
published	6	5	11
accepted for publication	1	6	7
Sub-totals	13	19	32

Source: Based mainly on Appendix 2. Relevant publications not listed there may be found in end notes 17, 22 and 52.

(a) to interface a computable general equilibrium (CGE) model such as ORANI with a conventional macrodynamic model;

and

(b) to introduce money and other financial assets into the Walrasian framework.

Since the latter approach explicitly recognizes stores of value, it necessarily involves (at least to a minimal degree) explicit recognition of the intertemporal choices which must be made by the agents whose behaviour is modelled.

The approach (a) has been investigated in detail at Impact;<sup>56</sup> work on approach (b) commenced during Dr Andrew Feltenstein's 1984 tenure of a senior visiting research fellowship at the University of Melbourne.<sup>57</sup> Whilst development of (b) is at a very early stage, it promises an integrated treatment of the markets for money, securities, and commodities. This would enable monetary shocks to generate real effects in the medium term (say, 2 years). This might allow monetary influences to affect different industries in fundamentally different ways (not currently possible in ORANI) and as well would allow sectoral shocks to exert economy-wide effects on monetary and financial markets (not easily handled in the existing ORANI-MACRO system). Additionally, if successful, the new model would provide new insights into macroeconomic policy, including alternative strategies for financing/eliminating the government's budget deficit. Of course, before adopting such a framework, it should be tested against the existing alternative (the combined ORANI-MACRO system). Such competitive trials of the two frameworks are planned for the work programme.

### 5.3 Flexible Computer Software for Policy Modelling<sup>58</sup>

The proposed developments would be led by Dr Ken Pearson of La Trobe, who would work full time on this research initiative at the Impact Centre during 1986. The proposals are made with two groups of economists in mind.

Firstly, there are practising economists who wish to use one or more different models for simulations. These may not be experts in the economic (or mathematical) theory behind the models and may not be very familiar with computers. The package should allow them to obtain results for their simulations without their having to know (or be concerned) about the internal workings of the code. They should be able to use the model as long as they are sufficiently familiar with the economic bases of the model and its data. Secondly, there are economists who may wish to design and make available to others a new model of this kind. Again they may not be very familiar with computers. The package should assist them in implementing the model with as little distraction from the economics as possible. Below these two groups are referred to as model users and model designers, respectively.

All the software in the package must be model-independent; that is it must apply equally well to all computable general equilibrium models (CGEMs) of the Johansen class (where the latter is interpreted as the set of models which can be linearized successfully in terms of logarithmic differentials). More specifically, this means models determined by equations in terms of vector variables with real values which are

to be solved by passing to the (linearized) equations in the percentage changes. Having model-independent code is obviously efficient in that, once written, it can be used for all such models, both old and new. In contrast, model-specific code is a one-off product that is of value only for one model (or a few specific ones) but cannot be used for other new (or old) models. Of course it will still be necessary to write some model-dependent code for each model. The aim is to reduce this part of the implementation task as much as possible.

To be of use to economists anywhere, the software in the package must be portable in the sense that it runs (either without change or with a very small number of easily made changes) on a wide range of computers. This means that the code must be in a standard subset of a standardised programming language and contain as few as possible parts which depend on the hardware or operating systems in use. Since the model-independent code so far developed at Impact is in FORTRAN, and since that is a language which is standardised and available world-wide, it seems the logical choice. In summary, the package must be a collection of portable, model-independent code of use to model users and model designers.

(a) **Steps in Implementing a CGEM**

Essential steps in implementing a CGEM are the following:

- (1) Development of the theory underlying the model
- (2) Formulation of the structural equations in nonlinear form  
(viz., with variables expressed in the levels)

- (3) Derivation of the linear form of the structural equations
- (4) Algebraic condensation of the system of linear equations by the elimination of variables sufficient in number to make feasible the computational solution of the model
- (5) Assembly of the data base
- (6) Calculation (from the data base) of (default) coefficients for the condensed system
- (7) If the default data and/or parameters are not the ones wanted by the user, calculation of the modified coefficients (from the modified data)
- (8) Choice of closure and shocks
- (9) Solution of the condensed system
- (10) Calculations of any back-solutions required (i.e., the determination of the solution values of variables previously eliminated in step (4))
- (11) Printing of results
- (12) Is the large-change procedure (i.e., full non-linear solution) wanted? If so, do the following once or several times, as required:
  - (a) recalculate a new data base from the solution at the last round;
  - (b) recalculate the coefficients for the condensed system;
  - (c) solve the new condensed system.

Note that the model designer begins at step (1) and the model user enters at about step (7).

While presumably steps (1), (2) and (5) cannot be automated, it should be possible to make all of the rest largely automatic in a model-independent and portable manner. Of course, it will be possible to automate some steps more fully than others.

(b) **Additional Desirable Features**

The following three additional features are desirable and amenable to automation:

(13) (for model designers) Model respecification When a new model has substantial overlap with an existing model, it should be relatively easier to build the new model by modifying the old one rather than by starting from scratch. In particular, it should be easy to build a new model by adding or deleting equations and/or variables from an existing model.

(14) (for model users) Choice of closure and shocks Ideally it should be possible to choose any variable (whether or not it is in the condensed system) to be exogenous or endogenous, and to shock any variable. This means it should be possible to make:

(a) eliminated variables exogenous or endogenous,

(b) absorbed variables exogenous or endogenous.

(15) (for model users) Choice of user-specified parameters

Ideally, it should be possible for the user to vary these in any (economically sensible) way allowed by the theory.

(e) **Potential Benefits**

Once successfully implemented, these facilities will reduce the task of special purpose modelling to a routine basis. At present, by contrast, each special purpose modelling effort -- e.g., studies [21] and [25] referenced in Appendix 3 -- requires considerable mobilization of skills in the creation of computer software. Of course, superior skills of economic analysis will still be required by the new package: however, the elimination of essentially computational aspects will greatly cut the cost of developing special-purpose models such as are often required to service IAC enquiries. The package will also make training of graduate students in CGE modelling a great deal easier, and will be used in a new graduate level course at the University of Melbourne to be mounted for the first time in 1986.

5.4 Interaction with Other Research Programmes

Interaction with other research programmes (along the lines discussed above in Section 4.5) is expected to continue. New initiatives at the IAESR in modelling the personal distribution of income within an economy-wide CGE model, and on using a CGE model as an aid to portfolio choice, seem likely to provide suitable vehicles for cooperative work.

## 5.5 Concluding Remarks

The Impact Project has been outstandingly successful in:

(a) achieving cooperation between academic researchers and government policy economists,

and in

(b) maintaining a tight focus on an interrelated set of policy issues

via

(c) the use of an integrated framework of economic and demographic analysis.

A spin-off has been a substantial graduate research training programme.

The models developed by the Project are widely used in policy analysis. Their maintenance and improvement in line with new developments in data availability, in economic and econometric theory, and in computational algorithm design, will ensure a progressive enhancement in the capability of the Impact policy information system. Like other capital goods, the system will degenerate if necessary maintenance is allowed to lapse. Moreover, progressive incorporation of the improvements mentioned above is necessary to avoid obsolescence and thus to allow the system to continue to make credible inputs into policy analysis.



END NOTES

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2. In this section I draw fully on material cited below in note 8.
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6. Rowen Craigie, "Impact - A Framework for Analysing Agricultural Policy Issues", Rural Marketing and Policy (Adelaide, S.A. Department of Agriculture and Fisheries), Vol.9, No.1 (February 1979).
7. Peter B. Dixon, Alan A. Powell and B.R. Parmenter, Structural Adaptation in An Ailing Macroeconomy (Melbourne: Melbourne University Press, 1979), pp. ix-xi.
8. 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), especially pp.129-131.
9. A convenient entry point to the BACHUROO literature is Dennis Sams and Pamela Williams, "The Impact Population Projection Facility: A Non-Technical Overview", Impact Working Paper No. B-22, University of Melbourne, August 1983, pp.28; a more detailed account is given in Dennis Sams and Pamela Williams, "An Economic-Demographic Model of Australian Population, Labour Force and Households", Impact Working Paper No. B-18, University of Melbourne, August 1983, pp.97.

10. The main reference for ORANI is P.B. Dixon, B.R. Parmenter, J. Sutton and D.P. Vincent, ORANI: A Multi-sectoral Model of the Australian Economy (Amsterdam: North-Holland, 1982), pp.xvii and 372. Major enhancements to ORANI's agricultural data base are described in Philip D. Adams, "The Typical Year Data Base for the Agricultural Sector of ORANI 78", Impact Preliminary Working Paper No. OP-45, University of Melbourne, April 1984, pp.113; and in Peter J. Higgs, "Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-78 Data Base", Impact Preliminary Working Paper No.OP-49, University of Melbourne, January 1985, pp.180. A Modified version of ORANI, suitable for long-run policy analysis, is described in Mark Horridge, "The Long-Run Closure of ORANI: First Implementation", Impact Preliminary Working Paper No.OP-50, University of Melbourne, February 1985, pp.87 + 35.
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21. Sheila M. Bonnell, "An Examination of Some Aspects of Changes in Labour Cost and Employment in Australia: 1961-1981", thesis submitted to La Trobe University for the degree of Doctor of Philosophy, School of Economics, March 1984.
22. Peter B. Dixon and Sheila M. Bonnell, "A Measure of the Incidence of the Costs of Structural Change: The Experience of Birthplace Groups in the Australian Labour Force during the 'Seventies'", Economic Record, Vol.59, No.167 (December 1983), pp.398-406.
23. Peter J. Higgs, B.R. Parmenter, and Alan A. Powell, "The Scope for Tariff Reform Created by a Resources Boom: Simulations with the ORANI Model", Australian Economic Papers, Vol.23, No.42 (June 1984), pp.1-26.
24. A.R. Pagan and J. Shannon, "Sensitivity Analysis for Linearized Computable General Equilibrium Models", Australian National University, 1983 (mimeo).
25. See the first reference cited in note 10 above.
26. Peter B. Dixon, B.R. Parmenter and Russell J. Rimmer, "Extending the ORANI Model of the Australian Economy: Adding Foreign Investment to a Miniature Version", Ch.12 in H.E. Scarf and J.B. Shoven (eds), Applied General Equilibrium Analysis (New York: Cambridge University Press, 1984), pp.485-533; Mark Horridge and Alan A. Powell, "Long-Run Closure of ORANI: A Proposal", Impact Preliminary Working Paper No.OP-46, University of Melbourne, April 1984, pp.109; and Mark Horridge, "The Long-Run Closure of ORANI: First Implementation", Impact Preliminary Working Paper No.OP-50, University of Melbourne, February 1985, pp.87 + 16 + 39.
27. Russel J. Cooper, "A Tariff Experiment on the Interfaced ORANI-MACRO System", Impact Preliminary Working Paper No.IP-18, University of Melbourne, April 1983, pp.29; see also the reference cited in note 11 above.

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30. Industries Assistance Commission, The Dairy Industry, Report No.333 (Canberra: Australian Government Publishing Service, 1983).
31. G.A. Meagher, B.R. Parmenter, R.J. Rimmer and K.W. Clements, "Special Purpose Versions of A General Purpose Multisectoral Model: Tax Issues and the Australian Wine Industry", Impact Preliminary Working Paper No.OP-41, University of Melbourne, September 1983, pp.39.
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38. Alan A. Powell, "The Role of Economic Modelling in National Economic Management" (in Chinese, Translated by Meng Jian-Hua), Translated Excerpts on Quantitative and Technological Economics (Beijing: Institute of Quantitative and Technological Economics), No.5, pp.62-68.
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40. BACHUROO's capability of replicating conventional demographic projections provided by the Australian Bureau of Statistics is demonstrated in Dennis C. Sams, Lynne S. Williams, Pamela J. Williams and Jim D. Stevenson, "A Comparison between the ABS Population Projection 1980-2001 and a Compatible Projection using the Impact Population Projection Facility", Impact Preliminary Working Paper No.BP-27, University of Melbourne, July 1981, pp.48.
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42. Alan A. Powell, "Aspects of the Design of BACHUROO, An Economic-Demographic Model of Labour Supply", pp.277-300 in A.C. Kelley, W.G. Sanderson and J.G. Williamson (eds), Modeling Growing Economies in Equilibrium and Disequilibrium (Durham, North Carolina: Duke University Press, 1983); Russel J. Cooper and Keith R. McLaren, "Design of the ORANI-MACRO-BACHUROO Interface", Impact Preliminary Working Paper No.IP-17, University of Melbourne, September 1982, pp.29.
43. Dennis Sams and Pamela Williams, "An Economic-Demographic Model of Australian Population, Labour Force and Households", Impact Working Paper No.B-18, University of Melbourne, August 1983, pp.97 (see pp.39-40 for quotation).
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47. Andrei Rogers and Pamela Williams, "A Framework for Multistate Demoeconomic Modeling and Projection, in A.M. Isserman (ed.) Population Change and the Economy (Dordrecht: Kluwer-Nijhoff, 1985). Ms Williams reviews the overall conference in "Regional Economic-Demographic Modelling and Projection: Review of an International Conference", Australian Journal of Statistics, Vol.26, No.1 (April 1984), pp.45-57.
48. Wolfgang F. Ernst and B.R. Parmenter, "ORANI-WA: A Model for Analysing the Impact of Economic Shocks on Western Australia", paper presented to the Thirteenth Conference of Economists, Perth, W.A.. August 1984, Impact Project archive document No.OA-238, pp.19.
49. P.G. Warr and P.J. Lloyd, "Do Australian Trade Policies Discriminate Against Less Developed Countries?", Economic Record, Vol.59, No.167 (December 1983), pp.351-364.
50. P.G. Warr and B.R. Parmenter, "Protection through Government Procurement", Centre for Economic Policy Research Discussion Paper No.91, Australian National University, 1984.
51. Not listed in Appendix 2 are the paper cited above in note 48, and the following BACHUROO computer manuals (issued in 1983 as Research Memoranda):

Author/s	Title	Impact Archive Document No.
Dennis Sams and Pamela Williams	"A User's Guide to POPFAC: The IMPACT Population Projection Facility"	CA-69
Dennis Sams and Pamela Williams	"A User's Guide to Accessing the IMPACT Population Projection Facility CCL Procedures"	CA-66
Pamela Williams, Dennis Sams and Henry Gardner	"MIGSEN, DEMGEN and DEMSEN - Three Programs to Generate the Projected Exogenous Demographic Scenario for a Population Projection using the Impact Population Projection Facility"	CA-68
Brock Bryce	"ECOSEN - A Program to Generate the Projected Exogenous Economic Scenario for a Population Projection using the Impact Population Projection Facility"	CA-60
Brock Bryce, Dennis Sams and Pamela Williams	"POPMOD and ECOMOD - Two Programs to Generate a Population Projection with the Impact Population Projection Facility"	CA-63
Dennis Sams and Pamela Williams	"PRTDEM: A Program to Print Demographic Data from the Impact Population Projection Facility"	CA-64
D.S. Richardson	"PRTECO: A Program to Print Economic Data from the Impact Population Projection Facility"	CA-62

Author/s	Title	Impact Archive Document No.
Dennis Sams and Pamela Williams	"PRTLII: A Program to Print Labour Force, Income and Household Data from the Impact Population Projection Facility"	CA-65
Lynne S. Williams and Pamela Williams	"GENDAT: A Program to Update the Economic Database of the Impact Population Projection Facility"	DA-09
52.	Published during the triennium (but first issued at an earlier date and therefore not listed in Appendix 2) were the following chapters of books: (i) Alan A. Powell, "Aspects of the Design of BACHUROO, An Economic-Demographic Model of Labour Supply", pp.277-300 in A.C. Kelley, W.G. Sanderson and J.G. Williamson (eds), <u>Modeling Growing Economies in Equilibrium and Disequilibrium</u> (Durham: Duke University Press, 1983); (ii) Peter B. Dixon, B.R. Parmenter, Alan A. Powell and D.P. Vincent, "The Agricultural Sector of ORANI 78: Theory, Data and Application", pp.237-274 in Kelley <u>et al.</u> (eds), <u>op.cit.</u> ; (iii) D.P. Vincent, P.B. Dixon and A.A. Powell, "Changes in Supply of Agricultural Products", pp.210-224 in D.B. Williams (ed.), <u>Agriculture in the Australian Economy</u> (Sydney: Sydney University Press, 1982); (iv) Alan A. Powell, "The Role of Labor Statistics in the Models of the Impact Research Project", pp.129-159 in Dennis J. Trewin (ed.), <u>Statistics in the Labor Market</u> (New York: Marcel Dekker, 1983); (v) B.R. Parmenter, "Inter-Industry Analysis: The ORANI Model of Australia's Industrial Structure", pp.69-112 in L.R. Webb and R. Allen (eds), <u>Industrial Economics: An Australian Study</u> (North Sydney: George Allen and Unwin, 1982).	
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54.	Peter Cory and Mark Horridge, "A Harris-Style Miniature Version of ORANI", Impact Research Centre (forthcoming).	
55.	The long-term costs of protection cannot be handled effectively by the current generation of (constant-returns-to-scale) models. For a discussion of the reasons, see Peter B. Dixon, "Economies of Scale, Commodity Disaggregation, and the Costs of Protection", <u>Australian Economic Papers</u> , Vol.17, No.30 (June 1978), pp.63-80.	
56.	See Alan A. Powell, Russel J. Cooper and Keith R. McLaren, "Macroeconomic Closure in Applied General Equilibrium Modelling: Experience from ORANI and Agenda for Further Research", <u>Impact Preliminary Working Paper</u> , No.IP-19, University of Melbourne, September 1983, pp.60.	
57.	Andrew Feltenstein, "A Dynamic General Equilibrium Analysis of Financial Crowding Out: Theory with an Application to Australia", Fiscal Affairs Department, International Monetary Fund, Washington D.C., 1985 (mimeo), pp.56.	
58.	This section draws freely on Ken Pearson's research proposal, "Automating the Solution of Computable General Equilibrium Models of the Johansen Class", School of Mathematics, La Trobe University, 31 January 1985, pp.7.	

APPENDIX 1

GRADUATE STUDENT TRAINING  
ASSOCIATED WITH THE  
IMPACT PROJECT  
1976 -1985\*

Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and	Notes
P.D. Adams (Melbourne)	M.Com.	(a) See title (e) under the entry for Mr Higgs. (b) "The Short-Run Behaviour of Agricultural Industries in ORANI 78 - Methodological Overview and Analysis of Base Year Data", Impact Preliminary Working Paper Op-42, December 1983. (c) "How Responsive Are Agricultural Industries in ORANI to Price Changes?", Impact Preliminary Working Paper Op-44, February 1985. (d) "The Typical Year Data Base for the Agricultural Sector of ORANI 78", Impact Preliminary Working Paper Op-45, April 1984.	"An Analysis of the Short-Run Output Response of the Australian Agricultural Sector and the Development of a Typical Year Agricultural Data Base" (1985).		Note: Mr Adams is the author of a computer manual prepared for the Project and not listed here.
C.M. Alaouze (Melb/Wisconsin)	Post-master's pre-doctoral experience	(a) "Estimates of the Elasticity of Substitution between Imported and Domestically Produced Goods at the Four-Digit ASIC Level", Impact Preliminary Working Paper Op-11, July 1977. "Estimates of the Elasticity of Substitution between Imported and Domestically Produced Goods Classified at the Input-Output Level of Aggregation", Impact Preliminary Working Paper Op-13, October 1977. "A Disaggregated Measure of Pressure of Demand: Its Use in Import Demand Estimation", Impact Preliminary Working Paper Op-16, October 1977.			Note: Mr. Alaouze was employed by the Industries Assistance Commission working on the development of the impact models between the completion of his M.Agr.Sc. degree at Melbourne and his entry into the Ph.D programme in Economics at the University of Wisconsin. Dr. J. Marsden and Mr.J. Zeitzsch are co-authors of title (a).
S.M. Bonnell (La Trobe)	Ph.D	(a) (with P.B. Dixon) "The Impact of Structural Change on Employment of Migrants in Australia during the Seventies" Ch.4 in P.Douglas (ed.) THE ECONOMICS OF AUSTRALIAN IMMIGRATION (Sydney: University of Sydney Extension Programme, 1982), pp.13-20.			"An Examination of Some Aspects of Changes in Labour Cost and Employment in Australia: 1961-1981" (1984).



APPENDIX 1 (ctd)

Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	Notes
(b)		"A Preliminary Analysis of the Effects of Changes in the Occupational Structure in Australia on Employment by Sex, 1971-76", <u>Impact Preliminary Working Paper IP-16, 1982.</u>		
(c)		(with P. B. Dixon) "A Measure of the Incidence of the Costs of Structural Change: The Experience of Birthplace Groups in the Australian Labour Force during the 'Seventies", <u>Economic Record, Vol. 59, No. 167 (December 1983), pp. 398-406.</u>		
(d)		(with T. C. Chew and P. B. Dixon) "Measuring the Impact of Structural Change on Groups in the Australian Labour Market", pp. 343-359 in G. Steinmann (ed.), <u>Economic Consequences of Population Changes in Industrialized Countries, Vol. 8 of Studies in Contemporary Economics (Berlin: Springer-Verlag, 1984).</u>		
C. Brooks (Monash)	M. Ec.	"An Econometric Model of Household Headship" <u>Impact Preliminary Working Paper BP-14, August 1978.</u>		Course work degree. Note: Miss P. Williams is a co-author of this paper.
V. Caddy (Monash)	M. Ec.	(a) "Demand Equations and The ORANI Moduls: An Exposition", <u>Impact Preliminary Working Paper OP-02, July 1975.</u>		"Production Functions and the Measurement of Substitution Elasticities" (1978).
(b)		"Empirical Estimation of Substitution Elasticities for Manufacturing Industry: A Review", <u>Impact Preliminary Working Paper OP-09, November 1976.</u>		
(c)		"An Application of A Random Coefficient Model to The Problem of Estimating Aggregate Production Parameters", <u>Impact Preliminary Working Paper OP-10, March 1977.</u>		
(d)		"Determinants of Australian Migration", <u>Impact Working Paper B-07, June 1978.</u>		Note: Professor Powell and Miss B. Jackson are co-authors of title (d).
K. Chareonwongsak (Monash)	Ph. D			"The Occupational and Industrial Structure of Wages and Employment in Australia" (1981).

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Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and	Notes
T.C. Chew (La Trobe)	B.Ec. Honours project				"The Effects of Structural Changes in the Australian Economy on the Age and Birthplace Composition of the Workforce". (1981)
L.H. Cook (Monash)	Ph.D	See title (d) under the entry for Dr. Bonnell.  (with Peter B. Dixon) "Structural Change and Employment Prospects for Migrants in the Australian Workforce", Australian Economic Papers, Vol.21, No.38 (June 1982), pp.69-84.			"The Effects of Structural Changes in the Australian Economy on Employment Prospects for Groups Classified by Duration of Residence and Entry Status". (1984).  "Validation of a Johansen - Style Multi-sectoral Model: Norway, 1949-61" (1981).
R. Cragie (Monash)	Summer research training internship				(Summer 1976)
A. Dolan (Melbourne/ANU)	Post B.Ec. pre-masters summer research internship	(with Alan A. Powell and Dennis C. Sams) "The Treatment of the Fishing Industries in the Long-Run Closure of ORANI" Impact Preliminary Working Paper, No. OP-32, August 1981.			(Summer 1981)
J. Flaherty (La Trobe)	M.Ec.				"Export Facilitation and the Australian Motor Vehicle Industry" (submission expected 1986).
P.J. Higgs (La Trobe)	B.Ec. Honours project	(a) "The Short-Run Effects on the Australian Economy of Alternative Oil-Pricing Policies" Impact General Paper G-36, November 1981.  (b) See title (a) under the entry for Dr. Liew.  (c) (with D. Parham and B.R. Parmenter) "Occupational Wage Relativities and Labour-Labour Substitution in the Australian Economy: Applications of the ORANI Model", Impact Preliminary Working Paper, OP-30, August 1981.  (d) (with B.R. Parmenter and R.J. Rimmer) "Modelling the Effects of Economy-Wide Shocks on a State Economy in a Federal System", Impact Preliminary Working Paper OP-37, January 1983.			"The Short-Run Effects on the Australian Economy of Alternative Oil-Pricing Policies" (1980).  Notes: Mr Higgs was employed by the Industries Assistance Commission as a member of the Impact Research Centre before commencing his Ph.D at Harvard in September 1982. Mr Higgs, under sponsorship of the Wool Research Trust fund, spent the periods May through July, 1983 and 1984, as a researcher at the Impact Centre.  Mr Higgs is the author/co-author of three computer manuals produced for the Project
(Weib/Harvard)	Ph.D (see note)				

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Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and Notes
		<p>(e) (with P.D. Adams) "The Disaggregation of Gross Operating Surplus for the Agricultural Sector of ORANI", <u>IMPACT Preliminary Working Paper</u> OP-40, October 1983.</p>		
		<p>(f) (with B.R. Parmenter and A.A. Powell) "The Scope for Tariff Reform Created by a Resources Boom: Simulations with the ORANI Model", <u>Australian Economic Papers</u>, Vol.123, No.42 (June 1984), pp. 1-26.</p>		
		<p>(g) "Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-78 Data Base", <u>IMPACT Preliminary Working Paper</u>, OP-49, January 1985.</p>		
J. Iacono (Monash)	M.Ec.	<p>"Durables in The Consumption Function", <u>IMPACT Preliminary Working Paper</u>, SP-05, September 1976</p>	<p>"Durables in the Consumption Function" (1976).</p>	
Liew Leong-Hoe (Monash)	Ph.D	<p>(a) "Incorporating Regional Dimensions in Economy-wide Models: A Preliminary Report on a Tasmanian Version of ORANI", in R.E. Glass and K.B. O'Connor (eds), <u>Papers of the Australian and New Zealand Section of the Regional Science Association</u>, 6th Meeting, August 1981 (Melbourne: ANZ Section of the Regional Science Association), pp.217-240.</p>	<p>"A Multi-regional, Multi-sectoral General Equilibrium Model of the Australian Economy (1981). [Note: This thesis was awarded the gold medal and prize of the ANZ Section of the Regional Science Association for the best thesis in regional science submitted in Australasia during 1981.]</p>	
		<p>(b) "Regional Disaggregation of A National Economic Model: The 'Bottoms-up' Approach", <u>IMPACT Preliminary Working Paper</u>, OP-34, August 1982.</p>	<p>Note: Messrs P.J. Higgs and B.R. Parmenter and Dr R.J. Rimmer are co-authors of title (a).</p>	
		<p>(c) "A Johansen Model for Regional Economic Analysis", <u>Regional Science and Urban Economics</u>, Vol.14, No.1 (February 1984), pp.129-146.</p>		
		<p>(d) "Tops-down' versus 'Bottoms-up' Approaches to Regional Modeling", <u>Journal of Policy Modeling</u>, Vol.6, No.3 (August 1984), pp.351-368.</p>		
Loke Weng-Kheong	Summer research training internship			(Summer 1977)

Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and Notes
V. Manion (Monash)	M.Ec.	"Regional Variations in Labour Force Participation Rates - Australia 1971", <u>Impact Preliminary Working Paper, BP-03, July 1976.</u> "A Disaggregated Model of Wage Determination", <u>Impact Preliminary Working Paper, BP-17, February 1979.</u>	Course work degree.	
M. McAleer (Monash/Queens)	Post-master's pre-doctoral internship	(a) "Dynamics in The Consumption Function - A Systems Approach to Employment Effects", <u>Impact Preliminary Working Paper, MP-02, February 1977.</u> (b) "Estimation of the Consumption Function: A Systems Approach to Employment Effects on the Purchase of Durables", <u>Impact Working Paper M-02, February 1979.</u>	Note: Professor A. Powell and Professor P. Dixon are co-authors of title (a). Mr. A. Lawson is an additional co-author of title (b). Title (b) appears as Ch.7 in E.G. Charatsis (ed.) <u>Proceedings of the Econometric Society European Meeting 1979: Selected Papers in Memory of Stefan Valavanis</u> (Amsterdam: North-Holland, 1981), pp.169-198.	
G.A. Meagher (Monash)	Ph.D	"Multiperiod Planning Models and General Equilibrium", <u>Impact Preliminary Working Paper SP-09, March 1977, pp.33.</u>	"A Multiperiod Multi-Sector General Equilibrium Model of the Australian Economy" (1978).	
B. Meltzer (Monash)	M.Ec.	"A Comparison of Some Effective Rate of Protection Calculations with the Results of a General Equilibrium Model", <u>Impact General Paper No. G-26, May 1980.</u>	Minor thesis: "A Comparison of Effective Rate of Protection Measures with ORANI Results" (1979).	
D.L. Ryan (Monash)	M.Ec.	"Effect of Ethnic Origin on Household Consumption Patterns in Australia", <u>Impact Preliminary Working Paper SP-10, June 1977.</u>	"Demographic Variables in an Expenditure System" (1976).	
R.M. Schmidt (Duke)	Ph.D	(with Allen C. Kelley) "Modelling the Role of Government Policy in Post-War Australian Immigration". <u>Economic Record, Vol.55, No.149 (June 1979), pp.127-135.</u>	Note: Mr Schmidt visited Impact with his supervisor, Professor Allen C. Kelley, during March 1979, to work on the research leading to the publication listed.	

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Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and	Notes
M.D. Smith (Monash)	Summer research internship	(with K.W. Clements) "Extending the Consumption Side of the ORANI Model", <u>Impact Preliminary Working Paper OP-38</u> , February 1983. (with K.W. Clements) "Estimates of the Generalized Working Model", <u>Economics Letters</u> , Vol.16 (1984), pp.171-175.	Mr. Smith held an initial summer research internship of the Faculty of Economics and Commerce at the University of Melbourne -- Summer, 1983.		
J. Sutton	M. Eng. (Opps. Research)	"The Solution Method for the ORANI Module", <u>Impact Preliminary Working Paper OP-05</u> , June 1976.	"Solution Techniques for the ORANI Model of the Australian Economy" (1978).		
Sirivardana (La Trobe)	Ph.D		Note: Dr. Sutton is a co-author of the North-Holland monograph on the ORANI Model (Dixon <u>et al.</u> , 1982).		
A.H. Tulipule (Melbourne)	Ph.D	(a) (with M.K. McIntosh) "BACHUHOO - An Economic-Demographic Module for Australia", <u>Impact Working Paper B-02</u> , May 1976	"A Computable General Equilibrium Model of the Colony of Victoria, 1880" (1985).		
		(b) "Estimation and Mapping of the Distribution of Income in Australia for the Impact Model", <u>Impact Preliminary Working Paper B-05</u> , November 1976.	"Factors affecting the Supply of Labour Hours in Australia" (1981).		
		(c) "Commodity-Specific Subsidies, Demand Patterns and the Incentive to Work", <u>Impact Preliminary Working Paper B-10</u> , November 1977; Published in <u>National Housing Conference 1978</u> (Canberra: Australian Government Publishing Service, 1980).			
		(d) "Empirical Estimation of Labour Supply Elasticities", <u>Impact Preliminary Working Paper B-12</u> , July 1978.			
		(e) (with A. Powell) "Estimates of Household Demand Elasticities for the ORANI Model", <u>Impact Preliminary Working Paper OP-22</u> , September 1978.			
		(f) "Revised Estimates of Labour Supply Elasticities", <u>Impact Working Paper B-12</u> , April 1980.			

Note: Professor A. Powell and Mr R Filmer are joint authors of title (c).

Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and	Notes
V. Manion (Monash)	M.Ec.	"Regional Variations in Labour Force Participation Rates - Australia 1971", Impact Preliminary Working Paper, BP-03, July 1976. "A Disaggregated Model of Wage Determination", Impact Preliminary Working Paper, BP-17, February 1979.	Course work degree.		
M. McAlleer (Monash/Queens)	Post-master's pre-doctoral internship	(a) "Durables in The Consumption Function - A Systems Approach to Employment Effects", Impact Preliminary Working Paper, MP-02, February 1977. (b) "Estimation of the Consumption Function: A Systems Approach to Employment Effects on the Purchase of Durables", Impact Working Paper M-02, February 1979.	Note: Professor A. Powell and Professor P. Dixon are co-authors of title (a). M. A. Lawson is an additional co-author of title (b). Title (b) appears as Ch.7 in E.G. Charatsis (ed.), Proceedings of the Econometric Society European Meeting 1979: Selected Papers in Memory of Stefan Valavanis (Amsterdam: North-Holland, 1981), pp.169-198.		
G.A. Meagher (Monash)	Ph.D	"Multiperiod Planning Models and General Equilibrium", Impact Preliminary Working Paper SP-09, March 1977, pp.33.	"A Multiperiod Multi-Sector General Equilibrium Model of the Australian Economy" (1978).		
B. Meltzer (Monash)	M.Ec.	"A Comparison of Some Effective Rate of Protection Calculations with the Results of a General Equilibrium Model", Impact General Paper No. G-26, May 1980.	Minor thesis: "A Comparison of Effective Rate of Protection Measures with ORANI Results" (1979).		
D.L. Ryan (Monash)	M.Ec.	"Effect of Ethnic Origin on Household Consumption Patterns in Australia", Impact Preliminary Working Paper SP-10, June 1977.	"Demographic Variables in an Expenditure System" (1976).		
R.M. Schmidt (Duke)	Ph.D	(with Allen C. Kelley) "Modelling the Role of Government Policy in Post-War Australian Immigration". Economic Record, Vol.55, No.149 (June 1979), pp.127-135.	Note: Mr Schmidt visited Impact with his supervisor, Professor Allen C. Kelley, during March 1979, to work on the research leading to the publication listed.		

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Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and Notes
M.D. Smith (Monash)	Summer research internship	(with K.W. Clements) "Extending the Consumption Side of the ORANI Model", <i>Impact Preliminary Working Paper OP-38</i> , February 1983. (with K.W. Clements) "Estimates of the Generalised Working Model", <i>ECONOMICS LETTERS</i> , Vol.16 (1984), pp.171-175.	Mr. Smith held an initial summer research internship of the Faculty of Economics and Commerce at the University of Melbourne -- Summer, 1983.	
J. Sutton	M. Eng. (Oppns. Research)	"The Solution Method for the ORANI Module", <i>Impact Preliminary Working Paper OP-03</i> , June 1976.	"Solution Techniques for the ORANI Model of the Australian Economy" (1978).	
Sirivardana (La Trobe)	Ph.D	(a) (with M.K. McIntosh) "BACHUHO - An Economic-Demographic Module for Australia", <i>Impact Working Paper B-02</i> , May 1976	Note: Dr. Sutton is a co-author of the North-Holland monograph on the ORANI Model (Dixon et al., 1982).	
A.H. Tulpule (Melbourne)	Ph.D	(b) "Estimation and Mapping of the Distribution of Income in Australia for the Impact Model", <i>Impact Preliminary Working Paper BP-05</i> , November 1976.	"A Computable General Equilibrium Model of the Colony of Victoria, 1880" (1985).	
		(c) "Commodity-Specific Subsidies, Demand Patterns and the Incentive to Work", <i>Impact Preliminary Working Paper BP-10</i> , November 1977; Published in <i>National Housing Conference 1978</i> (Canberra: Australian Government Publishing Service, 1980).	"Factors affecting the Supply of Labour Hours in Australia" (1981).	
		(d) "Empirical Estimation of Labour Supply Elasticities", <i>Impact Preliminary Working Paper BP-12</i> , July 1978.	Note: Professor A. Powell and Mr R Filmer are joint authors of title (c).	
		(e) (with A. Powell) "Estimates of Household Demand Elasticities for the ORANI Model", <i>Impact Preliminary Working Paper OP-22</i> , September 1978.		
		(f) "Revised Estimates of Labour Supply Elasticities", <i>Impact Working Paper B-12</i> , April 1980.		

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Student's Name (University)	Nature of Training	Papers Written in Association with the Project	Title of Thesis (year of submission)	and Notes
C. Vale (Monash) L.S. Williams (Monash)	Summer research training internship Ph.D	<p>(g) "Estimation of Elasticities of Supply of Labour Hours for Australian Workers Classified by Sex and Marital Status", <u>Impact Preliminary Working Paper Bp-23</u>, August 1980.</p> <p>(h) "Effects on the Supply of Labour Hours by Employees of Changes in their Conditions of Employment", <u>Impact Preliminary Working Paper BP-25</u>, December 1980.</p> <p>"Updating the 1968-69 Input-Output Table: A Report on the Collection of Data", <u>Impact Research Memorandum</u>, 1976.</p> <p>"A Cross Sectional Analysis of Inter-Occupational Mobility in Australia", <u>Impact Preliminary Working Paper B-06</u>, February 1978.</p>	(Summer 1976)	"Occupational Mobility in the Australian Workforce" (1980).
		<p>(a) "A Two Stage Approach to the Modelling of Inter-Occupational Mobility in Australia", <u>Impact Preliminary Working Paper BP-11</u>, March 1978.</p>		<p>Note: Title (a) has been published (in abbreviated form) in <u>Australian Economic Papers</u>, Vol.19, No.34 (June 1980), pp.147-154. Title (b) appeared in <u>Australian Bulletin of Labour</u>, Vol. 7, No.3 (June 1981), pp.139-173, and title (c) in <u>European Economic Review</u>, Vol.20 (1983), pp.143-46.</p>
		<p>(b) "The Demographic Characteristics of People who Change their Occupations: A Preliminary Examination of the Data", <u>Impact Preliminary Working Paper BP-15</u>, 1979.</p>		
		<p>(c) "Occupational Mobility in Australia: A Quantitative Approach", <u>Impact Working Paper B-13</u>, December 1980.</p>		

\* Not listed above are the following current higher degree candidates: C. Blampied (M.Com. Melbourne), I. Bruce (M.Com. prelim. Melbourne), M. Horridge (Ph.D. Melbourne) and R. Rimmer (M.Sc., La Trobe). Mr P. Adams (who is listed above) is now a Ph.D candidate (Melbourne).



APPENDIX 2

IMPACT PROJECT PAPERS  
1 February 1982 - 28 February 1985

Document Number (Issue Date)	Author/s	Title/Publication Details
R-04 (1984)	Peter B. Dixon, B.R. Parmenter, John Sutton and D.P. Vincent	<u>ORANI: A Multisectoral Model of the Australian Economy</u> (Amsterdam: North-Holland, 1982), pp.xvii + 372.
IP-14 (May 1982)	Alan A. Powell	Aspects of Labour Market Theory and Behaviour Highlighted by Impact Project Studies, Ch.7 in R. Blandy and O. Covick (eds), <u>Understanding Labour Markets</u> (Sydney: George Allen and Unwin, 1984), pp.137-165.
IP-15 (Aug 1982)	Russel J. Cooper and Keith R. McLaren	An Approach to the Macroeconomic Closure of General Equilibrium Models, pp.28.
IP-16 (Aug 1982)	Sheila M. Bonnell	A Preliminary Analysis of the Effects of Changes in the Occupational Structure in Australia on Employment by Sex, 1971-1976, pp.21.
IP-17 (Sept 1982)	Russel J. Cooper and Keith R. McLaren	Design of the ORANI-MACRO-BACHUROO Interface, pp.29.
G-37 (Feb 1982)	S.M. Bonnell and P.B. Dixon	The Impact of Structural Change on Employment of Migrants in Australia during the Seventies, Ch.4 in D. Douglas (ed.), <u>The Economics of Australian Immigration</u> (Sydney: University of Sydney Extension Programme, 1982), pp.13-20.
G-38 (Sept 1982)	Peter B. Dixon, B.R. Parmenter and Alan A. Powell	Farm Incomes in Australia and the Real Exchange Rate: ORANI Simulations with a Back-of-the-Envelope Explanation, pp.32.

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Document Number (Issue Date)	Author/s	Title/Publication Details
G-39 (1982)	P.J. Higgs, B.R. Parmenter, R. Rimmer and L. Liew	Incorporating Regional Dimensions in Economy-Wide Models: A Preliminary Report on a Tasmanian Version of ORANI, in R.E. Glass and K.B. O'Connor (eds), <u>Papers of the Australian and New Zealand Section Regional Science Association</u> , 6th Meeting, August 1981, pp.217-240.
G-41 (Sept 1982)	Peter B. Dixon, B.R. Parmenter and Alan A. Powell	Farm Incomes and the Real Exchange Rate in Australia : Evidence From the ORANI Model, pp.17; an abbreviated version appears in <u>Journal of the Australian Institute of Agricultural Science</u> , Vol.49, No.4 (1983), pp.203-206.
G-42 (Dec 1982)	Peter B. Dixon	The Solution Procedure for the ORANI Model Explained by a Simple Example, pp.17; forthcoming in D. Batten and P. Lesse (eds), <u>New Mathematical Advances in Economic Dynamics</u> (London: Croom Helm).
G-43 (Dec 1982)	Pamela J. Williams, Dennis Sams and Vin Martin	Preliminary Projections of Victorian Household Formation, pp.35.
G-49 (Dec 1982)	D.P. Vincent	The ORANI Approach to Quantitative Modelling of the Australian Agricultural Sector, <u>European Review of Agricultural Economics</u> , Vol.9, No.4 (December 1982), pp.415-442.
C3-02 (Aug 1982)	Peter J. Higgs and B.R. Parmenter	How to Compute a Johansen Style Solution with the Melbourne Version of ORANI 78, pp.74.

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Document Number (Issue Date)	Author/s	Title/Publication Details
C4-01 (Oct 1982)	Peter J. Higgs and B.R. Parmenter	Computing a Johansen Style Solution with ORANI 78 : Completing Aborted Simulations or Using Previous Solutions to Generate Additional Results, pp.19.
BP-28 (Feb 1982)	Pamela Williams and Dennis Sams	Household Formation : Implications for Australia's Future, pp.50.
BP-29 (May 1982)	Clive Brooks, Denis Sams and Lynne S. Williams	An Econometric Model of Fertility, Marriage, Divorce and Labour Force Participation for Australian Women, 1921/22 to 1975/76, pp.105.
BP-30 (May 1982)	Dennis Sams and Pamela Williams	Some Projections of Australian Population and Labour Force, 1980 to 2001, pp.63.
BP-31 (Aug 1982)	Andrei Rogers and Pamela Williams	A Framework for Multistate Demographic Modeling and Projection, in A.M. Isserman (ed.), <u>Population Change and the Economy</u> (Dordrecht: Kluwer-Nijhoff, 1985).
BP-32 (Sept 1982)	Dennis Sams	Occupational and Industrial Segregation of Female Employment in Australia : A Review, pp.66-92 in Mavis Hoy (ed.), <u>Women in the Labour Force: The Proceedings of A Conference</u> , Bureau of Labour Market Research Monograph Series, no.4 (Canberra: Australian Government Publishing Service, 1984).
BP-33 (Nov 1982)	Alan A. Powell, Dean J. Parham, Dennis C. Sams and Russell J. Rimmer	A Wage Responsive Disaggregation of Labour Supply, pp.62.
OP-34 (Aug 1982)	Leong H. Liew	Regional Disaggregation of a National Economic Model : The 'Bottoms-up' Approach, pp.68.

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Document Number (Issue Date)	Author/s	Title/Publication Details
OP-35 (March 1982)	Peter B. Dixon, B.R. Parmenter and Russell J. Rimmer	The Sensitivity of ORANI Projections of the Short-Run Effects of Increases in Protection to Variations in the Values Adopted for Export Demand Elasticities, in D.C. Hague (ed.), <u>Structural Adjustment in Trade Dependent Economies</u> (London: MacMillan, 1984), pp.317-354.
OP-36 (April 1982)	B.R. Parmenter	The IMPACT Macro Package and Export Demand Elasticities, <u>Australian Economic Papers</u> , Vol.22, No.41 (December 1983), pp.411-417.
G-40 (revised) (Aug 1983)	Peter J. Higgs, B.R. Parmenter and Alan A. Powell	The Scope for Tariff Reform Created by a Resources Boom: Simulations with the ORANI Model, <u>Australian Economic Papers</u> , Vol.23, No.42 (June 1984), pp.1-26.
G-44 (June 1983)	Dennis Sams and Pamela Williams	Demographic and Economic Influences on the Size and Composition of the Australian Labour Force, 1980-2000, pp.50.
G-45 (June 1983)	Dennis Sams and Pamela Williams	The Demographic Impact of Migration on the Future Growth of the Australian Population and Labour Force, pp.44.
G-46 (July 1983)	Peter B. Dixon, B.R. Parmenter and Alan A. Powell	Trade Liberalization and Labour Market Disruption, pp.26; forthcoming in <u>Journal of Policy Modeling</u> .
G-48 (Sept 1983)	Sheila Bonnell, B.R. Parmenter, R.J. Rimmer and Michael E. Scorgie	Modelling the Effects of Changes in Junior Wage Rates on Teenage Unemployment: How Far Can We Go with Available Data?, pp.27.
G-50 (Aug 1983)	B.R. Parmenter	Multiregional Modelling of the Australian Economy: Experience from the Impact Project. Paper presented to the Eighth Pacific Regional Science Conference, Tokyo, 17-19 August 1983, pp.35.
IP-18 (April 1983)	Russell J. Cooper	A Tariff Experiment on the Interfaced ORANI-MACRO System, pp.29.

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Document Number (Issue Date)	Author/s	Title/Publication Details
IP-19 (Sept 1983)	Alan A. Powell, Russell J. Cooper and Keith R. McLaren	Macroeconomic Closure in Applied General Equilibrium Modelling: Experience from ORANI and Agenda for Further Research, pp.60.
B-18 (Aug 1983)	Dennis Sams and Pamela Williams	An Economic-Demographic Model of Australian Population, Labour Force and Households, pp.97.
B-22 (Aug 1983)	Dennis Sams and Pamela Williams	The Impact Population Projection Facility: A Non-Technical Overview, pp.28.
OP-37 (Jan 1983)	Peter J. Higgs, B.R. Parmenter and Russell J. Rimmer	Modelling the Effects of Economy-Wide Shocks on a State Economy in Federal System, pp.30 + 7.
OP-38 (Feb 1983)	Kenneth W. Clements and Murray D. Smith	Extending the Consumption Side of the ORANI Model, pp.42.
OP-39 (May 1983)	Peter B. Dixon, B.R. Parmenter and Alan A. Powell	The Role of Miniatures in Computable General Equilibrium Modelling: Experience from ORANI, <u>Economic Modelling</u> , Vol.1, No.4 (October 1984), pp.421-428.
OP-40 (Oct 1983)	Philip Adams and Peter J. Higgs	The Disaggregation of Gross Operating Surplus for the Agricultural Sector of ORANI, pp.33.
OP-41 (Sept 1983)	G.A. Meagher, B.R. Parmenter, R.J. Rimmer and Kenneth W. Clements	Special Purpose Versions of a General Purpose Multisectoral Model: Tax Issues and the Australian Wine Industry, pp.39; a heavily abridged version is forthcoming in J. Whalley and J. Piggott (eds), <u>New Developments in Applied General Equilibrium Analysis</u> (New York: Cambridge University Press).

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Document Number (Issue Date)	Author/s	Title/Publication Details
OP-42 (Dec 1983)	Philip D. Adams	The Short-Run Behaviour of Agricultural Industries in ORANI 78 - Methodological Overview and Analysis of Base Year Data, pp.49.
OP-43 (Nov 1983)	K.R. Pearson and Russell J. Rimmer	Sparse Matrix Methods for Computable General Equilibrium Models of the Johansen Class, pp.40.
C5-01 (Feb 1983)	Peter J. Higgs and Russell J. Rimmer	How to Compute Regional Results with the Melbourne Version of ORANI, pp. 106.
B-33 (April 1984)	Alan A. Powell, Dean J. Parham, Dennis C. Sams, Huynh Cong Hiep and Russell J. Rimmer	A Wage-Responsive Disaggregation of Labour Supply, pp.68.
OP-44 (March 1984)	Philip D. Adams	How Responsive are Agricultural Industries in ORANI to Price Changes?, pp.28.
OP-45 (April 1984)	Philip D. Adams	The Typical Year Data Base for the Agricultural Sector of ORANI 78, pp.113.
OP-46 (April 1984)	Mark J. Horridge and Alan A. Powell	Long-Run Closure of ORANI: A Proposal, pp.109.
OP-47 (May 1984)	Russell J. Rimmer	The Long Term Effects of Improved Labour Productivity in the Australian Basic Iron and Steel Industry, pp.53.
OP-48 (May 1984)	Peter B. Dixon, B.R. Parmenter and Russell J. Rimmer	ORANI Projections of the Short-Run Effects of a 50 Per Cent Across-the-Board Cut in Protection Using Alternative Data Bases, pp.39; forthcoming in J. Whalley and T.N. Srinivasan (eds), <u>General Equilibrium Trade Policy Modelling</u> , Proceedings of the New York Conference, Columbia University, April 1984 (Cambridge, Mass.: MIT Press).

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Document Number (Issue Date)	Author/s	Title/Publication Details
IP-20 (May 1984)	B.R. Parmenter and G.A. Meagher	Policy Analysis Using a Computable General Equilibrium Model: A Review of Experience at the Impact Project, pp.38.
IP-21 (April 1984)	B.R. Parmenter	Major Themes in the Results of Papers Presented to the 1984 Conference on Trade Policy Modelling, pp.16; forthcoming in J. Whalley and T.N. Srinivasan (eds), <u>General Equilibrium Trade Policy Modelling</u> , Proceedings of the New York Conference, Columbia University, April 1984 (Cambridge, Mass.: MIT Press).
G-47 (April 1984)	Pamela Williams	Regional Economic-Demographic Modelling and Projection: Review of an International Conference, <u>Australian Journal of Statistics</u> , Vol.26, No.1 (April 1984), pp.45-57.
G-51 (May 1984)	S.M. Bonnell, T.C. Chew and Peter B. Dixon	Measuring the Impact of Structural Change on Groups in the Australian Labour Market, pp.343-359 in G. Steinmann (ed.), <u>Economic Consequences of Population Change in Industrialized Countries</u> (Berlin: Springer-Verlag, 1984).
G-53 (May 1984)	G.A. Meagher	An Empirical Analysis of the Effects of a Change in the Mix of Direct and Indirect Taxation on the Australian Economy, pp.170.
G-54 (Feb 1984)	Leong H. Liew	A Johansen Model for Regional Analysis, in <u>Regional Science and Urban Economics</u> , Vol.14, No.1 (February 1984), pp.129-146.
G-55 (July 1984)	Alan A. Powell	Real Wages and Employment: An Econometric View, <u>1984 Newcastle Lecture in Political Economy</u> , University of Newcastle, Department of Economics, pp.16; forthcoming in J. Hyde and J. Nurick (eds), <u>Wages Wasteland: Wages and Unemployment in Australia</u> (Sydney: Hale and Ironmonger, expected 1985).

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Document Number (Issue Date)	Author/s	Title/Publication Details
G-56 (July 1984)	Russel J. Cooper, Keith R. McLaren and Alan A. Powell	Short-Run Macroeconomic Closure in Applied General Equilibrium Modelling: Experience from ORANI and Agenda for Further Research, pp.30; forthcoming in J. Piggott and J. Whalley (eds), <u>New Developments in Applied General Equilibrium Analysis</u> (New York: Cambridge University Press).
G-57 (Oct 1984)	Peter B. Dixon and Alan A. Powell	Researching a Non-Experimental System: The Impact Models of the Australian Economy, pp.20; forthcoming in <u>Australian Quarterly</u> , Vol.56, No.4 (1984).
G-58 (Sept 1984)	Industries Assistance Commission	The ORANI Trade Parameters (Papers and Proceedings of the Canberra Workshop, April 1984), pp.134.
G-59 (Aug 1984)	Leong H. Liew	"Tops-Down" Versus "Bottoms-Up" Approaches to Regional Modeling <u>Journal of Policy Modeling</u> , Vol.6, No.3, August 1984, pp.351-368.
G-61 (1984)	M.D. Smith and K.W. Clements	Estimates of the Generalized Working Model, <u>Economics Letters</u> , Vol.16 (1984), pp.171-175.
OP-49 (Jan 1985)	Peter J Higgs	Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-78 Data Base, pp.180.
OP-50 (Feb 1985)	Mark Horridge	The Long-Run Closure of ORANI: First Implementation, pp.87 + 16 + 39.
OP-51 (Feb 1985)	Ian Bruce	The ORANI 78 Input-Output and Parameter File for 1977-78, pp.70.
OP-52 (Feb 1985)	B.R. Parmenter, K.R. Pearson and R. Jagielski	Bottoms-up, Tops-down and Hybrid Methods for Regionalizing Computable General Equilibrium Models: Some Comparisons, pp.50.



APPENDIX 3

EXAMPLES OF INSTITUTIONAL USE OF THE IMPACT MODELS

Note: Since the IMPACT models are fully in the public domain, many independent applications of them will not be known to their builders. The following listing therefore is, of necessity, partial. Most simulations listed below focussed on the economy-wide, sectoral, and employment implications of the item listed under 'Topic'. Many of the simulation studies were conducted, on behalf of the parties listed, by officers of the Industries Assistance Commission. Some users of the IMPACT policy information system have accessed segments of the data base in order to conduct heuristic analysis or analyses based on their own special purpose models. These are indicated below by DB in the 'Model/s' column.

Topic	Simulations made by, or on behalf of (date)	Model/s [Reference*]
Structural change	Industries Assistance Commission (1977)	ORANI [11]
Protection of commercial and four-wheel drive vehicles	Industries Assistance Commission (1978)	ORANI [12]
Overseas oil price increases and Australian petroleum pricing policy	Confederation of Australian Industry (1978) Department of National Development (1978,1979) Treasury (National Wage Case) (1980)	ORANI
Approaches to macroeconomic recovery	Sir John Crawford's Study Group on Structural Adjustment (1978)	ORANI [10]
Trends in world commodity prices	ditto	ditto
Expansion of mineral exports	ditto	ditto
Possible tariff restructuring	ditto	ditto
Price changes in the processed food products industry	Prices Justification Tribunal (1979)	ORANI
Changes in the price of sugar	Department of Business and Consumer Affairs (1979)	ORANI
Changes in world demands for meat	Bureau of Agricultural Economics (1979,1980)	ORANI
Increased road and rail transport charges	Bureau of Transport Economics (1979) National Road Freight Industry Enquiry (1984)	ORANI

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Topic	Simulations made by, or on behalf of (date)	Model/s [Reference]
Domestic aircraft production	Australian Government Aircraft Industry Study Group (1979), Hawker Siddeley (1983)	
Import content of investment by mining sector	Treasury (1980)	DB
Impact of foreseeable technological changes	Bureau of Industry Economics (1981)	SNAPSHOT [3] [4]
Protection of motor vehicle industry	Industries Assistance Commission (1981)	ORANI [14]
Protection of wood and wood products	Industries Assistance Commission (1981)	ORANI [13]
Demographic changes in the labour force	Industries Assistance Commission (1981)	BACHUROO [12]
Regional implications of economic change	Industries Assistance Commission (1981)	ORANI [15]
The influences of certain factors on national economic performance	Industries Assistance Commission (1982)	ORANI [16]
Population and household projections	Department of Housing and Construction, Victorian Government (1982)	BACHUROO [28]
The disruption of Australia's overseas trade	Department of Defence (1982)	ORANI [1]
The regional incidence of recommended changes in the Commonwealth Grants Commission's 'State Factors'	Tasmanian Centre for Regional Economic Analysis/Tasmanian Government (1982)	ORANI [23] [24]
Impact of manufacturing protection on agricultural sector incomes	Bureau of Agricultural Economics (1982)	ORANI [8] [27]

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Topic	Simulations made by, or on behalf of (date)	Model/s [Reference]
Assistance for the use of chemical fertilizers	Industries Assistance Commission (1982,1985) Bureau of Agricultural Economics (1984)	ORANI [17] [22] [2]
Import quotas, resource development and intersectoral adjustment	Bureau of Agricultural Economics (1982)	ORANI [9]
Electricity pricing	Ministry for Economic Development, Victoria (1982)	ORANI [26]
Approaches to general reductions in protection	Industries Assistance Commission (1982)	ORANI [18]
The incidence of drought	Bureau of Agricultural Economics (1983)	ORANI [7]
Protection of the iron and steel industry	Industries Assistance Commission (1983)	ORANI [19] [20]
Incidence of indirect taxes, Victoria	Department of Industry, Commerce and Technology, Victoria (1983)	ORANI [5]
Taxes on alcoholic beverages	South Australian Government (1983)	ORANI [25]
National milk products market	Industries Assistance Commission (1983)	ORANI [21]
Workers' compensation, Victoria	Department of Industry, Commerce and Technology, Victoria (1984)	ORANI [6]
Cost to farmers of protection in manufacturing	National Farmers' Federation (1985)	ORANI
Changes in mix of direct and indirect taxation	Economic Planning Advisory Council (1985)	ORANI
Immigration policy	Department of Immigration and Ethnic Affairs and Committee for Economic Development of Australia (1985)	BACHUROO and ORANI**

\* References (denoted [ ]) to this appendix are listed on pages 59 and 60.

\*\* A forthcoming report is cited in end note 44, p.39, above.

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APPENDIX 4

DETAILS OF IMPACT TRAINING COURSES  
1981-84

Note: All courses listed were held in Melbourne, under the auspices of the University of Melbourne. This Appendix does not cover internal training courses mounted by the Industries Assistance Commission and held in Canberra. All of the Melbourne courses were residential. The basic ORANI training course lasts ten days; the regional extension takes a further two days. The BACHUROO courses each lasted one week.

Table A4.1

STUDENT NUMBERS AT IMPACT TRAINING COURSES  
1981-84

Model	Student Composition				Total No. Students	Date
	Federal Government	State Governments	Educational Institutions	Impact Staff and other Participants		
ORANI	10	5	7	5	27	Nov 1981
BACHUROO	4	1	4	3	12	Nov 1982
ORANI	7	3	5	8	23	Nov 1982
BACHUROO	9	3	1	2	15	Sep 1983
ORANI	5	1	12	10	28	Nov 1984
Sub-Totals:						
ORANI	22	9	24	23	78	
BACHUROO	13	4	5	5	27	
Total:	35	13	29	28	105	

Table A4.2

INSTITUTIONAL SPONSORSHIP/AFFILIATION OF STUDENTS ATTENDING  
IMPACT TRAINING COURSES  
1981-84\*

Institution	Student Name	Course	Year
<b>A. Federal Government</b>			
<b>(i) PARTICIPATING AGENCIES:-</b>			
Bureau of Industry Economics	James Juniper	O	84
	Gordon Schmidt	O	81
Bureau of Labour Market Research	Steven Baker	B	83
	Clive Brooks	O	84
	Wendy Fisher	B	83
	Paul Inglis	B	82
	David Kalish	B	83
	Tom Karmel	O	84
	Lucio Krbavac	O	81
	Pat McMahon	O	81
	Frank Vella	B	83
	Lynne Williams	O	81
Department of Home Affairs and Environment	Alison Currie	O	81
Department of Immigration and Ethnic Affairs	Lyle Baker	O	82
	Shelley Cooper	B	83
	Bob Goddard	B	82
Industries Assistance Commission	Ian Bright	O	81
	Brook Bryce	B	82
	Phil Bubb	O	82
	Don Harding	O	82
	Gary Henry	O	84
	John Larum	O	82
	Dennis Lawrence	O	81
	Juan Merchan	O	82
	Barry Moore	O	82
	Herb Plunket	O	84
	Linda Richardson	O	81
	Lynne Thompson	B	83
<b>(ii) NON-PARTICIPATING AGENCIES:</b>			
Bureau of Transport Economics	Sue Watt	O	81
Department of Housing and Construction	Barbara Martin	B	82
	Mark Mussared	B	83
Department of Defence	Bernard Pailthorpe	O	82
	Sam Bateman	O	81
Institute of Family Studies	Terry Tremayne	B	83
Social Welfare Policy Secretariat	Catherine Crompton	B	83

TABLE A4.2 (ctd)

Institution	Student Name	Course	Year
<b>B. STATE GOVERNMENT</b>			
NSW:			
Department of Environment and Planning	Stephen Cardenzana	B	83
VIC:			
Department of Agriculture	Dan Norton	O	81
Department of Premier	John Rogan	O	81
Ministry of Economic Development	Bob Burke	O	81
Ministry of Employment and Training	Bruce Parr	B O	82 82
Department of Industry, Commerce and Technology	Tony Milanese	O	84
Technical and Further Education	Arvie Dobson	B	83
SA:			
Department of Environment and Planning	Linda Hart	B	83
Department of Industry Affairs and Employment	Ted Fedorowicz	O	82
WA:			
Department of Agriculture	John Roberts	O	82
Department of Resources and Development	Peter Giumelli	O	81
NT:			
Department of Chief Minister	Michael McCallum	O	81



TABLE A4.2 (ctd)

Institution	Student Name	Course	Year
<b>C. EDUCATIONAL INSTITUTIONS</b>			
Australian National University	Mohammed bin Salleh	0	84
	Adrian Pagan	0	81
La Trobe University	Sheila Bonnell	B	82
	Peter Dixon	B	82
	Allan Layton	0	82
	Godfrey Lubulwa	0	82
	Brian Parmentar	B	82
	Mahinda Siriwardana	0	81
	Leon Glezer	0	84
	Rom Jagielski	0	84
	S B Jayatilleke	0	84
Macquarie University	Russel Cooper	0	81
National Institute of Labour Studies	David Harrison	B	82
University of Melbourne	Tomasz Glowacki	0	81
	Jocelyn Horne	0	81
	Sue Jaffer	0	82
	David Johnson	0	84
	Ian McDonald	0	82
	Sam Ouliaris	0	81
	Vince Uris	0	84
	Don Watson	0	84
	University of New South Wales	Truong Truong	0
Ross Chapman		0	84
Nôrman Dudley		0	84
University of Queensland	Ross Drynan	0	84
	Jim Skinner	B	83
	Trevor Mules	0	81
University of Western Australia	Robert Fraser	0	82
Warrnambool Institute of Advanced Education	David MacKay	0	82
Western Australian Institute of Technology	Geoffrey Crockett	0	84

\*Training in-house of Impact staff, and private sector students, are excluded from this table.

APPENDIX 5

MEETINGS OF THE WORKSHOP IN APPLIED/COMPUTABLE GENERAL  
EQUILIBRIUM MODELLING, UNIVERSITY OF MELBOURNE,  
1984 AND FIRST PART OF 1985

<u>Date</u>	<u>Speaker/s</u>	<u>Topic</u>
13 Feb 84	Dr Ian S. Duff, Atomic Energy Research Establishment, Harwell, U.K.	An Introduction to Sparse Matrix Techniques
9 Mar 84	Dr Keith McLaren, Monash University; Dr Russel Cooper, Macquarie University; Professors Peter Dixon and Alan Powell, University of Melbourne	Symposium on Short-Run Macro- economics in ORANI
1 June 84	Dr Andrew Feltenstein, International Monetary Fund and University of Melbourne	A Computational Programme for a General Equilibrium Model Incorporating Financial Assets: Progress Report
15 June 84	Mr Mark Horridge, Industries Assistance Commission	Lon-Run Macroeconomic Closure for ORANI
12 Sept 84*	Professor Richard Harris, Queen's University, Ontario	Export Promotion in the Face of Entry Deterrents
28 Mar 85	Mr Ian Bruce, University of Melbourne	The Sensitivity of ORANI Projections to the Data Base Used

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<u>Date</u>	<u>Speaker/s</u>	<u>Topic</u>
3 April 85*	Dr Tony Meagher and Mr Brian Parmenter, University of Melbourne	Some Short-Run Effects of Shifts from Indirect to Direct Taxation
11 April 85	Dr Peter Cory University of Melbourne and Boston University; Mr Mark Horridge University of Melbourne	A Harris-Style Miniature Version of ORANI
18 April 85	Mr Peter Wilcoxon, University of Melbourne and Harvard University	Computable Models of Investment with Foresight
23 April 85	Mr Wolfgang Ernst, University of Melbourne	Optimised Economic Policy: A Feasibility Study on LP-MO, A Linear Programming Version of Miniature ORANI
2 May 85	Mr John Shannon, University of Melbourne and ANU	Sensitivity Analysis for Linearized CGE Models
9 May 85	Dr Russel Cooper, Macquarie University	Consumer Demand and Portfolio Choice
4 June 85 5 June 85	Professor Richard Harris, Queen's University	Reaction to Proposals by Cory and Horridge for a Harris-Style Australian Model
13 June 85	Mr Peter Higgs, La Trobe and Harvard Universities, and University of Melbourne	A Multi-Country Data Base for CGE Modelling

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\*Joint meeting with Faculty Seminar.

