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Economic Modelling and the National Strategy for Vocational Education and Training

by

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ABSTRACT

In 1994, the Australian National Training Authority (ANTA) was established by agreement between the Commonwealth, State and Territory governments. Central to the agreement is the National Strategy for Vocational Education and Training (VET) which is organized around the four main themes of responsiveness, quality, accessibility and efficiency.

To promote efficiency in the allocation of training resources, ANTA and a number of State government agencies responsible for VET planning take into account employment forecasts generated using the *MONASH* model of the Australian economy.

To promote responsiveness to the needs of industry, a network of industry training and advisory bodies (ITABs) has been set up. The ITABs' responsibilities include the development of "industry-credible, high-quality industry training plans as frameworks for identifying training needs in each industry, and for considering resource requirements".

In this paper we review some of the issues that arise in reconciling the information produced at these diverse levels of planning. In particular, we consider the role of the MONASH forecasting system as a planning framework for vocational education and training, and the caveats that must be borne in assessing the performance of the system in this role.

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ECONOMIC MODELLING AND THE NATIONAL STRATEGY FOR VOCATIONAL EDUCATION AND TRAINING

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1. Introduction

In 1994, the Australian National Training Authority (ANTA) was established by agreement between the Commonwealth, State and Territory governments. Central to the agreement is the National Strategy for Vocational Education and Training (VET) which is organized around the four main themes of responsiveness, quality, accessibility and efficiency.[1]

To promote efficiency in the allocation of training resources, ANTA and a number of State government agencies responsible for VET planning take into account employment forecasts generated using the *MONASH* model of the Australian economy.[2]

To promote responsiveness to the needs of industry, a network of industry training and advisory bodies (ITABs) has been set up. The ITABs' responsibilities include the development of "industry-credible, high-quality industry training plans as frameworks for identifying training needs in each industry, and for considering resource requirements".[3]

In this paper we review some of the issues that arise in reconciling the information produced at these diverse levels of planning.[4] Three ideas about the nature of the planning process are fundamental to our review. Firstly, it is mandatory that the future demand for labour of different types be forecast in one way or another. It takes time to conduct a training course. Furthermore, the skills that result are generally expected to retain their social usefulness for an extended period after the completion of the course. A decision to implement a training program must be informed by a view about the future, either explicitly or implicitly.

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[1] See Australian National Training Authority (1994).

[2] The MONASH forecasting system is described in Adams et al. (1994). Its application to forecasting employment by occupation is considered in Meagher and Parmenter (1995).

[3] See Australian National Training Authority (1994), p.8.

[4] The review has been prompted in part by the paper of Jackson (1995) and is, in some respects, a companion to that paper.

Secondly, training must be undertaken now. Whatever the deficiencies of the existing methods for projecting future labour demand, many decisions about training simply cannot await the creation of new methods to rectify those deficiencies. Hence efficiency in the provision of training services requires not only an ongoing commitment to improving our forecasting systems, but also a commitment to making the best use of the systems that are actually available at any point of time.

Thirdly, when disaggregated forecasts of labour demand by occupation and industry are added together, the resulting forecast of aggregate demand must be consistent with some plausible scenario for the macroeconomy. That is, forecasts of labour demand must be made with an economy -wide perspective.
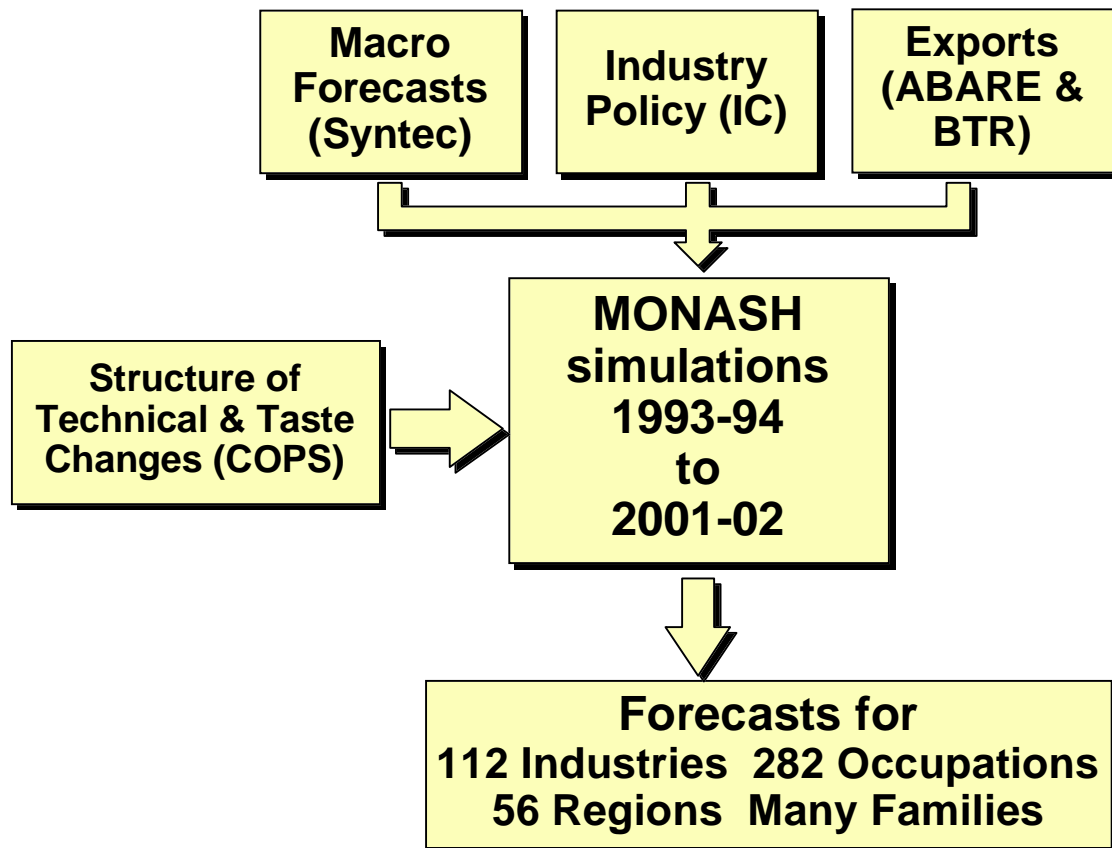
2. The MONASH Forecasting System

Since 1993, the Centre of Policy Studies (COPS) at Monash University has been preparing year-by-year forecasts for the Australian economy typically extending over a forecasting period of about ten years. The forecasting system used for this exercise is set out in Figure 1. Its centrepiece is a large dynamic general equilibrium model, the *MONASH* model.

A *MONASH* simulation takes as inputs:

- information about prospects for the macro economy provided by the commercial forecasting agency Syntec Economic Services;

- forecasts for export prices and volumes compiled by the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Bureau of Tourism Research (BTR);

- Industry Commission (IC) estimates of changes in protection implied by the industry policies of the government;

- estimates of future changes in technology and consumer tastes based on research undertaken by COPS.

As outputs, it provides detailed forecasts of output and employment by industry, occupation and region. In the sections that follow, we focus particularly on the occupational forecasts and their relationship with forecasts of training needs produced by the ITABs.

Figure 1. The MONASH Forecasting System

3. The MONASH System as a Planning Framework

The *MONASH* system provides a framework for planning the allocation of training resources in a number of ways. Firstly, forecasts about the future should be based on as much relevant information as possible about the past. *MONASH* relies primarily on data published by the Australian Bureau of Statistics (ABS), including the following:[5]

- Australian National Accounts, National Income and Expenditure,
- Australian National Accounts, Input Output Tables,
- Australian National Accounts, Input Output Tables, Commodity Details,
- Australian National Accounts, State Accounts,
- Australian National Accounts, Capital Stocks,
- Census of Population and Housing,
- Foreign Trade Statistics,
- Income and Housing Survey,
- Household Expenditure Survey,
- Labour Force Survey.

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[5] Details can be found in Australian Bureau of Statistics (1995).

In many cases, very detailed (and very expensive) material is prepared by the ABS especially for the system.

Clearly, large amounts of data from many sources can be brought to bear on the forecasting process via *MONASH*. Moreover, because it is a formally specified system, it requires all these data to be consistent with each other. Any inconsistencies that exist in the primary sources must be reconciled before the data can be included. The *MONASH* database is *coherent*, and it is this characteristic which makes the system especially powerful as a framework for organizing data.

As well as data about the past, formal or model-based forecasts must rest upon informed opinion about future changes in variables that are exogenous to the model. *MONASH* forecasts incorporate the views of many expert bodies, the more important of which are indicated in Figure 1. Moreover, *MONASH* is quite adaptable in this regard, and can accommodate more detailed exogenous forecasts as they become available. It can also produce alternative forecasts corresponding to competing views about the future. However, just as for historical data, all opinions formally incorporated in a particular forecast must be consistent with each other. A forecaster using *MONASH* must either seek a consensus between the expert bodies involved in forecasting the exogenous variables or impose his/her own judgement to resolve any outstanding differences before the forecast can proceed. In other words, the *MONASH* system provides a framework for coordinating much (but by no means all) valuable opinion about the future that bears on the training issue.

The system is also used in a much more informal way as an aide to coordinating forecasts of industry training needs prepared by industry training advisory bodies. In determining these needs, ITABs typically rely, not on formal modelling, but on digesting quantitative and qualitative information about their industries from a variety of sources. An important role of the ITABs in this process is to represent the views of their industries, a role that has been described recently as follows:[6]

"As the forums through which industries express their education and training needs, ITABs are well placed to articulate (industry) advice to state and national training authorities through formal instruments such as training plans and profiles. As industry consultation is a core role built into all the activities of ITABs, it is possible to develop, with adequate resources, a comprehensive profile of industries' expressed training needs by working with industry on an ongoing basis. Some research methodologies deployed by ITABs include industry meetings and forums, structured interviews, training needs analyses, industry surveys and questionnaires, and functional analysis. Enterprise based projects can also provide invaluable qualitative data about VET needs and the training environment in business. ... The effectiveness of such qualitative research is largely dependent on the extent to which industry needs, as expressed by industry, can be tapped, interpreted and integrated."

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[6] See Jackson (1995), p6.

This role of the ITABs is designed to meet the requirement that the National VET Strategy be responsive to the needs of business, and hence it constitutes an essential component of the Strategy. However, if the Strategy is to be efficient, it cannot simply rely on the needs expressed by business via the ITABs as a basis allocating training resources. Because these needs are typically determined independently for each industry, there is no presumption that they reflect a common view about the likely evolution of the economy as a whole, and hence there is no presumption that they will form a coherent plan for the economy as a whole. Indeed, to the extent that individual ITABs (and their advisers from industry) must compete against each other for a limited pool of training funds, there will be a tendency for training needs to be overstated. Just as it is essential for the Strategy to be responsive to the needs of business as expressed by business, it is also essential that it incorporate a mechanism that coordinates these expressed needs into a coherent whole.

At present, the mechanism adopted by state and national training authorities (including ANTA) for this purpose is an informal one that relies in part on *MONASH* forecasts of employment by occupation and region. As we have already noted, the *MONASH* system does have the virtue of producing coherent forecasts but, as a mechanism for coordinating the views of the ITABs, the system is capable of considerable improvement. The fundamental problem is that insufficient linkages have yet been established between the "top down" forecasting methodology employed by *MONASH* and the "bottom up" methodology employed by the ITABs. As a result, some ITABs perceive the two methodologies to be competing rather than complementary, and are inclined to adopt a negative position with regard to the *MONASH* system. In our view, many of the reservations that have been expressed are not well founded and constitute an unnecessary barrier to the creation of the required linkages. This issue is important for the future of the VET Strategy and is taken up in some detail in the next section.

4. Assessing the MONASH System

4.1 Explaining Model Results

Formal modelling has an advantage over other forms of forecasting (such as distilling expert opinion) in that its projections can always be totally explained in terms of its theory and data. The *MONASH* model and its antecedents have been "explained" in numerous books, refereed journal articles, training courses, and formal presentations to national and international conferences, as well in innumerable informal written and oral communication with commercial clients and other interested parties.

As a general proposition, the modelling team at the Centre of Policy Studies (COPS) aims to explain results in whatever level of detail the user requires. However, the explanation process imposes significant costs on the user as well as the provider. It is a fact of life that the results of a sophisticated economic model can only be explained in detail to a person who is prepared to make a considerable effort to master the explanation and is prepared to bear the associated cost. On the other hand, model builders cannot demand that users accept their models as black boxes, and they must stand prepared to provide detailed explanations if required. Indeed, a user should be very suspicious of any model builder who is not so prepared.

Although very detailed explanations are very costly to provide and to receive, it is also true that *MONASH* forecasts can be usefully understood at many different levels of detail. At present there is no regular forum for explaining *MONASH* forecasts directly to the ITABs, although some are usually represented at biannual briefings given to the state training authorities. In June 1994, an additional round of briefings specifically for ITABs was organized by ANTA and conducted by the author. In these presentations, time did not allow forecasts for each ITAB to be analysed separately, a circumstance that apparently led the representatives of some ITABs to conclude that such analyses are not possible. While this conclusion is clearly unwarranted, there does seem to be plenty of scope to provide the ITABs with better information about what *is* possible and at what cost.

4.2 The Development Process

The MONASH forecasting system is a system under development and this characteristic should be taken into account in assessing its performance. Clearly, its forecasts must be revised whenever a methodological improvement is made, but it would be quite inappropriate to conclude that the forecasts are unreliable because of such revisions. The timing of developments is dictated by research priorities, and the omission of a particular factor from the system at any point of time should not be taken to imply that its inclusion is thought to be undesirable or unmanageable.

In terms of forecasting employment by occupation, the role of changes in the distribution of employment across occupations within an industry (the *occupational share effect*) provides an excellent example of this point. Two things can be said with confidence about this effect: firstly, its magnitude can sometimes be very large and, secondly, its magnitude is very uncertain. To date, *MONASH* forecasts have abstracted from the occupational share effect, not because it is considered to be of no consequence or because it cannot be handled within the *MONASH* framework, but because the relevant research on its nature has not yet been completed. It follows that the user of current *MONASH* occupational forecasts must make his/her own allowance for the occupational share effect. This is undoubtedly a tall order, but it is no less true for that.

More generally, forecasts generated with a formal system are always conditional on the assumptions incorporated in that system and cannot be taken as absolute. It is ultimately the user's responsibility to understand their limitations and to make appropriate adjustments on the basis of any other information that is available. In other words, the *MONASH* forecasts are properly regarded as a framework for detailed planning at the ITAB level. Of course, if the qualifications that apply to a set of forecasts become too pervasive, the forecasts may cease to effectively inform the user's judgement. However, as far as the occupational share effect is concerned, the current *MONASH* forecasts provide precisely the right base from which to make the required (and admittedly uncertain) extrapolations.

One other point is worth making in this context. We have remarked above that formal forecasts are conditional on the assumptions made in

generating them. This should not be taken to imply that informal forecasts somehow manage to avoid making assumptions. The difference between the two generally lies in whether the assumptions are explicit (as they must be in a formal forecast) or remain unstated (as they often are in an informal forecast). Thus, if the occupational share effect is an important determinant of employment by occupation in the real world, any forecast of employment by occupation must - explicitly or implicitly - embody some assumption about the effect even though the forecaster may be unaware of its very existence. This truth is not well understood by some commentators who take great exception to stated assumptions but are apparently unconcerned by comparable unstated assumptions. Indeed, the necessity that its assumptions be explicit is a strength of formal analysis, rather than a weakness, because it allows the user to make amendments to the forecasts (via sensitivity analysis, for example) if he/she prefers alternative assumptions.

4.3 Economy-wide Modelling and Aggregation

It is fundamental to the *MONASH* approach to occupational forecasting that it should be conducted in an economy-wide context. Developments in the macroeconomy, including the business cycle, can be expected to affect the demand for all occupations. Developments in one industry affect the prospects for others via backward and forward linkages. Hence a body like ANTA, with responsibilities for planning the allocation of training resources across many ITAB areas, must have an economy-wide perspective. Similarly, a particular ITAB must try to take into account all economic changes that affect its own area no matter how indirect the transmission mechanism. A formal economy-wide model is an essential input into this planning process.

Any economy-wide multisectoral model relies on an input-output table as its primary data component. In Australia, the most detailed input-output table currently compiled by the ABS contains about 110 industries. It is this which conditions the number of industries included in the *MONASH* model.

Among economy-wide models, both locally and internationally, the amount of detail supplied by *MONASH* is outstanding. Nevertheless, the level of aggregation is not ideal for all purposes. Some ITABs find the *MONASH* categories to be very broad compared with their other sources of information, and hence to be of limited usefulness in suggesting precisely what kind of training they should aim to provide. They would like to see *MONASH* projections extended to a classification of occupations much more detailed than the one currently employed. Similarly, some ITABs are unimpressed by an analysis in which their industry has been lumped together with other industries and assumed to behave like the average of the resulting aggregate. These objections are well founded, but simply to point to their existence is not to establish that economy wide models are undesirable as planning tools or that the *MONASH* model is an undesirable variant of the genre. Both propositions are denied by other considerations we have canvassed. Rather, it is to flag those elements of the *MONASH* system that are most urgently in need of development from the point of view of the relevant ITABs.

The level of aggregation in *MONASH* reflects the data available in Australia to support an economy-wide model. Increasing the amount of detail included in the model will depend on accessing new data sources. As it turns out, the recent purchase of the *Commodity Details* matrix from the 1989-90 input-output table by COPS will alleviate some of the current aggregation problems, especially in the service sector. Beyond that, progress will require a significant research effort to determine the cost and sales shares of ITAB sectors not separately identified in the input-output table. The effort required is likely to be significant because the more readily available sources of data have already been accessed. However, such projects are potentially very important to the National VET Strategy because they offer opportunities for collaborative research between the *MONASH* modellers, officers of ANTA and officers of the interested ITABs. That is, they are capable of providing a vehicle for establishing the linkages necessary for the *MONASH* system to realize its potential as a planning framework for the ITABs.

4.4 Forecasts and History

When making forecasts about the future, it is always a good idea to keep a close eye on the past. Indeed, the database for the *MONASH* model is derived in part from a major review of developments in the Australian economy during the period 1986-87 to 1990-91[7]. However, *MONASH* forecasts of employment by occupation have sometimes been criticized on the grounds that they are inconsistent with historical experience. The following is a typical example made in the context of arts-related occupations:[8]

"... we run into problems when comparing Monash employment growth analyses to other data. Monash predicts an annual employment growth rate of 2.14% for photographers. Census data shows the employment growth rate of photographers at only 0.1% and the monthly labour force figures over 1986 to 1992 show their growth rate to be -0.6%. For other occupations, the figures are reversed, with the census and monthly labour force statistics showing major employment growth and the Monash model showing negligible growth. The Monash model's reversal of the trends shown by major statistical collection methodologies such as the census and the ABS monthly labour force statistics requires further explanation."

This sort of criticism is predicated on the false idea that the historical data on employment by occupation can be reliably encapsulated in a single growth rate figure. In reality, employment growth varies widely over time and history usually gives us a variety of figures from which to choose. Table 1 shows employment growth rates for arts-related occupations over the period 1986-87 to 1993-94. The growth rates are calculated from quarterly Labour Force Survey data using the same methodology as the critic cited above. For the period 1986-87 to 1991-92, the rate for *Photographers* is -0.7% per annum, i.e., approximately the same rate as that quoted by the

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[7]   The project is reported in Dixon and McDonald (1993). An extension of the analysis to occupations is contained in Meagher (1994).

[8]   See Jackson (1995), p.12.

critic.　However, as more recent data are added and as older data are deleted, the rate increases. If we use the 6-year period 1988-89 to 1993-94, rather than the 6-year period 1986-87 to 1991-92 used by the critic, the growth rate is 5.2% rather than -0.7%. That is, by the standards of the critic, the *MONASH* forecast for *Photographers* is too low rather than too high, and the call for "further explanation" as to why the forecast rate is so *high* is quite inappropriate. An examination of the growth rates for the other occupations in the table reveals that the situation for *Photographers* is by no means unique.

If MONASH forecasts were shown to be in serious conflict with the historical record, the criticism would be significant and the forecasts would need to be revised. However, such a demonstration is not straight forward and a casual analysis is unlikely to withstand thorough scrutiny.

Table 1. Average Employment Growth Rates, Arts Related Occupations, Per Cent Per Annum

Code	Occupation	1986-87 to 1991-92	1986-87 to 1992-93	1986-87 to 1993-94	1987-88 to 1993-94	1988-89 to 1993-94
2801	Painters, sculptors and related professionals	8.612	7.045	4.259	0.788	-0.740
2803	Photographers	-0.733	1.247	0.996	3.552	5.191
2805	Designers and illustrators	2.947	3.664	4.262	4.317	4.681
2807	Journalists	0.957	0.130	1.423	1.628	0.440
2809	Authors and related professionals	7.374	5.894	7.126	10.433	8.621
2811	Film, television and stage directors	3.021	-0.308	-3.464	-7.766	-7.903
2813	Dancers and choreographers	9.531	9.166	4.500	-3.648	-0.481
2815	Musicians, composers and related professionals	-2.911	-0.351	-0.182	0.440	0.494
2817	Actors and related professionals	5.505	4.727	1.928	1.267	-3.174
2819	Announcers	8.523	5.661	3.861	2.312	4.525
2800	Artists and related professionals	2.338	2.331	2.307	2.213	2.010
4925	Craftworkers	2.669	4.478	3.326	3.722	5.105

5. Summary

In this paper we have argued that:

- Forecasting is an essential element of the National VET Strategy.
- The need for forecasting is immediate and, at any point in time, the best use must be made of existing forecasting tools.
- The efficient allocation of training resources requires an economy-wide forecasting perspective, such as that provided by the *MONASH* forecasting system.
- The *MONASH* system provides a powerful framework for coordinating data, expert opinion and independent ITAB assessments of industry training needs.
- The *MONASH* will not achieve its full potential unless better linkages are established between its "top down" methodology and the "bottom up" methodology of the ITABs.
- The establishment of the appropriate linkages would be facilitated by collaborative research projects involving representatives of the MONASH modelling team, ANTA and individual ITABs.

References

Adams, P.D., P.B.Dixon, D.McDonald, G.A.Meagher and B.R.Parmenter, (1994), "Forecasts for the Australian Economy Using the MONASH Model", *International Journal of Forecasting*, 10, 181-189.

Australian Bureau of Statistics (1995), *Catalogue of Publications and Products*, Catalogue No. 1101.0.

Australian National Training Authority (1994), *A National Strategy for Vocational Education and Training*, Brisbane.

Department of Employment, Education and Training (1991), *Australia's Workforce in the Year 2001*, Canberra.

Dixon, P.B. and D.McDonald (1993), "An Explanation of Structural Changes in the Australian Economy: 1986-87 to 1990-91", Background Paper No. 29, Economic Planning Advisory Council, June.

Jackson, T. (1995), "Skills for the Future: Targeting Resources to Industry Needs", paper presented to the conference on Vocational Education and Training: Towards a Skilled Australia, Brisbane, 8-10 February.

Meagher, G.A. and B.R. Parmenter (1995), "Future Workforce Skills: Projections with the MONASH Model", paper presented to the conference on Vocational Education and Training: Towards a Skilled Australia, Brisbane, 8-10 February.

Meagher, G.A. (1994), "Structural Change and the Dispersion of Earnings", paper presented to the 23rd General Conference of the International Association for Research in Income and Wealth, New Brunswick , Canada, August.