# ECONOMIC GROWTH RESEARCH IN NEW ZEALAND: THE FATHERS THAT BEGAT US

Filed under: History of Ideas, Methodolgy, Philosophy, Statistics, Growth & Innovation — Brian Easton at 11:38 am on Wednesday, July 1, 2009
*Paper to the 50th Anniversary Conference of the New Zealand Association of Economists: 1 July, 2009: Wellington.*

**Keywords**: Growth & Innovation; History of Ideas, Methodology & Philosophy; Statistics;

This paper looks only at the first 25 years of the New Zealand research program on economic growth. It focuses on the empirical analysis but refers to the one significant contribution to theory. The paper does not pay much attention to the policy issues, except as they impacted on, or illustrate, the scientific issues. I have included the principal lessons I learned from the research, as a way of illustrating its novelty; much which was original then has been incorporated into the conventional wisdom, some has been forgotten. [1] As George Satayana said 'those who cannot learn from history are doomed to repeat it.' [2]

It is the pioneers who should not be forgotten. The subtitle of this paper is 'the fathers that begat us'. Thus the paper is a contribution to the 50th Anniversary Conference of the New Zealand Association of Economists, for the key players in the research program were involved with the Association all those years ago. [3]

That the research program on growth commenced only about fifty years ago may seen surprising, but that is because the theory was then fundamentally different because there was not much data, and in any case it focussed only on the role of capital. Given the central role of diminishing returns in economics – Paul Samuelson reminds us it is a consequence of the laws of thermodynamics – economic growth based entirely on capital intensification must ultimately stagnate, a view that was common through most of the history of economics.

Among the stagnationists were Thomas Malthus, David Ricardo, Karl Marx, Maynard Keynes and Joseph Schumpeter. Initially, reflecting the economy of the times, Malthus and Ricardo had economic progress choked off by diminishing returns on land. The economy evolved and Marx's stagnation arose from diminishing returns from capital; Keynes talked about the 'euthanasia of the rentier'; Schumpeter thought that capitalism would be replaced by socialism. Each's theory allowed there would be some lift in economic standards from various effects – such as trade and specialisation (Adam Smith's contribution) – but eventually the economy would reach a point where additional capital would not produce significant additional output, and there would be stagnation – except Malthus expected population growth to exhaust those gains

earlier.

Fifty years ago little attention was given. to the classical account of economic growth in the economics taught at New Zealand universities. A few years later I attended two. Our introductory text, Samuelson's *Principles* (4th edition), did not have a section on economic growth, while the only growth economist I can recall was Evsey Domar. There were a number of courses on development economics, about how the poorer countries of the world could raise their living standards to that of the rich world. There were also related topics such as industrial economics.

The omission reflected the state of the subject. In 1952 in a survey of the economics of growth commissioned by the American Economics Association, Moses Abramovitz, contrasted growth theory with the other parts of economics, arguing that, unlike them, 'the problem of economic growth lacks any organised and generally known body of doctrine whose recent the subject … In spite of a continuing interest which began very early, the question has remained on the periphery of economics.' [4]

Yet between Malthus's *Essay on the Principle of Population* and Schumpeter's *Capitalism Socialism and Democracy* the per capita GDP – material output per person – of Western Europe grew about 1.1 percent per annum or about 5 times in 150 years. [5]

There are a couple of lessons here. The first is that there is much criticism of economists that their theories say that economic growth is inevitable. For over three-quarters of the profession's life that is simply not true. The second lesson is that. despite a host of eminent economists being stagnationists. economies nonetheless grew, a humbling reminder that perhaps economists dont have much influence on economic growth.

The phase of a 'lack of doctrine' came to an end in 1957 with the publication of Robert Solow's seminal 'Technical Change and the Aggregate Production Function'. [6] Like most great scientific revolutions it depends on newly developed data – in this case long run data sets of GDP, capital and labour and so on.

The essence of Solow's finding was that while capital per man-hour had increased 31 percent in non-farm America between 1909 and 1949, non-farm GNP per man-hour had increased 105 percent. This is not what one would expect if there was a diminishing marginal efficiency of capital (which Solow sneaked in via an aggregate Cobb-Douglas production function). So there had to be something else which was driving economic growth. Solow famously attributed to technical change , but saying 'I am using the phrase 'technical change' as a shorthand expression *for any kind of shift in* the production function. Thus slowdowns, speedups, improvements in the education of the labour force, and all sorts of things will appear as 'technical change'.

(original's italics)

Thus his 'technical change' was just a label for what today we call 'multi-factoral productivity' and which Tommy Balogh and Paul Streeten called 'the coefficient of ignorance'. [7] In the fifty years since the classic paper, there has been no convincing comprehensive measurement of the impact of the effects which contribute to this residual – say in contrast to the conclusion that around 20 percent of the growth of output per worker was due to increasing capital intensity.

The consequence has been that policy analysts have been left with little that they can be sure contributes to economic growth above that which capital formation does. Over the years a host of policies on what might explain the residual have been proposed and pursued.

A particular weakness has been that the subtlety of Solow's analysis has been lost on many who would seize upon it to promote their special interest – the best known example being the claim it is all due to 'technology', used with a far more specific meaning than Solow defined, and which leads to demands to increase spending on the special interests. Much of this approach seems to be to aimed at increasing the coefficient of ignorance, and the advocates certainly seem to have the necessary prerequisite.

One cannot but observe that economic growth seems to happen largely independent of the policies which are pursued. That does not mean that the growth path cannot be damaged ; one instances the Xhosa people who, following prophecies, slaughtered their cattle and destroyed their crops in the belief that there would be a millennium of abundance rejuvenation, the return of the dead and the dispersion of the Whites, thus leading to the destruction of their economic base, poverty and servitude. [8] However it is sobering that for half a decade after Solow, there have been prophets disguised as economists who have promised to accelerate the rate of economic growth, but there is no evidence that any of their nostrums have worked.

**Horace Belshaw (1898-1962)**

Of course, there are rarely decisive breaks in intellectual development, something which Horace Belshaw's last book *Population Growth and Levels of Consumption, with Special Reference to Countries in Asia* (1956). reminds us. Belshaw, whom I never met, was a generation older than the economists we are about to consider, dying in 1962 at the age of 64 having been a leading New Zealand economist for the preceding thirty years, including chairing the inaugural meeting of the NZAE.

As the book title indicates, Belshaw was primarily, but not exclusively, concerned with underdeveloped countries, and his chief concern was population control. His

development mechanism is capital intensity but he devotes an entire chapter to 'innovation and growth some requirements', largely influenced by Schumpeter. However innovation is not treated as important as, say, improving the quality of the labour force (as well as capital and social organisation).

I think it would be fair to say that Belshaw's instincts were that innovation had a role to play but he was not certain of their importance and, in any case in an underdeveloped country the issue was getting better technology rather than new technology.

**John (Jack) Victor Tuwhakahewa Baker (1913 -2009)**

Given that Solow was dependent upon the data base for his insights, it is appropriate to begin the New Zealand story with Jack Baker who became one of the great Government Statisticians (1958-1969). He was a founding member of the Association and subsequently a president. Because he was a public servant, some of his contributions are anonymous, while it is possible to attribute to him some work which was done by others, for statistics development is often a team effort.. [9] So it was John Kominik who developed the National Accounts and Jim Rowe (probably) who developed the first input-output tables.

Jack was not the first official New Zealand statistician involved in the estimation of aggregate economic production. There are nominal estimates in the *New Zealand Official Year Book* for the 1930s, when he was not in the Department of Statistics. Colin Clark probably had some influence on them.

The first official set of national accounts were derived by Dudley Seers who was working in the Prime Ministers Department during the war, before he returned to Britain. He once told me (with a gleam in his eye) that since social security taxes were levied on incomes consistent with those used in national accounts he simply grossed up the receipts to get the income side [10] The expenditure side was estimated conventionally by spending, except that private consumption was the residual to balance incomes with expenditure. [11]

Subsequently, the Department of Statistics took over the estimating National Accounts. It also produced Input-Output Tables for 1952/3 and 1954/5 (and later), which were also to play an important role in the economic growth research program. Initially, as for the Seers estimates, the accounts were nominal [12] However the *Economic Surveys* for 1960 and 1961 tabulated volume estimates of GNP back to 1949/50, estimated on the expenditure side [13] It is not evident who did them – the *Economic Survey* was issued in the name of the Minister of Finance, and presumably prepared by the Treasury. The statistics may have been calculated by the Department of Statistics, although they dont appear in its *Yearbook*.

Shortly after, a volume series for GNP, GDP, and GDE estimated from production side beginning in 1954/5. began appearing in the *Monthly Abstract of Statistics*, although it did not get the official imprimatur of the *Yearbook* until 1968. [14], [15]

While it is a truism that National Income equals National Expenditure equals National Product if a consistent set of prices are used, the various prices relate differently over time so that the aggregates do not equal one other when they are measured in constant prices. This is particularly troubling when the terms of trade change, because the value of an export in the production account is different from its value in the expenditure account, since a rise (say) in export prices relative to import prices enables the purchase of more imports for a given volume of exports, and hence greater expenditure.

Because the terms of trade suffered from substantial volatility, this was a prominent concern to the New Zealand economists of the day. [16] The issue became especially important in the Arbitration Court during general wage order hearings, for wages were set in relation not to productivity bu effective productivity, that is adjusted for the change in purchasing power as a result of the terms of trade. So the Government Statisticians appeared before the Court, and the Department of Statistics, published tables in the *Monthly Abstract* to explain this.

More generally, the consequences of terms of trade change on the measurement of aggregate output was one of a number of alerts I experienced as a student and researcher in the early 1960s, which told me that sectoral prices were important, and therefore sectors were important. It is perhaps not an accident that many years later, it was a New Zealand economist who drew the OECD's attention to the fact that they were measuring income and not production in their international purchasing power comparisons.

Another alert was Jack Baker's half year course in economic statistics at Victoria University. in which covering the construction of price indexes, he showed that prices increases were all over place and the index was a weighted average. That meant, of course, a different weighting including for a sub-aggregate, could give a different price index path.

Much of what Jack Baker taught us is now a part of the canon. Alas some has been forgotten.

**Conrad Alexander Blyth (1928-)**

Solow provided a theory based on the data. The major conduit of that theory to New Zealand was Conrad Blyth, who returned in 1960, after a PhD in capital theory at Cambridge University. to become the first director of the NZ. Institute of Economic

Research.


The NZIER's first research paper was Conrad's *Economic Growth: 1950-1960* (1960), prepared shortly after he arrived. It uses the *Economic Survey* data to evaluate economic growth in the decade, observing that national output had grown 3% p.a. and labour productivity 1.2% p.a. in the decade. It also estimates growth by sector concentrating on manufacturing and farming, the balance between them being a major policy issue at the time. [17]


The paper is pre-Solow, concerned only with the capital contribution to growth. [18] It paid particular attention to the balance between the agriculture and manufacturing sectors, which was a focus of much of the public policy debate at the time; protection – in particular the degree of protection to be applied to domestic manufacturing.


The paper's focus on capital was not alone. The following year the recently established Monetary and Economic Council published *Economic Growth in New Zealand* (1962) – the first substantive report after a current economy situation one in 1961 Its Appendix C on 'Causes of Slow Growth in New Zealand' lists 'growth as a neglected objective', instability and inflation, imports and growth, capital problems (four are identified), industrial structure and stage of development, transport incentives, taxation, and restrictive practices and regulations – almost all today's usual suspects. Those missing are those which Solow would have labelled 'technology'. (While it is difficult to identify exactly, the climacteric, the point at which New Zealand's growth rate began decelerating, seems to have been about the same time as the Council deliberated, another example of how little impact economic growth policy pronouncements have on actual outcomes.)


The same pre-Solow is evident in the Budget statements of the time which concentrate on the role of capital in growth. It may be wrong to attribute this entirely to the Minister of Finance, Harry Lake; it presumably reflected Treasury advice. [19]


Conrad wrote that his first paper was an agenda for research. in his valedictory research paper *Strategic Factors in New Zealand's Economic Growth: 1965 to 1975* (1965) before leaving the NZIER (to go to Australia and Britain). It reflects Solow's insights including an Appendix 'Technical Progress and Economic Growth.


As a research assistant at the Institute from 1963 to 1966, I do not recall ever thinking about a production function with labour and capital which omitted technical progress. I wonder too, whether that was where the importance of sectoral differences first came to my attention, although input-output tables and Chenery and Clark's *Industry Economics* (1959) – prescribed for development economics courses – would also have been influential, as would also relative prices.

Between his first and valedictory papers Conrad ran a research program on growth including involving Colin Gillion, Paul Hamer and Kerry McDonald, as well as directing the Institute. [20]  However one project which led to the Blyth-Crothall linear programming model was particularly important. As Conrad records

'I think the development of my LP model went something like this: In Cambridge I was thinking about the incorporation of the terms of trade into a GE model suitable for NZ. I read Chenery and Clark and the penny dropped. Sometime in 1959 … I turned to [RGD] Allen's *Mathematical Economics* to bone up on LP, so when I arrived in Wellington in August 1960 I had an idea of what I wanted to do. But it took a year or two before I got really under way. Robin Williams, of the Applied Maths Lab of the DSIR … and Colin Simkin were supportive. But I soon realized I needed a mathematical assistant and that is where Graham [Crothall] came in. As they say, the rest is history.' [21]

Graham came to the Institute, after completing a mathematics Masters at the University of Canterbury in 1961 with a thesis on linear programming. The combination of Graham's mathematical skills with Conrad's economic ones created New Zealand's first Computable General Equilibrium Model. [22] Indeed it was one of the first in the world, as indicated by publication in *Econometrica* [23]

By today's standards the pioneering model was crude. Based on the 1954/5 Input Output table, it had twelve sectors – manufacturing was either primary product processing or other – and applied a single point in time, with an investment constraint to ensure there was sufficient capital for tomorrow. Nevertheless there were at least three important elements to the model.

First, for a young economist who had done a little reading in general equilibrium theory (it was not taught, except indirectly by two dimensional models), here was a real live one. What was more, it illustrated the practical importance of shadow (or even market) prices. I knew the theory of LP but here it was connecting to economic issues of the day.

Second, the model had a lower return on exports after a threshold was crossed reflecting a non-zero price elasticity for exports. Here was the caution that the standard international trade theory does not give maximum output for zero tariffs when the demand for exports is price elastic and so sensitive to the amount supplied, since a tariff on a domestic good could reduce the export good on world markets, thereby raising its price.

Third, there was a seminar at the Institute which Jim Stewart attended [24] At that time Jim was a senior lecture in farm management, but he went onto the chair, and eventually principal of Lincoln University. I assume he was there, because he was applying linear programming to farms.

As it happened Jim had already worked with the third pioneer in New Zealand economic growth, although initially the focus was the farm sector [25] I assume Jim returned to Lincoln and discussed the Blyth-Crothall model with Bryan Philpott. The LP version did not appear for some years, but shortly after Bryan began using input-out put tables to study the economy from an inter-sectoral perspective necessary, as he would explain, to put the farm sector in an overall context.

**Bryan Passmore Philpott (1921-2000)**:

Bryan went to Victoria University College as a returned service man, having worked in a stock and station agency before the war. His post-graduate work was under Arthur Brown at Leeds University on the wool economy. Returning to New Zealand he worked first for the Meat and Wool Economic Service before taking up the foundation chair in economics at Lincoln College in 1958 and establishing the Agricultural Economics Research Unit in 1964.

His first (economics) love which, as we shall see, had important implications for his subsequent work, was the economics of wool. As his research program developed it extended to the whole of the farm sector, then the farm sector in the economy, and eventually, when he took up the McCarthy Chair in Economics at Victoria University of Wellington in 1970, the economy as a whole. (He maintained an interest in wool; he would say in the latter years of his life, he could still class wool.)

One of Bryan's many eminent students was Bruce Ross who filled his vacated chair, later becoming Vice Chancellor of Lincoln University, and eventually Director General of the Ministry of Agriculture and (sometimes Fisheries, sometimes Forestry). Following his masters thesis – Bryan and Bruce published the first report in his 'Studies in the Structural Development of the New Zealand Economy' series.

The practical need for the model came to a head in 1968 in the National Development Conference. A key element was the setting of indicative targets for economic growth. Two models were used to provide them [26]

The first, due to the NZIER (supervised by the then director, Jim Rowe), involved projecting GNP from the expenditure side, with some attention to the ensure such ratios as investment to production and imports to production were plausible.

The second, more elaborate, model was the Lincoln Model (involving Bryan Philpott, and presumably, Bruce Ross) which focused on production side with a 15 sector disaggregation. The five and ten year projections for the two models were similar.

I was not in New Zealand at the time. Reading the reports of the conference some years later, I was struck how the modellers struggled with the problem of projection when there had been a change in the terms of trade and hence a divergence in the expenditure and production side volume estimates. Their base year, 1967/68, was the first full year following the dramatic fall in the price of wool in December 1966. It was not just a matter of projecting the future price path, but how to interpret the volume changes when the expenditure and production aggregates did not readily reconcile.

There has always been a major problem with these forecasts. Performance depends on incentives – most particularly, in a capitalist economy, on the profit rate. Implicit in these volume forecasts there are profit rates, but they were never derived, not assessed to see whether they were realistic enough to induce the behaviour required to meet the volume projections. It is hard not to conclude that the New Zealand approach was too influenced by the material balances approach of planning in the Soviet Union, with little understanding – as Leonid Kantorovich, among others, was to draw attention to – that there were implicit market prices related to the shadow prices of the optimal planning. (That lacuna remains today. One might say for those who cannot count, that profit is a four letter word, not to be mentioned in polite company.)

One of the sector committees was 'Education, Training Research'. The following extract from the report of the Chairman (Geoff Schmidt, then professor of management accountancy at Victoria University of Wellington) has a particular relevance to this paper:

The various forces that contribute to the part of economic growth that cannot be explained by reference only to the size of the labour force and the stock of capital are in some cases known collectively as the residual factor. … The residual factor can be confidently claimed to be at least as important as capital investment in achieving economic growth. For example, a study published by the New Zealand Institute of Economic Research in 1965 estimated that over 60 percent of the increase in output per head of the labour force in both farming and manufacturing in New Zealand between 1955 and 1962 was due to this factor.
Now, of course, the residual factor is composed of many elements which, like the whole residual itself, are none the less really valuable, if difficult to measure. Mr Rowe gave us a list of the items … improvements in the field of industrial and commercial policy, economies of survey, better marketing and distribution systems, market research, improvements in determining the priority to be accorded the various agricultural industries and Government and commercial projects, technological innovations, managerial innovations, labour skills, and last but not least, the general content of the labour forces. [27]

Three years later, Blyth's 1965 paper continued to resonate. Note that the exposition does not give the significance to research, science and technology that a similar conference might give today.

Moreover, insofar as the NDC did not really know what was in the residual, and had little idea about the profit implications of the projections, most of its recommendations were related to commonsense and private interest, rather than to the quantitative targets.

The Lincoln Model, driven by Bryan and refined over the years, continued to be used by the National Development Conference after 1968 until it was closed down in 1973. By them Bryan had moved onto the McCarthy Chair in economics at Victoria University of Wellington.

**Modelling at Victoria University of Wellington.**

At the university Bryan assembled a suite of CGE models usually with women's names – Emily, Joanna, Joany, Julienne and Victoria (which was a LP model) are among the better known – typically again assembled by another galaxy of students including PhDs for Gareth Morgan, Ganesh Nana and Adolph Stroombergen. [28] In doing so he built up a deserved reputation among international CGE modellers for outstanding modelling and innovation. I can attest this, not only by the respect for him shown in the conversations I had with them in the 1980s, but I attended overseas seminars on issues which Bryan and his team had already solved.

One of the puzzles is why, after he retired, Bryan's economics department let (perhaps) their only international competitive advantage in economics lapse. (He continued to work in the department, but it took no measures to continue his program once he moved on.)

One reason may have been the expense. By comparison with much economic research (or doing no research at all) economic modelling is expensive. As well as drawing on university resources, the modelling was funded by small grants from the public sector (notoriously they were cut off in the 1980s under the Rogernomics regimes), from consultancy work (via the BERL economic consultants – Bryan was a founding director in 1958), and the New Zealand Planning Council, established in 1977. As a result of the resource shortages, many developments, such as of a skills differentiated labour force, were delayed, while others, such a the fiscal and distributional implications of the economic path, were never explored.

A feature of the Victoria suite of models was that they are usually better at analysing inter-sectoral relations than projecting a growth path. In the case of the Planing Council projections, a simple econometric model known as 'Haywood' was used, although in my view it gave few insights and in some respects was less economically sophisticated than the NZIER model used by the 1968 National Development Council [29]

Many of the runs of the Victoria suite of models are uninteresting, giving much the same conclusions as under a single sector model. But when the model runs are not trivial, they provide useful insights.

First, the runs are most revealing (relative to a single sector model) where their sectors grow at different rates. This occurs in the medium term in all economies – but as important as it is, it has to be ignored when an single commodity model is being used.

This 'twisting' during the expansion can be caused by output restrictions arising from resource limitations (e.g. energy and fishing) or from biological limitations (livestock growth is subject to a maximum biological rate). Conversely, a new resource can twist a sector in the opposite direction (e.g. the Taranaki hydro-carbon fields).

Differential productivity growth can also cause twisting. If the export sector is treated as an earner of foreign exchange for the purpose of imports, then a change in the terms of trade is equivalent to a productivity change. Change them and the economy twists in the medium term.

Although they are rarely decisive, different income elasticities of domestic or international demand will also cause sector to expand at different rates. Another cause of twisting can be the objective of the model changes, as explained in the next paragraph.

Second, it matters how a computable general equilibrium model is closed. It will be recalled that the standard totally self-contained general equilibrium model contains one more (commodity) variable than there are (independent) equations. The lacuna is resolved by setting the price of one commodity as the numéraire, so that the prices of other commodities are measured relative to it. In the Victoria suite, there are closure options other than a numéraire (equivalent to an inflation path), including a constraint on the size of the current account deficit, a maximum acceptable level of employment and a given real wage. The resulting configuration of the economy depends upon the choice of constraint, with the simple lesson that the choice of economic objective will affect the outcome (so that choosing an acceptable inflation track will result in a different track for the economy from choosing full employment or an acceptable international debt target).

The third lesson was that given the demand for New Zealand exports were price elastic, a positive tariff gives greater economic output than a zero tariff (a conclusion earlier demonstrated by the Blyth-Crothall model.) It was said that Bryan's moving from Lincoln to Wellington led him to abandon the farm sector for the manufacturing sector. In fact at Lincoln he had favoured abandoning of import controls and the introduction of a uniform tariff – variations of which he supported in Wellington. The irony of the criticism of Bryan was that any policy shift was founded on his earlier

work on measuring the price elasticity for wool. As the models began to seek optimal output (as when the Lincoln model morphed into the Victoria LP model), he found that he could not gain maximum output without a tariff, because increased agricultural output lowered the terms of trade.

Brian cherished his economic models as if they were daughters. To startle us he would say they could be disposed of like a woman. Following my telling him that some women objected to the metaphor, he apologised, and I never heard him use the image again. Ironically, when I argued that the Victoria model was obsolete, he defended the old girl basically because of his great affection for her.

**Measuring Growth**

Underpinning the model suite was the measuring economic growth. Bryan's interests go back to the 1950s since he was already measuring farm sector when he was at the Meat and Wool Economic Service (with Jim Stewart). My guess he got the passion – his greatest research passion – while as a post-graduate student at Leeds. Almost certainly his interest arose in a pre-Solow framework although he soon adapted to measuring the residual. .

At first he pursued this measurement of growth in the agricultural sector back to the First World War (his AERU colleague Robin Johnson took over the updating). Subsequently he investigated all the sectors of the economy. His output series goes back to 1954/5, but because he used the perpetual inventory method to measure capital stock, some of those series go back to the nineteenth century.

As far as I know there is no inventory of all the series which Bryan constructed. Today there are official estimates of his sectoral output, labour force and capital series, but they start much more recently. If one wanted to push them back to start at an earlier date, one would go to the Philpott data base. One always needs to push them back, there is a kind of sod's law which states that no matter what period one is looking at, there is always a need to have a data base that starts at least a decade earlier. A recent instance is studies of economic growth which start in 1970, whereas the climacteric seems to have started in the 1960s. [30]

Bryan was using the data series to calculate the Solow residual by sector. Since sectors expand at different rates, and have different Solow residuals, the aggregate Solow residual changes over time (say the last 50 years), even if the sectoral ones do not. A further complication is that the growth of sectoral and aggregate output is affected by the business cycle which makes it difficult to changes breaks in the residua track. Long series help.

**Peter G. Elkan (?- 2008)**

The one original and significant contribution to growth theory came from Peter Elkan. His biographical details are regrettably vague. He grew up in Hungary, was trained as a classical European economist, and then in 1948 was retrained as a Marxist economist. Escaping in 1956, he was trained for a third time at the University of Cambridge, which added to his considerable intellectual talents an extremely wide perspective of economics. He was one of Conrad's earliest recruits to the NZIER where he stayed to 1970, before moving on to UNCTAD and the ECE at Geneva, eventually retiring ito Cambridge.

His interest was international economics, where he proposed a number of inventive policies ingeniously underpinned by empirical research. He was (probably) the first New Zealand economist to estimate effective rates of protection, and he went onto a two-sector growth model of the economy which he published in *The Meaning of Protection* (1977) and the *New Model Economy* (1982).

The model's agricultural sector experienced diminishing returns because of the limited lands, but the manufacturing sector had increasing returns so that average productivity was higher the bigger the sector. As a result output was maximised by protection. [31]

Peter's model assumed that the terms of trade were constant. Years later, and unaware of Elkans' pioneering work, Mashita Fujita, Paul Krugman and Tony Venables linked two economies which had exactly the same endowments, at which point the outcome becomes almost bizarre (and mathematically intractable, in that there is no known general solution). [32] Both economies cannot produce high productivity manufactures, while the state where they have the same pattern of output is unbalanced. So one becomes a poor specialist producer of agricultural products and the other a rich specialist producer of manufactures. [33]

**The Treasury Research Program**

In the 1970s the Treasury began a growth research program led by one of Bryan's students, Jas McKenzie who subsequently became a deputy-secretary of the Treasury and Secretary of Department of Labour. It was, understandably, more policy oriented than the work I have just described, but as best I can gather, it did not start with policy preconceptions but tried to identify the causes of the slow growth at the time, in order to set a foundation for a policy framework. There are only fragmentary public publications, but in 1984 a paper was prepared for the Economic Summit Conference which was intended to be a Treasury summary of the program's finding, albeit it with a policy twist. *A Briefing on the New Zealand Economy* (1984) observed that New Zealand seemed to get a very poor growth return on its investment and concluded

First, the relative performance of the New Zealand economy has been poor for a long period (including periods, like 1965-72, when the terms of trade were relatively favourable). Second, although the deterioration in our terms of trade combined with a slowing of world trade in the mid-1970s and again during the 1980-83 recession would have had a negative impact on New Zealand's growth rate, these factors cannot be said to have been solely responsible for the steadily increasing level of unemployment and the continually high inflation rates of the last decade. These problems reflect our inability to adjust to those shocks as much as the shocks themselves. Thirdly, there were a number of countries who suffered either the same, or substantially greater, degree of external shock as New Zealand during the 1970s and whose economies performed considerably better than New Zealand's. Finally, although some fluctuations in real output coincided with similar fluctuations in external conditions, there are a number of instances during the last ten years when this was clearly not the case. Taken together these factors suggest that our experience over the last decade cannot be laid solely at the door of the world outside. The last decade has been particularly difficult for all countries. Some have fared better than others. We find ourselves amongst those who have fared worst despite the fact that many better performing economies have had to cope with external shocks as great or greater than those we have faced. (p.54)

The key lesson is that it recognises the role of the external economic environment on growth performance but argues that the internal responses were also important. So the research program began to integrate growth performance with macroeconomic management.

The notion that external conditions affect economic performance (albeit as the briefing says, are not the sole determinant, is not yet universally accepted. Growth studies which ignore it are common. It is true that today comparisons are frequently made with other economies, but they are mechanical rather than analytic failing to focus on differences in the experience of other countries relative to New Zealand.

**In Conclusion**

By 1984 we were moving into the next phase of the economic growth program, Jack Baker retired in 1969 after 40 years of service in the public service; he was to live in retirement for another 40 years. Conrad Blyth came back to New Zealand to the senior chair in economics at the University of Auckland in 1971, but his research interests moved on; Bryan Philpott retired in 1986, and while he continued to research until a few months before his death in 2000, there was little new innovation although there was a stedy progression of his work.

The new phase of the research program, borne largely by Bryan's students and colleagues proceeded outside the academy. That is another story, and a complicated one, because funding and public debate became dominated by a policy vision which was not greatly interested in empirical research nor the world outside the theory.

Much of what has been reported here is now a part of today's conventional wisdom. Economic growth is not seen to be primarily a matter of capital formation, although investment may be more important than the pure neoclassical model suggests, if what Solow called 'technology' is probably partly embedded in the capital.

If the effects of embedding can be ignored, we can measure with some precision the contribution of capital increases to economic growth using neo-classical theory. The conclusion is that, by itself, increased capital intensity makes only a small contribution to economic growth.

In recent years there has been the post-Solow theoretical development of 'endogenous growth'. [34] However, while it offers useful (indeed innovative) theoretical insights, it contributes little to our measurement of the causes of growth and therefore the relative contribution of the various effects.

More generally, while there is quantification of the Solow residue, usually now called 'Multi-Factor Productivity', there is little systematic disaggregation into its various alleged constituents – no Dennison-like attempt to estimate components of the residual. This is true even for 'human capital' – that is the upgrading work-skills – which is one of the easiest components to measure. [35]

Instead the policy debate has attached to the residual all manner of nostrums. Undoubtedly the quality of economic governance is important (although it may lift the level of output rather than affect the growth rate); undoubtedly new technology in the narrow sense of 'blueprints' is important but the quantitative connection between research and development is not explored (while the issue of the importance of offshore origins of the blueprints and the effective conduits to New Zealand production is hardly mentioned). Innovation is said to be important – how important? There has been discussion on the role of distance (plus the role of the economies of scale), but this contributor has found it impossible to quantify it, and hence measure its impact). [36]

Even so, differences between sectors (and therefore prices and profits) are largely forgotten. Much of recent work has been on the aggregate production side with little attention to the demand side of the economy.

This paper has been largely a recording of a research program in the past. If there are any lessons they are that, with the exception of the one big idea that economic growth was not dominated by the quantity of capital, the research did not have a great impact on policy. (Conversely, policy does not seem to have had much of an impact on economic growth.) As a result of Bryan Philpott's diligence, we have the possibility to measure the Solow residual by sector back to 1954/55 – before the New Zealand Economic Association was founded. While business cycles and measurement errors

add a lot of noise around the trends, it is surely interesting to investigate whether there have been any acceleration or deceleration in the Solow residuals in the period which cannot be explained by composition effects.[37]


I opened with Satayana's 'those who cannot learn from history are doomed to repeat it.' About a hundred years earlier, Marx had gazumped him with 'the first time it is tragedy; the second time farce'.


**Endnotes**

[1]  This paper might be thought of as the prequel to a  memoir of my own contribution.
[2] Conrad Blyth Frank Holmes, Dennis Rose and John Yeabsley have contributed to this paper; thankyou.
[3] Conrad Blyth did not arrive back in New Zealand until 1960; Jack Baker and Bryan Philpott were at the founding meeting.
[4]  M. Ambramovits (1952) 'Economics of Growth' in B. F. Haley (ed) *A Survey of Contemporary Economics: Vol II*, p.132.
[5] http://www.ggdc.net/maddison/
[6] R. Solow (1957) 'Technical Change and the Aggregate Production Function', *The Review of Economic Statistics,* vol 39 (August 1957) pp. 312-320.
[7] T. Balogh, T. & P. P. Streeten (1963) 'The Coefficient of Ignorance', *Bulletin of the Oxford University Institute of Economic and Statistics*, May 1963, pp.97-109.
[8] B. A. Pauw (1975) *Christianity and the Xhosa Tradition*.
[9] See http://www.stuff.co.nz/dominion-post/news/features/obituaries/1999243/John-Baker-Public-service-mandarins-long-run for an obituary.
[10] I think it was he who told me that margins were added for under-reporting: 25% for farm incomes, 10% for the incomes of the other self employed.
[11] This meant that Private Consumption included all the errors in the other components. Sometimes it was quite wrong. B. H. Easton (1966) *Consumption in New Zealand; 1955/6 to 1965/6.* A major problem was that the estimate for stock change aggregate included the effect of the price appreciation of the inventory items, as well as the volume change.
[12] I recall as a part of the *Quarterly Predictions* team in 1964 to 1966, that they were nominal was not considered a problem since inflation was low.
[13] And therefore subject to the errors mentioned in endnote [11].
[14]  The Real National Product series of the 1961 *Economic Survey* maps reasonably closely to GNP and GDP series in the 1968 *Yearbook*.
[15] J. V. T. Baker (1965) *The War Economy*, uses only nominal economic aggregates and thus does not address volume of aggregate production changes, which is a pity. One might have the volume estimates could have been pushed back.
[16] In 1982 I met the eminent American business cycle researcher Geoffrey H. Moore at Columbia. He was struggling with the problem, and surprised when I readily understood it and at the elegance of the New Zealand solution.
[17]  A minor point is that Blyth's sectoral table does not sum up, a matter I checked in a minute or so with a spreadsheet. I mention this not to show off, but to remind current generations of the extraordinary computing power it has available to it, and

how the fathers that begat us struggled without it. An obituary of Jack Baker praises him for introducing the first computer into the Department of Statistics in 1961.

[18] Blyth says that the paper 'did not say much about the residual because I thought the contribution of the residual in NZ was relatively smaller than in the US and I was emphasizing the "fact" that it took a relatively large amount of capital to produce an increase GDP.' email to author, 22 June 2009.

[19] Two Economic Lieutenants'

[20] I reported to Alan Catt, who was in charge of macroeconomics.

[21] Email to author, 22 June 2009.

[22]  General equilibrium theory and linear programming are based upon much the same mathematics, and a linear program of an economy can be interpreted as a computable general equilibrium account of the economy. I illustrated this by constructing a parallel CGE model to Philpott's Victoria LP model which had the same inputs and the same outputs. I called it Albert after Bert Brownlie, Professor of Economic at the University of Canterbury who was one of New Zealand's most active general equilibrium theorists. Regrettably the paper on Victoria and Albert (in the antipodes) has been lost.

[23] C. A. Blyth and G A Crothall (1965), 'A Pilot Programming Model of New Zealand Economic Development', *Econometrica*, 33, No 2.

[24] By coincidence I was at the seminar in 1963. I had been interviewed in the morning for a job at the Institute.

[25] B. P. Philpott and J. D. Stewart (1958) *Income and Productivity in New Zealand Farming, 1921-1956*

[26]  National Development Conference (1968) *Report of the Proceedings of the National Development Conference:: Plenary Session 27-29 August 1968*

[27] NDC (1968) *op. cit.* p. 122-3.

[28] For a detailed account of many the models, see G. Wells and B. Easton (1986) *Economy Wide Models of New Zealand*, especially pp.73-94; 169-275. .

[29] See Wells and Easton *op cit.* pp.135-148

[30]  As a footnote, my estimates of the date of the climacteric are based on a series which begins in 1862. I wish I knew quantitatively more about what was happening in the 1850s and 1840s.

[31]  I did the initial computing for Peter's model.

[32]  M. Fujita, P. R. Krugman and A. J. Venables (1999) *The Spatial Economy: Cities, Regions and International Trade*.

[33] B. H. Easton (2007) *Globalisation and the Wealth of Nation* is based upon the model.

[34] P. Romer (1990) 'Endogenous Technological Change,' *Journal of Political Economy*, Vol. 98, No. 5, "Part 2: The Problem of Development: A Conference on the Institute for the Study of Free Enterprise Systems." (Oct. 1990), pp.71-102.

[35] I am pleased to report that there were papers at the 150th anniversary conference which were beginning to address this.

[36] Easton (2007) *op cit.*.

[37] My current work is based on GDP series that go back almost 150 years. But there is no capital series, and the labour series behaves oddly (for the explainable reason that it is not possible to separate out full-time and part-time employment over the entire period). Nor is there any sectoral breakdown before 1920.