Erkin Bairam: 1958-2001
His Contribution to Economics

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Introduction

With Erkin Bairam’s untimely death on 21 May 2001 at the age of 43, New Zealand lost one of its most distinguished and prolific applied economists. Born in Nicosia, Cyprus, most of Bairam’s working life was spent in the Department of Economics at the University of Otago in Dunedin, New Zealand. At the age of 33, he became one of the youngest full professors to be appointed in New Zealand, and, by the time of his death, had published over 60 articles and 4 books. Bairam had two main research interests: namely, the theoretical specification and estimation of aggregate production functions and the testing of Thirlwall’s law of economic growth. But his interests went wider than this. He was a gifted applied econometrician and made contributions to econometric theory and also published in the areas of inflation and labour economics. Although he would have been the first to admit that he was not a natural sportsman, he developed an interest in the economics of sport, especially cricket and published some innovative papers in this area. He also undertook some notable work in calculating the research rankings of economics departments (always a contentious issue), with an article being published in the prestigious Journal of Economic Literature (Bairam, 1994a).

Bairam’s undergraduate training took place at the University of Essex, where he gained a BA (Hons) in Economics in 1980. He left Essex for Hull, where he was awarded an MA in Econometrics in 1982. He then began work on his PhD thesis entitled Returns to Scale, Technical Progress and Industrial Growth in the USSR and Eastern Europe: An Empirical Study, 1961-75, with John McCombie as his supervisor. He was awarded his doctorate in 1986 and the following year was appointed as a lecturer at the University of Otago. By 1991, after only four years, he had risen to the rank of full professor. This tribute will discuss some of Bairam’s key research contributions, as well as his contribution to the Department at Otago.

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The Estimation of Production Functions and the Verdoorn Law

Bairam’s early published research was influenced by the writings on economic growth of the late Lord Kaldor, and in particular, the Verdoorn Law\(^1\). Indeed, Bairam’s Master’s thesis examined aspects of Kaldor’s famous economic growth laws (Kaldor, 1966, 1967). The Verdoorn Law is the most important of these laws and is the relationship between the growth of industrial labour productivity \((p_{\text{IND}})\) and output \((q_{\text{IND}})\) given by:

\[
(1) \quad p_{\text{IND}} = a + b \ q_{\text{IND}}
\]

A large number of empirical studies (including Kaldor (1966) using cross-country data for the advanced countries over the period 1953/4 to 1963/4) found values for the Verdoorn coefficient \((b)\) typically around one half. The law is best regarded as a linear specification of Kaldor’s technical progress function and a Verdoorn coefficient of one-half was interpreted by Kaldor as showing the presence of substantial increasing returns to scale. This is because an increase in the growth rate of output by one percentage point causes employment to grow by one-half of a percentage point and also induces an increase in the rate of growth of productivity by the same amount. The latter effect Kaldor interpreted as being due to dynamic increasing returns to scale, including induced technical progress. Kaldor (1967) included the investment-output ratio in the Verdoorn law as a proxy for the growth of the capital stock but found that this did not significantly affect the estimate of the Verdoorn coefficient.\(^2\) (See McCombie, Pugno and Soro (2002) for surveys and new studies concerning the law.) Kaldor (1966, p.288)\(^3\) argued that the Verdoorn Law was a “dynamic rather than a static relationship – between the rates of change of productivity and of output, rather than the level of productivity and the scale of output – primarily because technological progress enters into it, and it is not just a reflection of the economies of large-scale production”.\(^4\) In the late

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\(^1\) The term Vedoorn Law was first coined by Kaldor (1966) after P.J. Verdoorn, who was one of the first to discover this empirical regularity (Verdoorn, 1949). Nevertheless, it was Kaldor who brought this law to prominence.

\(^2\) Alternatively, the “extended” Verdoorn law may be specified as \(p = \varphi + (\beta-1/\beta)q + (\alpha/\beta)k\) where \(\alpha\) and \(\beta\) are the output elasticities of capital and labour, \(k\) is the growth of the capital stock and \(\varphi\) is the rate of exogenous technical progress. Given the stylized fact that there is no growth in the capital-output ratio in the long run (i.e. \(k = q\)), it follows that \(p = \varphi + (a+\beta-1/\beta)q.\) As \(\alpha\) and \(\beta\) are approximately equal for industry, a Verdoorn coefficient of one-half implies returns to scale of 1.33, which are substantial.

\(^3\) The page number refers to the reprint of the monograph in Targetti and Thirlwall (1989).

\(^4\) The parameter \(\varphi\) in footnote 2 is, as noted, assumed to be exogenous, but a substantial part of this may be induced by the growth of output, through, for example, learning by doing (Arrow, 1962). Consequently, \(\varphi = \varphi' + \zeta q\) and the Verdoorn coefficient now equals \((\alpha + \beta + \zeta - 1)/\beta\). Hence, Kaldor’s emphasis on the importance of the role of technical progress in the Verdoorn coefficient.
1970s and early 1980s, the Law had been subject to considerable controversy and equation (1) was shown to be deceptively simple. In particular, Rowthorn (1975) had shown that if employment growth was chosen as the regressor instead of output growth, there was little evidence of static and dynamic returns to scale. Rowthorn’s specification assumed that the growth is supply, rather than demand, constrained as Kaldor maintained.

Bairam was intrigued by this debate and his survey, arising from his thesis, of the issues and published in *Australian Economic Papers* in 1987 is still widely cited today. In this survey, he carefully enunciated the various problems underlying the specification and estimation of the Verdoorn Law. These included omitted variable bias (especially from the omission of the growth of the capital stock in some studies), simultaneous equation bias and the problem of exogeneity, and the problem posed by the diffusion of innovations. Bairam considered that the scope for the further use of cross-country data for the advanced countries had been effectively exhausted and there was a need for alternative data sets to shed new light on these issues. To this end, Bairam, in his Ph.D. thesis, estimated various specifications of the Verdoorn Law (explicitly including the growth of the capital stock) for different industries and regions in the Soviet Republics. Earlier research (e.g. Gomulka, 1977; and Bergson, 1979) had obtained production function estimates for the Soviet economy, but not for individual industries or regions.

Bairam argued that in a planned economy, the growth of inputs, not output, should be considered as exogenous as in Rowthorn’s specification of the law. He further considered that because of the role of central planning and the existence of widespread rationing, relative price changes do not generate significant simultaneity between the growth of inputs, productivity and output. Nevertheless, he used instrumental variable estimation techniques just in case there was a serious issue. The problem of simultaneity is still an important but largely unresolved issue in the estimation of the traditional Verdoorn Law.

The major results were published in his paper “Returns to Scale, Technical Progress and Output Growth in Branches of Industry: The Case of the Soviet Republics, 1962-74 (Bairam 1987b). Here he reported estimates of the degree of returns to scale and the rate of technical progress for nine major branches of Soviet industry. He found, perhaps surprisingly, that only Fuel displayed statistically significant increasing returns to scale. Two industries showed evidence of decreasing returns to scale and the remaining six industries exhibited either constant or small statistically insignificant increasing returns to scale. Durbin’s ranking
method was used in an attempt to overcome the problem of simultaneity, although the results proved very similar to those of ordinary least squares.

What is particularly interesting were the high rates of exogenous technical change for the various industries that Bairam obtained. This stood (and still stands) in marked contrast to the conventional view that because of central planning and the lack of incentives, Soviet industries experienced very little or no technical progress. Growth was seen as predominantly the result of capital accumulation. Bairam further found that comparing these results with those for the US, the rate of technical progress in the various industries actually exceeded the American rates. However, the rankings of these growth rates were roughly the same in the two countries; the more technically innovative industries were the same ones both in the US and the Soviet Republics. Bairam attributed these high rates of technical progress to be the result of the Soviet Republics’ relative technological backwardness, providing scope for technological catch-up (see, for example, Gershenkron, 1965; Gomulka 1977, 1983). It was also found that technological progress tended to be greater in the more capital-intensive industries.

Similar results were obtained for the COMECON countries in Bairam (1987c). Bairam (1987d) used a similar methodology to Bairam (1987b,c), but obtained estimates for different Soviet, and Polish, regions, rather than industries. Evidence was found of markedly decreasing returns to scale for Soviet regions, but of either constant or moderately increasing returns to scale for Polish regions.

Bairam’s research broadened to a consideration of different types of aggregate production functions. In particular, he turned his attention to whether or not the Cobb-Douglas production function was the most appropriate specification. In Bairam (1988a) the Constant Elasticity of Substitution (CES) production function, of which the Cobb-Douglas is a special case, was used to obtain estimates for the same nine Soviet industries as in Bairam (1987b). It was found that the Cobb-Douglas specification was appropriate for all industries, except fuel and chemical industries.

CES production functions had been used previously to estimate production functions for the Soviet economy, although not for individual industries. However, it was not possible to find in the literature any consensus as to the value of the elasticity of substitution. Gomulka
(1977), for example, concluded that the value could lie anywhere between 0.1 to 1.2. Bairam (1987c) shed new light on this issue. He estimated a Variable Elasticity of Substitution (VES) production function using time-series data for Soviet industry, in aggregate, over the period 1950-1978. These results suggested that the transcendental production function was a more appropriate specification for Soviet industry than the Cobb-Douglas specification he had used in his earlier work. The implied elasticities of substitution for each year were all significantly less than unity, and fell dramatically over time (from 0.783 in 1950 to 0.122 in 1978). This was an important result as it showed that the elasticity of substitution obtained in empirical work would depend on the time period under consideration and assuming a constant elasticity of substitution was likely to lead to a serious misspecification error. This was the likely explanation for the wide variation in values that previous studies had found. This result was further supported in Bairam (1990b), which obtained estimates for the whole Soviet economy, as well as for the industrial sector.

Bairam (1988b) repeated the exercise for Romania, with but with an extension: estimates were obtained for specific industries (fuels and energy, chemicals and metallurgy, and other industries) as well as for the industrial sector in aggregate. The results mirrored those for Russia, namely a variable elasticity production function was found to be more appropriate for Romania than was the Cobb-Douglas. The value of the elasticity of substitution was also found to be less than unity and once again decreased over time.

Bairam (1989) estimated a VES production function for Japan, which allowed for learning by doing due to increasing experience in production. Experience was proxied both by cumulative gross investment (following Arrow, 1962) and cumulative output. In contrast to the results for Romania, the elasticity of substitution was found to be greater than unity and increasing over time. The learning-by-doing parameter was positive and significant, suggesting that learning by doing was important in Japan’s pre-war growth experience. Bairam and McRae (1999) obtained estimates of a non-constant returns to scale production function for the agricultural sector, using cross-country data for a sample of 101 countries. It was found that agriculture is characterised by decreasing returns to scale. However, there could be a misspecification due to the fact that the authors chose not to include land as a factor of production. The paper concluded that productivity differences across countries could be explained in terms of diseconomies of scale and differences in capital intensities.
Bairam’s work on estimating production functions has a number of important implications. A key finding is that the Cobb-Douglas production function is not always the most appropriate specification. This has implications for both the theoretical and empirical work on economic growth that blossomed during the 1990s, as much of this work typically assumes a Cobb-Douglas aggregate production function (see, for example, Mankw, Romer and Weil, 1992). Bairam came constantly to question the use of a constant-returns-to-scale Cobb-Douglas production function in studies of economic growth, as many seminar presenters at Otago could attest. His work also provides support for the Gershenkron/Gomulka technological backwardness hypothesis. Another important finding was that the elasticity of substitution fell over time in Romania and the Russian Republics. However, the opposite occurred for pre-World War Two growth in Japan. This all suggests that an interesting avenue for future research would be to apply Bairam’s methodology to the East Asian economies, especially during their period of rapid economic growth following the mid-1960s. This has proved a controversial issue (Krugman, 1994; Young, 1995; and Nelson and Pack, 1999) and it would be interesting to see if Bairam’s approach helped resolve some of the issues.

**Thirlwall’s Law, Balance-of-Payments Constrained Growth, and the Harrod Foreign Trade Multiplier**

In the traditional specification of the Verdoorn Law for the advanced countries (although not for the Soviet economies), it is assumed that growth of output is generally determined by the growth of demand for that country’s output. This stands in marked contrast to the neoclassical approach (whether of the Solow-Swan or the endogenous variety), with the latter’s emphasis on the role of the supply side. The argument is that for much of the early post war period, there was either surplus labour in agriculture and many of the service sectors and/or else a large volume of immigration. Both of these meant that the growth of manufacturing was not determined by the exogenous growth of the labour supply (Kindleberger, 1967, Cornwall, 1977).

This view, largely originating from the work of the late Lord Kaldor (1966, 1967, Targetti and Thirlwall, 1989) also saw the rate of capital accumulation as being determined by the growth of output, and not by the propensity to save, whether exogenously determined or derived from some intertemporal utility maximising process. The question then arose as to why a region or country cannot grow as fast as it wishes or until it actually encounters a supply constraint through the growth of, for example, government expenditure. The answer
lies in the existence of the balance-of-payments constraint. The central tenet of the balance-of-payments-constrained growth model is that a country cannot run a balance-of-payments deficit for any length of time that has to be financed by short-term capital flows and which results in an increasing net foreign debt-to-GDP ratio. If a country attempts to do this, the operation of the international financial markets will lead to increasing downward pressure on the currency, with the danger of a collapse in the exchange rate and the risk of a resulting depreciation/inflation spiral. There is also the possibility that the country’s international credit rating will be downgraded.

Consequently, in the long run, the basic balance (current account plus long-term capital flows) has to be in equilibrium. An implication of this approach is that there is nothing that guarantees that this balance-of-payments equilibrium growth rate will be the one consistent with the full employment of resources or the growth of the productive potential. The seminal paper that developed what has now been called the post-Keynesian approach to growth is Thirlwall (1979). The growth of exports is determined by the growth of world income and the rate of change of relative prices. The growth of imports is specified as a function of the growth of domestic income, together with the rate of change of relative prices. Substituting these into the definitional equation for the balance-of-payments, expressed in growth rate form, gives the growth of domestic income as a function of the growth of world income, the rate of change of relative prices, and the growth of net international capital flows.

If the impact of the last two on economic growth is quantitatively negligible (as empirically is the case), the growth rate of income consistent with balance-of-payments equilibrium is given by \( y_B = \frac{\varepsilon z}{\pi} = \frac{x}{\pi} \). In this equation \( \varepsilon, \pi, z, \) and \( x \) are the world income elasticity of demand for exports, the domestic income elasticity of demand for imports, the growth of world income, and the growth of exports. These two equations for \( y_B \) are alternative specifications of what has come to be known as “Thirlwall’s Law”. It can be seen that the key factor determining the growth of a country is the growth of the exogenous component of demand, viz. exports, which in turn is determined by the growth of world markets. Thus, the model is an extension of the export-led growth hypothesis, but where the balance-of-payments is explicitly incorporated.

There are substantial differences between countries in their values of \( \varepsilon \) (and of \( \pi \)) and hence in how fast these economies can grow without encountering balance-of-payments problems.
The disparities in $\varepsilon$ and $\pi$ are interpreted as reflecting differences in non-price competitiveness (e.g. differences in the quality of goods and services, the effectiveness of a country’s distribution network, delivery dates, etc.). Thus the supply side is important to the extent that these supply characteristics play a crucial role in explaining the growth of exports and, hence, income. This stands in marked contrast to the way in which the neoclassical approach emphasizes the supply side, where technical change and the growth of factor inputs, notably the growth of labour, are the causal factors in the growth process.

A necessary condition for the balance-of-payments constraint to be binding is that the rate of change of the exchange rate is ineffective in determining the growth of exports and imports. If this were not the case, then real exchange rate adjustments could ensure that the balance-of-payments was brought into equilibrium at any given rate of growth of income, including the growth of productive potential. However, it should be emphasized that the balance-of-payments-constrained growth model does not imply that changes in relative prices have no effect on the current account. It may be that changes in these are sufficient to bring a current account deficit back into equilibrium when, for example, the economy is growing at or near its balance-of-payments equilibrium rate, but they are unlikely to be sufficient to raise the balance-of-payments equilibrium growth rate, *per se*. Given the multiplicative nature of the export and import demand functions, to achieve the latter would require a sustained real depreciation.

There are a number of reasons why this is implausible. First, there may be real wage resistance, which makes it difficult for a continuous nominal depreciation to be translated into a corresponding sustained real depreciation. Secondly, firms may “price to market” so that imports and exports are unresponsive to any changes in the real exchange rate. Thirdly, the values of the price elasticities of demand may be so low that the Marshall-Lerner conditions are barely satisfied. If the absolute value of the price elasticities sum to one, then the rule $y_B = \varepsilon/\pi$ holds, even if there is a substantial rate of change of relative prices. Goods and services that enter into international trade are for the most part highly differentiated and so their demand curves are relatively inelastic. Firms compete for sales predominantly by attempting to shift outwards the demand curve for their products through increasing their non-price competitiveness, rather than by moving down the demand curve through improving their price competitiveness.
Having been introduced to Kaldor’s and Thirlwall’s approach to economic growth during his studies at Hull, it was only natural that Bairam became interested in Thirlwall’s Law and especially with its econometric testing. It was noted above that Thirlwall’s Law is given by the formulae:

\[(2a) \quad y_B = (\varepsilon/\pi)z\]
and
\[(2b) \quad y_B = (1/\pi)x\]

Both equations reflect the workings of the “dynamic” Harrod foreign trade multiplier (Harrod, 1933) or, more generally, the Hicks “super-multiplier”. A successful economic policy is one that increases the value of \(\varepsilon\) and/or reduces the value of \(\pi\) (i.e. improves non-price competitiveness) which relaxes the balance of payments constraint leading to faster economic growth.

Estimates for \(\varepsilon\) and \(\pi\) can be obtained by estimating the Keynesian export and import demand functions given by equations (3) and (4) below, which underlie the derivation of equations (2). Initially, these were estimated in logarithmic form (Houthakker and Magee, 1966) as:

\[(3) \quad \ln X = c + \eta \ln(P_d/P_f) + \varepsilon \ln Z\]
\[(4) \quad \ln M = c + \psi \ln(P_f/P_d) + \pi \ln Y\]

where the upper case letters denote levels of the various variables, \(X\) and \(M\) are the volumes of exports and imports and \(P_d\) and \(P_f\) are domestic and foreign prices expressed in a common currency. \(\psi (\leq 0)\) and \(\eta (\leq 0)\) are the relevant price elasticities of demand. The estimated parameters \(\varepsilon\) and \(\pi\) can then be used to calculate values for \(y_B\) from equations (2a) or (2b), using growth rates averaged over a number of years. (Thirlwall’s Law does not imply that the growth of capital flows are unimportant in relaxing the balance-of-payments constraint in the short run, only that in the long run, as defined as a period of years, there will be no significant growth of net capital flows). If \(y_B\) equals \(y\) then this suggests that growth is balance-of-

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5 For a full derivation of Thirlwall’s Law, see, for example, Thirlwall (1979), McCombie and Thirlwall, (1994), Bairam (1988c), Bairam and Dempster (1991) and Bairam (1990a).
payments constrained, lending support to Thirlwall’s Law. One way of testing for this is to estimate equation (5) using cross-country data:\(^6\)

\[
y = \beta y_B
\]

and to test the null hypothesis that \( \beta = 1 \).

Early support for the law showing that there was a significant rank correlation between \( y \) and \( y_B \) for the advanced countries is to be found in Thirlwall (1979), but much of the early testing of the law was due to Bairam. Bairam (1988c) tested Thirlwall’s Law using time-series data for 19 European and North American economies. The estimated differences between \( y \) and \( y_B \) were generally small. Bairam and Dempster (1991) came to the same conclusion for a sample of 11 Asian countries. Bairam (1990a) obtained the same result for a sample of developing countries, with the exception of four oil-exporting countries, which were found to have actual growth rates well in excess of their balance of payment constrained growth rates.

A major question concerning the statistical testing of Thirlwall’s Law arose with the development of new econometric techniques and the problem of whether or not the import and export demand equations were spurious. The variables generally tended to be I(1) and Bairam was one of the first to show that the early results generally held. He estimated equations (3) and (4) using first differences (i.e. transforming the nonstationary into stationary variables) and found that the estimates of \( \psi \) and \( \pi \) were almost identical to the ordinary least squares estimates (not withstanding the loss of long-run information).

Subsequent studies using more sophisticated techniques have generally confirmed the validity of Thirlwall’s Law (see McCombie, 1997).

In an important extension of Thirlwall’s model, Bairam (1997) explicitly tested whether or not the values of \( \varepsilon \) and \( \pi \) are a function of the level of development, as proxied by the level of per capita income. Estimates obtained using the Box-Cox regression technique suggested that \( \varepsilon \) is negatively correlated with the level of economic development, while \( \pi \) shows no relationship. This suggests that as \( \varepsilon \) changes with the level of economic development, long-run estimates of \( y_B \) should be calculated using equation (2a), rather than equation (2b). It is

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\(^6\) A drawback of this approach is that it is possible that one country that is not balance-of-payments constrained could be an outlier in the regression and leading to the rejection of the hypothesis for the remaining countries, even though they are in fact balance-of-payments constrained. For a discussion of other tests of Thirlwall’s Law, see McCombie and Thirlwall (1994).
also found that the income elasticity of demand for the exports of the developing countries is actually higher than that of the advanced countries. Given that the former produce primary products while the latter produce manufactured goods, it might be thought that the converse would be the case (i.e. that manufactured goods should have a higher income elasticity of demand than primary commodities).

The finding that the developing countries should be able to grow faster for any given growth of world income than the advanced countries is surprising. Thirlwall (1997) suggests that finding a negative correlation between \( \varepsilon \) and the level of economic development is due to the fact that very few low-income countries, which export primary products, were included in the data sample. Thirlwall further suggests that failing to find a significant relationship between \( \pi \) and income per capita is evidence of the fact that developing countries restrict imports to protect their balance of payments and suggests that without these measures the income elasticity of demand would be higher for poor countries than rich countries. Nevertheless, given that the values of \( \varepsilon \) do differ between countries, Bairam’s work suggests that it is important to determine what causes these differences. As suggested by Thirlwall (1997), an interesting avenue for future work could be to see if this result holds for a broader sample of developing countries, including the poorest developing countries that rely heavily on primary products for export income. In the work to date the values of \( \varepsilon \) and \( \pi \) have generally been taken to be exogenous, whereas they are likely to be deeply endogenous. This is an important future area of research that was implicitly identified by Bairam.

Bairam and Ng (2001) tested for the constancy of \( \varepsilon \) and \( \pi \) over time in New Zealand, Canada and the United Kingdom, using cointegration techniques. It was found that \( \varepsilon \) and \( \pi \) were stable over time for New Zealand, but not for Canada or the United Kingdom. However, it was found that estimates of \( y_B \) using equation (2b) were a good predictor of growth rates. This was taken as providing evidence that estimates of \( y_B \) using equation (2b) are valid.

**The Box-Cox Transformation**

Bairam often questioned whether it was appropriate to assume a linear or log-linear functional form in applied work. In several of his papers, he used the Box-Cox (1964) transformation, which allows for more general functional forms and it is surprising that he seems to be one of the few economists who made full use of this technique. For example,
Bairam (1988d) used the Box-Cox transformation to analyze the effect of the variability of the money supply on the variability of inflation, using panel data for the OECD. It was found that the variability of the money supply did affect the variability of inflation. It was also found that it was appropriate to measure the relationship between the two variables using a log-linear specification. Bairam (1995) tested Wagner’s Law (that government spending will grow faster than income) using time-series data for the United States. Previous tests of Wagner’s Law (e.g. Ram, 1986, 1987) had assumed that the relationship between the two variables was log-linear.

Bairam (1990f), in a paper that did not use the Box-Cox transformation, examined the effect of government expenditure on economic growth, using time-series data for 20 African countries. It was found that for 11 of these countries government spending reduced growth, for the other 9 countries government expenditure either had no effect on growth, or tended to increase it. These results showed that generalizations about the effect of government expenditure on growth are dangerous, as the effect of government spending on growth can differ from country to country.

Bairam (1995) extended Bairam (1990f) by using the Box-Cox regression technique to allow for a more flexible functional form. Another innovation was to disaggregate government spending into various components: state, federal, defence and non-defence. It was found that federal non-defence spending grew more quickly than national income, supporting Wagner’s Law. However, no support for Wagner’s Law was found for the other categories of spending. Bairam also used the Box-Cox transformation in Bairam and Howells (1994) and Bairam, Howells and Turner (1990) (both discussed below).

**Ranking the Research Output of Economics Departments**

Over the last couple of decades, attention has become increasingly focussed on the quality of the research output of the various university departments, especially where they are funded by public money. In the United Kingdom, the controversial Research Assessment Exercise grades departments every five years with a ranking from 5* (outstanding) to 1. Its importance may be understood when it is realized that government research funding is influenced by these gradings. While this procedure has not yet been undertaken in New Zealand, Bairam became interested in the problems posed by constructing research rankings for economics.
departments. Bairam (1994) examined the institutional affiliations of authors published in the *American Economic Review, Econometrica, the Economic Journal, the Journal of Political Economy* and the *Quarterly Journal of Economics*. An interesting result, which the author did not comment on, was that British universities (London School of Economics, Cambridge, Oxford and Warwick) were at the top of the league table for the *Economic Journal*, with the top North American universities (with MIT, Chicago, Harvard and Princeton being the most prominent) taking the lead in the US journals. Bairam (1996) ranked the New Zealand economics departments on the basis of per capita publications in various categories of journals. A variety of rankings showed Otago and Victoria to be at the top of the league table.

**The Economics of Sport**

Bairam also had a keen interest in sport, at least from the perspective of an interested researcher and spectator. The two sports that Bairam’s research covered were cricket and golf. Bairam and Howells (1994) attempted to test the efficiency wage hypothesis with respect to golf. This hypothesis suggests that, *ceteris paribus*, the greater the prize money on offer, the lower would be the golf scores. When holding constant other variables, such as the difficulty of the golf course, that were likely to affect performance their results supported the efficiency-wage hypothesis. It was indeed found that the higher the prize money on offer, the lower the golf scores.

The research of Bairam that generated the most interest in the popular press combined two of Bairam’s main, although rather dissimilar, interests in life: estimating production functions and cricket. For this work Bairam teamed up with Glenn Turner, the former New Zealand Test cricketer, and John Howells, a cricket enthusiast in the Department at Otago. Bairam, Howells and Turner (1990), following the methodology employed by Schofield (1988) for English county cricket, estimated a production function for domestic cricket in Australia and New Zealand. The estimates obtained enabled the authors to determine whether batting or bowling was more important in winning games, and, more specifically, whether aggressive or

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7 There are indications, however, that some form of RAE is likely to be introduced in New Zealand, although at the time of writing (August, 2002) the precise form it will take is not clear.
defensive batting and/or bowling was the key to winning matches. The results differed for the two countries. In New Zealand the probability of winning was maximised by attacking batting and attacking bowling, with batting being slightly more important than bowling. The implication for team selection inferred from this was that the ideal all-rounder was a batsman who could bowl a bit. The results for Australia were somewhat different. In Australian domestic cricket the probability of winning was maximised by a combination of attacking batting and defensive bowling.

During the 1991 Cricket World Cup, held in Australia and New Zealand, much controversy surrounded the formula used to determine the total required to win a rain-interrupted game. Bairam and Howells suggested an alternative formula, which generated considerable discussion in the media. At the time it was thought that their formula was too complex, and lacked transparency. However, it was no less transparent than the Duckworth-Lewis formula now used in one-day cricket internationals for rain-affected matches.

As far as anyone at Otago knows, Bairam’s love of cricket was confined to research, either the estimation of production functions or field trips to Carisbrook (the main cricket ground in Dunedin), or in front of the television. ‘Administrative duties’, so he insisted, always prevented him from taking part in the annual staff versus students match in the Economics Department at Otago. Whether Bairam was the batsman who could bowl a bit, which his research indicated was the key to winning games, we will now never know.

**Bairam’s Contribution to the Economics Department at Otago**

Bairam was a prolific researcher up until the time of his death. He was also a very popular teacher of econometrics and labour economics at Otago. Students warmed to his accessibility and friendly demeanor. During his time as Head of Department at Otago from 1995-1998, Bairam worked tirelessly for the Department, often putting the interests of his staff and students ahead of doing his own research work, and, at times, his own health. When Bairam’s time as Head of Department was over, he left the Department a much more cooperative and collegial place than when he took over.

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8 Attacking batting can be defined as scoring runs quickly, whereas defensive batting is more concerned with occupying the crease. Attacking bowling involves taking wickets quickly, whereas defensive bowling means not conceding too many runs per over.
Bairam’s untimely death left a big gap in the Department. He will be remembered for his research and his teaching, but what his colleagues miss the most is his sense of humour, his friendship and his concern for other people, as is readily apparent from John Howells’ (2002) appreciation of him.

Bibliography


