BRINLEY THOMAS

Proceedings of the British Academy, **90**, 499–517

Brinley Thomas
1906–1994

WELL KNOWN AS A MONETARY ECONOMIST, a champion of the Swedish school of economics, and a student of labour mobility, Brinley Thomas was appointed to the Chair of Economics and Social Science at the University College of South Wales and Monmouthshire, Cardiff, in 1946. While presiding over the growth of a major complex department and participating actively in public life, he established a reputation as the world authority on the economics of migration. Exposing a major weakness in classical international trade theory, he described how migration of labour and capital had linked the nineteenth-century American and European economies, and he developed the concept of the Atlantic Economy. A series of books and articles secured his position as the leading analyst of nineteenth-century economic growth.

After his retirement in 1973 he built on already strong links with American universities, and was still teaching and researching while in his mid-eighties. In these later years he extended his interests back into the eighteenth and seventeenth centuries and developed an important interpretation of economic growth in terms of energy crises. His last book, published shortly before his death, ended with a plea that economic theorists should pay more attention to the irreversibility of time, and return to Marshall's concern for a biological approach to economic change.

His first book was published when he was thirty; his last when he was eighty-seven. Including articles, his publications spanned sixty-four years.

Brinley Thomas was born into the small mining community of Pontrhydyfen on 6 January 1906. His father had worked his way up to the position of deputy mine manager. A chapel deacon, Welsh-speaking and with Welsh values, he and his wife sacrificed to ensure that Brinley, his brother and three sisters were well educated. After passing the public examination young Thomas went to the local grammar school, which he left at the age of seventeen with a scholarship that took him to the University College of Wales at Aberystwyth. Torn between history and law as subjects of study, he chose the former. Required to take a related subsidiary subject, he also began to study economics.

The department of history was not to his liking, and he secured permission to switch his main allegiance to economics. At the age of twenty he graduated with First Class Honours, and two years later, in 1928, was awarded his MA with distinction. While working for it he was active in the Fabian Society and became President of the United Kingdom Students Section of the League of Nations Union.

High unemployment in coal-mining deprived his father of a job. Convinced that his studies had but begun, Brinley felt that he had to contribute to the family purse. His brother had yet to complete his medical studies, and his three sisters had to be considered. He left the university to teach evening classes in Pembrokeshire. Fortunately his father obtained a post as deputy manager in Porth, in the Rhondda Valley. His family migrated across the mountains and he resumed his studies. Helped by a Fellowship from the University of Wales, he went to the London School of Economics to work for a Ph.D., which he received in 1931. While there he wrote his first short paper, 'The Organisation of Religion in Wales', which appeared in the *Welsh Outlook* in 1929.

By-products of his Ph.D. were three papers. The *Welsh Outlook* published 'Men, Machines and Maintenance' in 1930. In the same year *Economica* printed 'The Migration of Labour into the Glamorganshire Coalfield (1861–1911)', and in 1931 the *Economic Journal* printed 'Labour Mobility in the South Wales and Monmouthshire Coal-mining industry, 1920–30.' His family experience and his love of history had already begun to carve his personal niche in economics.

In the *Economic Journal* paper he based his statistical analysis on information from the annual exchanges of unemployment books in forty-six Ministry of Labour offices in South Wales, using as his model an investigation undertaken in Lancashire by Jewkes and Campion. He

concluded that the South Wales coal-miners were not as immobile 'as some people tend to think'. They were more mobile than the Lancashire cotton workers. He gave three main reasons for such stickiness as there was: the high proportion of the unemployed who were married with children; shortage of houses in the new area and the burden of house-ownership in the old area; and the physical effects of being unemployed for a long time, including the 'sinister' tendency of the unemployed to adapt their life-style to their new circumstances. He was relying not only on statistics but also on the insight provided by his own experience and wide reading of government and other reports — an approach that never left him. He was also making points that were always to colour his thinking about migration.

After a spell as research assistant at the LSE he was awarded the Acland Travelling Scholarship that allowed him to spend nine months in Berlin studying German financial and economic crises, and to contribute a section on Germany to Hugh Dalton's *Unbalanced Budgets: A Study of the Financial Crisis in Fifteen Countries*. It also gave him first-hand knowledge of the rise of Nazi Germany, and an opportunity to practice an impishness that never left him. He smuggled out an old German flag, which he cherished to the end of his life. Encouraged by Dalton, he disregarded the rules of behaviour on the German railways and teased and tormented Nazi soldiers who were travelling in the same compartment. Once Dalton had to dash from London to save him from prison.

His adventures in Germany were followed by six months in Sweden, where he returned many times, adding Swedish to his other foreign languages of English and German. While there he familiarised himself with the work of David Davidson, who had held the Chair of Economics at Uppsala from 1890 to 1919, and had played a significant role as an adviser to his government on the economic policy that a neutral country should adopt. Thomas considered that this neglected economist had widened the scope of monetary theory, so that it was no longer concerned so narrowly with the value of money. In celebration of Davidson's eightieth birthday he wrote his next paper, 'The Monetary Doctrines of Professor Davidson', published in the *Economic Journal* in 1935. In it was a passage that could have been about himself:

> The barrier of language tends to make the flow of ideas as between large and small countries a one-sided affair. Economists in a small country must necessarily be linguists: and before they embark on original work they have usually mastered the recognised classics. But, unfortunately, it is often

> only after a long time-lag that their important contributions receive due recognition in the outside world

This article was quickly followed by his first book, *Monetary Policy and Crisis: A Study of Swedish Experience* (London, 1936) in which he emphasised the importance and quality of Swedish economic analysis and its application to government policy. There was 'a northern shrine where the English-speaking pilgrim may . . . derive inspiration, if he is prepared to take upon himself the burden of a difficult language'.

He discussed the impact of the First World War on inflation in Sweden, and the part played by economists in minimising it. Then he reviewed the monetary and trade cycle theories of Wicksell and later Swedish economists, and contrasted them with the doctrines of the Austrian School, then so influential in England. This led to a consideration of the application of these ideas in the management of the Swedish economy from 1924 to 1935. His conclusion contained a truth that was more novel then, but even now is sometimes unheeded: 'The example of Sweden indicates that a slump can be shortened and a recovery accelerated when the Government and the Central Bank co-operate to diminish uncertainty and to furnish the conditions necessary for a revival of investment.'

He returned from Sweden to the LSE where his lectures used Myrdal's terms *ex ante* and *ex post*, until then unheard in England. (They seem to have first appeared in print in England in an influential article by Ohlin in the *Economic Journal* in 1937.) One of his students was the young G. L. S. Shackle, who wrote that he was 'of all the teachers of economics of my time the one most charged with celestial fire, the one who swept the brain of at least one hearer with a rustling wind inspiration'.

But monetary economics and public finance, in which he had begun to establish a reputation, were a diversion from the path that this 'English-speaking pilgrim' had chosen. Later he told me how he viewed his study of migration as his *pererindod*, his pilgrimage on which he progressed towards his goal only through immense dedication and effort. During the remainder of the 1930s his publications were all concerned with labour mobility and showed an increasing interest in international migration.

A Leverhulme Scholarship enabled him to spend the year 1938–9 surveying migration trends in the British Commonwealth. When war broke out in September 1939 he was in Canada. He reported to the

British Embassy and became attached to the War Trade Department of the British Embassy in neutral Washington, where he put his knowledge of German to good use. While working in New York he met Cynthia Loram, an artist and art historian, whom he married in 1943, and by whom he had a daughter, Patricia.

When America entered the war he became Director of the Northern Section of the Political Intelligence Department of the Foreign Office, where his flair for languages helped him in his contact with undercover agents in northern Europe. When Denmark was finally liberated he had to visit the country with whose resistance movement he had become so involved. Required by protocol to be in uniform, he was amused and thrilled to be made a temporary full colonel. After meeting and thanking many whom he had known only by their code-names he was presented with a beautiful Danish tea-set by its designer, who had been one of his contacts.

At the end of the war he returned to the LSE, but the chair of Economics and Political Science in the University College of South Wales and Monmouthshire, in Cardiff, was vacant. He was appointed to it in 1946, and changed the title to Economics and Social Science. Fortunately for economics his attempt to secure adoption as a parliamentary candidate a few years later failed. (It was probably prompted by a desire to influence economic policy in line with his knowledge of the role of academics in the management of the Swedish economy.) He remained in his Chair at Cardiff until his retirement in 1973, actively participating in university affairs and Welsh public life as well as pursuing his research, in which there was now an important change of emphasis. He had noted that until 1900 the significant migration from Britain had been to the United States — a fact that had been ignored by most ninteenth-century British literature on the subject. His attention to the British Commonwealth gave way to a detailed study of 'the Atlantic community of nations' and so to his discovery of 'the Atlantic Economy.'

As he had already shown in his study of Swedish monetary theory, Thomas relied heavily on a critical reading of early works. His Honours students were expected to sit a paper on the History of Economic Thought, and as he dissected the views of classical economists he displayed a rare blend of scholarship, clarity of presentation and infectious enthusiasm. Close to his desk in his study at home he had filing-card cases crammed with notes he had taken while reading the classics, both famous and obscure, some going back to his student days. He put

them to good use in his study of international migration, which was to occupy most of the rest of his life.

His *magnum opus*, entitled *Migration and Economic Growth* (Cambridge), was sponsored by the NIESR and published in 1954. It was eagerly awaited. His main ideas and the preliminary fruits of his statistical and historical investigations had already appeared in 'Migration and the Rhythm of Economic Growth, 1830–1913', published in *The Manchester School* in 1951. They clearly indicated a completely new interpretation of nineteenth-century growth. The dust-jacket to the book he fondly called 'MEG' carried his own summary of his major findings:

> . . . between the 1840's and World War I, when the United States was absorbing labour and capital from Europe, the long cycles in home construction in the United Kingdom and the United States were inverse to one another. In the era during which Great Britain was the leading creditor nation, there was never a chronic sterling shortage: the main reason for this was the alternation of phases of intensive domestic investment on either side of the Atlantic. In periods of active trans-Atlantic migration and capital exports, investment and income per head rose rapidly in the United States and slowly in the United Kingdom; in periods of dwindling migration and capital exports, it was Great Britain's turn to experience a relatively vigorous upswing in home construction and real income per head. In the former periods Great Britain was supplying sterling through foreign lending and in the latter periods through a growing import surplus. The inverse relation between British and American cycles of home construction ceased when the United States checked immigration and emerged as the leading creditor nation responsible for nearly half of the world's manufacturing output.

To appreciate the significance of this study we need to look at the critical account of the classical view with which Part I began. He argued that the classical economists 'theorized on two different planes'. In discussing international trade they 'had nothing to say about migration between countries; their doctrine was usually illustrated by exchanges of British goods for the produce of other sovereign countries . . . where, if only for reasons of language, it was perfectly reasonable to assume that international mobility of labour would be negligible.' He held this assumption to be a source of much wrong thinking in the development and application of the theory of international trade. Even greater error arose from the other aspect of the dualism in classical thinking.

While trade theory virtually ignored migration, discussion of Mill's 'larger community' of countries had a great deal to say about emigration.

> On the one hand, there was the static theory of international trade, based on the law of comparative costs, which gave scientific justification for the policy of free trade. On the other hand there was the dynamic theory of colonization, based on the law of diminishing returns and the tendency of profits to fall to a minimum. The art of colonization was listed as one of the few exceptions to the general rule that there must be no State interference with private enterprise: it was held to be not only desirable but indispensable that the Government should spend money on promoting the emigration of labour and capital from the mother country to overseas territories.

What was important to Wakefield and J. S. Mill was that the social structure of 'non-competing groups' — labourers and proprietors — that existed at home should be created and maintained in the colonies. Sending surplus labour to the surplus land of the colonies would bring benefits to the proprietor class at home only as long as the emigrant labourers were prevented by 'the sufficient price' of land from becoming peasant proprietors.

This theory provided Marx 'with a most congenial text'. But Marx's greatest contribution to economic thought was his attempt to formulate a theory of economic development. The later Victorian theorists had not continued the classical questioning of the nature of economic evolution. 'The territory of economic dynamics was abandoned and the vacuum was filled by the Marxists, who have been highly skilled in extracting the maximum of surplus value from their intellectual monopoly.'

Social structure and economic dynamics became key concepts in the development of Thomas's theory. He rejected Viner's assertion that the classical economists had assumed place immobility and occupational mobility, and that the latter had played no significant part in their theory. The vital phenomenon omitted was class mobility. After reviewing the contributions of Sidgwick and the debate between Edgeworth and Bastable (between 1897 and 1903) he pointed out that a few years earlier the Swedish economist, Wicksell, had been 'at pains to hammer home . . . that free trade theory rests on the fundamental assumption that the population of a country is a kind of property-owning democracy with capital and land fairly uniformly distributed among the members.'

After illustrating his assertion that 'the whole discussion' of the mobility postulates of classical theory afforded 'a good example of the limitations of static models', Thomas wrote one of his key statements:

> The surprising thing about the [Edgeworth–Bastable] controversy . . . was the apparent failure of both sides to appreciate the real significance of emigration of labour from an old country. . . . The course of economic development since the eighteen-forties should have made it perfectly clear

> that an innovation such as free trade implied by its very nature a movement of labour and capital from England to the undeveloped countries. The United Kingdom was a member of a wider community of nations which was undergoing a dynamic transformation under the impact of technical progress, and this entailed an interregional distribution of factors of production. The process called for a theory of economic development embracing the mutual relationship between national specialization, internal mobility, international migration and the course of trade. An analysis of the process of emigration is not complete unless the assumptions about internal migration are made clear.

He summarised his conclusions. The static pure theory of international trade rested on the assumption of perfect internal mobility between classes as well as occupations. When class immobility was postulated the analysis was closer to the facts of the free trade period: but then 'the interaction between the degree of internal immobility and the rate of external migration' required us to drop the assumption of international factor immobility. There was need of a theory of development that explored the dynamic inter-relationships just described.

While his study of economic thought showed him the lack of such a theory, it was his pursuit of history that showed him the need. As he was to show increasingly in his later years, he was an avid reader of British and American economic and social history, and loved few things more than old newspapers and other contemporary accounts. Economic theory that ignored 'how people tick' was doomed, and evidence about how people ticked long ago was essential to his exploration. Some of this evidence had to be statistical.

In using statistics to study migration he relied most on three techniques. He used age-distribution tables and life expectancy data to estimate numbers of net immigrants over a period. He followed the American economist Kuznets in examining growth and major fluctuations with the aid of data for overlapping decades. He devoted a great deal of effort to fitting trends (usually second degree parabolæ) to lengthy time series, and to examining annual deviations from these trends.

He had reservations about all three techniques, especially trend-fitting. I was his research assistant at this time. We had long discussions about the validity of fitting mathematical trends by methods well suited to physical investigations in which time did not appear as variable. When used with time series these methods attached as much importance to data for every single year, and so the trend value in any year was determined as much by actual values for future years as by actual values

for past years: yet how could economic behaviour be so symmetrically dependent on past and future?

We tried to devise a trend that in every year reflected only past data. Eventually he decided that this was not his area of expertise. It would be better to be criticised for using standard if unsatisfactory techniques than have interest in his analysis of migration take second place to discussion of what would inevitably be a controversial and unsatisfactory attempt to devise a new way of fitting trends to historical data. But he had to keep in mind that statistical analysis alone would not be enough to support his conclusions.

Whenever statistical evidence pointed to an important conclusion he would devote whatever time and effort might be necessary to checking whether other evidence supported it. Evidence of all kinds had to be considered and interpreted. 'Statistical ''facts'' do not speak for themselves: their story has to coaxed out of them. In approaching the subject' he had 'certain hunches as to the best way of wheedling out the truth'.

Having noted that 'emigration from the United Kingdom as well as from the continent of Europe showed marked peaks and troughs with a span almost double that of the business cycle', he set out to examine these fluctuations 'in relation to changes in the rate of economic growth in the United Kingdom and the major receiving country, the United States.' This implied 'a study of capital exports, international trade, domestic investment and national income'. His study of international migration was part of a study of the process of economic growth — not of a single country but of a vast economic region that straddled the Atlantic.

Schumpeter's work on innovations as agents of dynamic change, and his emphasis on the risk of vital elements of causation becoming concealed by over-aggregation, became part of Thomas's own thinking. But he criticised Schumpeter and Akerman for tending 'to overlook those variables which bring about changes in the balance of economic power within the international community'. Instead he would view 'movements of population and capital from one country to another as an expression of growth in the international economy' which would be 'looked upon as a whole. By approaching the time-series of each country with this hypothesis in mind, we shall not expect them all to tell the same story and we may come across structural turning-points' that had not previously been identified.

There was need of:

> a concept of economic development which stresses the widening of markets, the dynamic of increasing returns, and the international mobility of labour and capital as a medium through which an international economy grows and changes its character. . . . Migration not only induces but is itself partly determined by changes in the structure of the international community.

In examining these changes there would be special attention to the 'minor secular swings, showing an average interval of about eighteen years from peak to peak' that so many of the statistical series revealed. A Malthusian cycle of extreme population pressure, leading to similar cycles in emigration, which would influence methods of production in the receiving country, was part of the explanation. Another was the sensitivity of building activity to changes in population. All this led to changes in relative attractivenesses of old and new countries as places for investment by the old countries, and so to cycles in capital flows.

This was the area to be studied in the main part of the book with every tool on which he could lay his hands, statistical and historical, refined and crude. In the end everything had to gel, and make sense to a very critical, well-informed and honest mind. If it did not, he was dissatisifed; and dissatisfaction had to be turned into understanding.

He began with a careful account of the sources and limitations of migration statistics, and a detailed analysis of migration from the United Kingdom 1840–1940 and of Irish emigration over a similar period, finding clues about how the emigrant communities had ticked. Occupying three chapters and supported by several pages of statistics, Part II is a model of how the evaluation and analysis of historical statistical data should be approached.

Part III began with a reprint of his *Manchester School* article. Empirical studies of international migration had already asked questions about links between its cyclical movements and the short business cycles of the countries concerned. Thomas noted that graphs of immigration into the United States from Great Britain and Germany in the period 1831–1913 displayed not only short cycles but also 'minor secular fluctuations' with a span of about eighteen to twenty years. Asserting that 'two short words are better than three long ones', he called these 'long swings'. The British series showed major troughs in 1840, 1860, 1878, and 1897; the German series in 1843, 1862, 1878 and 1898. Similar patterns were revealed for immigration from Ireland and Scandinavia. Simon Kuznets had already drawn attention to the existence of 'secondary secular movements' in the American economy. It was time to extend the area of analysis. Arguing that a study that

confined itself to business cycles was 'bound to leave out important features of economic developments', Thomas explored 'the long upswings and downswings in international migration and the rhythm of economic growth of the United States and Great Britain respectively in the period 1830–1913'.

Later chapters showed him at his best in obtaining statistics and extracting meaning and inspiration from them. Insisting that 'you can't make bricks without straw', he revealed an ability to maximise the output–input ratio, always carefully checking his conclusions against other historical testimony, and his own powerful reasoning.

Internal migration often entailed change of occupation. Thomas persuaded the Bureau of the Census to release unpublished data which he used to examine the social classes attained by immigrants from England, Wales, Scotland and Ireland. He went on to comment on the links between immigration and social mobility, and how this was changing over time.

With Schumpeter's waves of innovation in mind, he was delighted to find that statistics of patents granted for inventions in the United States showed sharp rises at the same time as the big upswings in immigration. As the 'widening' of capital structure (defined as a declining or constant ratio of capital stock to GNP), testified, these were periods of increased productivity. Booms in immigration stimulated invention. No wonder America found fame as the home of mass production.

In a chapter on internal and international migration he produced evidence that when migration within an 'old' country (such as Britain or Sweden) was low there was also low home investment; at the same time capital exports and emigration were high. In the 'new' country statistics of internal migration were less obtainable. He used data about Negro migration as a proxy for total internal migration, and argued that swings in external migration were also inverse to those of internal migration in the countries that received the international migrants—a proxy and argument that he later rejected, as we mention below.

Other chapters traced the origin and impact of American restrictions on immigration, which he considered to be against the interests of an expanding international economy, and the changing pattern of migration to the Dominions. In concluding he wrote of his awareness 'that the analysis has done little more than touch the fringes of a complex subject'. There was need of more empirical work, but perhaps he had

done something to 'indicate in what directions further work might bear fruit'.

One passage from the last chapter is particularly pertinent to a current argument:

> The fact that the United States is a country of internal free migration and free trade makes it easier for it to solve problems of interregional balance of payments than if the various States had immigration quotas, exchange restrictions and tariff barriers. Equilibrium is not re-established without some decline in the standard of living of the weak region; the two conditions, however, ensure that the decline is kept within bounds and that a breathing space is allowed so that the region's productive capacity can be restored.

His earlier emphasis on language differences as a barrier to migration reminds us that the comparison of a contemplated United Europe with the United States of America is seriously weakened by the absence of one of these conditions.

The book contained 138 statistical tables, 80 of them full-page, and 43 statistical diagrams or charts. It was well received, especially in America. Economic historians and sociologists paid it most attention. It sparked off a lively debate about long swings and the Atlantic Economy to which he contributed several more papers, contributions to books and lectures on both side of the ocean.

With 'MEG' out of the way, he set about honouring a long-standing promise to direct a study of the Welsh economy. This led to *The Welsh Economy: Studies in Expansion* (Cardiff, 1962) which he edited and partly wrote. It was an opportunity to return to his theme. He used historical statistics, particularly of the coal and steel industries and house-building, to show that the growth of South Wales was more in tune with that of the United States than of England. Steam coal made South Wales part of the export sector. When English capital formation was in decline, South Wales was prospering. High overseas demand drove up Welsh coal prices, leading to rising incomes and rising marriage and birth rates.

This finding quickly rekindled his interest in regional disparities, and initiated a laborious statistical enquiry, based largely on Inhabited House Duty statistics, that eventually produced enough straw for a few more bricks, which he used to great effect in 'Demographic Determinants of British and American Building Cycles 1870–1913', which appeared in Donald McCloskey (ed.), *Essays on a Mature Economy* (London, 1971). The paper reappeared the next year as Chapter 2 of

MAUD — *Migration and Urban Development: A Reappraisal of British and American Long Cycles* (London, 1972).

Except for Chapter 3, on the role of international capital movements, a few minor passages and some statistical tables, the whole of 'MAUD' appeared as the lengthy 'Part IV: Reappraisal' of 'MEG II' in 1973, a full long swing after the first edition. Parts I–III differed very little from the first three parts of 'MEG I' but used better statistics where these existed. I recall the glee with which he waved aloft a copy that he had somehow acquired of Feinstein's newly completed but unpublished thesis, full of new historical statistics of capital formation. Here was something new against which to test his theories. What could be better?

The 'lively debate about long swings and the Atlantic Economy' had been 'facilitated by superior quantitative methods and a marked improvement in the range and quality of historical statistics.' Spectral analysis had confirmed his assertion that long swings were no statistical mirage; and nobody had been able to refute the existence of the long term inverse relationship to which he had drawn attention, 'at least in the period 1870–1913'.

He considered the criticism that the inverse nature of the long swings was fortuitous: 'that the operative forces were in the domestic sphere and not in any interacting process'. After producing other counter-arguments he insisted that holders of this view had not paid enough attention to demographic factors. One-sided and American-centred arguments were rejected.

Even Schumpeter had failed to consider the whole as more than the addition of its parts, but 'secular growth entails internal shifts within the aggregate via international factor movements; the expansion of the whole may well express itself through disharmonious rates of growth in the parts. This is what happened in the Atlantic economy . . .'. There was

> . . . an interregional competition for factors of production within the Atlantic Economy, with the Old World and the New World alternating in their intensive build-up of resources. This is the essential characteristic which distinguishes these long swings from short business cycles. Long swings are fluctuations in the rate at which resources are developed, whereas the short business cycles are fluctuations in investment in producer durables and inventories.

This alternation led to the inverse relationship, and

> . . . it seems to be a condition of this inverse investment cycle that (a) a substantial part of the capital formation is sensitive to the rate of population growth, and (b) the rate of population growth is mainly determined by the net

> migration balance. The mechanism also entails an inverse relation between internal and external migration.

He produced a carefully thought out formal statement of a model, with nineteen equations and two identities, which was too imprecisely specified to be of immediate econometric value but is a useful summary of his thinking.

In 'MEG I' his explanation of the inverse relationship had not ignored monetary influences but these had not formed an important part of the mechanism. In 'MEG II' this had to be remedied with the help of statistics that had been produced by Friedman and Schwarz and other recent work. The controversy about the long swing could not 'be settled by models . . . which ignore international interaction and which take no account of the transmission mechanism linking money with other economic variables.'

> From 1879 . . . to 1913 the leading countries of the Atlantic economy were on the gold standard. The financial dominance of London and the international repercussions of the Bank of England's policy were major factors. In each country there was an interaction between the 'real' economic magnitudes and the changes in the supply of money entailed by the discipline of the gold standard.

This was part of the explanation of the 'inverse rhythm of growth in United Kingdom, the leading lender, . . . and the United States and other countries of new settlement. . . '.

In the pre-1913 Atlantic Economy, 'the inverse cycle was propelled by real determinants but . . . in the crucial phases when expansion gave way to contraction, changes in the stock of money played a significant part in influencing the course of the economy.'

The analysis was extended to Canada, Australia and Argentina. Another chapter looked at the dynamics of the 'brain drain', one of the more significant features of migration in the years between his two editions. It was concerned both with the flow from Europe to America (encouraged by high United States government spending on research and development) and with the outflow of graduates from developing countries who trained more than they could use. Negro migration and the American urban dilemma occupied the penultimate chapter. A brief look at more recent American and European experience ended with an inquiry into 'the solemn question whether we should say farewell to the Kuznets cycle' (or the long swing). Despite the 'moving epitaph' written by Abramovitz, his own view was that it was still alive. The

ending of Bretton Woods in 1971 was possibly 'the beginning of a new process of interaction which could entail systematic long swing divergencies between growth rates in the United States and an enlarged European community of comparable magnitude.' It is too early to dismiss the suggestion.

His second edition appeared in 1973, the year of his retirement from the Chair he had held for twenty-seven years. His department had grown to provide courses in social science, personnel management, law and accountancy. Brinley had towered over it, a stranger to democracy. When he arranged an appointment or set a deadline he expected it to be observed. His colleagues appreciated that in applying the same rule to himself he was allowed considerable latitude. Impatient with inefficiency, he could be generous over mistakes made and admitted in honest effort. Sloppy thinking earned either light-hearted ridicule or scorn. A very private man who seldom saw the need to explain himself, he appeared hard at times; but he was capable of great kindness and helped many. What he would not tolerate was anything that seemed to interfere with his work or his department. A slightly built man, usually neatly dressed with a dominating shining balding head, and a small inquisitive nose, he had blue eyes that could twinkle with mirth or glare with a searing intensity that none could ignore. Appreciative of good food, rugby, beer and honest company he could be the life and soul of a party. His nimble command of words and sense of the incongruous frequently led to loud shoulder-shaking laughter that infected all around. At times it took control and rendered him incapable of serious discussion. His penetrating staring scowl was a warning to keep out of his way but within his reach. Even then, occasionally some colleague who knew him well would light upon a happy thought or verbal quip and turn his wrath into mirth.

When I was his research assistant I attended some of his honours courses. One of these was scheduled for 10.00, but he always arrived promptly at 10.20, having been at work on his book until only six or seven hours earlier. One morning I was working in his room when he suddenly arrived at 10.00. It was fifteen minutes before his class started to drift in, and as each student arrived his glare darkened. A memorable explosion of frightening anger was imminent. But a brave student ventured that abundant experience of *ex post* actual arrival times had caused him to alter his *ex ante* ideas. Brinley's eyes cleared, his shoulders shook and the lecture had to be abandoned.

He had served on the National Assistance Board (which led to his

appointment as OBE in 1953) and as Chairman of the Welsh Council (which led to his advancement to CBE in 1973). He had spent considerable periods abroad, especially in the United States where he was a visiting professor at Johns Hopkins for a term in 1968 and a National Science Foundation Fellow at Brown University in 1971. The importance of his work on the Atlantic Economy was recognised by his peers when he was elected a Fellow of the British Academy in 1973. One of his proudest moments was when the National Eisteddfod honoured him by accepting him into its bardic circle in recognition of his services to his beloved country.

On retirement from his Chair he became director of his college's Manpower Research Unit and quickly developed further research and teaching links with American and Canadian universities. These provided him with the opportunity to continue his studies in a congenial atmosphere where he spent half of every year. His summers were spent mainly in his home in Cardiff, with his extensive library.

In 1993, fifty-seven years after the publication of his first book and a full long swing after his retirement, his final volume appeared. *The Industrial Revolution and the Atlantic Economy: Selected Essays* (London), contained ten essays, most of them updated and revised versions of papers published elsewhere. Two had pre-dated his retirement, but most of the rest were first published between 1980 and 1991. Two chapters came more or less untouched from 'MEG II'. Two others were portraits of Robert Owen and a challenging analysis of the beneficial impact of the industrial revolution on the Welsh language. The remaining six chapters showed how three main questions had fired his interest in the last quarter of his life. They were pulled together in an impressive Introduction, written when he was eighty-six, that summarised a new interpretation of economic growth and its prospects.

One question was whether his model that identified and so well described the Atlantic Economy in the nineteenth century could be applied to the eighteenth century, in which a few writers had identified the possibility of long swings. He detected a 'striking similarity', with three long upswings between 1703 and 1776 and an inverse relationship. But after 1760 the effects of a shortage of timber, charcoal and iron were increasingly evident, and the marginal cost of supplying iron-intensive goods to the colonies was rising. This prompted his second question: 'was this energy crisis different in kind from previous shortages?'

He took a new look at the energy shortage in the seventeenth

century, invoking fourteen contemporary writers and an array of Swedish (and other) statistics to inspire his thinking. It led to a rejection of Nef's argument that there was a first industrial revolution between 1540 and 1640, when the use of coal led to no fundamental change in the nature of the economy. But between 1640 and 1680 there was a severe crisis within the timber economy. This produced incentives to adopt coal-centred techniques which led to the development of engineering skills and expertise that gave Britain the edge over other countries. We learned how to smelt metals, including iron, from ores with coal or coke, and how to use steam to pump water from mines. For several decades low population growth was accompanied by an abundance of energy: but then came 'a population explosion and an acute energy shortage intensified by Britain's excessive defence commitments after the Seven Years War' (1756–63). A few years later, 'the loss of the American War was the last nail in the coffin of the charcoal iron age'. Attemps to solve the energy crisis by massive increases in imports of timber and charcoal iron failed.

> The organic economy was caught in a Malthusian trap. How could an unprecedented swarming of people on a small island be made consistent with a rising standard of living? This was impossible if the economy remained basically organic: it was necessary to change the energy base from the flow of solar energy to the stock of fossil fuels.

What eventually enabled this to be achieved was the discovery in 1784 by Henry Cort (to whom he devoted a chapter) of how to use coke instead of charcoal in the refining of pig-iron. 'Thanks to the Cromwellian energy crisis British inventors had evolved the expertise which enabled them to solve the post-1760 crisis.'

Thomas concluded his Introduction with the suggestion that now another energy crisis has to be solved. There has to be a switch from the stock of solar energy embodied in fossil fuels back to the flow of solar energy. One way of achieving this is indicated in a prediction by the Nobel Laureate N. F. R. Calvin, one of his colleagues at Berkeley, that by the end of the century commercially adequate efficiency of the photochemical cell will enable us to store renewable solar energy for use by people everywhere.

While working on 'MEG II' he had become 'increasingly aware that the evolving Atlantic economy should be treated as an ecological system'. His first paper on this topic was published in 1975. His work on energy crises confirmed his view. Following his habit of a lifetime,

he went back to earlier writings and in 1991 published 'Alfred Marshall on Economic Biology' in the *Review of Political Economy*. The final chapter of his last book built on these. Entitled 'A Plea for an Organic Approach to Economic Growth', it examined Marshall's case for economic biology. Economic change is an irreversible evolution, and biological models and analogies should be used instead of mechanical ones, in which time is treated as reversible. Marshall was at pains to stress this, and promised to write about it in a second volume of his *Principles*, but he failed to do so, giving weak health and pressure of other work as his reasons. Thomas argued that his papers revealed another reason — an intellectual dissatisfaction with his own ideas about how to treat time.

> Marshall's basic insight was that the study of economic growth must mean the abandonment of mechanical equilibrium models based on the reversibility of time. This message was not heeded by his successors.
>
> When Marshall recognized the full implications of irreversibility he rejected his mechanical model of growth and called for a biological approach. Yet . . . when the study of economic growth became a major preoccupation in the 1950's and 1960's, Marshall's conclusions were ignored and mechanical models similar to the one which he had discarded became a prominent element in economics curricula everywhere.

In stressing the need for 'theories of growth which will be ''in time'' not ''out of time'' ', Thomas was voicing the same dissatisfaction with the treatment of time as he had expressed when fitting trends to time series forty years earlier.

In 1976, three years after his retirement and to mark his seventieth birthday, his Festschrift was published by the University of Wales Press. *Population, Factor Movements and Economic Development: Studies Presented to Brinley Thomas*, edited by Hamish Richards contained essays by several distinguished international scholars and others, like Richards and myself, who began academic life as his research assistant. A few months before his death in 1994 I visited him in his home where he lived with his books. He talked of his love for Sibelius and for fine paintings, and of books he was reading. Then he picked up his Festschrift and read out a sentence I had used to end a personal note about him, 'There's a whole long swing of life and output yet to come,' he read in a voice that had lost none of its slightly nasal resonance. 'You were right,' he said. 'There was, and I've done it. Now it's time to have a rest.' He told me of how he was relaxing — reading and thinking about the economics of New Testament times.

After his death his daughter found, on a table next to his favourite chair, chapter headings for a new book looking back over his life and times. Scholarship, reading, researching and writing were this Welshman's life to the very last.

J. PARRY LEWIS
University of Manchester