BUSINESS CYCLES, LONG WAVES, AND COMPANY LONGEVITY IN BIRMINGHAM AREA METAL INDUSTRIES 1780 - 1980

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LIST OF CONTENTS

APPENDICES

CHAPTER FOUR

LIST OF TABLES (APPENDIX)

APPENDIX 1.A.1

Diverse Categories of Natural Cycles

The concept of regularity as observed in natural phenomena appears to be deeply etched into the cognitive framework whereby man perceives the creation. Everywhere in nature are found cyclic movements (Galpin 1981) and it is argued (Davies 1981) that the universe itself is a cyclic mechanism.

If that be the case, it is contended here that these hierarchies of interconnected rhythms have a direct influence upon the man-made world. They do this through their continuous modification of the conditions of work upon land (for the purpose of production needed to satisfy human wants) (MacLaren 1948) and by their direct effects upon human beings themselves.

There also exists the 'biological template' of the notion of a cycle, as observed in the morphological stages of transformation undergone by creatures at every level during their lifetimes; viz - the early rise and subsequent decline of their energies and capabilities.

Many other types of cycle exist, as follows:

Systemic cycles:

These derive from man's geocentric observation of orbital and axial planetory mations about the sun (like electrons about an atomic nucleus) with their effects of years, seasons, months, days and nights comprising the calendar measurement of time. Oceanic tides and thermal and electro-magnetic fluctuations noted by meteorologists are linked phenomena. (Moore 1982)[1]

Long phasic cycles

These comprise aeonic telluric episodes such as those hypothesized for rock and ocean formation, movements of continental plates, core temperature changes giving rise to alternating ice and tropical ages, precession of the magnetic poles, and periodic bursts of volcanic activity.

Further examples of phasic effects concern long-term processes such as alternating periods of glacial advance and retreat (Utterström 1955), alternating climatic spells (Wheeler 1965) and short-term cycles such as that of the hydrosphere, of atmosphere in steam engines, and of combustion of fossil fuels. Even shorter phasic effects are discernible in quasars, quartz crystals, electric current and wave transmission frequencies.

Short-term phasic cycles include those affecting the biosphere eg solar flares changing radiation levels and the O-zone layer (Jevons 1885, Jevons 1909, Sasson 1982) so altering temperature, wind and rainfall that all levels of organic life are influenced. Variations in crops (Poynting 1884, Zahorchak 1984, Le Roy Durie 1972) and harvests (Phelps-Brown and Beveridge (1933) (1936)), agricultural stock (Benner 1875), fertility (Smith (re Easterlin) 1981) nuptuality (Flinn 1970) population (Habbakuk 1966) plague (Zinsser 1935, MacNeill 1976) human excitability (Tchijewsky 1922) and war[2] (Dewey 1964, Wright 1965, Modelski 1984, Modelski and Margan 1985 Nef 1950 Gauquelin 1973 Goldstein 1983 Screpanti 1982 Rasler and Thampson 1983) form a sequence of effects conjoined by common external conditions and their changeable influences. Together, they modify supply and demand as seen in costs of production, relative prices and absolute quantities of output.

Function cycles regulating whole organism are also of a phasic kind. They include receipts of impressions by the sensory apparatus brainwaves revealed by electro-encephelagrams; currents of nervous energy circulating round the living body; alternating predominance of intellectual, emotional and physical energies over regular intervals of days, (the cause of moods); menstrual cycles in females and of potency in males; phases of glandular activity of various periodicities; the metabolisms associated with the digestive tract; creative activity (Bril 1982) and inertia; breathing, heartbeats and bodily movements.

Ritualistic

These cycles are man-perpetuated and concern the organization of time into segments having periodic recurrence. They involve not only religious and cultural festivals, holidays and celebrations, commercial fairs, sales, promotions, circuses etc, at specific calendar dates, but such events as sessions of Parliament and of the Law Courts, the organization of rotas of meetings, agendas for discussion, or periodic elections or referenda, and the routines of accountancy concerned with monitoring business, budgeting, forward planning, and meeting statutory requirements.* They might also include 'conventions' concerning the plots of plays and novels and the composition of poetry and music, the duration of sporting activities and the regulation of leisure pursuits.

Anthropomorphic

These cycles might include archetypal stages through which pass civilizations, cultures, empires, nations, epochs, eras, generations, reigns, revolutions, elections and periods of political leadership, thus affecting all races, societies and communities, regardless of religion, ideology, or level of information.

Pan-economic

These cycles are those which are inherent in the structures and development of national economies, sectors, industries, and companies, and the 'life-cycles' of, premises processes, plant, machines, products and 'markets', together with associated opportunisms, manipulations, persuasions, and changes in fashion, style and design.

These cycles serve to place a convenient perspective upon historical sequences but do not themselves provide a rational explanation, or justification for whatever is observed. In many case of cyclic appearance, linkages may exist beyond the horizon of data collection.[3]

APPENDIX 1.A.2

Failed attempt for coherent cycle study

The now defunct UK Cycles Network was formed in 1980. By 1983 it comprised 90 distinguished corporate and individual members from world-wide Universities, Research Institutes, Public Limited Companies, Financial Consultancies, and Market Institutions.

Two study groups had then been formed to investigate, a) Master view of cycles, b) London Market Cycles, while others were planned covering Social and Natural Cycles and Methodology.

Initial findings were that there are many new and validated observations, proven concepts - theories and constructs, tools for measurement and methods of analysis available from such scientific disciplines as cybernetics, physics or biology which appeared to be highly relevant to cycles research.

The Main task was seen as to formulate a thesis which will explain the behaviour of all, or most-cycles in the following domains within one grand process model: astronomical, geological and climatic; chemical and biological; social and psychological; cultural and political; organizational and technical.

The priority was identifying cycles and then recognizing how they fit together within a coherent framework. At that date, twenty economic cycles, twenty social cycles, and eleven natural cycles had been researched, mainly by the Society for Strategic and Long Range Planning and the British Consortium for Innovation.

APPENDIX 1.A.3

The course of a cycle - a Kaleidoscopic view

Qualitative indications as to what one should expect at each identifiable stage of a cycle are provided by many authors, each providing copious observation and an economic rationale in support of their theory.

As times changed, successive theories became progressively deficient in respect of current business environments: eg the classical economists were unable to incorporate the very large role of Government in the 20th century, while Schumpeterians overlooked the possibilities of extended credit for domestic consumption (Roegen 1981) likewise Keynesians missed the theoretically devastating occurence of an economy based not on scarcity but on abundance coexisting with stagflation; (Stewart 1983), while monetarists under-rated the startling consequences of simultaneous debt renégement and stickiness in dollar recycling between economies in opposite hemispheres. (Gyöngyössy 1985)

Many indeed are the cyclically altered layers of the national economy stacked around the basic triad of land, labour and markets; these are summarised for immediate purposes under the 'holdall' categories of government services, wealth-producing firms, financial intermediaries and consumer households.

It is under these main headings that a schema of the contribution of eleven economists to a description of the course of a cycle has been collated (added to which are a few originals observations by the writer). The entries are intentionally 'crude' and telegraphic; the sequence follows that already described, except in that stagflation replaces stagnation as the initial phase of the business cycle - the progress of a long-wave may be taken to be similar: a schema reproduced from Beckman's 'The Downwave' is appended.

Technical Annexe (Extract)

The following is an extract from 'The Economist' 1982 publication 'The World Measurement Guide' (p 179):

"Over the period of the business cycle, the rate of growth is positive during expansion, and accelerating during the early stages of recovery; then the rate of growth falls and is small or negative during recession.

In terms of calculus, where dy/dt is the first differential (rate of change) and d^2y/dy^2 is the second differential (rate of acceleration) the changes in these

rates are indicated in (a sine-curve) diagram.

That is, the first differential is positive (there is positive growth) during recovery from a trough; the second differential is at first positive (the rate of growth is increasing) then as recovery continues, a point of inflexion is reached at which the second differential becomes zero (the rate of growth, while still positive, begins to slacken): at a peak the first differential becomes zero (the rate of growth changes from positive to negative) while the second differential is still negative: the rate of fall then increases until another point of inflexion is reached (when the second differential is zero) when the rate of fall begins to slow down, becoming zero at the bottom of the trough."

Comment

The entire cycle is thus depicted as the result of percentage differences, positive and negative, in the year on year growth rate of a variable. It is total economic indicator of the general tempo of change in the representative variables selected to illustrate its progress.

Other descriptions

The course of an actual cycle has been described with vigour by Mill (1867), Marshall (1884), Lavington (1917) Mitchell (1927), Haberler (1937) and from the theoretical standpoint by Hicks (1961) Sterman (1983) et alia. The following extract from the Business Prospect section of 'Management Today', headed 'The Recurrent Cycle', provides a contemporary description: (Morrell, The Henley Centre for Forecasting, 1979).

"It has always been the case that one cycle tends to generate its successor. From a position of high unemployment and idle capacity, expansionary government policies generate faster spending and output growth. Higher capacity utilisation generates an even bigger increase in profits. Improved profits and cash flow lead to increased investment spending, while at the same time the demand for consumer credit rises, as does the demand for business credit to finance rising levels of stocks and work-in-progress. Demand is added to demand, which tends to accelerate, and, unless checked early, will lead to increasing inflationary pressure, an excessive rise in imports and a balance of payments deficit."

"Government policies are then thrown into reverse. With tighter credit conditions and rising costs, business demand for credit tends to force interest rates up. The combination of clear money and tougher fiscal policies reduces spending and output growth, and cuts heavily into profits. Businesses then attempt to cut back and reduce inventory levels. Investment spending plans are trimmed, and the sharp cycle in investment and stock levels is maintained."

"The cycle also has its own sequence, for a setback in the US will depress exports into the US from other manufacturing countries with a time-lag of some three to six months. Then the combined effect of the slowing down of industrial output in all the industrialised countries of the West leads to a slackening of demand for raw materials and commodities. This, in turn, depresses commodity prices, and the export earnings of primary producers fall. Their balance of payments deteriorates, and their ability to import from the industrialised countries suffers. The downturn, following this sequence, is staggered over a period of two years for the world economy; and, on present evidence, the cyclical pattern will be repeated in just the same way as before, with the intervals between cycles averaging four or five years."

DEPRESSION 1

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Covert collusion by owners of machines to reduce wages	'Workers unite' for better terms
2 MARSHALL	-	Distrust prevails (b) Reserve funds increase	a) Prices relatively low, many works closed	Temporary orders & unemployment
3 SCHUMPETER	-	Interest rates are low	Lean economic structure without much development	-
4 LAVINGTON	-	See 2(b) above	Cautious reorganisation to prepare for revival : looking for signs of change	Labour more efficient:
5 KEYNES	Deficit spending, public works	See 3 above (b) Excess idle funds	Little need for investment funds (c) low output. see 2a above	Public employment at low wages
6 HABERLER	Selective subsidies and intervention in specific cases	Debts repaid. see2b + 5b Reduced domestic MV	a) Stocks liquidated, resource under-utilised opportunities abound	-
7 HAWTREY	-	Banks buy securities, some borrowing occurs	Merchants increase stocks purchaseing power grows	Consumers buy more at bottom prices
8 TINBERGEN	-	Large liquidity of financial businesses	Innovations pre-planned see 5c + 2a + 6a above	High unemployment
9 DUESENBERRY	-	Savings accummualte	Housing need occasions some new starts	Incomes low & steady
10 MATTHEWS	Deliberate gov't optimism	More favourable Balance of Payments	Lack of actual net manufacturing investment	Aggregate consumption relatively reduced
11 MITCHELL	-	See 2b + 5b above Conservative credit policy	Business costs low, narrow profit margins, discouraged by low trade	Emergence of new consumer tastes & fashions
12 (KIMMERLING)	Large deficiencies in public spending	Counter cyclical borrowing and investment	Steady wholesale prices	Changed industrial attitudes

Recovery 2

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Increased surplus accrues to owners	Extra time at work Creates owners' surplus
2 MARSHALL	-	Risks reappraised (b) Lender willing to advance credit at low r%	Orders increase (b) Enterprising buyers obtain cheap business for new products	-
3 SCHUMPETER	-	Purchasing power extended for entrepreneurs' use	(a) Exceptional entrepreneurial. Prices for innovators. Prices still restrained	New consumer purchasing power as secondary effect
4 LAVINGTON	-	(a) Rise in profit expectations see 2(b) above. Rising rents	Small profits from general increase in trade Slight price rise Confidence revives	Low wages & prices but more employment
5 KEYNES	Government encourages revival restrains taxation	See 4(a) above and 2(b) (b) Actual rise in investment	Investment funds cost less more purchases of intermediate goods at relatively low prices	Gradual take-up into private employment
6 HABERLER	Securities bought in open market some tariff protection	Long-term rate of interest diverges from short-term	Foreign demand increases . See 2(b) & 3(a) above. Results of public works	Availability of labour
7 HAWTREY	-	Idle balances utilised (b) Growing optimism	(a) Traders renew orders. Surge in producer orders (c) Capacity start to expand	See (3) above
8 TINBERGEN	-	Zero speculative incomes Low discount rate	New combinations made (b) needs to replace outworn and inadequate plant	See (4) above
9 DUESENBERRY	-	Ample mortgage funds Easy credit terms	(a)New construction sports Good builders' profits	Home-buying 'spree'
10 MATTHEWS	Balance of Payments adjustment policies	Rising Public expenditure on goods and services Tax remissions	Stockbuilding renewed See 9(a) above & 7(c) above Foreign opportunities open	See (3) above
11 MITCHELL	-	See 5(b) above See 7(b) above	See 8(b) above and 7(a) above. Tendency to advance prices on current orders as trade grows	-
12 (KIMMERLING)	MS on Target PSBR under control	Static inflation Banks cut base-rates	World trade set to rise. Imports sucked in costs rise	Increased productivity and retail spending

PROSPERITY 3

Author	Government Action	Financial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Surplus raised by economies of social resulting in low unit costs	Small wage incentive conceded in order to expand production
2 MARSHALL	-	(a) Speculators exaggerate extension of credit	New enterprises proposer under energetic leadership older ones decline relatively	Labour rates highest in developing industries
3 SCHUMPETER	-	High strain on reserves See 29a) above	Maximum diffusion of innovation Market saturation near	High labour turnover and job mability
4 LAVINGTON	-	Expansion of mutual commitments see 2(a) above complacent optimism	Expansion of plant High inter-trading speculative production	(a) employment & (b) wages level off at higher rate
5 KEYNES	Increased taxes Budgetory surplus	(a) Interest rates high Tension in market	New investment checked	-
6 HABERLER	Revalued currency	(a) Over-abundant credit (b) Over-high interest rates	(a) Excessive imports close supply gaps Delays profits level off	Waste & inefficiency detract from output per capita
7 HAWTREY	-	See 5(a) above 'Horder See 6(a) above terms'	(b) Speculative stockbuilding High prices and costs	Full employment (b) high consumer demand
8 TINBERGEN	-	See 5(a) above	Improvements to production and distribution Large-scale orders continue	See (4) above
9 DUESENBERRY	-	Slower rise in savings	Price/wage spiral-see 7(b) above	Demand for labour outstrips specialist supply
10 MATTHEWS	Warnings re 'overheating'	Inflow of foreign s/t K See 6(b) above	See 6(a) above Durables reach saturation Expansion plans fulfilled	-
11 MITCHELL	-	Monetary assets exchanged for real invokes K Shortfall (see 9 above) vis à vis Ms: call for loans	-	See 5 above, see 7(b) above
12 (KIMMERLING)	Efforts to subsidize uncompetitive concerns	Indicators dip. Warnings sounded. Mood begins to alter	Big response to enterprise schemes Lessened management control	Some labour displaced by new plant & equipment

BOOM 4

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Price competition forces reductions and pressure to reduce costs	Cost reductions lower level of wages Relative surplus
2 MARSHALL	-	Changed balance of trade bolsters expectations	(a) Prices and costs tend to rise Fluctuating demand (b) opens profit opportunities	Wages rise for skills in short supply
3 SCHUMPETER	-	(a) credit commitments en-larged Land values increase Interest rates go higher	See 2(a) above and 2(b) Swarms of initators appear Bankruptcy for many	Heavy labour need mops up unemployed
4 LAVINGTON	-	New savings become inadequate vis à vis credit expansion driven by optimism	Increased buying (b) new investments (c) strong rise in general profits	Incomes purchase more
5 KEYNES	Control exchange rates	-	-	-
6 HABERLER	Increase Ms Balance	Raised invisible earnings Interest rates go up (c) MS increase	New products abound expansion spreads all sectors Increased imports	(a) Earnings rise with increased productivity
7 HAWTREY	-	See 39a) and 6(c) above	(a) Stackholders repeat orders Higher Turnover see 4(b) 'Higher profits generally'	(a) General demand rises General wages rise
8 TINBERGEN	-	Liquid resources utilised see 3(a) above. Boom in speculative incomes	New inventions made Rise in TT: K ratio See 4(b) above	See 6(a) and 7(a) above
9 DUESENBERRY	-	High return on volumes lent and spent	Houses sell fast at competitive prices Factories in demand	Wide choice of goods at rising prices
10 MATTHEWS	Expansion welcomed Revenues high	Credit greatly expanded Government debts repaid or re-scheduled	Marked rise in exports consumer durables up see 7(a) above	-
11 MITCHELL	-	Optimism self-justified Rents rise as an amount	Producers flat out Renewal costs soar Buyers Hoard See 7(a) above	Incomes permit increasing demand for new products
12 (KIMMERLING)	Prices and Incomes policies introduced	Institutions speculate in markets. Some collapses under boom pressures	Primary, transport, brewing peaks Major industries execute capital projects	Wage claims raise unit costs

CRISIS 5

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	Monetary factors precipitate crisis	New high output machines as demand falls away	Labour displaced by machines made by labour
2 MARSHALL	-	(a) Under-realized profit expectations (b) Crisis of confidence	Sudden curtailment of investments projects	Dedundancies begin gradually
3 SCHUMPETER	-	See 2(a) above collapse of weak concerns (c) Credit restrictions	(a) High costs, lower prices (b) reduced margins and (c) over-sated markets	-
4 LAVINGTON	-	Realization of errors See 2(a) above	See 3(a) inducing forced receiverships and liquidations	Apprehension about job security grows
5 KEYNES	Increased expenditure	External event causes See 2(b) above	-	-
6 HABERLER	(Avoid demand restrictions)	Ms inelastic because base too narrow. Supply of new funds too restricted	See 3(a) above	Wage inflation continues and worsens crisis. Inflexibility
7 HAWTREY	-	Loan recalled.See 3(c) above Reneged commitments	Orders cancelled despite following wholesale prices general 'overproduction'	'Forced savings' 'Under-consumption'
8 TINBERGEN	-	Fall in speculative incomes Banks ration credit. Doubts over future	Supply bottlenecks develop	Consumer prices remain high
9 DUESENBERRY	-	Callapsed morale and tendency to panic	Housing slump	Income rises do not compensate for checks to credit
10 MATTHEWS	-	Adverse Balance of Payments on secondary wave causes run on reserves	Consumer derables growth slumps See 3(c) above	-
11 MITCHELL	Gurantees for existing once new debts; buying bonds	Orerous rates of interest. High volume of MkV. Bad debts accumulate	Private investment falls See 3(b) above & 3(b) Output volumes checked	Consumer demand stays relatively high
12 (KIMMERLING)	Support for sterling or Devaluation. MS squeeze on liquidity	Rumours precipitable crisis. All future growth discounted narrow reserves	Acute cash-flow problems, shares phummet. Profits varish	Strikes threaten economy Gloom descends

RECESSION 6

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Depressed consumer demand reduces incentive to reinvest	Competition for work between reserve of unemployed
2 MARSHALL	-	(a) Loans are contracted rates of exchange altered	World-wide transmission of State of domestic trade. Established firms work at loss	Labour wages or less employment
3 SCHUMPETER	-	Fall in interest rates	Creative destruction of weaker, obsolescent firms, C) Stocks accumulate	Unemployment worsens
4 LAVINGTON	-	See 2(a) above. Purchasing power reduced, low resources. Pessumism	See 3(c) above merchant orders decline cumulative spread of liquidations	Waves of reundencies due to closures
5 KEYNES	Sell Bonds	Demand for credit falls	Output and investment decline	a) fall in aggregate consumption & savings
6 HABERLER	-	Loss of confidence	Incomplete installations abandoned	-
7 HAWTREY	-	See 2a, & 3 above Credit further restricted	Some projects completed, some credits retained some projects contiue	5a) above induces fall in retail prices
8 TINBERGEN	-	Liquidity crisis	Bankruptcies	Redundancies
9 DUESENBERRY	-	Mortgages difficult	Maintenance work goes on	Many out of work
10 MATTHEWS	Demand is wrongly restricted	BoP still adverse See 6 above	De-stocking. See 5 above Cost-cutting sales	Labour costs still rising per unit of output
11 MITCHELL	-	Banks depressed, uncertainty prevails low profit expectations	Sector disparities widen, capacity static. Low demand for primary products	Arrears of payments Increased litigation
12 (KIMMERLING)	Fiscal policies (wrongly) harden	Rush of funds into bonds New issues few & under subsribed	Check to energy consumption Retrenchment and divestment	Social costs escalate Depressed mentality

STAGFLATION 7

Author	Government Action	Finiancial Institutions	Manufacturing Organisations	Consumer Households
1 MARX	-	-	Production of commodities sinks to low level	Subsistence wages, job at any price
2 MARSHALL	-	Investors switch funds to wherever yields are highest	a) Prices stagnant, empty pressures available	Reduced workforce finds seasonal alternatives
3 SCHUMPETER	-	Accumulation of funds static rents	Business as usual, sales at a discount	-
4 LAVINGTON	-	Unwarranted pessumism and mistrust	See 2(a) above, contracts at low rates to spread overhead costs	High social security costs
5 KEYNES	Increase deficit spending	Liquidity trap. Little demand for credit. C) savings & r % low	Very low profit expectations	Incomes palarized b) aggragate demand flat
6 HABERLER	-	Institutions slow to cocenterance risks	Dis-investment continues	See 5b) above
7 HAWTREY	-	See 5 (c) above, loans liquida repaid	Bankruptcies contiue, wasted capital projects, costs higher than prices	Demand stagnat
8 TINBERGEN	-	Dull markets	Stocks run low, little activity, forced sales	Relatively lower wages and cheaper goods
9 DUESENBERRY	-	Easirer mortgages	Stable house-prices and rents	See 8 above
10 MATTHEWS	-	Foreign exchange restored	Negative FC formulation Exports decline	-
11 MITCHELL	- -	Doubt re-securities, bad debts written off some new savings	Stuggle for solvency, commodities fall in price, output volume at low level	See 7 above
12 (KIMMERLING)	Defence contracts increased	Insurance funds large	Divestment opportunites phummet. Profits varish	Discount for bulk purchases, despondency permeates

Production factor	Author	Upswing	Downswing
Capital	Forrester	growing capital intensity (shift to capital goods sector)	declining capital intensity (shift to consumer goods sector)
	Mandel	revalorization of capital (increasing accumulation)	devalorization of capital (decreasing accumulation)
Labour	Freeman	increasing employment (product innovation)	increasing unemployment (process innovation)
Raw Materials & Food	Rostow	scarcity (induces price increase growing internationalisation of production and investment	abundance (induces price decreases)
Innovation	Mensch	improvement innovations	apparent, and later basic innovations
	Mandel	innovation in energy technology	diffusion through the whole economy
	Freeman	product innovations	process innovations
	Rostow	growth of new leading sectors (related to primary production)	diffusion of new leading sectors
	General	maturing of innovations	diffusion, and later birth of innovations
The whole Economy			
Macro-economic growth		high	low, even negative
Price		increasing	decreasing
Markets		non saturated	saturated
International trade & investment		expansion (liberalism)	contraction (protectionism)

APPENDIX 1.A.4

International Enmeshment

Arguments that the British economy had not been export propelled [Sahel (1981), Lewis and O'Leary (1955)] and therefore British cycles could not be better understood in relation to fluctuations in the world economy were countered, it seems, by others,[4] according to which great importance attaches pre 1870 and continuing importance pre 1914 of export values upon fluctuations in British money incomes.

Coincidence of key crisis dates in the economies of the United Kingdom, the United States of America, Germany and France between 1879 - 1914 provided empirical evidence. The correlation of co-movement averaged 83.1 per cent over 419 months in the earlier periods, but since 1918, had become only 45.2 per cent (Van Roon 1983).

Home investment had habitually been viewed as an alternative or complement to profitable investment overseas as and when and where autonomous opportunities had occurred. The international character of the business cycle [Marshall (1892), Brown (1965)] was thus easily transmitted between primary producers and industrial economies. The UK economy did show greater co-movement with European than with other economies (Morgenstern, 1959).

The course of exports could not convincingly be considered as the single most important variable in British economic fluctuations, especially after 1930; although they did display greater volatility of change in response to foreign crises or the changing terms of trade, they represented only a marginal proportion of GDP. (Chang (1970), Imlah (1967), and a somewhat sluggish influence upon it.

The image of a rocking-horse receiving an impulse has been given (Samuelson (1964) pp 250 - 266) to explain the combination of external and internal constituent causes of a cycle. Impulses were ascribed pragmatically to technological innovations, resource discoveries, dynamic growth of population, territorial acquisitions, feedback effects of new investments and other activities giving grounds for 'justifiable optimism'. The continuation of growth ensured the perpetuation of cycles, since without renewed growth the above effects would inevitably 'tail off'.[5]

These arguments did not forestall those delineating reciprocity with lagged interaction as part of a world cyclical process, involving mega-fluctuations between trading 'blocs'. Political exploitation of differential growth rates between countries had led to alternating eras of protectionism and free trade as the dominant ideology. Short-term inverse motions became absorbed into long-term co-movement of economies.

APPENDIX 1.A.5

Cycles in contemporary economic policy

Differing understandings about which assets constitute savings and of the role of savings vis à vis investments divide exponents of the three main trends in modern economic theory about what happens during cyclical expansions and contractions.

Modern classicists cheerfully believe that increased savings result in increased investment, employment, division of labour, technical change, output, consumption and so further savings in a virtuous circle of thrift and growth.

Neo-Keynesians dismally contend that increased savings result in reduced consumption, less demand, less investment, employment and output and less future savings, and they provide no place for the effects of improved technical input.

Monetarists, (despite adverse confirmatory causality testing: Tobin 1970) believe that any increase in the money supply - whether through increased lending by the commercial banks, operations in the bond market or borrowings from abroad - results in inflation without a corresponding increase in real national income, thus undermining the role of savings and their value as a catalyst.

Many attempts to synthesize disparate views (Patinkin 1965, Pasinetti 1975, Walsh and Gram 1980, Reid 1985) have led to general acceptance of NAIRU (the non-accelerating inflation rate of unemployment) as a derivative from an augmented Phillip's curve, and a general monetary and PSBR 'squeeze'.

By refraining from using fiscal policies or injections to create a multiplier effect which would waste itself in inflation, the governments of Western European countries have accepted under-utilisation of resources and declining productivity (Kaletsky 1984) in order to escape from 'stagflation'.

An out-turn of 'damped' cyclical growth (Judd and Scadding 1982) has ensured low levels of inflation at the price of stagnating output, high levels of unemployment, and retarded technological reinvestment. Inputs have been minimised as costs while output has not been maximised due to inadequate aggregate demand. Oil prices have dominated world financial cycles.

Superseding gold and currency reserves as the dominant cycle of finance in the Western World, the oil finance cycle (Lomax 1982) is at the epicenter of the international market fluctuations. Phasic unfoldment influences balances of payments, exchange rates, interest rates, price-competitiveness, investment, money-supply, output, employment, income and consumption of all industrial nations.

This is a master cycle operating through the economic institutions and national political processes, electoral cycles and foreign policies and trade agreements of the whole world economy, developed, developing and under-developed.

APPENDIX 1.A.6

Cyclical Indicators and the Treasury Simulation Model

1.A.a Composition of the Indicators

Cyclical indicators chart movements in the economy over the business cycle. In particular, they help in analysing and forecasting movements in the economy. They do not measure the absolute level of output or actual rates of growth but are concerned only with identifying the cyclical variations around the long-term trend.

The UK cyclical system is under continuous review and is revised at discrete intervals. It consists of groups of such indicators chosen for their ability to reveal cyclical movements in the growth of economic activity[6] (CSO Economic Trends October, 1983 (p 148 - 153) and earlier articles March 1975, May 1976 and March 1983).

Since 1975, the Central Statistical Office has collected, analysed and since 1975 published data relating to both leading, coincident and lagging cyclical indicators. These are generally used as a monitoring device providing advance warning of turning points in the business cycle. There is also a composite indicator to assist in evaluating general change, but its ten year span of existence is wholly insufficient to throw light on the long-wave effect.

According to 'Economic Trends' (1983):

Longer Leading Indicators include total dwellings started; net acquisition of financial assets by industrial and commercial companies; rate of interest on 3-month prime bank bills, Financial Times Actuaries 500 share price index; CBI Quarterly Survey - change in optimism.

Shorter Leading Indicators include Bankruptcies; new registrations of cars; wages and salaries per unit of output; gross trading profits of companies; credit extended by finance houses etc; CBI Quarterly Survey - new orders and expected changes in stocks.

Coincident Indicators, gross domestic product (3 measures); volume of retail sales; manufacturing production; level of below capacity working (CBI Survey) and CBI Quarterly Survey - actual changes in stocks.

Lagging Indicators, manufacturing stocks; engineering industries, orders on hand; investment in plant and machinery; unemployment; vacancies notified.

Each of these four categories are reduced to a single graph of a time-series, then fused to form a composite cyclical index[7] running from 1964 onwards. Other Economic Indicators in graph form cover money, prices, earnings, company income, fixed investment, consumption, retail trade, output, labour, overseas trade, balance of payments and exchange rates. The system is subject to important technical improvements from time to time.

These many symbiotic graphs showed remarkable, slightly varying co-movement over two decades, sufficient time to compare several cyclical upswings and several downswings and to gain perspectives on recovery and recession. (EPR No 167 May 1984). Some component series eg: unemployment and unfilled vacancies 1950 - 55, showed an inverse relationship to each other reminiscent of the Phillip curve.[9]

Demonstration of another strongly fluctuating curve was found in a business climate indicator 1968 - 1980 for all EEC countries in the UN. 'Economic Survey of Europe' 1980; a second chart, illustrating 'demand pressure and price expectations', demonstrated synchronous movements of even greater amplitudes. Predictions on the likely outcomes for all countries were derived from analysis of the component variables of these indicators.

UK cyclical tendencies (1978 - 1984) are demonstrated by regularly updated official indices covering producer prices, retail sales, stocks manufacturing output, production industries output, earnings interest rates (Sterling Interbank) sales, orders, stocks in wholesaling, retailing and total distribution; rents of offices, shops and industrial premises; GNP at constant factor costs; business confidence, capital spending and the 'leading business cycle composite indicator.

The timing schedulesof the four indicator groups are about 12 - 18 months; about 6 - 8 months; current; about one year in arrears. The timing characteristics of the component and composite indicators are measured relative to the dates of turning points in the general economic cycle - called 'reference cycle dates'. These are the dates at which economic activity - as assessed from the three measures of Gross Domestic Product at constant prices, the volume of retail sales and the output of the production industries - deviates most from its long-term trend.

The method of compiling the composite index is complicated, consisting essentially of giving equal weights to the component series of each group of indicators to form composite indices from the detrended, smoothed and rescaled results. A criticism of this method is that it ignores changing relationships between the components as the cycle turns - ie: it is a

'doctored' impression of what is happening - but it has the advantage of a consistent method applied to fairly consistent variable performance.

There exists an option in the detrending of original growth series[8] to reveal cyclical deviation: either the long-term trend is subtracted, or it is eliminated by division of the original series by the long term trend - whichever yields the more even set of cyclical amplitudes for the detrended version of the series.

1.A.b The Treasury short-term Forecasting simulation Model

Official short-term economic forecasting activities developed well in advance of any formal model. By the late 1950's both the economic thinking and the statistical framework of forecasting were recognizably similar to the present situation. But with quarterly national accounting figures a recent introduction, there were not the runs of figures necessary for a systematic econometric treatment.

"Gradually, during the 1960's, as longer runs of data accumulated and research studies were completed, fully formalised equations were acquired for the most important behavioural relationships. These relationships, however, were not put together as a complete model until quite recently." (GES 1974)

Further revisions have in fact been made in the 1984 remodeling, mainly to extend the monetary inputs [see also Moore and Siskin (1967), Ball (1970), Hymans (1973), O'Dea (1975), Auberbach (1982), Lomas (1983) and Treasury Occasional Papers]

The Treasury model has been described more in terms of 'approximate predictive likelihood'[10] (Davison, 1986 than of greater degrees of certainty, and also criticized as an 'embodiment of the parochial economic beliefs of present operator' (Brittan 1984). It is composed in fact of several hundred equations representing what are *highly unstable specified relationships and definitional identities.*

Delays ranging from one week up to ten years are common in attempts to obtain verified quantity data for the selected series. The provisional guesstimates utilised for reasons of expediency were found later to vary by up to 3 per cent from the eventually verified out-turn. *This deviation was sometimes larger than that of the cycle itself.*

The model is built around the individual components of the income and expenditure flows leading up to an estimate of aggregate demand and output. It is an atomistic not a theoretical construct, and does not envisage inter-connections between decisions on various aspects.

Neither does the model provide a satisfactory formal treatment of the inter-actions between real and monetary variables, or envisage a phasic alternation in these inter-actions (Ohlin, 1937). Accordingly, there exists no cyclically effective overall strategy for managing the national economy.

Its flow-chart contains no apparent reference to any of the cyclical indicators, although including elements of the components of several series comprising each. It is a disaggregated, static system, and as such, gives rise to no conflict with the political processes of consultation, lobbying, and exercise of official judgments.

A further comment summarises the situation:

"Analysis, whether economic or other, never yields more than a statement about the tendencies present in an observable pattern, but only what would happen if they continued to act as they have been acting in the time interval covered by our observation and if no other factor intruded (my emphasis)". (Islam 1985)

1.A.c Government as an economic agent

However, the government cannot simply be considered as a generator of random monetary and fiscal shocks to influence the trend of growth: the electoral cycle and an in-built massive commitment to rolling programme expenditures ensure it a major rather than marginal rôle in economic performance (Friedman and Laidler (1975), Burgess (1977), Maloney and Smirlock (1981), Akerholm (1982)

As Mullineux (1984) states, "Government needs to be endogenised in cycle models" and a "game theoretic treatment of the interaction between the government and other economic agents is required." He refers to Lucas' (1975) equilibrium business cycle theory in a competitive economy subject to random monetary shocks and Barro's (1980) addition of a global capital market into this model.

Mullineux also reviews Nordhaus (1975) theory of a political business cycle where government is viewed as a vote utility maximiser (Downs 1957) subject to an inflation/employment trade-off curve deliberately manipulated for electoral advantage so as to form a cycle (Boddy and Crotty 1975) and Frey (1978) (Tufte 1974, 1978) adds a cycle in disposable income.

It was understandable that economic agents, especially decision-takers, were faced with a spectrum of stochastic futures[11] and uncertainty in the absence of generally agreed economic models incorporating cyclical features. (Knight 1921) (Collingridge 1984)

The situation at HM Treasury at the time the forecasting model was developed was described as follows:

"In any particular situation the analytical tools, if used properly, serve primarily to distinguish real from imaginary difficulties, and to concentrate attention upon the things that are crucial. They do not make decisions for us, though sometimes the particular reformulation of the problem which they force us to undertake may suggest that one specific course of action is fairly compelling." (Williams 1967, p 3)

Mid-twentieth century attempts by Government to regulate the economy so as to achieve a menu of policy objectives took the form of 'fine-tuning' of taxation, expenditure and interest rates in order to marginally influence activity, inflation, employment and the balance of payments; also to redistribute wealth and increase welfare. However, these efforts met with but modest success, and culminated in 'stagflation' (Hodson 1972) (Sherman, 1979), Meadows et al (1979) and the 'Black Economy' (Heertje et al 1982)

Keynesian theorists regarded the Government as an agency acting on behalf of the public's welfare by trying to reduce the amplitudes of the cycles using counter-cyclical monetary and fiscal policies. Following Dow (1964) and Paish (1965), Matthews (1969) opined that government in the UK had often accentuated rather than alleviated fluctuations by implementing policies so their effects occurred in the wrong phase of the cycle.

This might be offset by the role of unused production capacity, eliminating inefficient managements through liquidations, and promoting faster growth through more effective competition. A deliberate policy of lower, 'damped' expansion, with greater price stability encouraging exports to pay for necessary imports, might be pursued at the cost of higher unemployment.

The dissenting proposition had long been that the Government ran the economy in the interest of the dominant, capitalist class, as put by Kalecki (1943) Feiwel (1974) Boddy and Crotty (1975). On the other hand, Bronfenbremner (Ed) 1969 and Zarnowitz (Ed) 1972 led one to believe that despite mistiming, anti-cyclical demand management policy could have actually reduced the amplitude of the business cycle in the post-war growth period.

When stagflation exploded the Keynesian theory and demolished the simple Phillips - curve trade-off between inflation and unemployment, the Friedman - Schwarz (1963) monetarist theory became recognized, although not formally tested for its causality Grainger 1969) Sims (1977, 1980). It was soon roundly refuted for its manipulation of historic data (Hendry and Ericson -1983). Under the monetarist scheme, real national income remained as if unaffected by changes in nominal national income: trends alone were real, fluctuations illusory.

Precise forecasting remains elusive both because of the inadequacy of selected variables to accommodate the total complexity of all factors relating to modern economies in their international context (Ackley 1971) and because, despite the widespread use of leading indicators, cycles do not follow mathematically exact periodicities as they repeat forward from the present moment.

It seems obvious that predictions based upon extrapolations from the evidence of only one phase of a cycle would quickly become falsified by events, (Lundberg 1965) and policies dealing with only one phase would correspondingly become rapidly inappropriate. The same argument holds for the retrospective longitudinal view, involving a sequence of seemingly inevitable decisions actually taken, all having strictly temporal validity.

APPENDIX 1.A.7

A framework for byegone cycle theories

Fashion generally dictates what is currently considered as economics (Tribe, 1987), but the long antecedent history of economic thought nevertheless may contain some important features with considerable residual impetus for current observation [cf: Barber (1967), Roll (1978) Hollander (1979)]

Accordingly, with regard to theories and observations relating to economic fluctuations, commented upon by a succession of 18th and 19th century economists, it has been possible to formulate a reference econogram which accommodates their main underlying propositions, despite altering perspectives.

The sequence of modes of economic thought in Great Britain included the following: the Schoolmen (Aquinas, Scotus and followers); the bullionist/mercantilists (Mun, Malynes, Misselden and perhaps Galiani, Forbonnais); the physiocrats (headed by de Quesnay); classicists (Smith, Ricardo, Mill); socialists (Engels, Marx and followers); marginalists (Jevons); neo-classicists (Marshall, Walras, Pareto); radicals (George, Veblen); cyclicists (Schumpeter, Lavington, Mitchell, Pigou Haberler); modernists (Keynes, Tinbergen, Samuelson with neo-Keynesians and followers); and monetarists (Friedman et al), now followed by systematisers (Forrester, Klein, Leontief and others).

Those British social conditions giving rise to our simplified reference model were that the political economy was dominated by three main groups of interests: landowning monopolist agriculturists forming the governing class; commercial traders increasing wealth through exchange; and a much smaller group of financier-rentiers and dealers involved in transactions with specie, bills, bonds, shares consols and other financial instruments.

The output of the economy was basically agricultural produce and that of extractive primary industries, at least until 1780 - 1810, when industrial wealth based on manufacturing and processing both organic and mineral substances enormously increased in volume.

The cycles to which the early economy was prone were perennially those of weather, harvest, famine, (3 - 4 years) plague (7 - 10 years), and war (c 15 years) upon an otherwise virtually static economy. **The effects of these influences were most keenly felt in trade as cycles in price and demand.**

The rôle of innovations and technological evolution in industrial life was

very slow to develop, if one takes an overall perspective, although extremely rapid of particular trajectories are followed (eg; transformations in iron-smelting and in textiles machinery).

The part played by specie in foreign trade was of enduring interest to early economists, as was the effect of money supply on prices, and their derivations of value. Arguments were put forward by many pre-Smithian writers, including Petty, Newton, Cantillon and de Quesnay.

The role of seapower and a merchant-fleet in securing wealth from international transactions involving grain and other commodities was emphasized. Trade increased the national income, especially when high value exports were used to procure low value food and material imports.

The Government levied duties on trade, and also taxes on property - not until Gladstone's tenure of the office of Chancellor of the Exchequer were they levied upon incomes, but not until later yet upon industrial profits.

The standpoint adopted by physiocracy was that only agriculture was productive, and then only due to the manner in which landowners allocated land for several uses, one of which was the production of their own consumer goods by the labour force serving the aristocracy. (Cantillon 1763).

"the real value of everything used by man is proportionate to the quantity of land used for its production and for the upkeep of those who have fashioned it" (p 115)

As land availability for productive uses was seen as the constraint upon increase in employment and consumption, therefore upon population and the level of wages seen as an aspect of the rent of land, demand for output was determined by the composition of claims to the use and product of land: ie a proportion of its rent. Although Cantillon did not distinguish between wages and material costs in production, Smith (1786) did so. Capital abundance was assumed, interest rates ignored. (except by Locke and Hume)

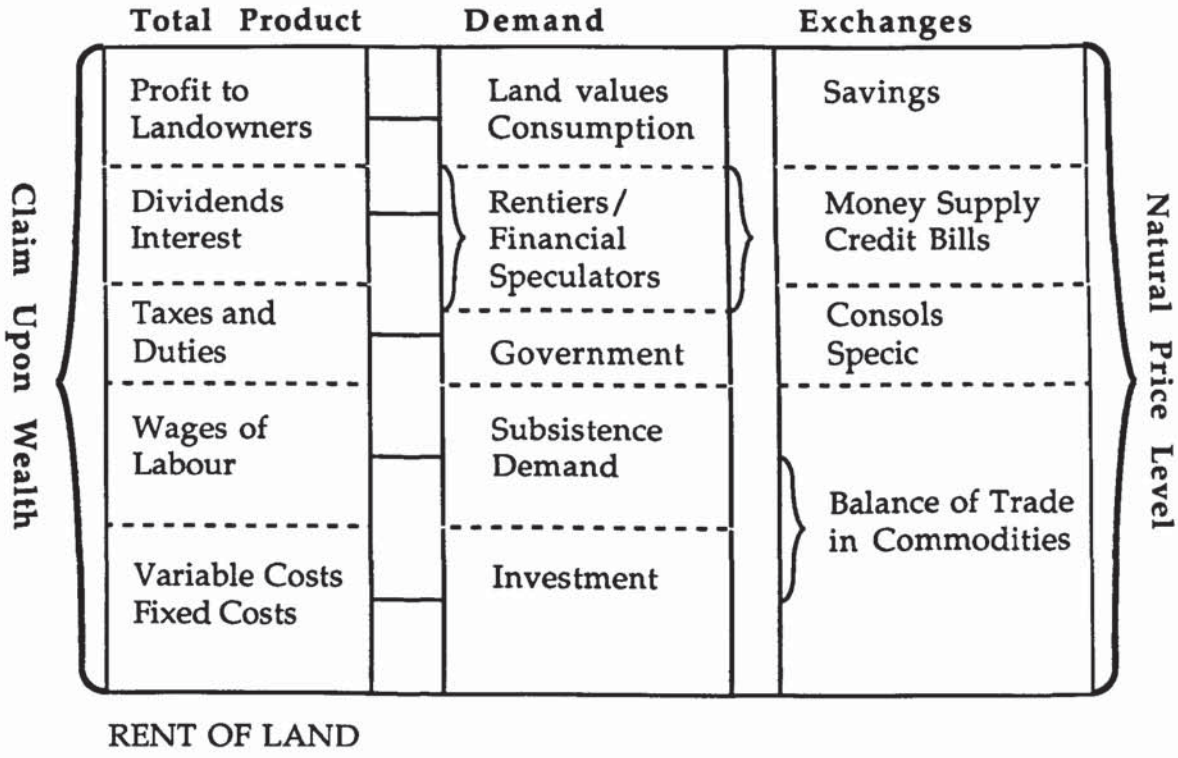
Perhaps Cantillon provided the first coherent analysis of an economy as a single independent whole, first on a closed, then an open theoretical basis. Cantillon *expected cycles because of long lags in the trading adjustment position.*

He seemed aware that a "Positive balance of trade involved an inflow of the monetary metal, silver, and that this would increase the money supply, increase the price level, reduce competitiveness and eventually reverse itself" (Brewer 1987, p 5)

Cantillon remarked "States who rise by trade do not fail to sink afterwards" (p 235).

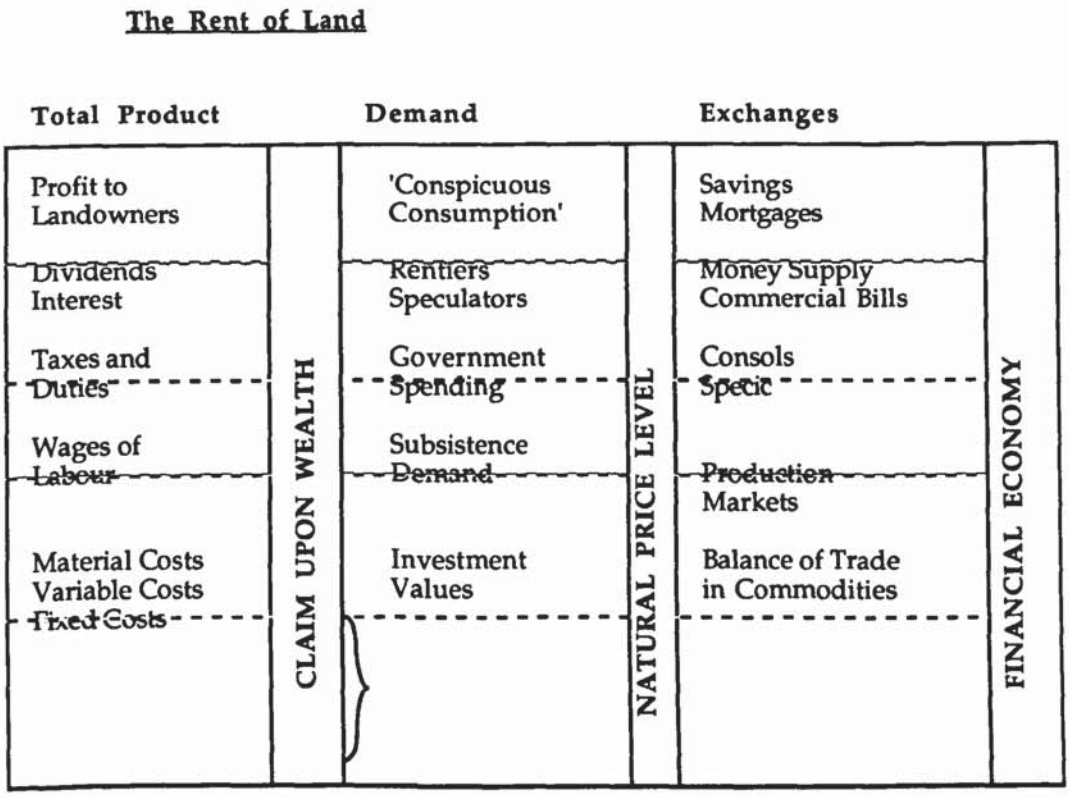
He seemed well aware of the price - specie flow mechanism (Blaug 1985, p 21), and saw profit as management wages and a compensation for risk-taking. His general attitude to market operations was 'laissez-faire'.

We have now attained a position whence sundry explicit factors comprising the fundaments of the agricultural economy may be juxtaposed in a simple reference framework. ordered together in what seems a sensible relationship, these factors provide a 'mute theorem' model.



It is based on the land rent view of the components of national income, with claims upon wealth related to title to land; hence also division of the product and product enhancement through trade. An *interconnected* series of differentiated demand prices makes up the natural price level.

THE RENT OF LAND



Cantillon's acceptance of a high price-level economy as preferable was based on the argument that grain exports in abundant years increase landlord's incomes, therefore their consumption of goods and services therefore incomes of those who supplied them, and so also the latters' incomes. The higher the price of export sales, the greater the improvement in the circular flow of national income. The harvest thus determined cycles in the level of national income.

Such was the basis of the monopolist property-owning capitalism upon which the rise of industry and its autonomous fluctuations was based in the Ricardian era following the defeat of Napoleon at the battle of Waterloo.

Prolonged Anglo-French conflict had called upon the reserves of the country in every way, resulting both in forced development in metal industries and capital investment in shipping, as well as heavy financial demands. Deep recession followed the return of peace to Europe.

With ascendancy of the manufacturing interest, scarcity of money capital to finance labour-replacing, slowly produced and expensive machinery (increasingly powered by steam engines) enters the 'tableau'; industrial labour was 'casualized', and did not share in the cooperative profit of their

efforts.

As cheaper goods widened the base of demand for industrial products, the purchasing power of the masses little by little entered the demand comprising 'consumption' and influenced levels of output.

Whereas the previous economy had became largely 'static', the new economy became progressively more dynamic, but also prone to supply constraints followed by market constraints and over-production, followed by market shortages and high prices with full production: a production cycle was set up, exaggerated by the demands for first new, then replacement capital to be invested, and running parallel to the already long-established trade cycle. (Sismondi 1803 and 1818 - 19)

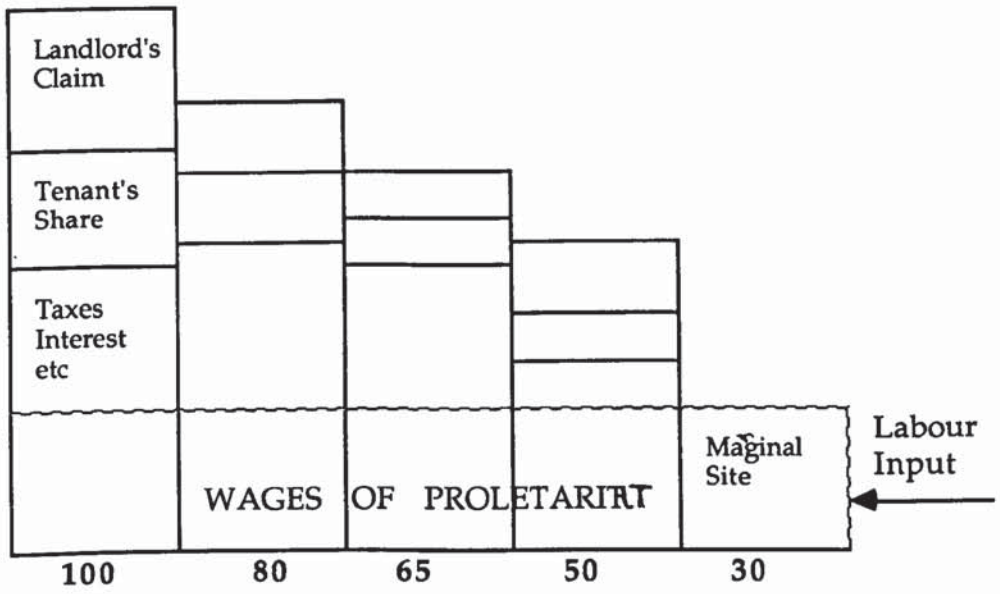
Since competition increased both at home and abroad, another aspect to enter was that of technological innovation and improvement, both increasing capital intensity and lowering unit costs, raising profits, displacing labour (hence suppressing wages) but resulting in higher productivity and a premium paid to skilled 'hands'.

Employment, previously seasonal and partly based on craft skills and domestic industry, became increasingly vulnerable to the additional cycles set up. The proletariat had increasingly to pay accommodation rents, and tenants, supervisors and entrepreneurs were faced with largely fixed commitments despite trade fluctuations and inconstant - even fickle - demands. Bankruptcies became more common as obligations could no longer be met.

Moreover, whereas previously sites on land where production occurred had been mainly agricultural, the commencement of a long period of intensive urbanization accompanying the congregation of industry along canals and roads, and later, railways, resulted in a range of site values greatly in excess of any previously experienced, with composition rents and differentiated prices reflecting demands, access, development and physical production through the 'free market' mechanism.

LAW OF RENT AND WAGES

Law of Rent and Wages



Furthermore, the landlord had often interposed a tenant between himself and common labour, the former becoming the owner of the capital plant and premises, claiming the entrepreneur's share, the latter a landless proletariat unable to enforce any claim above subsistence.

Petty saw labour as the fundamental measure of value and its source, with rent as the only surplus. Cantillon saw the possibilities of imbalances between production and consumption; Ricardo, in his law of rent and wages, perceived the fluctuating proportions between the various claims to wealth under altered economic conditions, including the new surplus created by manufacturing; (Steuart 1803). Malthus (1798) examined the effects of increasing population upon limited resources in good times and in bad.

Smith's theoretical system implicitly accepted economic fluctuations, relying for adjustment on the price mechanism. The price mechanism adapted by manufacturers was based upon calculations of labour as a cost of production instead of as the 'sine qua non' agent of activity. Wages accordingly rose and fell according to the supply and demand for labour.

Buy why did the economy continue to fluctuate fairly regularly between 1818 and 1920? Profits, (Ricardo 1815) were a primary regulator of economic growth, together with changes in resource distribution between enterprises (1819). Mis-allocation of resources was a cause of imbalances, whereas

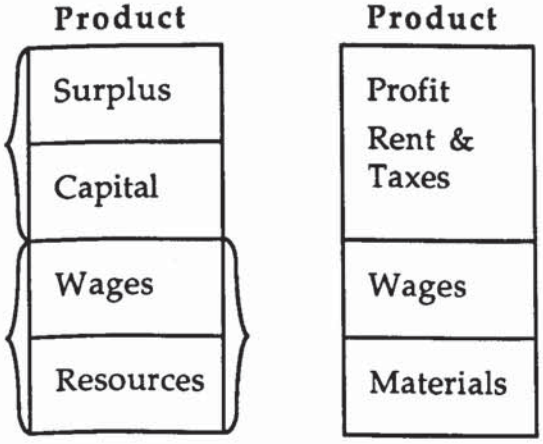
Mathus regarded surplus labour as the problem, with capitalists more interested in increasing savings than consumption, leading to gluts of unsold goods.

It was evident that growing opposition between the interests in society was occurring due to the effects of fluctuations in trade and output upon the levels of prices, employment, interest rates and wages, with a pendulum movement between consumption and savings, the whole mechanism depending upon narrow profit margins. Both trade and industry faced diminishing returns at times of depression. (Saffra, 1946).

One can only nowadays view the pursuit of an invariant standard of value for heterogeneous goods from divergent capital structures with equal current labour inputs as bizarre. (Peach 1987). Our econogram does help explain the composition of price. The influence of consumption upon production occupied Mill (1829).

". . . remote causes of fluctuations being very little understood, so that unreasonable hopes and unreasonable fears alternately rule with tyrannical sway over the minds of a majority of the mercantile public; general eagerness to buy and general reluctance to buy succeed one another in a manner more or less marked, at brief intervals."

The common assumption of all these writers was that Say's Law (1785) held: 'supply creates its own demand', and any dislocation was temporary. By the mid-19th century, endemic economic instability, frequent crises, an impoverished workforce in some areas and some trades, prompted Marx to proclaim a remedy for what appeared an age-old condition repeating in unique historical conditions. In place of private property in land he places ownership of the means of production, inverting previous understandings of rent and replacing them with capital. Variations in the proportion of the latter to other economic factors determined the alternating conditions experienced in capitalist economies.



The concept of the margin developed by Jevons (1871) had little resemblance with that of the marginal site as expounded by Ricardo in his theory of rent and wages, but followed the view that marginal *differences* between economic factors were the determinants of changes in their composition. Many of Jevon's works show intense preoccuptation with economic fluctuations and their causes. (1862, 1865, 1866, 1878, 1879 and 1882).

Rapid, although temporary fluctuations are admitted by Marshall (1890 p 709) in relation to real wages:

"But very soon, the inflation of credit subsides, and is followed by a depression; prices fall, and the purchasing power of money rises: the real value of labour falls, and its money value falls faster."

He saw confidence as the key to economic growth

"Confidence, by growing would cause itself to grow; credit would give increased means of purchase, and thus prices would recover. Those in trade already would make profits; new companies would be started; old businesses would be extended; and soon there would be a good demand even for the work of those who make fixed capital" (my emphasis)

Thus, by the commencement of the 20th century, we have the following ideogrammatic resumé":

Π	Profit	Residual proportion of rent product
G	Taxes	Goverrnment taxation and spending
F	Charges	Payments to financial intermediaries
W	Labour	Wage rate negotiations

In the period after 1900 until the present, the precedent set by WC Mitchell has been adopted, namely, classification of economists by category of some kind, since they became numerous, and examination of their theories would not only occupy much space, but has already been carried out.: cf: (Mitchell, 1927), Haberler (1937), Delbeke (1982), Mullineux (1984). Five categories are selected, as follows:

Crisis Writers:

Wirth (1858), Rodbertus (1863), de Woolf (1909), van Gelderen (1912), Aftalion (1913), Baranowsky (1913) Trevithick (1920), Bouniation (1922), Martin (1924) (1926), Lederer (1925), Spiethoff (1925), Rosenberg (1926), Röpche (1936), Regnek (1968), Flamant (1970), Singer-Keval (1970), Kindlelerger (1978).

Researchers:

Juglar (1860), Kondratieff (1926), Hansen (1951), Kuznets (1954), Tinbergen (1956).

Theorists:

Ricardo (1815, 1819), Mill (1829, 1867), Jevons (1860 -), Marx (1867/85/94), Marshall (1893), Schumpeter (1912), Hawtrey (1922, 1925), Pigou (1927), kalechi (1939), Kaldor (1948), Hicks (1950), Goodwin (1951), Duesenberry (1958), Matthews (1968), Klein (1983).

Eclectics:

Lavington (1927), Mitchell (1928), Haberler (1980), Lundberg (1965), Smookler (1966), Mullineux (1984), Sherman (1983).

Systematisers:

Forrester (1977), Mensch (1978), Mandel (1980), Ray (1980), Metcalfe (1983), Delbeke (1983), Freeman (1983), Modelski (1987).

APPENDIX 2.A.1
DATA-BASE CHRONOLOGY

1730 - 1800	List of bankruptcies	Ashton
1736 -1936	Index of bankruptcies	Hoffmann
1779 - 1860	Notices of bankruptcy	*London Gazette*
1801 -1981	Decennial Census (Occupations)	HMSO
1809 -1901	Bradford Dyers' Associations (members)	Phyzsaklea
1829 - 1913	Total sequestrations in Scotland	Burns & Mitchell
1832 - 1913	Business failures in Scotland	Moss & Hume
1839 - 1913	Business failures in Scotland	Rodger & Hamilton
1850 - 1913	Kondratieff in the World Economy	Solomou
1852 - 1917	Company winding-up reports & expenditures	Board of Trade
1856 - 1864	The first 2000 English companies	Sliannon
1856 - 1913	Archival index of Birmingham firms	Smith
1857 - 1881	New Joint Stock Companies Register	Board of Trade
1861 - 1891	Parliamentary sessional papers	HM Commissioners
1862 - 1984	Birmingham Co-operatives Societies	*Directory & Year Book*
1866 - 1913	Record of US insolvencies	Dun & Bradstreet
1880 - 1881	Longevity of 2000 joint stock companies	MacGregor
1884	Summary lists of bankruptcies	*London Gazette*
1885 - 1913	Liquidations and bankruptcies in England & Wales	Lomax
1888 - 1900	Competitions in Coffin furniture	*Birmingham Post*
1891 - 1917	Annual Companies Report Nos. 1 - 26	Board of Trade
1891	Issues of new companies	*The Times*
1893 - 1916	New companies, liquidations, & stock	Board of Trade
1903 - 1983	Periodic Census of Production	HMSO
1910 - 1980	Estimates of insolvency & longevity	DTI
1910	Major industrial enterprises at 1900	Court
1914	Review of Commerce - Birmingham firms	Dent
1914	Report of the register of Joint Stock Companies	Board of Trade
1920 - 1980	Registrations, removals & company stock	*Barclays Review*
1939 - 1960	General Annual Bankruptcy Reports	Board of Trade
1945 - 1969	Firms floated on Birmingham Stock Exchange	*Year Books*
1952 - 1981	Companies Reports	Central Statistical Office
1956 - 1980	'Insolvencies & the business cycle'	*Barclays Review*

1957 - 1960	Captains of industry	*Birmingham Sketch*
1958 - 1970	Analyses of numbers of enterprises	*Economic Trends*
1959 - 1980	German failure statistics	IFO, Munich
1960 - 1980	Company insolvencies in Great Britain	*BarclaysReview*
1962 - 1982	Annual Abstracts of Statistics	CSO
1962 - 1974	Insolvencies in England & Wales	DTI
1966 - 1975	Enployees, employment & new openings	DTI
1966 - 1975	Openings & closure of UK manufacturers	GES
1968 - 1973	Industrial analysis of receiving orders	DTI
1968 - 1982	Insolvencies in England & Wales	*British Business*
1968 - 1974	Bankruptcies & Liquidations	DTI
1970 - 1978	Company Liquidations & Receiving Orders	CSO
1971	Metal manufacturing insolvencies, England & Wales	DTI
1973 - 1982	Life-span analysis of ceased UK companies	DTI
1973 - 1982	Flow of stock of VAT registered businesses	DTI
1973 - 1982	Survival & failure rates of VAT registered firms	DTI
1974 - 1980	Company liquidations and bankruptcies	*Economic Trends*
1974 - 1982	Survival and lifespan: failure per sector	DTI
1974	Rise & fall of deregistrations with lifespan by sector	DTI
1974 - 1980	Insolvencies in England & Wales	DTI
1975 - 1983	Small businesses in Hampshire	University of Southampton
1977 - 1981	Member State bankruptcies	EEC
1979 - 1980	Sectors of Trade (Reg. & De-Reg. for VAT)	DTI
1979 - 1981	Company failures by sector	*Barclays Review*
1979 - 1983	Company liquidations & mergers	DTI
1980 - 1981	Stops and starts by turnover (£)	Inland revenue
1980 - 1983	Business starts & stops, UK (Turnover, Sector)	DTI
1980 - 1983	Business starts over stops	DTI
1980 - 1984	Stocks, starts & stops of firms in the UK	DTI
1981	Failure rate & change in industrial production	*Barclays Review*
1982	Regional & industrial analysis of starts & stops	DTI
1983	Sectoral Tables: bankruptcies & liquidations	*British Business*
1984	First Year liquidations of starter companies	*British Business*
1985 - 1986	Insolvencies & liquidations	*British Business*

APPENDIX 2.A.1

Index Starting Dates 1698 - 1920

The indexes hereunder provide long-run time-series from diverse starting dates, following the earliest - (that for cotton yam and goods) 1698. They are principally those utilised by Hoffmann.*

TABLE 2.A.A

Date	Subject	Date	Subject	Date	Subject
1699	Sugar	1700	Armed Services	1700	Patents*
1700	National Income	1700	Tin*	1701	Population*]
1702	Malt	1713	Paper	1727	Copper Ore*
1736	Bankruptcies*	1760	Liner*	1760	Land Rent*
1771	Copper*	1780	Wool/Cloth	1786	Building (Materials)*
1786	Engineering*	1787	Silk/Thread	1787	Beer
1789	Ship-building*	1790	Tobacco	1790	Cake
1790	Hemp	1800	Flour	1800	Iron & Steel*
1801	Leather	1802	Spirits	1802	Government Spending
1820	Confectionery	1820	Stocks & Shares	1820	Copper Goods*
1821	Soap & Candles	1821	Coastal Shipping	1820	Railways*
1831	Furniture	1831	Woodworking	1829	Letter Post
1840	Rubber	1840	Vegetable Oils	1808	Lead (Ore)*
1849	Rail (Passengers)	1850	Exports	1853	Zinc*
1853	Tin ore	1856	Rail (Goods)	1856	Zinc Ore*
1860	Industrial Output*	1860	Building (Output)	1865	Chemicals
1866	Meat	1870	Incomes	1880	Tramways
1882	Gas	1885	Aluminium*	1886	Unemployment*
1900	Sub-sector Output*	1907	Motor Vehicles*	1908	GDP
1913	Printing	1920	Electricity		

2.A.2 LOCAL HISTORY OF BIRMINGHAM - First Generation Period Overview 1780 - 1820

"The first nine months of this year were employed in writing the history of Birmingham." Will Hatton's Diary, 1780

The West Midlands climate, although generally cooler and wetter than that of London, (where annual rainfall measurement were taken over several centuries), is noticeably drier and more moderate on the high breezy slopes of the plateau where Birmingham has been built.

During the 16th and 17th centuries the local and adjacent rivers - Rea, Tame and Stour, tributaries to the Avon, Trent and Severn - provided radial transport arteries to ports giving access to the Irish Sea, North Sea and the Bristol Channel. Along their densely wooded, steep banks, so rich in deposits of coal, iron, lime and clay and those special sands needed for metal working arose the early mills, forges and workshops of metal producers and miners of Birmingham and the Black Country during the first industrial revolution.

A mere village itself, inhabited by some 1200 persons, in the 16th century; a somewhat larger one of 4000 in the 17th century; increasing by 35,000 to around 40,000 citizens and 71 new streets containing 4,172 houses at 1761; Birmingham's growth continued to be exceptionally rapid, (markedly due to the drawing power of its developing metal industries) through 1780 to the first census of 1801, when the population stood at 187,000. Between 1778 and 1831 this population doubled: Even by 1811, there existed 260 new streets containing 16,096 houses and another 85,756 people. This population growth became one driving force of industrial development.

Transportation of bulk materials by first, improved rivers, then by the new canals opened between 1769 - 91 (the names of Brindley, Smeaton, Telford remain renowned) halved the cost of raw materials and of exported commodities. The city became the merchanting and warehousing hub of a toll-free inland waterway system reaching to Liverpool and Manchester, London, Bristol and Gainsborough. By 1811, some 200 new workshops had sprang up along two miles of the Aston-Bordesley cut, such were the advantages.

The nearby coal and ore extracting areas of the Black Country such as Bilston, Dudley, Tipton, Walsall and Wednesbury contributed to these changes, as did the towns of Bewdley, Coventry, Gloucester, Leicester, Sedgeley and Worcester. In 1780, extraction of coal reached 840,000 tons pa. After 1779, iron largely replaced copper for industrial, military, export and domestic usage, due to its abundance, cheapness and improved quality: an

Assay Office for precious metals was opened in Birmingham in 1773.

For more than a century before it was overtaken by Manchester in 1852, Birmingham stood first among provincial towns in respect of 'grants of letters patent' outstanding. Two generations before the advent of Watt's improved rotary steam engine (1764 - 1784), machinery of many sorts had become common place in the city's industries. Inventiveness and innovation in Birmingham were always impressive and contributed substantially to progress. Application of steam-power to industrial equipment made good natural deficiencies in waterpower, (and the 'siphoning-off' of the early cotton industry to Lancashire).

Founded in 1783, the Birmingham Industrial Committee was the forerunner of the Chamber of Commerce, chartered in 1813. Some of its members were illustrious fellows of the Royal Society, and between 1766 and 1816, of the famous discussion group for scientific entrepreneurs, the Lunar Society. Many had connections, too, with the Scottish Universities. These inputs sparked innovations.

Powered usage of materials by dies, stamps and presses, forming the mechanical core of Birmingham's 'metal bashing' industries, depended for their suppliers upon the rolling mills, (also 'made in Birmingham'). These were fed in turn by the iron masters and coal producers of the surrounding countries of Staffordshire, Slropshire, Worcestershire and Warwickshire. Upon their calculations of market trend and output prices turned those of all the principal enterprises within the Region.

The scenario is described by Court[1]: "Steam blew the furnaces, worked the hammers at the forge, bored cylinders and forged gun barrels, punched and sheared metal, drove the lathe, assisted the boiler-maker, and rolled iron for every conceivable purpose. Much steam was employed to make other steam engines." (many of which were exported overseas).

Much of the industrial craft output of Birmingham was hand-processed and had arisen from the early developed skills of artisans and labourers, smithies and finishers. Long before 1740, there existed corn mills, iron and coal extraction, agricultural implement making, hand-made nails, lorimers' artifacts, brass ornament manufacture (at first from imported materials), - a trade in swords, muskets and guns, jewellery and gilt 'toy' manufactures, edge tools and heavy toys, piano wire spinners; producers of fire-irons and light ironcastings; pin-making and wirework; bell-founding; and up to 1770 a flourishing buckle, and after 1795 a flourishing button trade.

By 1780, these were joined by machining and casting, wire hawsers, cast iron holloware, iron wood-screws, and measuring instruments, each destined to

become a major branch of manufacture throughout the 19th century, but then in a buoyant infancy.

Indeed, new sub-divisions of industry arose every four to six years on average, such was the growth in output calling forth yet further output with attendant services, diversification and enlargement of scope.

By 1820, the additions comprised: Britannia ware and pewter; coins, medallions and Birmingham's own Mint; the electro-plating technique and industry; the invention of malleable iron castings; prodigious output of penholders with steel pen-nibs; and metallic reflectors for lighthouse illuminations (non-metallic industries such as glass, leather, chemicals, papier-mache; food and clotheing are ignored in this summary). The art of 'japanning' or lacquering tinplate, iron, copper and even slate become strongly established.

Nettlefold, in 1786, secured a US Patent nail-making machine, which when improved, so out performed hand production in volume, variety, precision and cheapness, the the hand-cut nail industry rapidly diminished; although it had been several centuries in existence and than employed upwards of 30,000 domestic artisans within a 15 miles radius of the city. Nevertheless, a vast export need of nails, tools, and of finished metalwork to the colonies and the world remained fulfilled; slitting mills, introduced from Liege in Belgium fifty years previously, had played a major role.

Products typical of previous generations continued to be made in Birmingham, including scythes, sickles, reaping hooks, axes, hatchets, bills, chains, seals, clasps, horse locks, lock-bolts, door hinges, window-bars, staff-heads and false silver 'soft tammy' buckles, together with every type of brassware, iron holloware, and silverplate and goldsmith work.

Villages adjacent to Birmingham also abounded in blacksmiths, ironmongers, lorimers, tool-makers, cutlers, wiremakers, edge-grinders, roller producers, anvil and vice-makers, and fire-iron producers. They toiled at Aston, Balsall Heath, Bordesley, Deritend, Digbeth, Edgbaston, Erdington, Handsworth, Perry bar, Sandwell, Witton and Yardley.

Described by Edward Burke in 1812 as the 'toy-shop of the world', Birmingham produced, in qualities ranging from the very best down to cheap, nasty and perishable, multitudinous products of the workshop staffed by women, boys and girls, as well as skilled men. Products like purse-mounts, sword hilts, snuff-boxes, studs and châtelaines, brooches, bracelets, watch chains and all kinds of ornaments, buttons and buckles in decorated metal were made in vast quantities.

The famous Soho works (1764) and the foundry at Handsworth, resoundingly opened by Matthew Boulton in January, 1796 , brought together the best brains, finest artists, most skilful producers the Birmingham and its surrounding districts could provide. The range, quality, value and success of its output broke all records. Advanced means of management, motivation and supervision were introduced; these market a stride forward in the development of an integrated factory, thereafter provoking many imitations.

Close connections with the supply of swords, cutlasses, muskets, sporting guns, and later, rifles had accompanied and encouraged entrepreneurial advancement since the days of the English Civil War (1643). In 1689 - 92, five gunmakers undertook a contract to produce 200 specified muskets for the Government. When rifles were required against the American independents in 1774, Birmingham possessed over 400 "gun-makers". In 1813, assent was obtained for a (much-desired) Gun Barrel Proof House in Birmingham.

Export to Asia, North America and to the Royal West Africa company - where the price of one negro slave was one Birmingham musket - compensated for the violent instability of the market for arms in England and Europe. Some 100 - 150,000 barrels and stocks were exported by the turn of the century. The Napoleonic wars called forth production of over three million of each between the collapse of the Peace of Amiens in 1804 and the Battle of Waterloo, and Allied victory, in 1815. (Copper percussion caps were not made until 1816)

The gun manufacturing process, requiring repeated reheating of the metal to high temperatures, boosted coal consumption. Mines were deepened to the level where flooding, despite pumps driven by steam engines, became an insurmountable menace due to the absence of an integrated system for drainage. Although still distant in time, an end to easy exploitation of natural resources began to loom. Cort's puddling process (1784) had eased iron production bottlenecks; and the erection of foundries in Birmingham shifted heavy industry eastwards.

As Court so admirably describes (p 188): "In the conclusive character of its growth, with furious bursts of investment alternating with sudden depression, the Midland iron industry shared the features of the iron industry elsewhere". Irregular movements of output and prices, caused by wars, population growth, industrial expansion, and the development of scientific enquiry underlay the formidable success of these soi-disant indispensable ironmasters of early 19th century England.

ADDENDUM

A MARVELLOUS RECORD FOR INVENTION

An extraordinary increase in the numbers of patents sealed by Birmingham inventors between 1722 and the Patent Law Amendment Act, 1852, is evidenced by the following table of cumulative totals:

1722 - 1800	90
1800 - 1809	122
1810 - 1819	187
1820 - 1829	268
1830 - 1839	410
1840 - 1849	667
1849 - 1855	776

(Source: Birmingham Inventors and Inventions. E Prosser, 1881) Only 7 per cent of these inventions applied to outside the metal trades.

Cotton spinning machinery

John Wyatt, from Sutton Coldfield, spun the first cotton thread by rollers in 1700, a device improved by himself with Lewis Paul and John Warren at the Well, Upper Priory, Birmingham, 1741 - 45. The premises were still known as the "Cotton Mill" when acquired in 1792, a quarter of a century after his death (although production had long ceased). His spinning-by-rollers technique was thus far earlier than Richard Arkwright's patent or a more perfected machine. John Wyatt's weighing machines, too, were adopted after his death.

Steam engine saga

James Watt's 1769 Patent of improvements to Newcomen's steam engine, renewed from 1784 - 1800, introduced separate condensers. His separate applications for 'sun and planet' balancing mechanism and double acting engine were granted in 1781 and 1782. Matthew Wasbrough, a Bristol engineer, invented the crank action for rotary action in steam engines in 1779, half a century before Stephenson's locomotive. Charles Twigg and Co, rollers of metal, grinders and borers of gun barrels at the Steam Mill, Snow Hill, instantly went into partnership with Wasbrough. Working rotary engines were well established by 1783 (cf Birmingham Directory).

STEAM ENGINES IN BIRMINGHAM 1780 - 1835

Birmingham businessmen put 331 new steam engines with separate

condensers into operation in their works between 1780 - 1835, at which date 169 were extant, exerting 2,700 total horsepower (1,770 horsepower for working metals, a use begun in 1792):– a table of steam engines in the borough of Birmingham in 1835 is contained in 'Report of the Birmingham Philosophical Institute (1836)' quoted by WHB Court, 'Rise of the Midland Industries', ch3, Oxford, 1938.

Court also referred to the Statistical Committee analysis of use of steampower during the Napoleonic wars, from which comes this extract:

> ..."*a power equal to 102 horses in employed by iron founders, engine makers, and smiths and was first applied to these purposes in 1788; a power of 370 horses is employed in rolling copper, brass, and other metals, and was first applied to these uses in 1790; a power of 150 horses is employed in drawing wire and was first applied to the use in 1808; a power of 201 horses is employed in the iron forges and wrought iron mills and was first applied to the use in 1813; a power of 104 horses is employed in screw-making and was first applied to this use in 1819; a power of 34 horses is employed in drawing metal tubes and was first applied to this use in 1822*"

A Description of Birmingham Toys

> "*An infinite variety of articles . . . divided into several branches, as the gold and silver toy makers, who makes trinkets, seals, tweezers, tooth-pick cases, smelling bottles, snuff boxes and philligree works, such as toilets, tea-chests, inkstands etc etc. The tortoise toy maker makes a beautiful variety of the above and other articles; as does the steel, who makes cork screws, buckles, draw and other boxes, snuffers, watch chains, stay hooks, sugar nippers etc and almost all of these are likewise made in various metals and for the cheapness, beauty and elegance no place in the world can vie with them*". - *Sketchley's Directory 1767*

These items could be made with a variety of attractive finishes such as enamelling, black japanning, or inlaid mother-of-peal. Later 'gilt toys' and 'light steel toys' included all cheap jewellery, buttons and small decorated household goods. Sketchley's Directory continued . . .

> "*they are the makers of axes, chisels, plane irons, adazes, hooks, bills etc great quantities of which are exported to North America, and various other parts*".

As early as 1759, 'toys' worth £620,000 were produced; 80 per cent went to

export via a network of merchants and their overseas agents. Production was partly mechanized, and consumption by the rising population amazingly great. Before 1780, low price had already become incompatible with high standards of manufacture. In 1800, there were 25 button makers active in Birmingham, producing in all conceivable shapes and sizes from wood, shell, glass, horn, bone, slate, gilt metal, enamelled metal, steel, porcelain, ivory and paste and precious stones, also no less then 96 plates of metal.

2.5.3 B Local History of Birmingham

Second generation period overview 1820 - 1860

The climate altered but little: the weather stayed British in Birmingham and District. The population swelled to 819,000 by 1861, largely due to influx from far and near. Housebuilding generally kept pace with population increase. Wages rose with general prosperity; although some large firms formed, many remained small, and self employment stayed the rule. Unionisation was weak, and in some trades (eg polishing) low wages, unsuitable environment, inadequate housing, and industrial diseases exerted a remorseless toll on,health life and limb.

In was an era of growing municipal involvement with housing, sanitation, safety and law and order. The new town hall - for which a classical design had been submitted by J A Hansom, (inventor of the Hamsom Cab) - was opened in 1832. Some 18 miles of watermain and 40 miles of brick-built sewers were laid; but speculative housebuilders constructed over 2,000 back-to-back 'court' blocks without light or drainage, inside or out, leading to outbreaks of cholera. In 1852, J Pigott - Smith, appointed surveyor until his retirement in 1890, began the herculean task of transforming Birmingham into the 'best-governed city in the world'.

The years 1820 - 60 covered dramatic changes in Birmingham's communications. In 1830, the Liverpool and Manchester railway had opened; between 1835 - 8 the Birmingham to London North-Western Railway Company, based at Crewe, linked existing lines with the Grand Junction railway. Joseph Chamberlain cleared slums to allow trains to penetrate to the City Centre of Birmingham; but did not rehouse the occupants. In 1842, the Metropolitan Railway Carriage and Wagon Company was founded at Saltley.

Corporation Street was rebuilt, at once attracting commerce and service industries. The Midland Bank in Colmore Row opened in 1830; Queen's College in 1843 - 44; the Midlands' Institute in 1856. The city became incorporated by Charter in 1838, the same year as a riot caused by failure of the People's Charter: the subsequent formation of a police force under the

Home Office, was transferred under the City Watch Committee in 1842.

Always a free centre for business unhampered by gilds, trade unions, and companies, Birmingham was also a haven for religious dissenters, non-conformists, refugees and the persecuted minorities. More exuberant manifestations of this diversity were observed in the revivalist preachers Drs Dawson, and Dale; and in Cardinal Newman, who preached at Birmingham's first Roman Catholick cathedral (St Chads, built 1838) and the famous Oratory in Hagley Road (1852). Lord George Gordon, MP, endowed the Jewish synagogue.

Many new industries formed under the 1862 Companies Act; older ones continued; and some diminished (nailmaking by hand)_ or temporarily all but disappeared (buckles and ornamental buttons). Cast metal statues, wrought iron revival, umbrellas and parasols, and coffins and funeral ornaments reflected changing interests. The heavy manufacture of chains, cables and anchors for the navy, of boilerplate and armour plate, and of safes with their locks and keys, also brass and iron bedsteads, counterbalanced more artistic endeavours, and with heftier profits. Seamless brass tubes were invented in 1888.

The Great Universal Exhibition of 1851 at Crystal Palace outside London provided an unsurpassable showcase for multitudes of Birmingham products, machines and patented inventions - also through surprising foreign competition, a great spur to better design and presentation.

Electroplating processes for silvering, gilding, bronzing etc, introduced by Elkington's in the 1840's, instigated another large-scale activity. Winfield developed hollow metal tubes and gas piping, which together with boiler plating using Griffiths patented rivetting (1838) enabled large gasholders to be erected to supply streetlighting and domestic needs.

Standardization of measures and gauges enabled greater precision to be applied to sizes of nuts, screws bolts and machine tools needed for the embryro engineering industry. In heavy industry, rolled, pressed and stamped sheet metal was subjected to powered machine-punching hammering, piercing, pinching, shearing, cutting, grinding and filing.

All these industries, multiplying greatly and reinforcing each other, were great consumers of iron ore, coal and machinery, especially of steam engines: the Soho works produced 1,878 of these during its lifespan. Output in many companies increased by leaps and bounds during this generation, as if in a modern parable of talents.

The toy-trade had burgeoned from a dozen firms with 400 artisans and 1,800

juvenile employees to around 550 artisans with 7,500 employees in the early 1860's. The product range and quality and price range all became extremely varied, the workmanship from amazingly ingenious and beautiful down to the shoddy and crude. Over 1£m gold and silver was used in jewellery every year, and diamond consumption increased tenfold. electro-gilding processes enabled 'catch-penny' imitations to be made on a vast scale.

Hardware and holloware trade proliferated in their endeavours to meet almost insatiable demands for household and housebuilding products at home and abroad, and numbers employed doubled 1830 - 50. The per-trade, based on manufacturing millions of steel nibs - 1,500 million in 100,000 varieties at its height in 1890, had began in 1823, and Birmingham thereafter supplied two-thirds of the world's need for a century and a quarter.

Coins, medals and token from Heaton's Mint were also produced by the ton for local, national and foreign circulations. Between 1816 - 20, Thomason's Metallic Bronze Vase - a copy of the Warwick vase, reconstructed in marble from a broken Greek original was displayed at his Church Street showrooms, thereafter at Aston Hall, and currently in the City Museum of Art and Science. Gilders and die-sinkers had both long since branched out as distinct industries, serving many others.

The gilt button trade, susceptible to changing fashion, switched to pearl and shell finishes when Queen Victoria succeeded to the throne in 1837. some 22 tons of South Sea shells were consumed each week in this production, made by 280 garret-masters and hundreds of outworkers from supplies made available through a few large concerns.

Thus not only did output expand under dozens of differing influences, but its composition changed and diversified throughout succeeding decades. Taking advantage of these changes, and the low cost of producing with simple equipment for one' own home or workshop, hundreds of small business were staring up, with some failing, every year. Many incurred no legal debts, therefore did not enter the bankruptcy lists of London Gazette. They simple ceased business and disappeared without trace. Others, specializing in cut-steel, copper gilt, hand-pointed glass, tortoise shell, jaspers and myriads of other finishes, became prosperous and renowned, and continued for over a century.

In brassfounding, copper usage had increased from 650 tons in 1780 to 20,000 tons in 1865. Nine main specialities had developed in the brass trade, each of considerable industrial strength. Galvanising also took place ona great scale. Parallel developments took place in plate, crown and sheet glass, where prices were slashed: special advances occurred in annular and polyzonal lens, and diverse optical equipment and scientific instruments were successfully made. Fancy leather goods, cases etc, were introduced.

In the gun trade between 1855 - 64, the average number of rifle barrels proofed in Birmingham was 611,630 compared with 382,647 pa in London. There were 599 manufacturers in 1865, who paid piecework rates to 7,340 hands according to demand for their specialities, both in materials and setting up.

A string of innovations begun in 1792 resulted in extensive development of the wire and rigging trade, with substantial naval orders. A reliable, non-stretch, easily pitched wire for piano and other musical instruments was developed by Horsfalls. In 1865, over 30,000 miles of wire was produced by some 600 persons, 250 of whom worked for a single firm. Wire work was a separate branch, employing over 500 persons on its own.

Pin-making was another sub-sector employing over 1000 persons and utilising over three tons of brass wire and 40 tons of iron and steel wire per week in the 1860's. Iron and screw production used over 5,000 tons of wire weekly for an output of 130,000 gross of screws at that time. This company, Jennings and Co, was taken over by Nettlefold and Chamberlain, and renamed the Patent Nut and Bolt Co. In 1866 production rose again.

Other trades, too numerous to mention, fill the annual of this heyday of industrial enterprise in Birmingham. a roll-call of some illustrious names of industrialists contemporary to these events now follows (they form but a sample) Atkins, Barker, Belliss, Benson, Betteridge, Booth, Brewster, Brindley, Brown, Carlotti, Carpenter, Chance, Cordall, Cox, Edwards, Elkington, Ensell, Field, Fox, Gillott, Godfrey, Griffiths, Hardiman, Heaton, Henderson, Horsfall, Jennings, Kendrick, Lancaster, Marshall, Martineau, Mason, May, Mitchell, Onion, Osler, Parkers, Pugin, Richardson, Ryland, Salt, Selby, Stephenson, Souter, Summerfield, Tangye, Thomason, Tranter, Waterhouse, Webb, Webster, Wesley, Western, Weston, Winfield, Wright and Yates

2.5.3C Local History of Birmingham

Third generation overview 1860 - 1900

The rate of population increase continued to diminish in Birmingham until it reached a figure of 15 per cent per decade at the end of the nineteenth century. The stock of houses was consequently tending to an excess of what could be bought or rented, once even amounting to a surplus of 5,000 units in the mid-1880's, when Cadbury's and several other companies had left the congested city centre for suburban or greenfield sites (1879).

Whereas three main technological trajectories[1] and their subdivisions had characterized city industrial progress up to 1860, the period until 1900 elaborated upon these and was itself demarcated by three distinct phases: 1861 - 1875, the end of the old industrial era of malleable iron with collapse of the Franco-Prussion War boom (1770 - 5); a transition period lasting ten years; and from 1886 - 1899 new momentum from a greatly changed industrial structure, with noval products and techniques, especially in hardware and engineering.

Originally local in scope, then regional, the focus of Birmingham's commercial interest became fixed upon world-wide export opportunities during the Free Trade era starting in 1846. The Chamber of Commerce vigorously supported liberalization of trade and attempted to influence British foreign policy in its favour. It also campaigned against high changes for freight by canal, rail and road, and opposed any legislative proposals tending to increase (members') costs of production.

In 1860 the country was recovering from depression commencing in 1857; than the start of the American Civil War 1861 - 64 disturbed trade; yet boosted demand for buttons, guns and edge tools from Birmingham. A financial crisis in 1866

abruptly ended this partial boom, and depression reigned until a slight recovery in 1869 heralded a burst of economic activity again in the early 1870's.

Writing of large-scale manufacture in 1865, Timmins (p 96) exaggerated but slightly: "The process of manufacture . . . as in most mechanical trades, has progressed wonderfully. Less than half a century back, nearly everything was done by manual labour; now nearly everything is done by the aid of machinery." Timmins continued "our colonist, carrying with them the wants and habits of their native land, spread the demand for our manufactures over the entire world."

Yet until after 1860, Birmingham experienced scant large-scale concentration of factory enterprise such as constituted the industrial revolution in Lancashire cotton manufacture. The conditions of handicraft disfavoured factories, and instead encouraged a multitude of small units, with average employment between 30 and 60 persons, and workshops engaging only six persons were the rule.

Heavy industry was concentrated mainly in the South Staffordshire coal and iron producing centres of the Black Country, where, in 1864, some 10.5 million tons of coal was raised annually from 540 collieries. A limited life of only twenty years was forecast for coalfields at Bilston, Coseley, Tipton, Wednesbury, Oldbury, West Bromwich, Buckmore and Brierloy Hill. Additional resources lay in the areas around Cannock Chase, Hagley, Harbome, Halesowen and Smethwick. Land fetching £20,000 per acre at the peak became worked out prematurely due to flooding, despite mechanical pumping installations.

In the 1860's, more than half of the locally mined coal was used in local blast furnaces, for which local iron was supplied. In 1806, 42 blast furnaces with an average annual output of 1,600

tons contrasted without many other using Cort's (1784) puddling process to make pig-iron; by 1830, there were 123 furnaces, many using Nielson's hot-blast (1829) by 1865, there existed 170 blast furnaces, with 45 using the Bessemer steel process (1863). The take-up of technical breakthrough was extremely rapid due to intense rivalry between competing producers.

The effects of population increase allied with greater prosperity had encouraged rapid growth in the finished metal industries; and to trades supplying household artifacts and items of personal adomment there seemed to open up a vast market.

By 1865, the number of firms in the brass trade had increased to 421 employing approx 9,500 persons (whose average life expectancy, due to poor industrial conditions, was only 40 years). There was at that time no trade society and never any strikes in the brass industry.

The invention (1838) of seamless brass tubes had opened up new possibilities such as bedsteads, fenders, stairrods, curtain rails, cornices etc added to existing specialities such as castors, pulleys, handles, racks, hooks; cabinet, bell and general brassfoundry; stamped brassfoundry, finished and in the rough; rolled brass-ware and sheathing; cock-making and plumbers' brass-foundry; lamp-making; gas-fittings; and naval brass foundry. Steam engines also required large numbers of brass fittings, as did pumps and other machinery.

The building and carpentry booms in Birmingham, in America and in the Colonial Empire boosted demand for standard machine-cut nails, which earlier had reduced employment in the ancient hand-made nail trade by around 30,000 persons between 1830 - 50. Competition from Belgium was also keenly felt.

Competing with brassware, the range of ironmongery also extended to include hinges, rods, smoothing irons, fences,

balustrades, window bars, umbrella stands, door knockers, latches, handles, scrapers, porters, cast iron nails and shoepins. These were supplied in 1865 through 14 firms employing 2,430 people. Lock, key, bolt, nut, and screw makers employed around 3,500 people; while another 3,500 were employed in each of chain and anchor, tin plate, rolling stock, pen production, watch and dock, wire, edge-tool, hollowware and bedstead manufactures.

In 1861, when breech-loading guns were ordered for British soldierly following experience in the Crimean War, an initial order for 1,000 small-bore carbines was received by Birmingham gunmakers; to be followed by many more. Exports opportunities were presented by the American Civil War and the wars between Prussia and first Denmark then Austria 1860 - 1865. Over 783,403 rifles were made 1861 - 64; all but 50,000 were exported to these arenas of conflict. The Franco-German war of 1870 - 75 further enlarged this industry, before a slump set in, affecting all but sporting guns and hunting rifles.

Depression hit the various trades differently, each lifting again by an advantageous turn of events: sword production, down between 1815 - 39, revived with bayonets (1860's); jewellery and metal buttons, declining since 1824 and 1837 respectively, boomed again when gold was discovered in California and Australia (1849 - 50). Pewter and Britannia ware was ousted by electroplating with 'German silver' alloys between 1840 - 1860, which grew to engage 7,000 workshop artisans and (Elkington's) 1,000 factory workers. Wire-drawing also employed c 1780 in 1861, and some 1,000 were engaged in the woodscrew industry. Within these trades were found scattered a total of about 2,000 'engineers' and 'machine-makers'.

Over 100 Singer sewing machines - an American invention perfected in Birmingham - were produced weekly between 1853 - 65. Housebellows by Onions (founded in 1650) were produced at

the rate of 260 dozen per week, together with 30 forge bellows. Hoes for cultivating overseas plantations came from 30 edge-tool works employing over 3,500 persons to make nearly 3,000 varieties and sizes of implements. Surgical accoutrements became another specialist branch. Coin production from Watt's and Heaton's Mints boomed between 1860 - 66, when 3,317.5, tons of bronze and copper coins, medals, and 'manillas' were stamped.

In heavy industry, wagonworks producing all types of railway rolling stock under the 1862 Joint Companies Act could barely cope with overwhelming demand from domestic and overseas railway companies. Hydraulic machinery (Tangyes started in 1855) included lifts, presses, hoists, punchers and shearers (treating everything from delicate dental palate plates to 1,000 ton impact goods). Circular and handsaw production became another local speciality.

One-piece tinplate manufacture for domestic dishes, baths, vases, tubes, octogon bottles etc was further improved by Bressi's mechanically applied ornamentation, and Kendrick's produced a great variety. Galvanised roofing and buckets were sold by 10,000's weekly.

In contrast to these types of production, the handmade wrought-iron revival movement, involving four firms, employed a few highly skilled and artistic specialists in engraving, damascening, niello-work, enameling, filigree, saw piercing, 'beating up', gilding, burnishing, and generally 'working up' metals.

Development of chemical, pharmaceuticals, photography, paint, varnishes and turpentine, papier-maché, plaster, 'parkeslne' plastics, wax vesta matches, soap, red lewd etc, and the various types of glass, optical and medical instrument industries, all lay outside the scope of this review, but proceeded nonetheless.

Trade slumped at the end of the Franco-Prussian War, when German and American competition resumed. While the volume of production increased, its profitability, like that of exports, declined. Capital became super-abundant; there were excess unsold stocks of finished goods; and rates of interest were low. This type of depression, with irregular onset in Birmingham due to sporadic bursts of activity centred on Government orders, reached its nadir around 1885 but continued for a further decade without sustained recovery or a return of optimism. The Chamber of Commerce, giving evidence in 1886 to the Royal Commission enquiring into the depression of trade, stated that it had became uniform in duration and intensity.

In the exaggerated boom of the early 1870's, prices and wages had virtually doubled; but fallen prices and unemployment characterised each year thereafter 'and the extent of trade had greatly diminished'. Over-promoted, over capitalised limited companies wilted and collapsed, especially in heavier industry, but small, highly diversified units of production survived better. The enlarged and extended Factories Acts of 1864 and 1867 began to apply to Birmingham's type of industry, more severely affecting employers in depression years.

A growing division between capital and labour interests in production, together with a vignette of the character of local industry, can be discerned in the numbers and types of trade unions and employers associations formed between 1841 - 1901. Combining in the face of threats both internal and foreign, and seeking to protect themselves from both obsolescence and competition, these societies aimed to provide members with mutual wage and price protection, solidarity and financial support.

Local iron-making went into decline: Bessemer and Gilchrist-Thomas methods of steel-making require for non-phosporous ores with high amounts of haemetite imported from overseas:

exhaustion of local supplies encouraged the industry to relocate near the coast.

The gun, metal button and flint glass industries all declined after 1875, due to both mechanization, foreign competition, and tariff walls against exports. British industrial supremacy gave way to an international struggle for markets and a rush to consolidate colonial possessions and resources. The Afghan uprising and Indian mutiny temporality lifted demands for arms.

A United States 'Consular Report' for 1881 disclosed that out of 181 blast furnaces in the Birmingham area, only 67 were in blast, supplying 400 rolling mills. Puddling furnaces numbered around 2,000; factories 2,583 and workshops 6,378. Part-time working was prevalent.

Estimates made by G C Allen, [OP Cit (p 210 - 228) an invaluable source of statistical material and descriptions of change] provide an illustration of how employment fluctuated in Birmingham's metal industries between 1871 - 1886. Jewellery trades relied on Royal Events to boost their lagging enterprise with souvenir productions; employment in small arms halved; in button and wire trades it declined by a quarter; in tinplate and edgetool, it stagnated; while in the brass trade alone, spurred by vast copper ore discoveries around lake superior in Canada, it doubled. Birmingham pinmakers in 1878 were producing 37 million from the total national output of 50 million per annum.

Declining prices marked this whole generation, during which profits often shrank but wages for those able to sustain employment rose in real terms. A Table giving employment details of those engaged in thirty selected industries 1861 - 1911 is given by Allen (Table V p 459) in the statistical Tables of his Appendices. Only nine of these Birmingham industries were outside the metal trades.

Table VIII (p 462) 'production of Pig-Iron in South Staffordshire and Worcestershire' between 1806 - 1914 shows vividly how fluctuations modified the undulating long-term trends over this period. These movements reflected demand changes in the locality from metal-users and finishers who responded to market needs at home and overseas for an enormous variety of metal goods 'made in Birmingham'.

Although trade in general did not substantially improve for another decade, industry in 1886 had in some large measure transformed its structure, in part due to the disappearance of many failed firms, in part to a reorienting of effort and specialisation to meet new technological conditions and further export opportunities. (See Footnote)[2].

Not only had the first, and even second generation of entrepreneurs passed away - their successors were often more keen to manage at arms length through the Limited Liabilities clauses of the Companies Act - but that working Birmingham population, half of whom were aged under 21 in 1861, were themselves aged or gone by 1901. Yet the population of Birmingham and District (including Coventry and surrounding towns) at that date had risen from 819,000 to 1,483,000 (Census Reports).

The long decline in prices, due both to competition and to improved and cost reducing methods of production, continued until 1895 - 6, which date Kondratieff made the turning point of his (theoretical) 'longwave'. The Birmingham Chamber of Commerce Journal, (August 1913, p 144) describes how, from the 1870's, the curves of 47 retail prices of food in London moved: "By bold and precipitous sweeps the price line descends until 1896; and from that date until 1912, by undulations between peaks, the price level is raised." From a peak of 151.9 in 1873, the index falls to 98.8 in 1887, 88.2 in 1896, to reach its base of 100 in 1900.

Percentage unemployed in 1872 was 0.9 per cent; by 1879, the figures rose to 11.4 per cent, dipping to 2.3 per cent before rising to 10.2 per cent again in 1886. These peak years of unemployment were also peak years of company failure and bankruptcies, the causes for which were evident from the foregoing narrative.

After 1886, surviving industries producing finished goods had their potential transformed by the advent of small portable gas engines enabling mechanical methods to be adopted in workshops and small premises run by factors. Coinciding with these developments, self-centred, independent family ownership began to give way to promoted and managed enterprise, where amalgamation were actively sought in order to achieve the advantages of vertical and horizontal integration, coordinated marketing, contract-sharing, and price cartels.

The direction of manufacture moved away from semi-finished, smaller or simpler articles towards highly finished and composite products, of which the most important was to become the motor-car.

> *"Constructional engineers and boilermakers took up the trade in motor-frame pressings and wheels. Factories engaged in producing watch movements turned to the manufacture of small bolts, nuts and screws for engineering purposes.*
>
> *Brass founders became concerned with lighting and starting equipment for cars, and the non-ferrous mills with tubes and strip metal for motor car components factories. Other in the brass trade took up the production of electrical equipment. Penmakers began to produce light stampings for the motor car (and later, aeroplane) factories and pearl button makers took advantage of the demand for electric light switches" (Allen-Conclusion (op cit)).*

In the car trade itself, initially high proportions of skilled and versatile craftsmen were engaged, but later an increased use of machinery and a minute division of labour converted these demands into semi-skilled jobs, thereby displacing or downgrading the workforce.

Other composite products responsible for expansion past 1886 included those of the artificial silk, food and drink, rubber, engineering, machine tool and electrical installation industries, and their foundry and accessory suppliers. Some large scale industrial plants were set up outside central Birmingham at Witton, Bourneville, Selly Oak, Fort Dunlop, Longbridge, Smethwick etc.

A change of habits and taste coinciding with the end of the Victorian era, together with these sweeping innovations, rendered absolute the products of several local trades. In brassfoundry, survival was enhanced by the stability of English tastes and the substitution of stamping and pressing for casting.

Bicycles, introduced in Coventry by invention of the 'safety bicycle', created a boom in Birmingham's cycle trades in 1896, where some 10,000 persons were employed up to 1914. Relegated to a minor position were the tinplate, japanning, saddlery and harness, metal bedstead and cast-iron hollow-ware trades. Yet transitions were made: saddlery to cycle - saddles; harness to fancy leather goods; saddlers' ironmongery (formerly 'lorimerss') to small vehicular components; cast iron hollowware producers

> *"launched out as manufacturers of motor and electrical castings, sanitary fittings, motor wheels, as well as stamped hollowware" [Allen (p 439)].*

Among world-famous industrial names from this generation were Mond (Chemicals), Tangye (Hoists), Birds (Custard), Kynoch (Cartridges), Eley (Bullets), Waters (Pistols), Grice (Small

arms) and Gill (Small arms), Avery (Scales), Lucas (Lamps), Dunlop (Tyres), Guest, Keen and Nettlefold (Steel, iron, furnaces, nails, nuts, screws, bolts etc) Fattorini (Civic regalia), Bunce (Birmingham Post), Bright (MP) Stevens (Pressed glass), Chamberlain (Mayor and MP).

A prime vertical example of a £4.5m merger which took place in 1902 was that of Guest, Keen and Nettlefold formed from Nettlefolds steel makers (acquisition - hungry screw-makers from Smethwick) and the conjoining of Guest and Company and the Dowlais Iron Company with Patent Nut and Bold Company, incorporated in Birmingham in 1864. Besides embracing a wide variety of finished products, this combine was also highly integrated and controlled mines, blast-furnaces, steelworks, rolling mills and engineering plants. An example of horizontal integration was that in the welded tube trade between H and I Stewarts and Menzies in Scotland and of Lloyd and Lloyd in Birmingham, also in 1902.[3]

Addendum

After 1854, when Chamberlain arrived in Birmingham, civic life accelerated. Library provision was notable: the first Free Library opened in 1861; the Central Library in 1865; Reference Library (1866); Public Art Gallery (1867) - the same date as the Second Reform Bill, Municipal gas and water undertaking (1873); and slum clearance and central area redevelopment (involving inter alia the Artisans and Labourers' Developments Act 1875); together with a new Council House opened 1879, were outstanding. Birmingham Education Society had been formed three years before the 1870 Education Act. Free school meals were introduced for the poor in 1894.

Suburban railway lines to Sutton Coldfield and to Harborne had been built in 1862 and 1864. Electric trams were introduced in 1900. The Elan Valley Project at last brought abundant soft Welsh water to city homes.

A chair for industrial and commercial studies was founded at the University of Birmingham, which has been richly endowed by Joseph Mason, the pen manufacturer; just as, later, buildings at Aston University were endowed by the Kendrick hardware family.

About 100 pieces of public open space, including Cannon Hill Park, most of which was laid out and donated by Louise Ryland in 1873, and 500 acres of the Lickey Hills on the South-west boundaries, donated by the Cadbury family, contributed to these amenities.

2.5.3 D Local history of Birmingham

Fourth generation period overview 1900 - 1940

The years 1900 - 14 before the transition period of the First World War and its aftermath - marked the end of an epoch. In terms of cultural values, it was continuous with all that preceded it; yet it manifested the industrial tendencies of an unrecognisably different future..

Whereas growth, both domestic and export, formerly depended upon population expansion and industrial supremacy; by 1900, both German and American competitors had invaded many important Birmingham product-markets. Industrial transformations caused by the application of new technologies were those upon which employment and continued prosperity henceforth chiefly depended.

The sudden spurt in popularity of safety bicycles, then a substantial increase in motor-car and motorcycle production, affected almost every existing trade and skill available in Birmingham. These three composite products called for output from the widest range of suppliers, from forging, stamping, pressing, rolling and engineering works: for ferrous and non-ferrous castings; and (at Smethwick) new aluminum castings; for tubes, seamed or weld-less; for sheet metal, wire, screws, locks, lighting equipment, instruments, springs, tyres, upholstery, wheels, axles, brakes . . . by 1914, over 40,000 persons were employed in vehicle production, with machine tools particularly stimulated and differentiated by this upsurge of mono causal growth. Thus the fortunes of the city became closely entwined with the progress of a single, new and mighty industry.

A great deal of metallic output was also associated with the electrical industry. From General Electric Company's Witton works from 1901 onwards came dynamos and meters, motors and pumps, light fittings, steel conduit tubes, silver and copper wire, high speed engines for generating stations; and by 1914, switchgear, transformers and other electrical industry heavy equipment, for which Birmingham had became a major supplier and production centre. These new industries were conducted in very large factories using powered mechanical equipment for mass production. They were serviced by networks of ancillary industries.

The growth of engineering industries became of first importance to the progress and expansion of the whole industrial structure. Belated adoption of standardized interchangeable parts for large-scale output had enhanced its capacities immeasurably. An Institute of Metals was founded in Birmingham in 1908 'to encourage research in respect to non-ferrous metals, and to apply the results to manufacture.'

Among the more recently established subdivisions, welded tubes for gas and water supply vied with German and American products. A large overseas demand for railway rolling stock and the addition of dining and sleeping cars sustained that activity, as did orders for the London Underground. Mechanical changes everywhere increased demands for nuts, screws, bolts, rivets, clamps, vices, etc.

Among the older trades, jewellery and brass were chief; the former helped by the 1890 abolition of duties on silverplate for trophies and tableware and by the 1899 De Beers diamond combine (which steadied prices); the latter, brass, by expansion in electrical fittings, turbine blades, motor markets and general plumbing. Heavier chains and anchors were required by shipbuilders; colonial development still required 'branded' name edge-tools; high-class door and lock furniture prospered; in the pen-trade, typewriters and fountain pens began to pose serious competition. Hollow-ware, cast iron and tinplate trades were largely replaced by enamelled steel for bath-tubs, basin, bowls, urns, teapots etc; by aluminum utensils suited for use on gas-cookers; and by galvanised dustbins and water-tanks, for which demand seemed endless.

In the gun-trades, the Belgian barrel-makers at Liège had gained the comparative advantage, but War office orders for Lee-Metford rifles for the Boer Wars, and Lee-Enfield rifles subsequently sustained this industry, which also made sporting rifles and airguns from 1906 onwards. But in 1911, the numbers employed were less than in 1865, due to the demise of many Birmingham producers.

War-time demand was especially heavy for drop-forgings and aluminum castings, for saddlery and harness, swords and bedsteads. Between 1913 - 20 the annual output of pig-iron rose from its previous level of 460,000 tons to meanly 700,000 tons per annum.

Removal of foreign competition gave a new lease of life to a long list of declining industries; although some previously expanding sectors (cocoa, chocolate, artificial silk, jewellery and sporting guns) were handicapped by restrictions, through the enlistment of many small masters. Other long-established trades found that new classes of product were in demand.

Following army demobilisation in 1918, and a short post-war boom, full employment gave way to mounting unemployment: in 1920 munitions workers, not needed as soon as no further profit could be gained from their labours, marched on London. Employers stated "There is little scope for further business except in war-work". Birmingham became the city worst hit by post-war business failures and redundancy.

While Birmingham's traditional manufacturing base was always in the metal industries, latterly in machinery and vehicles, the national process of industrialisation and changes in the distribution of the workforce presented other forms of competition. The numbers of manufacturing employees had risen from 3.9m (1851) to 4.5m (1881) and 6.1m (1911). The percentage of the labour force employed in metals, machinery and vehicles (Deane and Cole) also increased and continued to increase: 24.3 per cent in 1891; 29 per cent in 1911, 36.9 per cent in 1921, up to a peak of 45.5 per cent in 1951, thereafter diminishing with both the decline of manufacturing and the growth in service industries.

1922 was the third winter of unemployment for large numbers of Birmingham workpeople. Wage levels had also fallen for those who were employed. The situation became for worse than during the slump of 1904 - 5, or that of 1914, which hit jewellery, brass, motorcar and motorcycle trades. There was much short-time working as the result of cancellation of overseas orders. Local distress called forth much charitable relief support, but wasted skills undermined morale, and led to crime and disorder.

In bedstead production, a sudden switch in fashion from brass and iron to wooden-based beds caused a collapse of this industry, still rising until then. Saddlers' ironmongery, machine-made nails, wire ropes, scales, pins, umbrella fittings and fastenings struggled often against foreign superiority.

"Other small trades become almost extinct' Allen wrote (p 274). 'Rope and twine manufacture dwindled to insignificance; medieval and artistic metal-work practically ceased; and match manufacture was completely gone by 1914."

Great expansions took place in glass, chemical, artificial silk, rubber, paint and varnish, food and drink, golf-ball and paperbox industries outside the scope of this review.

The revival in national trade which had appeared at the turn of the century quickly subsided; it rose again, but was abruptly dashed by the American crises 1906 - 8, before resuming (muted by the sudden death of King Edward VII in 1910) and surging through 1911, only to relapse into depression again in 1913.

The war years were altogether exceptional, especially busy and prosperous for the makers of arms, armour, aeroplanes, shells, bombs, ammunition, motors, cycles and all their ancillaries and accessories using steel, brass, nickel, aluminum, copper and alloys. Enormous quantities of war materials were produced from 67 factories brought together under the Birmingham Small Arms Company Limited. Planned output was directed by Lloyd

George, Minister for Munitions, from 1915 until 1919. Nevertheless, subcontracting remained important.

The scale of industry had been slow to change, with large units exceptional up to the 1880's, after when there occurred series of amalgamations, which together with natural growth, concentrated the bulk of certain types of production (such as steel, brass, metal alloys, machine tools, high-speed engines, and hardware, edge-tools, chains,) into much larger units, although remaining essentially unintegrated Electric and acetylene welding; folding, moulding, pressing, machining; capstan lathes, milling, drilling,boring and stripping machines, with drop-forging all helped revolutionize output. Oil-engines and electricity from local power stations had introduced powered equipment even into the smallest establishments.

There occurred increasing diversification specialisation and/or broadening of the base in growing firms simultaneously with greater simplification and standardization of products. New methods of production and organization had forced fresh functions onto the manager with a general tightening up (on costs, quality control, and discipline) in order to meet large orders.

Up to 1890, it had been the factor who had been responsible for materials, coordination and distribution; but increasingly it had become the rôle of manufacturers to manage purchasing organisation and marketing after 1890, thus also dealing with banks, controlling finance, regulations stocks and forming business policy.

After the war, such methods became more general, and helped avoid sharp fluctuations in particular trades. Direct selling to customers and to the public became the norm. Overseas representatives were appointed for the constructional engineering trade: industrial apparatus for electrical industry was sold direct to public bodies; after-sales service departments were set up in engineering; but wholesale merchants continued to supply domestic goods to retail outlets. Increasingly, firms sought to influence customers and consumer demand through various promotional media, especially advertising.

Postwar production of motor cars, commercial vehicles, motor-cycles and tricars, soared prodigiously; and in 1924 even bicycles and tricycles had increased somewhat from the 1907 levels. In 1919, over 24,000 private cars and 6,000 commercial vehicles were built; in 1927, these figures had became 157,000 and 52,000 respectively.

Ministry of Labour estimates for July 1927 showed 94,000 people employed in this industry in the Midland District. The motor industry had became of vital importance to the Birmingham area, chief among nine other major

employers including cycle; aircraft; electrical industries; railway carriage; iron and steel tube; constructional engineering; stove, grate, pipe and general founding; silk and rubber. Still very large, but declining, were glass; watch; jewellery; bolt, nut screw, rivet nail; wire; and chemicals.

Between 1923 - 27, the rate of unemployment fluctuated in accordance with the relative growths and declines of these industry sub-sectors: it varied between 8.3 and 10.2 per cent of the insured labour force in the Midland District. All those industries most involved in heavy war-time production became those requiring the greatest readjustment. A super-abundance of scrap vitiated ordinary supply of pig-iron to steelmakers. A two-thirds decline in output occurred in the chain and anchor trades.

Foreign competition once again wilted local production of cut-nails, buttons, brushes and brooms, cut glass and flats, and enameled steel hollow-ware. Pens, bedsteads and needles were subjected to foreign tariffs. Changed postwar habits and fashions reduced several trades. Survival required extreme adaptability and resourcefulness, and inevitably, many firms failed.

Continuous technical improvements characterized the most progressive sectors, in some of which conveyor systems for flow-line assembly were installed. The self-contained, integrated factory all but eliminated the need for subcontractors and outworkers. This centripetal organizational tendency was complemented by centrifugal location policies, following the examples already established at Longbridge and Selly Oak.

"In certain other trades, the earlier manufacturing processes have passed to other centres at home and abroad, and the district has been left with only the finishing operations." (Allen p 306)

Indeed, the boundaries of Birmingham themselves were changed (thereby causing adjustment problems with statistical records): A group of neighbouring parishes were added to Birmingham in 1911, including some which had previously been in Worcestershire. There were other additions in 1928 and 1931 (and minor boundary adjustments in 1966. In 1974 Birmingham and Sutton Coldfield combined to form the Metropolitan District of Birmingham.

Just as the onward march of invention had rendered many previous trades obsolete, so now development of concentrated employment in factories become increasingly constrained by new methods, machinery; and management. The great props of industrial supremacy and empire trade which had sustained past growth, and the stimulus of war, were no longer present in the days of the great depression, which began before the Wall Street crash of 1929, but lasted through the early 1930's.

Names such as Chamberlain, Asquith, Lansbury, Kendrick, Lanchester companies such as Austin, Dunlop, Cadbury, Albright and Wilson, Accles and Pollock and Imperial Metal Industries belong to this era, together with the Metropolitan Railway Carriage and Wagon Works.

While unemployment in Birmingham and Smethwick labour exchange areas in 1931 - 32 rested below 24 per cent, it was 30 per cent and over in the adjacent Black Country. Average unemployment in Birmingham 1931 - 38 was 9.6 per cent, compared with 16.9 per cent nationally, indicating a rapid recovery 1933 - 38.

Growth industries between 1923 - 37 were electrical engineering, generators etc; motor vehicles, cycles and aircraft together with building materials; whereas iron and steel, jewellery and plate all declined. The percentage of the insured workforce engaged in other aspects of the metal industries were as follows:

	1931	1937
Description of Trade	Percentage of insured workers	
Foundry and Secondary Process	3.11%	3.14%
General Engineering	5.11%	4.75%
Other Metal Products	14.16%	15.87%
	22.38%	23.76%

'Conurbation' - The Architectural Press. Birmingham 1948 Table XXV p 120

Between 1930 - 35, the Depression Years, the increase in net output of industrial production in Birmingham was approximately double the increase in employees and establishments, a productivity achievement far better than that obtained in Greater London during the same period.

An Index of Growth for the longer period 1931 - 37 (ex'Conurbation' Table XXIII p 118) for a total of 17 industries in the then Standard Industrial Classifications 1 - 7 and 11 provided a rise in Birmingham of 23.3 per cent compared with only 7 per cent nationally. Constructional engineering was the subsector leading this industrial growth, followed closely by foundry and secondary process industry.

Seasonal variations occurred in differing months in Birmingham's diverse industrial sub-sectors, thus stabilising the overall unemployment statistics. The relative absence of declining industries in the local economic structure also reduced average unemployment levels; but cyclical unemployment was apt to bite hard in the metal industries, due to postponed purchases. This was illustrated by the 1931 Census of Population figures, showing 10.5 per cent unemployed in metals nationally compared with 38.9 per cent in Birmingham's conurbation (including Dudley, Smethwick (48 per cent!), Walsall, West Bromwich (47 per cent!) and Wolverhampton).

In 1931, the industry of Birmingham was arranged in an inner and outer ring of developments about the old central care comprising the brass (Ladywood), gun (Central), jewellery (Hockley) and mixed metal (Deritend) areas. Metals and engineering was located mainly at Smethwick, on the outer ring (north-west). The inner ring comprised groups of factories at Nechells, Saltley, Bordesley, Small Heath, Greet, Balsall Heath; the outer ring groups at Witton, Tame Valley, Aston, Ward End, Stetchford, South Yardley, Acocks Green, Stirchley, Bourneville, and Selly Oak, then Smethwick. The major specialisations in the Birmingham area were then vehicles, jewellery and plate, cutlery and small tools: the decline of heavy industries continued until 1939 - the eve of the Second World War.

2.5.3 E Local history of Birmingham overview

Fifth generation period 1940 - 80

The outbreak of the Second World War once again revitalised the economy of Birmingham, based largely as it was on the motor industry, heavy metals, non-ferrous production, and light and constructional engineering.

Female labour swarmed into the factories to aid the output of arms, aircraft, ammunition and all the necessary fighting equipment; they replaced men conscripted for military service, (except those whose skills were vital to the war effort in factories, rather than at the front). By 1946, some 60,000 people had joined the workforce, and Unions grew correspondingly.

Relatively low technology, mass-produced metal products, and the absence of serious international competition until the early 1950's provided prosperity at the price of future growth and survival. In the 1960's, the motor industry began an alarming decline, accentuated in 1970's when factory closures became frequent and unemployment climbed from 0.7 per cent up to 11.0 per cent in 1979.

Between 1971 and 1977, some 800 company closures occurred - with 75 per cent resulting from establishment 'deaths', as opposed to relocation.

In Birmingham itself, as many as 17,000 jobs were lost between 1961 and 1971; some 14 per cent of all employment. Manufacturing was hardest hit; employment fell by a staggering 42 per cent over the decade, compared with a national average of only 6 per cent. Unemployment rose from well below the UK average to well above that level. The members of school leavers finding jobs fell from 70 down to 20 per cent.

Many large firms such as Lucas, Glynwed, Tube Investments had slimmed down to a size at which they could service, invest more, and research more. Nonetheless, around 300,000 jobs were currently linked to the car industry in 1980, engaged in 7,000 suppliers; the largest names among them were Automotive Products, Dunlop, Rubery Owen and GKN. Big firms seemed better able to survive recession and plant closure, which often meant liquidation for that 75 per cent of BICIC members (totalling 4,000 plus) who employed less than 50 persons in 1980.

Live births per 1,000 of population declined from 34 to 11 between 1871 - 5 and 1981 - 5; deaths per 1,000 population also declined, from 22 to 10, over the same period. Apart from very sharp changes during and after wars, the trends appeared to have been steady. Colder winters and epidemic diseases caused the death rate per 1,000 population to oscillate slightly more strongly

than the curve for live births. Life expectancy during the same period rose from 40 - 45 years to 70 - 75 years. By Mid 1974, the Birmingham population was 1,082,900 making it the second largest metropolitan district in the United Kingdom.

The city figure declined persistently until 1,025,400 in 1980, a steeper rate of population decrease than in the West Midlands as a whole (Office of Population Census Survey estimates); many economically active persons had left, even before 1980, as the balance by age group of those migrating between the city and the rest of Britain had shown.

Apart from spasmodic bursts of activity for war emergencies, the Birmingham gun-trade by 1980 had declined unrecognizably from the 600 firms in 1967 to only four. Production of double barelled shotguns had shrunk from 220,000 to 22 per annum. Motorcycle production, running at sufficient for 28,000 local jobs in the late 1940's, virtually disappeared following the collapse of BSA in the early 1970's under Japanese competition. Aircraft production and rail and road wagons virtually ceased post-war, although orders for the Tyne and Wear 'metro' helped revivee Metro - Cammell.

In 1980, Birmingham suffered 55 closures, almost double the total for the West Midlands in 1978: during 1980, male unemployment climbed to 14.4 per cent, overall unemployment from 4.0 to 7.0 per cent. Major sectors such as vehicles, metal goods, metal manufacture and mechanical and electrical engineering - accounting for 70 per cent of the region's manufacturing employment - recorded an estimated 175,000 job loss in the decade to 1976. The proportion of manufacturing jobs - the highest in the country at 44 per cent - made this loss all the more severe.

In 1968 the West Midlands gross domestic product per capita was 7.3 per cent above the UK average; by 1978 it was 2.5 per cent below. Output per employee in metal manufacture between 1968 and 1972 was particularly poor, about 4 per cent below UK's already low average.

Low investment in the 1960's and the latter half of 1970's had undermined the competitiveness of local firms in the metal industries and this become apparent in the 1979 recession. About 40 per cent of factory buildings in the Birmingham area had been built before 1918, and 70 per cent of firms were unable to expand because of urban congestion.
Small firms developed a tendency to invest in secondhand plant and machinery, instead of new numerically controlled systems. Large firms were investing abroad in order to meet customer requirements for on-shore manufacturing capability and speedy deliveries (not strike-prone, as in the UK). That was the changed competitive situation in 1980, largely due to a

decline in private and in public investment and lack of confidence in future growth prospects.[1]

Government regional policy strategy since the Barlow Commission's analysis of a dual problem of metropolitan congestion in the South-East and Midlands, and of underdevelopment and unemployment in the North and West, had been

"to restrict the further growth of large cities and to redirect surplus population and economic activity to the surrounding metropolitan hinterlands and to underdeveloped regions." (Management Today May 1981, p 49)

Industrial Development Certificates for factories over 10,000 sq ft (initially over 15,000 sq ft) became the policy instrument, diverting some 39,000 jobs away through factory movement 1960 - 74, and a total of an estimated 100,000 jobs elsewhere 1960 - 1980. (Smith/Mawson Study Birmingham University Centre for Urban and Regional Development)

Large local expansion plans by British Leyland, Dupont, Talbot, Rootes, Radiation-Ascot, British Aluminum, and International Paints were baulked by restrictions and diverted elsewhere, only to close after a few years. Speculative inward investment was also deterred: the City Council and the Department of Trade and Industry were both encouraging firms small and large to leave Birmingham for 'greenfield' locations in new towns. Thus long-term deindustrialisation became accelerated.

Central area redevelopment under the 1944 Town and Country Planning Act had involved relocating 1,654 central area companies (to join 2,300 other industrial and commercial concerns) from the five redevelopment areas of Nechells Green, Highgate, Lee Bank, Ladywood and Newtown.

In September 1962, the 100th firm to be relocated from the 557 firms still involved was featured in the 'Birmingham Post'. By then 83 firms (14.9 per cent) had already gone out of existence, 128 moved elsewhere in the city, 35 had left the West Midlands, and 93 others had made their own arrangements. Although 218 firms still had to be moved, the figures showed the extent of centrifugal forces before the Government regional policy had got into its stride. Various venture and enterprise zone schemes existed to help embryo firms in 'sunrise' industries .

Service industry redevelopment of the central areas had been colossal, and was continuing in outworn areas previously occupied by manufacturing trades.

Major developments included: motorways (under Sir Herbert Manzoni 1935 - 1963); inter-city rail links; freight terminals and inland container ports; Birmingham's extended international airport at Elmdon and the adjoining National Exhibition Centre constructed and improved since the 1960's; the Birmingham wholesale market (grant-aided by EEC in 1973) and the adjoining commercial Bull Ring Centre with the 'Pallasades' under-cover shopping precinct but the central node of various 'satellite' suburban shopping complexes with supermarkets; the new Birmingham Repertory Theatre in Broad Street; the Post Office telecommunications tower; the Midland HQ of BBC radio and Midland television; the Public Library in Chamberlain Square, opened in 1973; the Birmingham Post and Mail Building in Colmore Circus; and numerous restoration and improvement projects.

Together, these developments had helped displace the traditional metal industries from their dominant role in the local economy, which (still being measured in terms of manufacturing output and secondary sector employees) declined proportionately to the growth of the tertiary sector, even without the occurrence of widespread closures and contractions.

Britain's membership of the EEC from 1967 onward had served to increase competition in the supply of goods and services in which local industry had hitterto enjoyed a comparative advantage; but simultaneously it opened up European markets for greater penetration by Birmingham enterprises. The motor industry's selection of its suppliers; technological developments; material substitution; and foreign competition presented new challenges to management.

Even so, the City Council's publication 'Historic Birmingham' declares:

"The City has about 5,000 works or factories covering over 1,000 trades with products ranging from abbattoir equipment to zip fasteners. Following the traditional pattern, 70 per cent of the output comes from metals."

Twice as many firms now operate within the greater conurbation and administrative area outside the renovated core of the historic city. Two questionnaires were directed to this total area , each concerned to define respondents' current attitudes to trends, cycles and fluctuations in the economic and business environments of the immediate past, as experienced by their own company, and understood by themselves.

THE RISE & RISE OF BIRMINGHAM METAL INDUSTRIES

Date	Industry		Typical Products (Metals) 1740 Onwards
1980	Robotics	53	Programmed, automatic, self-activated, self-monitoring medical devices
	CAD/CAM	52	appreciation of modern methods to automated manufacture ,& production engineering
	Aerospace	51	Communication satellite and space-probe, meterological & scanning equipment
1940	Computer hardware	50	Cabinets, Frames, bases, keyboards, etc
	Consumer durables	49	Refridgerators, cookers, washing machines; enamelled steel holloware
	Heavy MC tools	48	Capstian lathes; milling; grinding; shearerg; pinching; boring; punching machines
1920	Aircraft	47	Component; chassis; propellers; struts; wheels; hangors and rotor-brades
	Motor vehicles	46	Motorcars; ;commercial vehicles; motor cycles and accessories
	Office equipment	45	Filing cabinets; typewriters etc Shopfitting and cashtills; calculators etc
	Electrical	44	Motors, lamps, generators, switchgear, equipment
	Munitions	43	Bullets, shells, bombs, missiles, cartridges, ammunition, rockets
1900	Oil, gas, petrol engine	42	Design, testing, mass-production of engines all sizes, powers, uses, speeds
	Engineering	41	Machinery-making, fitting; appehance manufacturing, composites; tool-making
	Lamps & cookers	40	Carriage and electric, Gas cookers, Parafin lamps and stoves, Electric cookers and ovens
	Pedal bicycles	39	Rapid evolution from 1.25d to tandem and racing bicyles and children's
1880	Copperwire	38	Telegraphic, telephonic, submarine cables, radio electrical; ornanments, curtain rails
	Seamless tubes	37	Gas pipes; watermains; pressures pipes; boilers bicycles; cylinders;
	Hydraulic machinery	36	Hoists, lifts, cranes, pulleys weighbridges, machine-tools, engineering
	Sewing machine	35	domestic and industrial
	Nuts, bolts, screws	34	Machine-made by the ton. Use of iron, brass, steel, alloys
	Accessories	33	Umbrella and parasols: surgical appliances: equipment for disabled
1860	Cut nails	32	Machine-made to standard sizes in large quantities
	Safety	31	Locks, keys, bolts, hinges, safes
	Fine instruments	30	Rules, scales
	Bedsteads	29	Brass / iron / alloy cots, bedsteads, and perambulators
	Wrought iron	28	Ornamental lattices, balustrades, interior decor, lampholders
1840	Railway equipment	27	Wagons, rolling stock, dining cars, sleeping cars, railway signals and equipment gates
	Iron-plating	26	Boilers, gas-holders, armour-plating, galvanised bins, tubs, buckets etc

THE RISE & RISE OF BIRMINGHAM METAL INDUSTRIES (Cont'd)

Date	Industry		Typical Products (Metals) 1740 Onwards
	chain & anchors	25	Heavy marine, industrial chains; naval anchors and fittings
1820	Illumination	24	Lighthouse lamp holder, metallic light reflectors; turntables etc
	Writing instruments	23	Steel,pens, nibs, mathematical instrucments
1800	Malleable castings	22	Ornamental statues, ironwork; pulley-blocks bar, railings, fenders, scrapers, porters, hooks, stands etc
	Electro-plating	21	Tinplate gilding and silverplating
	Die-stamping	20	Coins, medals, medallions, manillas, plaques etc: MINT
	Britannia ware	19	Pewter household equipment of diverse varieties
1780	Instruments	18	Measuring, mechanical, weighting, optical, medical, scientific, timing
	Iron wood-screws	17	All types for carpentry, housebuilding, woodwork, machinery etc
	Cast iron hollowware	16	Cooking pots, saucepans, frying pans, vrons; fenders, balustrades, bedsteads, pipes, tanks, cistems, plumbers ware
	Heavy wire	15	Hawsers, cables, combined rope and wire strand; springs
1760	Iron-castings	14	machinery; constructional; ship-building; statues; coffins
	Buckles & buttons	13	Ornanental buckles of all types: metallic, gilt, pecrlised, linen and uniform bottons
	Bell-founding	12	ecclesiastical, civic and domestic bells of all sizes
	Pin-making	11	Pins, needles, fish-books; light gauze firegaurds, dishcovers; baskets,
1740	Copperware	10	Cooking utensils; ornaments; vases; trays
	Piano wire	9	For all types of stringed instuments, lattice etc steel wire
	Edge tools	8	Axes, billhooks, hoes, saws, shovels, spades, forks
	Jewellery	7	Gilt toys, engraved, enamelled; bracelets, rings, imitation jewels, and heavy toys
	Gun-making	6	Swords, cutlasses, bayonets, muskets, rifles, shotguns, airguns, heavy guns
	Brass & bronze	5	Cannon, chardeliers, lanterns lamps, arrnaments, trinkets, fittings, tubes, hooks, snuffers, cocks
	Hand-made nails	4	Sadlery and harness accessories, bits, stirrups, horse-shoes etc, all nails
	Agricultural implements	3	Scyltes, sickles, adzes, rakes, hummers, anvils, tongs
Pre	Coal	2	Opencast and mined
1740	Iron ore	1	Pig-iron

APPENDIX 2.A.3

Decennial Accounts of Events 1780 - 1980

a) Explanatory Preface

The following text is a transcription of notations of events from a series of twenty ideal data matrices, each covering a decade and each comprising ten groupings of economic variables. It is not therefore an historical narrative concerned with trends of development. On the contrary, its structure uniquely depends upon a sequence of the ten groupings, repeated within each decade, as follows:

Climate and harvest; population and employment, with unemployment; land values and building; innovation and investment; legal and cultural factors; trade, confidence and bankruptcies, total output and industrial production; price inflation and interest rates; credit and banknote circulation, wars, crises and financial panics.

The numerical entries to the data-grid have been separated from the verbal entries; the former comprise the index of national economic activity (INEA), while the latter, (having been given a numerical weighting in INEA) are hereunder transcribed as they are grouped.

Any attempt to explain connection between events has been avoided as far as possible. An obvious drawback of this method is the loss of impetus in reading the account because of an absence of explanations, perspectives and ideational linkages comprising ordinary narrative.

The process however induces a strong desire for drawing conclusions on the one hand (to be found in the concluding chapter), and on the other hand permits the cyclical theme to emerge from the plain facts, so forming a residual impression in the mind which is almost entirely empirically based.

GENERATION PERIOD 'A' - The First Decade - 1780 - 1789

This decade contained the coldest March and the coldest November on record, in 1785 and 1782 respectively; also heavy rainfalls in the latter year and in 1879, adversely affecting harvest yields. The earlier year saw higher level of fertility and increasingly a more populous countryside, the years 1751 - 1781 having witnessed a population increase of 1.4 million, a level of increase four times greater than the previous 50 years.

Agricultural land averaged £28 per acre, steadily rising, and housebuilding also rose by over 10 per cent 1785 - 1789. The idea of 'scarce resources' underlying classical economics was reinforced by the prevalence of these particular conditions, which were underscored by further land enclosures, and, under the system of primogeniture, increased migration of people to the towns in search of a better life.

A year earlier, Crompton has invented his spinning mule; in 1771 the metallic ore molybedenium had been isolated and by 1773, tungsten; 1778; Yitrium, 1779 Uranium. By 1784, David Dale started his new lanark mills and Cort introduced his iron puddling process using a reverbatory furnace. The next year the first cotton mill power-loom to the driven by a coal-fuelled Boulton and Watt steam engine, with its separate condenser, rumbled into motion. By 1789, Arkwright's worsted mills were equipped with water frames. The applications of invention to machinery, power, fuel, metals and the organization of factory production promoted the take-off of the first industrial revolution.

On a broader view, Raikes in 1782 instituted Sunday Schools as a measure of elementary education; in 1784, the first mail coaches linked major towns, cutting journey-times along roads sometimes improved by 'turnpike' management. A tax on bricks, introduced in 1785, was a retrogressive social and fiscal measure, but the 1786 commercial treaty with France was welcome in its day.

Pitt the Elder's Bank Restriction Act, 1777, coinciding with the founding of the Birmingham Incorporated Chamber of Commerce, introduced inconvertible paper currency. In 1778, the first reform Act (that for Child Sweeps) passed into law; New South Wales become a British Colony and 'The Times' newspaper was started in premises near the River Fleet. William Pitt (the younger) became Prime Minister in 1789. These changes to the institutional setting had lasting significance for the conduct of business.

Optimism was the prevailing mood, encouraged by growth and engendering speculation before the trade trough of 1788, then, the number of bankruptcies - which had steadily declined (apart from 1782) - increased violently by 28 per cent, only to fall to their previous level in the following year.

Overall output of the economy in England and Wales actually increased most (+20.1 per cent) in the worst years for harvests of 1782 and 1785, the latter ranking as a peak year in the Hoffman index.

Taking the decade as a whole, industrial production increased by roughly 45 per cent, while prices (apart from a 9.5 per cent rise in 1781) oscillated every two to three years, with a slight tendency to rise over the decadse. On the financial front, Building Society management, begun in Birmingham in 1775, started to take root.

Despite the strong current of zeal underlying this decade, the American revolution and war of independence followed by the French revolution and Napoleonic wars were causes for deep anxiety. The U S panic of 1781 and stock market crisis of 1785 raised prices somewhat in England, but the bank crashes of 1788 restrained production and resulted in business failures. The uplift period of the first Kondratieff wave was not without its setbacks: but the war demand for copper lifted the price per long ton of copper after 1785. Japanese saying (1986): "Whoever pioneers production will have a decisive influence on the future patterns of trade."

The Second Decade - 1791 - 1799

Wet summer and a bad harvest in 1793, and the coldest January on record in 1795, delineate this decade. Despite this, a higher birth rate and lower death rate underlay population increase of one per cent during the first half; but only one half of one per cent in the second, when a decline in births and marriages had set in during a near famine situation.

The acreage of land statutorily enclosed between 1761 - 1792 was seven times that of the preceding three decades. Housebuilding reached its peak in the industrial trough year of 1793, a level not seen again until 1799. Many iron-works were opened in this period, causing a spurt in output, and there was rapid building of new cotton mills, particularly throughout the North.

Metals discovered this decade included Titanium (1790 - 4) Vanadium (1791), Beryllium, Chromium and Zinconium (1797) and Telluruim (1798). While cheap wrought iron became available from puddling furnaces, Trevithick in 1792 built the first steam locomotive - the same year as the LeBlanc process was discovered - just one year before Telford engineered the Ellesmere

Canal, and 'Canal Mania' raged following the Duke of Bridgewaters' success. Eli Witney's 'cotton gin' was invented in America (1799) (The importance of rotary motion had been demonstrated by McComick's threshing machine in 1786).

The first Board of Agriculture (precursor of MAFF) was set up in 1793; the Speenhamland system of Poor Relief in 1795, with its attempt to 'stabilize' homeless, jobless landless vagrants; Dr Jenner discovered the efficacy of his smallpox vaccinations in Nottingham (1776); the Unlawful Oaths Act (1797) was passed, and the first Combination Laws (1789-90). In 1798, Malthus wrote his notorious 'Essay on Population'. Further elements of the industrial economy thus created for themselves a place in history.

Bankruptcies were highest in 1793, lowest in 1794. Guesstimates of the national industrial capital as a percentage of the total national capital yield figure of 20.8 per cent in 1798, (including overseas securities); capital formation was possibly in the range 7 - 8 per cent per annum, later to fall to 5 - 6 per cent prior to 1815. Output per capita probably trebled between 1745 and 1800, according to Hoffman's research.

By 1800, the United Kingdom was already the leading industrial nation according to Ashton; and total output of a tenfold increase in the number of furnaces and forges had risen to 19,585 tons per annum. Output of fine copper, which had peaked at 4,000 tons in 1787, thereafter declined in the face of foreign imports and the use of alternatives, but its price rose ever move strongly (except in 1796).

A high turning point of the trade cycle preceeded a high peak of industrial production 1791 - 2, followed by a sharp fall 1793 - then a repeat pattern 1796 - 97. Prices (Schumpeter - Gilboy index) generally continued to fluctuate at two to three year intervals, remaining steady overall. The first English Savings Bank was founded in 1799.

Panic hit the United States Stock Exchange in 1792, which was followed by a slowdown in British business as war with France resumed in 1793. The trough in 1797 was marked by another bank crisis, followed by the Irish rebellion 1798 and the Hamburg crisis of 1799. Events oversea influenced British economic activity rather little.

If the Kondratieff long-wave theory is to be believed, this was also a decade of upswing, and shorter cycles should have peaked in 1796. There was certainly an abundance of credit during the latter years, which were industrially recessed, even though prices rose again 1798 - 99. Wheat prices had fallen 30 per cent 1795 - 1797, due to a relatively dry year in 1796. Output soared 15.7 per cent in 1799.

The Third Decade - 1800 - 1809

A famine situation developed at the turn of the century and persisted through had harvests in 1804- 5 and the coldest September on record in 1807. Recovery came with a relatively dry 1808, and increased crop yields nevertheless.

Population grew slowly and steadily, with low marriage rates. This occurred despite the fact that wages rose, for employees, more than the cost of living, until 1806; whenafter, as Lomax remarked, the rate of population increase doubled to 0.4 per cent per annum approximately. Labour shortages appeared in 1808, (possibly because better weather encouraged temporary rural employment in bedging and ditching etc around newly enclosed properties).

Building increased steadily throughout 1802 - 1806, at around 0.6 per cent per annum, but more slowly both before and after these years. Technically, power looms were spreading among cotton mills, and it was the end of drop spindles for yarn spinning: Declining markets at the latter end of the decade halted cotton mill building.

Trevitthicks' steam carriage made its first journey in 1801; Wm Murdoch introduced gas lighting at Boulton's Echo works in Birmingham; the West India docks were opened in London; and Cayley flew his first model glider. In metals, Tantallum was discovered (1801), Columbium (1803) and Cesium (1803).

The first Census was conducted in 1801, showing a population of 8,893,000 in England and Wales, and within that year came Act of Union with Ireland, followed in 1802 by the Health and Morals of Apprentices Act. Wm Pitt died just as trade with South America (1807) was about to commerce and before a mercantile war gripped the cotton trade 1808 - 9. British Schools opened to their first pupils, aiming to fulfill elementary needs (1808). *A sharp rise in bankruptcies of over 20 per cent occurred in 1800 and 1801, and of over 13 per cent in 1806. These did not occur during years of trade depression as much as in years of fallen price, when industrial output was nearing its peak.* The effects of increasing competition were no doubt feet by many firms, but perhaps in the years following peak output or bottom prices, rather than coincidentally.

A strong trend in growth of output began around 1801, says Freeman, and continued with sharply alternating peaks and troughs roughly every 3.5 years until 1832. According to the Rousseaux index, prices lessened in all years but 1804 - 1806 (inclusive). At the beginning of the decade, credit was abundant; toward the end, it had been strained by excessive speculation.

The Napoleonic wars continued in Europe: the temporary Peace of Amiens in 1802 conicied with a sag in both general prices and of copper; a semi-crisis, followed by a change in the rate of interest, occurred in 1805, the year of the Battle of Trafalgar, with a prices boom and a slump in output accompanying the US stock exchange crisis of 1808 and the general industrial and financial crisis of 1809.

Once again, it seemed that *commercial rather than military matters were responsible for the major changes; but that military matters may also have influenced businessmen's views of their pecuniary interests.* It was beginning to emerge that change itself, if rapid or unexpected, appeared as the main concomitant of increased changes in the rates of bankruptcy. Following the first pinnacle of bankruptcies in 1705 - 6, those of 1801, 1803 and 1805 were relatively minor howbeit on an ascending scale.

The Fourth Decade - 1810 - 1819

Another wet, even wetter, decade with the very cold winter of 1814 and the coldest July on record in 1816. Unemployment added to the prevailing distress due to shortages, yet the population grew a further 16.5 per cent from its 1811 figure of 10.2 million by the end of 1819, with increasing marriages and births and a peak in building activity.

By 1810, the average price of agricultural land had risen to £36 per acre (about 20 per cent on 1780) reaching £48 by 1818. Meanwhile, wheat prices had halved, thus facilitating the survival of the population both brought about by higher yields per acre.

The decade saw the end of the use of handlooms for cotton. Cerium was discovered in 1813, Cadmium (as a zinc by-product) in 1818. 'The Comet', an iron steamship, first sailed on the Clyde in 1812; stephenson's Blucher engine was invented in 1814 and his 'Rocket' locomotive ran the first train service in 1819.

Tinned food was started in 1811; the Birmingham Gun Barrel Proof House in 1813; Westminster was lit by gas street lamps in 1814, the year marking the start, (says Mensch,) of an era of clustered innovations lasting until 1828. Davy's miners' safety lamp was introduced in 1815, (a year famous for defeat of Napoleon at the Battle of Waterloo) and Macadam was appointed then as surveyor general of roads at Bristol.

The start of the Regency period was marked by Luddism; Jane Austen wrote her 'sense and sensibility' in 1811, the same year that National Schools began, Two years after, the East India Trade monopoly was abolished and in

1814, Cape Colony was officially founded. Owen's Factory Act of 1815 continued the train of social reform, while 1819, the year of the 'Peterloo massacre', also saw legislated the first Factory Act for cotton mills. The Birmingham Law Society was established in 1818.

A wave of bankruptcies struck the speculative collapse year of 1810, and the level of nearly 40 per cent increase was repeated in 1819, exceeded only by the post-war pinnacle of a 55 per cent increase in 1818. Copper price per long ton declined in every year bar 1815 and 1818, while general prices plunged in 1810 and again in 1815 - 16.

Output, on the other hand, remained buoyant, achieving peaks in 1811, 1813, 1815, 1818, and not too severe troughs or recessions in 1812, 1814, 1816 and 1819. *Again, the story for prices and output, and the peaking of trade in 1810 and 1818,did not square with the Kondratieff upswing model, nor with each other.*

Yet some surplus capacity was evident up to 1814, a period which nevertheless gave rise to a slight revival of business. The general *peace-time collapse of 1816 was accompanied by a second pinnacle of bankruptcies and a third followed in 1819*. Rates of interest changed in 1811 and 1815, the time of the so-called 'Reconversion Crisis'.

This decade was also punctuated by a series of industrial-cum-financial crises: the great panic of 1810, the US war of 1812, the general peace crisis of 1815, the post-war primary recession, and the US Stock Exchange crisis 1818 - 19 marked out the decade as one of turbulence and anxiety at home and abroad.

Ricardo was prompted to write concerning the slump and its social consequences - probably his work was the first of a long series of treatises concerning the cyclical character of commercial behaviour. By the close of this decade the scene had been set for much of what followed in the next century and a half. Economic changes would arise from many causes: changes in economic activity would tend to be associated with changes in the level of bankruptcies.

Overview of Generation Period 'A'

The first group of four decades in the study fell into the reign of George III, and between 1785 and the post Napoleonic collapse of 1819 constituted the upswing of the first Kondratieff long wave in prices and inventive activity; it also included the take-off phase of Rostow's stages of industrial development.

Climate was generally in a cold, wet phase and harvests were frequently poor at a time when cottagers in a steadily expanding rural population increasingly were driven off the land by both customs of inheritance and by numerous Enclosure Acts; Attracted more and more to find employment in urban surroundings, sometimes in factories and workshops, they began to form a landless proletariat:also potential immigrants.

Despite unfavourable weather, crop yields were generally increasing and encouraged a tendency to earlier marriage and greater fertility rates, with a general cessation of serious plagues also reducing the level of morbidity. In 1801, the first year of Population Census, around 8.9 million people lived in England and Wales: by 1821, the figure was 12 million. Birmingham's population actually doubled over the same period.

Land values - (agricultural {c £28 per acre at the outset, c £30 per acre at the close}) - increased rapidly during the 1790's. Building activity fluctuated, increasing nearly every year, with special spurts starting in 1802 and again in 1817, reflecting both diversion of investment from Consols and the rising need to house the expanding population, whose wages periodically rose a little more than the cost of subsistence. Slight retardations in the growth of building activity in some years seemed to have led to greater increases in following years.

These decades witnessed far-reaching changes in technology with both the introduction of new inventions in the textile industry and new processes in iron-making; the spread of more concentrated forms of factory organization; the increasing adoption of steam engines as prime movers in mines and mills; application of machinery and new methods of agricultural production such as crop rotation. New metals were discovered, new medical knowledge appeared; after the Canal Mania of the 1790's, developments in highways, shipping and locomotion carried forward a revolution in communication; gas lighting began,tinned goods were invented, and many old methods began to yield to new ones.

Unfortunately, there are no usable estimates of the overall level of capital formation available until around 1865, but probably industrial, commercial and financial capital stood at about 20 per cent of the national total, and rising quite strongly, as calculated by the income method. Output per capital pre 1785 probably grew at a rate of 0.3 per cent per annum, but in the fifteen years up to 1800 at 0.9 per cent per annum (a rate faster than that of population growth). Although land as a proportion of total national capital declined from one third to approximately one fifth 1806 - 1824, its value doubled from £29.8 m, to £60.1 m in the same period (Schedule A Assessment - Land Tax Office).

Among notable 'firsts' were (1784) the first bales of cotton to reach Liverpool docks from the Southern States America, and the first mail coach: (1793) first Board of Agriculture set up; (1795) start of Speenhamland system of relief; (1789 - 90) Combination laws; (1807) trade with South America (1818) Birmingham Law Society established.

Each of these events, occurring at a specific date, entrained long-term consequences of great magnitude but hardly affected other factors immediately, or even noticeably in the short-term. Thus they are not accorded a heavy change score in the matrices:

Business confidence was held to have been most closely influenced by the terms of trade and its visible and invisible balances; changes in numbers of domestic bankruptcies year on year; and information about real conditions affecting output, prices, and credit, as modified by wars, crisis, panics and other threats and opportunities as they had occurred.

(P Rousseaux 'Les mouvements au fond de l'economie anelaise 1800 - 1813' - Brussels 1938.)

The acreage statutorily enclosed in England and Wales between 1761 - 1792 was seven times greater than that of the preceding decades.

The estimated percentage of the total occupied workforce in manufacturing and mining industries was 29.7 per cent in 1801 rising to 49.1 per cent in 1951; the sharpest rise, from 1811 - 1821, occurring during the Napoleonic Wars. Small retardations occurred in 1841, 1871, (1911) and 1931.

Technology may develop a trajectory within a single firm as witness Coalbrookidale and the Quaker (cf: Reynolds, Wilkinson, Telford) family of the Darby's, whose ancient ironfoundry became the largest in the world by 1838, some 300 years after the monks of Wenlock Priory first operated a urance at that site. Eg: in 1709, iron was first successfully smelted using coke; in 1712, a Thomas Newcomen steam engine was installed; in 1729, the first iron wheels were cast for a colliry railway line and in 1767, the first iron rails were cast to replace wooden; in 1777 cylinders were cast for Boulton and Watt engines; in 1778 ribs were cast for the iron bridge over the Seven Gorge; in 1790, L-shaped plate rails were produced; in 1802, Trevithick built the world's first steam locomotive using parts made at Coalbrookdale.

Output changes followed an erratic succession of peaks and troughs across the decades; apart from a marked decline in output, exports, patents sealed and a sharp peak in bankruptcies occurring in 1795 - 6, the trend was strongly upward until 1805, levelling out until 1820, then rising sharply again to 1830. (B Parry Lewis).

The Hoffman series for the production of pig-iron and steel rose continuously from 1817 to 1827, while copper ore production did not dip until 1823, even though the production of copper itself saw a sharp fall between 1817 and 1819. The serious disturbances of 1819 were followed, the next year, by a sharp fall in living costs and a mild revival in trade. Cornish tin and copper ore productions peaked somewhere between 1780 - 1790 and 1794 - 1804, and Birmingham brass exports around the turn of the century, due to a general surge in domestic use at home and abroad. The growth of trade between 1780 and 1800 was 'both more rapid and certainly more sustained than in any previous period' (B Parry Lewis). Average real output grew by 30 per cent 1780 - 1800.

'B' The First Decade 1820 - 1829

Bad harvests characterized the first four and last two years of the decade, with exceptionally wet years in 1821, the bottom of a trade depression, (and in 1824). By the 1821 Census, marriages had increased by one seventh since the last census (65 per thousand per annum for a decade) and the population of England and Wales reached nearly 15.5 million. *Large families, with many income-earning children, were a benefit in good times, but were 'eliminated' in bad times . . . and conditions continued to fluctuate violently from year to year.*

A peak in building, particularly of mills and blast furnaces, was reached mid-decade, whereafter activity slackened. The average price of agricultural land was £22 per acre; enclosure of commons and open spaces was largely complete. Hand cropping for woollens and the *use of wooden machinery finally yielded to metal and steam engine motive power in most factories.* Crompton's 'mules' had up to 100 spindles, and some multi-storey mills utilised power from both water, wind and steam.

In 1825, the Stockton - Darlington railway opened; followed by the Menai suspension bridge next year. The ominbus was introduced for town travel (horse-drawn until the 1860's steam traction engines thereafter), and in 1821, Cobbett began eleven years of his famous 'rural rides'; John Walker introduced friction matches tipped with phosphorous.

From 1824 - 1855 was a most active period for tin and copper - mining in Britain, although prices stayed depressed, apart from a small recovery in 1827 and 1829. In those years, aluminium was produced and improved, the first metallic beryllium and thorium made, and Neilson's 'hot blast' was patented as a further stride in the revolution in metal production technology (1828).

1825 was marked by inauguration of free trade with Ireland and the Combinations Act, permitting peaceful workers' Unions. London University was founded in 1828; Peel's Police in 1829, (also the year of Catholic Emancipation).

After a quiet start to the decade, *business confidence took a battering during the trade trough of 1826, when bankruptcies reached an all-time high; and this flood continued through to the end of the decade.* A rise in the interest rate and a catastrophic collapse in the price level in 1825 had signalled this debacle, from which only partial recovery occurred. (Hoffman's index).

By contrast, industrial output declined most in 1820 and 1827, both years of financial panic in the United States, and followed banking crises in England, but was at or near record levels in other years of depressed prices. 1825 was especially a peak year, and 1828 one of a major recovery in output. strong demand for textiles, iron and coal marked these post-independence years of the American pioneers; and eight years of this decade also evidenced an upward trend in investments.

In financial markets, bank credit was increased through the reconversion of small notes into gold - Scotland refused Peel's limitations measures in 1826 - and foreign governments flocked to London for funds from which to finance their own industrial progress. There was a surge of investment in Mexican silver mines released from Spain. *In 1826, several dozen English country banks failed; gold reserves left England; and another of many periodic banking crises ensued.* Reckless speculation on commodity imports apparently underlay these events.

Overall, this was a volatile and turbulent decade, dangerous alike to fledgling enterprises and insecure banks; but one of a virile current of activity resulting in a 30 per cent increase in gross national product.

'B' The Second Decade 1830 - 1839

Although begun with an exceptionally cold winter, and including in 1837 the coldest April on record, harvests generally improved during the drier years comprising this decade. Mass immigrations of the British populations to the recently formed colonies of Australia and new Zealand, as well as to the United States, began and continued until 1859.

The 1831 census gave the UK population as 17.8 million, that of England and Wales 13.9 million. *The 'echo' effects in succeeding generations of previous 'birth bulges'; urban and overseas migrations; booms and slumps of industry and trade, showed themselves.* Despite that, the population rose 13.4 per cent during this decade.

The average price of agricultural land rose a further £3 per acre to £25, and housebuilding, which increased at a steady rate until 1836, began to accelerate up to 1839. Engineering factories and workshops were set up on a large scale everywhere, as cheaper iron was available. Automatic machines for nail-making put an end to the hand-made processes employing 20,000 persons in the Black Country. Machine tools made better machines possible.

Railways linked London and Birmingham, Liverpool and Manchester, and investment was extended to the United States. In 1832, the great Hafed

copper smelter at Swansea began production, with heavy ensueing exports of sheet and unwrought copper. Magnesium was discovered. The Darby family foundry at Coalbroolidale was indisputably the world's largest.

Faraday invented his dynamo (1831); McCormick built a reaper (1833); Morse patented his telegraph (1837); Brunel constructed his bridges and embankments and the first transatlantic steamship completed its maiden voyage; also in 1838, fire destroyed London's Royal Exchange; in 1839. Goodyear processed natural rubber into a useful product; Nasmyth patented his steam-driven hammer; and Daguerre produced his first photographic plates: it was a momentous decade for the impulses from invention.

A revolt of farm labourers occurred at the start of King William IV's reign in 1830; the General Truck Act of 1831 corrected some wage abuses while the election and great Reform Act of 1832 and the abolition of slave-owning in 1833, together with activation of local Board's of Health (following the cholera epidemic of 1831), appointment of factory inspectors under the 1833 Factory Act, and amendments to the Poor Law (1834) together with the municipal Corporations Act of 1835, launched fundamental social changes before Dickens wrote his novel 'Oliver Twist' and Queen Victoria ascended the British Throne (1837). The years 1839 - 1848 were characterized by the 'Chartist' movements. *The decade witnessed serious attempts to remedy defects and abuses accreted during rough years of unprecedented change.*

The years 1831 and 1837 were the worst for bankruptcies, which lessened considerably during the middle years of the decade, when industrial prices also picked up (Rousseau. index), while copper prices fluctuated wildly; national investment and income peaked in 1836 and 1839, while output, up 40 per cent in the decade, also peaked in 1830, (although the rate of increase had fallen sharply).

The year 1831 and 1837 recorded strong output surges, with troughs following in 1832 and the latter half of 1837. These movements illustrated a tendency to over-production with resultant inventory cycles, so diluting a general investment confidence among industrialists.

Joint stock banks competed, in this see-saw, to give credit; and the anchor-rôle of the Bank of England as lender of last resort was much needed in order to stabilize the financial system (1837). In 1832, a Building Society was founded in Birmingham; in 1836, 'Benefit' Building Societies were placed under the Friendly Societies Act, and two years later a model set of rules was issued.

It was a decade in which the colonial wars of trading advantage and plantation ownership began; of bank failures in Calcutt (1831) and India; another US panic in 1835/6, following intense speculation, and again in 1837; 63 English country banks experienced a payments crisis in 1838 - 39; but the decade ended with gold discoveries in Australia.

'B' The Third Decade - 1840 -1849

Very good harvests in 1842 and 1848 (despite heavy rain early in that year), with poor harvests 1845 -1847, and improved harvests 1840 - 1, and 1843 - 4, and 1849 marked a change in climate to warmer summers. While some sections of the population suffered deprivations, fuller employment prevailed until the Irish potato famine of 1845 - 6 propelled waves of immigrants to Liverpool, Glasgow and America.

The UK population in 1841 climbed to over 20 million, of whom nearly 16 million inhabited England and Wales. Population again increased - by 12.5 per cent during this decade. High unemployment - from 3.9 through 19.3 to 33 per cent - hit ironfounders between 1847 and 1849.

Sticky rents, long construction periods and more limited credit due to frequent financial crises and the incidence of colonial wars of acquisition, pacification and commercial exploitation slowed initial progress with housebuilding but brick production rose thereafter until 1849. Building by-laws, with local Boards to approve plans for developments, were passed (1846): the last two years saw 'building mania', with speculative housebuilding undertaken simply to raise ground rents (despite a limited clientele of persons earning £500 or more per annum and the poor still unhoused).

In this decade, the era of rail transportation really arrived, with such an overshot boom in railway investment (more than £40 million in 1847 and some spectacular malpractice) that a temporary reaction occurred in 1848 before further expansion proceeded. Canal and river transport concerns ceased to dominate commercial freight.

Copper in abundance was discovered in Australia and Canada, depressing prices of British copper per long ton 1842 - 1845, after which there was some recovery. 1845 was the overall bottom turning point of the Kondratieff long-wave, and the evidence of the Rousseaux and Sauerbeck - Statist indices tends to support that concept. In 1848 began the California 'gold-rush'.

Among numerous innovations were Jacquard's loom for fancy patterned cloth; Rowlands Hill's Id post; Robert Thompson's Pneumatic tyres; Elias

Howe's sewing machine patent; Morton's use of ether as an anaesthetic; Simpson's pioneering use of chloroform; Walter Hunt's patent of the safety pin; and the invention of conical steel buffers for railways. The Institution of Mechanical Engineers was founded in 1847. A national telegraph service was started and (1843) the first telegram sent. The industrial effects varied enormously, both short-term and long-term. In Rochdale, pioneers started the first cooperative wholesale enterprise (1844).

Birmingham's Law Courts opened in 1840; Chartists presented their petition for the reform of Parliament in the post-election year of 1842, without avail. The Factory Act restraining the use of women's labour was introduced in 1844 (Disraeli published 'Sybil' and Engels 'Conditions of the working class', both in 1845). 1846 saw the momentous, long-delayed Repeal of the Corn Laws, and abolition of agricultural protection. In the election year 1847 come the ten Hours Act, followed by an attempted Public Health Act (not implemented until 1875). The Repeal of the Navigation Laws was passed in 1849. Thus much attention was directed to the institutional framework.

As the long-wave bottomed out, bankruptcies rose at 1842 to twice the level recorded 14 years previously; the years following were marked with sharp mood alterations between deep depression and unbounded confidence. Total output rose by 35 per cent during this decade, as Britain continued to develop as the workshop of the world, the leading industrial nation and the centre of global trade, unchallengeably supreme at least until 1848.

Peaks in railway investment, industrial output, trade and building coincided to secure the centre of the decade; a slight depression struck in 1847, before growth resumed. Credit was easy; there were high bullion reserves, and although imperfect, the 1844 Bank Charter Act helped stabilize business during spasmodic crises, failures, strikes, panics, wars, and foreign revolutions. An era of considerable agricultural prosperity began, lasting until 1864.

'B' The Forth Decade - 1850 - 1859

Good harvests alternating with a couple of bad ones every third year, and a world crisis in 1857, distinguish this decade, one of overall average rainfall.

Population increased at the less rapid rate of 11.1 per cent over ten years, (22.25 m in UK, 18 m in England and Wales). The working population increased from 12,460,000 to 12,880,000 between 1850 and 1859, and unemployment averaged 4.2 per cent (peaking to 7.3 per cent in 1858). Immigration slackened.

Housebuilding rose even more strongly both nationally, and (after 1856), particularly in Birmingham. Wood and brick prices reached new heights in the first half of the decade, and nationally agreed building wages were introduced in the second half of this decade. New and enlarged textile mills averaged around 300 a year between 1851 and 1856. Between 1867 and 1869, coal mining wages rose, fell and rose again.

The Great Universal Exhibition of 1851 at Crystal Palace, housed in Paxton's great design of wrought iron and glass, won world-wide admiration, and was followed by lesser exhibitions in capital cities everywhere. In 1850, the first tubular bridge was opened; the first British grain 'clipper' built; a submarine cable laid between Dover and Calais; Cayley flew his man-carrying glider; and by mid-decade, the main railway network had been completed. The first safety elevator was built by Otis (1854), and in 1855 the first underground railway was constructed in London.

In 1856, Bessemer introduced his new converter in the enhanced steel-making process, resulting in heavy subsequent industrial investment. Wind power went out of use for grinding flour; ring-spinning frames were introduced into cotton mills, greatly upgrading their output capacities. Lenoir made the first internal combustion engine (1858); and an aluminum works was set up the following year: the London General Omnibus Co Ltd had been founded in the previous year.

Legislation to extend the application of the Ten Hours Act was passed in 1850, also the Libraries Act. In 1851 was formed the Amalgamated Society of Engineers. Elected in 1852, Gladstone as Chancellor of the Exchequer began a series of 'Free Trade' budgets extending to 1866. In 1854, he repealed the Prohibition against Usury. *Limited liability for Joint Stock Corporations, including banks, was introduced by the 1856 Companies Act. This period exemplified the reciprocal adjustment of English law to industrial capitalism.* Disraeli was elected Prime Minister in 1859.

A trough in trade and building in the opening years gave way to expansionist optimism as bankruptcies fell, checked by a sudden pinnacle of failures in 1854, and yielding to depression again in the later years as excess capacity in iron and coal lowered prices and increased unemployment.

Cotton exports to India rose, and colonial demand also peaked. Copper prices, firm up to 1855, faltered and fell 1856 - 8 as did mineral prices generally. Cotton increased by 60 per cent. Industrial production, up 39 per cent over the decade, had peaked in 1853 and 1857; GDP rose quite strongly from 1855, onwards, with overproduction of some commodities. *Riffled guns replaced former types, and became greatly improved by the Birmingham trades.*

Credit remained scarce with low rates of interest rising to 5 per cent by 1855. The great fall in UK industrial production occurred in 1858, following strong rises, and bank rate rose first to 7 per cent, then 10 per cent; then fell to 2.5 per cent again by 1859. Gold was found in Australia in 1851; in 1854, the USA began to mine copper in large quantities: a financial crisis occurred in the same year, and a US collapse again in 1857, necessitating yet another suspension of the Bank Charter Act. The Crimean War 1854 - 1856 was followed by the Indian Mutiny, 1857. Large investments were made in American railways.

Overview of Generation Period 'B' - 1820 - 1859

King George IV ascended the throne in 1820, succeeded by Queen Victoria in 1837, (midway through this Generation). These auspicious years marked Britain's grinding effort to establish industrial ascendancy and to retain supremacy in world markets for mass-produced goods. They commenced at the *theoretical peak of the long-wave in price which bore onwards and downwards to around 1843, before rising through the Great Exhibition year of 1851 to a new peak in 1864.* From 1846 to 1938, the empirical Sauereck - Statist index provided an unbroken record of prices of goodsand raw materials, including minerals.

Inventions such as the railway and the steamship offered enormously cheaper, faster and more punctual carriage of metals, ore and finished products first internally, then soon afterwards, all over the globe. Recently acquired colonies became great consumers of British industrial products, while often specializing in primary commodities and extraction industries themselves.

Entrepot trade and the volumes of exports and imports inexorably rose, and activity increased even further; *not without such crises and fluctuations however, that pinnacles of bankruptcies appeared at least every 8 - 10 years. It was a period of economic activity quickened by new methods and assiduously ploughed - back profits.* There was considerable hardship endured periodically by many, but substantial gains for successful capitalists and entrepreneurs. The effects of some inventions did not materialise until long after the decade in which they first appeared. (eg rails for wheeled transport and elevation of canal barges overland etc)

The proportions of the workforce engaged in both agriculture and fishing declined, and those engaged in industrial and other pursuits increased. The previous generation had already set those main tendencies which were to characterize the industrial revolution: in this generation, they found sturdy expression.

The index of patents sealed (or granted) rose strongly in the late 1820's and thereafter displayed a cyclical character in which peaks frequently coincided with peaks in bankruptcies. Certainly, not all new methods succeeded; either because they were poor propositions or because, temporarily, the cycle took a downturn; or because credit became over-strained at the boom-time, leading to collapse of enterprises.

Cycles of industrial output ran as follows: 1825 - 1832, a slump during which efforts were made to reduce machine hours and increase productivity; 1834 - 1836, a short boom, when cost economies were achieved through better capital plant; 1841 - 1848, a recession, with both 'over-production' and under-consumption (ie: wage demand deficiency with 'flexible' employment); and 1849 - 1854, renewed prosperity, higher fixed costs, higher prices and fiercer competition.[1]

Railway - building in the UK (eg: London to Birmingham) involving coal, iron and engineering did accelerate the developments already boosted by better roads and canal transportation, and fed its own progress. By 1839, there were 1000 miles of track under construction, employing 50,000 men (about one per cent of the working population): by 1849, over 4,000 miles of railway had been laid.

Between 1788 - 1830, pig-iron output rose tenfold, as did engineering. Despite the upsurge in textiles, by 1840 only one person in eighty worked in cotton mills; but was nevertheless responsible for 7.5 per cent of the gross national product.

Housebuilding was regionally erratic during the 1830's, but peak brick output occurred for main cities and suburban developments 1843 - 1848, (following a depression in 1841 - 2) and an absolute peak of activity was reached in 1852.

A great expansion of credit and financial facilities providing backing for industrial enterprise on a scale hitherto never experienced occurred after the Great Exhibition year of 1851[Exhibit 1]. This generation as a whole was one of vigorous economic activity.

Tin, Copper, Lead (British Historical Statistics)

(Graphed) tables give all the continuous series of statistics that are available about the three non-favous metals which have been historically important to this country (particularly Birmingham)

'C' The First Decade 1860 - 1869

A wet start to the decade, with bad harvests necessitating grain imports in 1862, was followed by better weather alternating with wetter every two years, ending in 1869 with a good harvest. Population rose 12.7 per cent to 13.0 million in England and Wales. A labour shortage was felt in 1864 - 5, the year of the (theoretical) long-wave peak in prices, and so it became a depression year of the business cycle. Emigration rose sharply mid-decade.

House building nationally increased dramatically despite the 'depressed' years of 1862, (with half-completed structures and wages insufficient to pay the new high rents demanded) and also 1868. Between 1858 - 64, a large rise in Birmingham house-building occurred, resumed (after a lull) at a lesser pace between 1865 - 70. Prices in housebuilding in other regions did not synchronize well with each other or with the overall trend. Land values were somewhat depressed.

Cheaper Bessemer steel became available, and in 1862 the Solvay process was developed in Belgium: together with the LeBlanc process, it was introduced to England by Ludwig Mond in 1867. In 1864, Alfred Nobel invented dynamite, one year after the metal Indium had been discovered and one year before large nickle deposits were uncovered in America. The Siemens - Martin steel-making process was patented in 1805 and a regenerative furnace started in 1866, ideal for producing rails in large quantities.

Cheap workmen's fares on trains were introduced; in 1865 sailed the first iron-clad British warship; in 1863 the Metropolitan Railway Company began to enlarge the London Underground train system; Pitz invented his water-jacket furnace; in 1866, a cable service was established between Britain and America; 1868 Westinghouse perfected his airbrake for trains and in 1869 the opening of the Suez Canal shortened the sea-route to India and the Far East.

A long-sought commercial treaty with France was signed by Cobden and Chevalier in 1860. The post office savings bank commenced in 1861. In 1862 come an Act limiting the liability of joint stock companies (having ever increasing effect on company structures over the next generation). In 1863, an Alkali Works Act was aimed at reducing chemical pollution. The North of England co-operative wholesale society was formed.

Among great exhibitions were the London International, 1862, and the Birmingham and Midland Counties Working Men's Industrial 1865: others were held in Dublin, Moscow, New-Zealand and Paris (1867). In 1869 was held the South Staffordshire Industrial and Fine Arts Exhibition. In retrospect, the decade has been referred to as the 'high noon of mid-Victorian prosperity' and the 'golden age of English agriculture'. Wages rose to a level one third higher than that of 1850. Disradi introduced his Second Reform Bill in 1867, together with two Factory Acts. Canada became a Dominion of the British Empire. In 1868 of the Trades Union Congress was formed.

Bankruptcies declined in all years except 1860 and 1865 - 68, and generally became relatively few. Exports increased, credit grew, until the 1866 trade peak fell back to depression at the end of the year. Iron and steel exports continued to rise.

Iron ore output soared from a 7,200,000 tons (1861) low to a 16,250,000 tons approx (1871) high. Shipbuilding was rising; railway construction high. Share prices on the Stock Exchange more than doubled between 1859 and 1864, 'After the depression of 1857, most of the country was now full of optimism and energy' (B Parry Lewis p.100).

In fact the price of copper per long ton fell (along with most other minerals prices) moderately every year except 1864 - 5. Output as a whole rose by 33 per cent in the decade, including steady growth in engineering output, except 1866 - 7 when an industrial peak gave way to a sudden slump. Coal, cotton and railways all grew in volumeof output.

Exceptional strong growth in output was recorded in the years 1862 - 1865; in 1867 and 1869. For Lomax and Haffmann, 1862 was a trough year of depression, but not so for Feinstein. The trade cycle peak of 1866, coinciding with Hoffmann's industrial peak, was a stagnant or negative growth year for Feinstein. This conflict extended from the empirical and included the theoretical framework of cyclical peaks and troughs, both short-term and long-wave. These differences arise from the differing compositions and weightings given indices on the one hand, and from overlapping super-imposition theories on the other.

Bank rate rose from 3 per cent to 8 per cent 1860 - 1862 at a time of credit scarcity, but fell to 2 per cent 1862 - 63, only to rise to 9 per cent in 1864, the year of the start of a strong investment boom in South Wales coal. A panic and financial collapse in the United States in 1860 led to suspension of the Bank Act, and recurrent overseas crises accompanied the American Civil War and 'cotton famine' years. A primary US recession followed the cessation of hostilities, buoyed up by 'railway mania', since the military and

commodity significance of rail-freight had been demonstrated.

The years 1866 - 7 were also beset by crises - those of Credit Mobilier in France and of Overend Gurney collapse in England, whence capital had been lent for construction projects throughout the world. Again, the Bank Charter Act had to be withdrawn to deal with the crisis. The end of the Franco-Prussian War in 1869, coinciding with yet another American crisis, had a depressive effect on the arms manufacture of Birmingham. Colonial wars of acquisition, trade, pacification and unification continued.

'C' The Second Decade - 1870 - 1879

Although much drier, the start to the decade produced poor harvests in 1871 - 2 and in 1876, and 1879 was an exceptionally cold winter, reducing activity everywhere. UK. population increase was 13.9 per cent over the decade; the new total for England and Wales (for which the increase was 10.7 per cent over the decade rose to 14.9 million persons.

Land values rose rapidly, with average agricultural land at £52 per acre in the peak housebuilding year of 1874, and some urban land adjacent to new public transportation facilities realizing unheard-of value increases. Cotton towns also experienced a housing boom in some areas; property speculation was general wherever rising demand was noticed.

Armoured warships continued to be built and commissioned for the Royal Navy and the merchant fleet expanded. Giant steelworks were developed, and some Welsh coal and metal towns 'died'. A cluster of electrical inventions ushered in the new age, among them Bell's telephone, Edison's phonograph and Swan's light bulb. In 1870, Gramme had perfected the electrical armature; the typewriter was invented in 1873. Siemen's method, Holloway's Bessemer Convertor, and the Gildrist - Thomas method (of adding lime to a calcined furnace lining of dolomite) vied with each other for cheap steel production. The metal Gallium was derived from zinc (1875).

In 1870, the Education Act signalled a major advance. In 1871, Trade Unions became legalised and bank holidays were instituted. A Local Government Act was also passed to enforce public health legislation. In Germany (1873) Bismarck declared that 'the German Empire must not take its policy from Manchester'. Gladstone was elected Prime Minister (1874) and presided over legislation affecting labourers' dwellings, food and drugs, public health, and trade unions.

Some business confidence remained and although trade growth slackened, bankruptcies were relatively few and declining until the

massive pinnacle of the last two years 1878 - 79. Colonies were added and trade expanded, especially in Africa.

Large shows and exhibitions were held in Wolverhampton (1871), Aston (1872), Vienna (1873), Philadelphia (1876), Manchester (1877), Birmingham (1878), Paris 'The Great Universal' (1878), and Sydney, Australia (1879). The Jay, Cooke and Co cotton failure upset the US eastern trade and spread gloom for several years afterwards (1874 - 78); but the boom in coal began in 1875 despite commercial price depression, closure of many works, and the collapse of Building Societies due to a spate of withdrawals. A trade and a business cycle trough coincided in 1879, by when a prolonged agricultural decline had commenced. During the years 1876 - 1886, one quarter of all industrial firms were lost.

Copper prices per long ton started on a rising trend, and mineral prices (Sauerbeck - Statist index) markedly so, until 1872, when as an aftermath to the Franco-Prussian War, heavy declines set in: much the same could be said of interest rates over this decade. Output continued to soar, up by 23 per cent, with over-production of cotton 1771 - 2, and overall output peak in 1874; a building boom in 1875 - 7; cotton exports up again 1878, but ending in a recessionary trough in 1879. Output of iron ore in the UK reached a peak in that year, and steel ingots and castings continued a climb begun in 1871 and continuing to 1906, but with falling prices 1873 - 79.

From 1878 onwards, the dawn of electrical production called forth new metal refining processes and uses for many of the metals discovered over previous decades. Steel production increased about fivefold 1865 - 1879; soda ash production threefold, soda crystals threefold, and bleaching powder more than sevenfold. Combined chemicals exports 1847 - 1876 increased from 16,500 tons to 273,000 tons.

Credit clearing rose strongly at the start of the decade, but went largely negative following the German panic, the US economic collapse and the Great Vienna crash of 1873 - 4. Krupp's iron cannon from Essen had helped the Prussians defeat the French in Europe, heralding a new element of power and aggression in Germany. In 1871 - 2, the United States had over-expanded production during the period of a second US railway boom and secondary depression followed from 1874 onward.

The 'Collie' failure of 1875 and of the City of Glasgow Bank in 1878 had widespread industrial repercussions. The Russo - Turkish War erupted 1876 - 77 during an era of increasing gloom and depressed profits in England. During this period, changes to Bank rate overtook the rate of interest on consols as policy instrument affecting investors, who had a choice of investment in domestic or foreign trade and industry or in government loans.

On the whole a drier, milder decade having very good harvest yields in 1885 and 1888; but grain imports continued. Population increased at the lesser rate of 11.2 per cent during this decade, reaching 16.3 million employed out of a total for England and Wales approaching 29 million by 1889. Over 2.5 million persons emigrated, especially following exceptionally high unemployment in the iron industries between 1884 - 86, (when production dropped following the introduction of steel at a time of increased foreign competition).

Engineering sales, largely of agricultural engines, harvesters, steamrollers etc, responded in marked fluctuations to international harvest prospects. (eg: Hornsby Sales Records 1867 - 1910, researched by the writer). *A world-wide industrial economy had come into existence with multi-national trading facilities centered on London* (cf A-Marshall).

House-building declined somewhat until 1886, in view of empty new speculations and existing properties with rents declining due to both overcrowding and under-occupation. Thereafter, rising and fluctuating rents became too high in proportion to the total incomes of the poor, (many compelled by poverty to live near their work), and so declined again in 1889.

It was a decade of considerable inventive success, with Swan's electric lightbulb (1880), Joule's heat conversion mechanics (1885), Dunlop's pneumatic tyre (1887), Ferranti's first central power station (1888), Ackroyd - Stewart's oil engine (1884 - 85 patents revised in 1889), Parson's steam turbine 1884, Eastman's colour cameras (1888) and Friese-Green's cinematograph (1889).

Lenoir and other gas engines provided power for smaller factories; tramways were electrified; automatic power looms entered most textile mills; and in 1888 Lever opened Port Sunlight, a year before erection of the Eifel Tower on the Paris skyline. Organic chemicals and armoured warships continued to be developed throughout these years.

The numbers of patents sealed in 1882 reached a record peak but fell back to the 1778 level in 1885 - 87, years of a very sharp rise in bankruptcies. After its peak in 1881, iron ore production continued to fall and steel ingots and castings to rise. Armored warships with improved guns continued to be developed, and shipbuilding with electrical industries helped revise profit - starved spirits up to 1883.

Bankruptcies fell and business confidence and trade peaked in the years

1880 - 1883, whereafter fallen rates of domestic profits turned investors abroad, and domestic reversals ruled. Only in 1886 - 88 did declining copper prices per long ton revive: general price-levels fell perpetually year on year.

Output rose 16 per cent during the decade, partly due to a gigantic rise in world cotton consumption. A trade, business and industrial zenith was attained in 1883, followed by a lull in the depression year 1885; then revival to a new industrial peak in 1889. Ferrous metal output followed these tendencies, as did engineering.

Credit clearing at major banks boomed in 1880 - 81, but underwent recessed activity until recovery, first in 1886, more strongly in 1888. The first Boer War 1880 - 1887, overlapped by the Irish Home Rule crisis 1885 onwards, provided a troubled backdrop, while the 1882 Paris Bourse Crisis, collapse of the 'liberator' in 1883 the 1884 USA railway finance crisis and depression, and the 1889 crash of the Secretan syndicate of copper market dealers jolted confidence, as did the London dock strike of that year.

Among notable Acts of Parliament were the Employers' Liability Act in the election year of 1880; Married Women's Property Act (1882); the Third Reform Act (1884 - time of the Fabian Society and meetings at Toynbee Hall) and County Councils Act (1888). Exhibitions were held in Milan, Melbourne and Birmingham (1881) Calcutta (1882) Antwerp (1885) Adelaide 1887 (The Victoria Jubilee year); Glasgow, London and Melbourne (1888) and Paris (1889).

'C' The Forth Decade - 1890 - 1899

The coldest December on record in 1890 and another very cold winter in 1891 and again in 1895, combined with low rainfall in eight years out of ten, evidenced changed climatic conditions: harvest yield fell in every year except the average wet (and milder) summers of 1881, 1884 and the dry warm year of 1899.

Population again increased by 12 per cent in the decade to over 30 million in England and Wales, of whom 18.25 million were in employment. Marriage rates increased from 1893 - 1895.

Depressed rental levels continued until the recovery of 1894, lasting well into the next decade. Building activity increased by 60 per cent, most dramatically in the last six years. In 1890, the Firth of Forth bridge was opened. In 1896, a steel framed warehouse was set up in Hartlepool, the same year that Ferranti started mass production of electrical goods at Oldham. Heavy chemical factories were constructed; viscose rayon manufacture was begun in 1892; the first British car, the Lanchester, was built in 1895, the year before Ford produced his first petrol-driven

automobile. Modern bicycles were developed in Birmingham during the early 1890's.

Automatic power looms were now found in most textile mills; diphtheria and tetanus vaccines were available from 1891; developments in electrical equipment enabled Marconi to transmit his first wireless signals in 1895; Edison projected his first motion pictures in 1897; the Curie's discovered radium in pitchblende in 1898.

The innovations of this decade heralded new industries of subsequent decades. An Engineers', Electricians', Builders' and Ironmongers' Exhibition was held in London (1890) and a Royal Naval Exhibition in 1891, and the 3rd Exhibition of Art, Brass and Copperwork in 1892, the year of an Electrical Exhibition at Crystal Palace, (and of a General Election).

In 1893 was held the Chicago Exhibition, in 1894 the First National Trades and Industrial Exhibition in London, and in 1895 the Mason College Industrial Exhibition in Birmingham. (the same year as the economist Henry George delivered his Glasgow oration on land reform - also another Election year.)

Around this time, the first important industrial and marketing combines were established. In 1896, the first edition of the 'Daily Mail' appeared as a popular newspaper. In 1897, Chamberlain brought in the Workmen's Compensation Act, and in Birmingham was held the 1st Midland Cycle and Motor Car Exhibition, with an Electrical and General Trades Exhibition in 1898.

The terms of trade continued their steady decline through the trade, business and industrial trough of 1884 - 5, and exports stayed depressed. Imperial trade preference was introduced in 1897. *The levels of bankruptcy fluctuated mildly year on year, with a generally declining trend.* Prices of pig iron and of copper per long ton fell annually until mid-decade, rising annually thereafter. 1884 - 5 could be taken as the bottom turning-point of the Kondratieff long-wave, although the recombination and conjunctures of more than a dozen factors may have been responsible for both the long decline and the new rise. Stock Exchange share prices lifted remarkably.

Output increased at the high rate of 24 per cent 1890 - 1899. Declining during the first six years, ferrous metal output picked up strongly after 1895 - 6; the lull in growth of GDP occurred two years earlier. Industrial output fluctuated until 1894, then rose convincingly year on year. Engineering output reached its nadir in 1883 then grew nearly 20 per cent by 1899, a peak in trade, building, and industrial activity.

Credit clearings were highest in recovery years such as 1890, 1895, 1897 - 8, and shadowed peaks of general activity. As this stirred, so money became cheaper again. In 1890 the Baring Bank and Argentina railways crisis struck; bank crisis in USA, Australia and India raised panics in 1893; the US recovery and the German-French arms build-up began in 1895; in 1899, began the Second Boer War.

Throughout the 1880's domestic sectors of the economy remained fairly depressed and industrial growth was low. The rate of income growth was made respectable only by income accruing from rising overseas investment and other invisible exports and by the improving terms of trade.

The upswing of 1880 - 3 and 1886 - 90 in the economy had no impact at all on building; yet the long and quite strong domestic boom of the 1890's coincided with an exceptionally vigourous building boom, which virtually carried it, and certainly *exhibited the strong interdependence of building cycles with general economic activity* both responding to common stimuli such as a sustained increase in real incomes or a favourable shift in expectations.

Overview of Generation Period C - 1860 - 1899

Improved collection of official statistics from the early 1860's onwards simplified the task of the economic historian as regards their availability, but introduced a new complexity and multiplicity in recorded detail.

Around the mid-1860's, the theoretical Kondratieff prices long-wave peaked, and was followed by a long decline in price, profits and interest rates until 1896. A pronounced trade cycle asserted itself, showing peaks every nine to eleven years.

Improved weather and harvests during the 'high farming' years gave way once again to poor harvests and colder winters during the 1870's and early 1880's with less rainfall but lower temperatures in the 1890's. Despite the shrinkage of the agricultural sector, fair harvest yields were achieved, but grain imports were increased in some years.

Population continued to increase at a compound rate per decade of around twelve per cent. Higher birth rates in more prosperous phases alternated with higher rates of emigration to America and the Colonies at other times, and the Irish Potato famine resulted in immigration to Liverpool and Glasgow, thence onwards abroad in many cases.

For over a century regional patterns of economic specialization and growth

had been developing and changing; with growing imports of farming produce and foreign finished goods, these patterns altered. As 'portable' steam power, with gas and oil internal combustion engines became available, so factory development spread more readily to areas not favoured by rushing water and wind, and workshops began to become mechanized. Improved transport and communication networks assisted diffusion.

Between 1850 and the start of the Great Victorian Depression of 1873, economic development was substantial. Growth in industrial output measured 2.5 times the earlier level; railway mileage increased from 6,621 to 16,082; coal production by 300 per cent; pig iron output by 291 per cent; and raw cotton consumption by 212 per cent.[2]

"By the late 1880's, a large engineering works 'might employ a dozen or more engines of varying capacity - to drive the beast, turn the rolls, work the hammers, power a diversity of machine tools, and operate lift, cranesand other manipulatory devices.' (cf Landes 1965, p.230)."

Improvements to firearms, equipments and uniforms continued, with many processes becoming standardized and mechanized. The American Civil War, Franco-Prussian War, two Boer Wars, and numerous other conflicts marred this period, in sofar as trade was interrupted. Armoured warships with improved guns were produced in large numbers for the Royal Navy.

Indeed the old revolution of iron, coal, steam and rail gave way to a new phase of concentration on steel, gas supply, paper, chemicals, electricity and shipbuilding, each with an average growth rate exceeding 3 per cent 1860 - 1900. In 1880, British manufacturing reached a peak of 22.9 per cent of the world total (rising from 1.9 per cent in 1780 and reducing to 4 per cent in 1980). (Bairoch 1982).

The rate of growth of exports started to slow in the 1850's and between 1873 - 1883 was accompanied by a deterioration in the net barter terms of trade. Steam power capacity and cotton spindlage (at 34,000,000 in 1867) surpassed that of all other nations, but the value of increased exports steadily fell, as did UK's share of trade and output.

In 1890, one third of the world's seagoing ships - 4/5 this of all steamships - were on the British register. Despite foreign tariffs, UK, exports rose by 63 per cent in volume as the result of British trade liberalisation policies. However, competition was growing, first from Germany, and then from America; by 1900 Britain had lost supremacy, despite vast Imperial trade from an 'Empire upon which the sun never sets'.

Yet upwards of one quarter of all British industrial firms had failed in the

year 1875 - 1880, and many others both before and after that collapse. Investment overseas had nevertheless surpassed £1000 million in value by 1875. (The financial and industrial aspects of the economy had become divided organizationally in the Bank of England since Lord Overstone's Bank Charter Act of 1844). A lack of synchronization between waves of home and foreign investment gave rise to seven to ten year cycles (Matthews 1959 p 203).

The period is punctuated throughout with abrupt contractions of credit, financial panics and crisis, bank failures, and domino-effect industrial collapses. It also was a formative period for class attitudes and one of numerous liberal reforms to the social and institutional fabric of the nation.

Despite great expansion, the atmosphere remained one of depression, restriction, caution and reversals. The West Midlands declined to the status of a marginal producer of its hithrto staple products, but Birmingham sustained its growth through invention, processing, guns and munitions, cycles (later cars), engineering and electrical works.

'D' The First Decade 1900 - 1909

Below average rainfall generally, yet with one of the wettest years on record in 1903 and the coldest June ever in 1909, this decade shows a general tendency for harvests to increase, with a Bumper year in glorious 1905.

Population rose by 10.3 per cent to 35.7 million in 1909, of whom 20 million were employed. While the average price per acre of agricultural land had sunk to £20 mid-decade, *urban land values continued to rise as the property market peaked in 1902: thereafter the recovery in rents slowed and ceased. The Lloyd George budget of 1906 threatened the taxation of land values, but was suppressed by the House of Lords. City rents resumed their increase towards the end of the decade, and the depressed level of house construction lifted again.*

Technical changes included operation of the first important factory to produce artificial silk; inauguration of the central London underground railway; transmission of the first transatlantic wireless message - all in 1900. Courtauld's first factory at Coventry started its production in 1902, including rayon, synthetic dyes, petroleum, fertilisers and other coal by-products.

In 1903, the American Wright Brothers demonstrated powered flight and its possibilities. In 1904, ventilation systems were introduced into skyscraper construction in New York; and a windshield-wiper was invented by Mary Anderson. In 1905, the first London motorbuses began to ply their city routes. In 1908, Brearley discovered stainless steel, in which Sheffield achieved parexcellence. In 1909, Bleriot flew across the Channel, and in 1910 Kimmerling became the first man to fly in Africa.

The Labour Party was formed for the 1900 General Election, - the year before Queen Victoria died and Edward VII ascended the Imperial Throne; the Commonwealth of Australia was created in 1901. Balfour introduced free but compulsory education for all under his 1902 Education Act.

The Tariff Reform Campaign - a protectionist movement - ended in defeat; the Land Reform Bill battled along, entraining a pact for the reform of the Constitution between Liberal and Labour MPs. New Zealand became a Dominion in 1907, and the following year social security (in the form of pensions for those over seventy years of age) began. Baden-Powell formed his Boy Scouts in 1908, the year of the Coal Mines Act. The Trade Boards Act, setting up Labour Exchanges, became law in 1909.

Business cycle peaks occurred in 1901 and 1907; then two troughs- 1904 and 1909. The level of bankruptcies oscillated on a declining trend, the main rises occurring during the industrial depression/peak trade year of

1900 and the trade trough and business slump of 1908.

Copper prices fell until 1904, then rose until 1907 before falling again, reflecting the course of general mineral prices, although farrous metal prices showed similar trends, engineering output prices increased consistently except 1904 - 5. GDP continued to increase gently; total industrial output by 9 per cent during this decade. All indices fluctuated slightly in a three-up/two-down annual sequence, but credit clearings were reduced only in 1902 and 1907. Dear money in face of heavy calls on capital and a six per cent bank rate characterized the period.

A crisis occurred in Germany in 1900, and a mild panic ensued in 1901. The Second Boer War ended in 1902; in Ontario, Canada, discovery of silver and cobalt mines was announced 1903. In 1904, the 'Boxer Rebellion' in China and in 1905 - 7 the Russo - Japanese War unsettled trade in those areas. In 1907, a series of financial panics hit financial, metal and commodity markets.

The Paris Universal and International Exhibition was held in 1900; engineering and industrial exhibitions were held in Birmingham in 1901 followed by a National Exhibition of the same type in 1902. The first annual motor show was held in Birmingham in 1905. In 1909. there was passed the Housing and Town Planning Act.

'D' The Second Decade 1910 - 1919

The driest year of this decade, 1913, was also one when the trade, industrial and business cycles peaked, but the poorest harvest came in another peak year, 1918. Otherwise, quite heavy rainfall characterised most years, with the coldest August on record in 1912 and another very cold winter in 1917.

The population of England and Wales rose only 4.6 per cent over ten years, but the employed population had reached 20.9 million out of a UK total of 45 million by 1914. Numbers of patents sealed fell dramatically during the war years, but the decline in bankruptcies was even more precipitous. Both soared again in 1918 - 19.

Housebuilding declined each year, only reviving marginally in 1919. In 1918, rent control was brought in to deal with acute post-war housing problems, and by the following year, local authorities were providing 60 per cent of the total of new accommodation.

As early as 1911, Rutherford penetrated the structure of the atom: although tanks had been tested at Aldershot in 1909, they were not used in battle until 1916. War time exigencies concentrated efforts on artillery machine

guns, mustard gas, aeroplanes and aluminum-framed, helium-filled zeppelins. Coastal shipping was generally replaced by lorries, and in 1919, Alcock and Brown made their first transatlantic flight, Heralding the protracted eclipse of transatlantic liners.

Sinking of the Titanic on her maiden voyage in 1912 was for many the symbol for the end of an era.

In 1910, the Union of South Africa joined the Commonwealth. In 1911, Lloyd George introduced national insurance for unemployment and sickness. The National Union of Railwaymen was founded in 1913, and in 1915 'shop stewards' became instituted on the Clyde. In 1916, an Easter Rebellion arose in Ireland, when Winston Churchill was Home Secretary and a munitions crisis was dealt with by Lloyd George. Controls were extended over almost every area of economic activity, as part of the war effort.

The world multi-lateral trading and supply system was split during the hostilities; this disruption continued with the boundary settlements and reparation payments of the immediate post-war period, when national feelings overcame economic common sense at the Versailles treaty negotiations. Keynes wrote his famous essay 'The Consequences of the Peace', this building his reputation. George V became King in 1910. The £1 note came in during 1915. Votes for women were introduced in the 1918 Representation of the People Act. A further Housing and Town Planning Act was passed in 1919.

Output of manufactures fell some 22 per cent during the war years, and was down 5 per cent in the decade. The year 1913 became a peak for industrial output and trade, if only by virtue of subsequent contraction. *It was a watershed for the entire economy, the end of an era, the transition into a new phase. Most central and east European economies collapsed. International trade was no longer sustained by new capital.*

At 1914, the UK undertook 43 per cent of the value of world trade, and imports had increased eightfold since 1870. The city of London was firmly established as the world centre for communications, finance and trading. Since 1890, the volume of industrial output had increased by 55 per cent but the rate of growth slackened, wages stagnated, emigration soared, and productivity and profits deteriorated.

Supremacy and dependence on external markets for raw materials and export sales had been challenged and upset by foreign competition, and the post war scenario was fragmentary. Between 1870 - 1913, interest received from Britain's overseas investments had risen from £50 million to £188 million per annum. The post-war situation was very flat in comparison.

During the whole period of the war, notes to the extent of £20.4 million were issued of which £4.1 million had been left in the reserve and £16.3 million went into circulation. (Sir Edward Holden, London City and Midland Bank, January 27, 1918).

Prices generally rose strongly and with accelerating force year by year, apart from a violent collapse late in 1915, followed by continued escalation. Copper, mineral and ferrous metal indices all rose. Pig-iron, replaced by steel, continued to slide. Engineering output accelerated persistently. The years 1910 and 1916 - 1919 showed a pronounced swelling in credit clearings by the clearing banks, with moderate falls in other years.

Cessation of war production of armaments, munitions, motorcycles, uniforms and medals hit hard at the Birmingham trades; many firms fell on lean times and disappeared during the readjustment of enterprise to peacetime activities. Vast demobilisation of the labouring servicemen offered no 'brave new world' nor 'land fit for heroes', but slums, the dole and economic servitude, relieved only by cheap beer and the escapist offerings of the cinema industry.

In 1912, the Balkan War had unsettled financial markets: the semi-crisis of 1913 and the war declaration panic after the assassination at Sarajevo marked the end of an epoch. The Russian Revolution of 1917, involving billions of frozen assets and unfulfilled commercial obligations, simply added to the upsets and frustrations of the war and its aftermath. Its long-term consequences were not comprehended.

Speaking to a meeting of Birmingham manufacturers convened at the Grand Hotel by the Council of the Chamber of Commerce on Monday December 17th 1918, Mr Arthur Kitson, managing director of Kitson Empire Lighting Company, declared that the explanation why periods of prosperity were inevitably followed by periods of depression was because, under the banker's legal tender system, restrictions were imposed upon exchange. Increased trade demanded increased banking facilities - increased loans - but the moment credits increased to meet this demand the gold reserves were strained, bank rate was raised, loans called in, the brake applied to the wheel of industry, production checked, employees discharged, enterprise discouraged, and the extra demand for money and credit, which prosperous times require, was choked off. He favoured an appropriate issue of paper currency.

'D' The Third Decade - 1920 - 1929

The year 1921 was exceptionally dry, 1927 rather wet, and all other years moderate in their rainfall. Harvests fluctuated slightly from year to year, at output levels below those of 1913 so that the level of production remained roughly constant over the decade. The average price of agricultural land rose again to £35 per acre.

The slow-down in population growth recorded throughout Europe was also evidenced in the UK, where the employed workforce remained at 21 million, of whom 6 per cent were without work in 1928 and 10.3 per cent in 1929. The population of England and Wales rose only 4.7 per cent to 39.2 million by the end of this decade.

Housebuilding rose by 66.6 per cent between 1923 and 1929, without recession, and continued until 1935, inflating GDP and investment in fixed capital. More advanced chemical plant was constructed when Imperial Chemical Industries formed in 1926.

Mid-decade saw a collapse in the British cotton industry but an era of mass production had begun epitomized in 96 quality car manufacturers by flow-line production methods (ie Austin Seven 1922). Cinema, radio, electrical, printing, cigarette and advertising industries enjoyed a mild prosperity, also purveyors of tinned food from factories.

The metal Rhenium was found in 1925; Baird's first television was made in 1926, (the first image transmission was in 1928) and a national electricity grid was begun. In 1927, Whittle patented his jet engine; in 1928, Fleming discovered Penicillin, just fifty years after Lister's work with antiseptics.

The first municipal housing estates were constructed in 1920; unemployment first exceeded one million in 1921; the British Broadcasting Corporation was formed in 1923; the first Labour Government (Prime Minister Ramsey MacDonald) was elected in 1924. Acts regarding Widows and Orphans, Pensions (1925), Property (1926), Equal Franchise (1928), and Local Government (1929) were passed.

Although the trade and business cycles reached a peak in 1920 - 21, bankruptcies soared spectacularly to record heights in a long depressive phase, before falling and reducing appreciably over the remaining years until 1929, although still at a high level.

Except for 1927 - 1929, copper prices fell heavily and so did especially mineral prices generally amid a pervasive price decline, scarcely relieved mid-decade. Interest rates rose in the trade peak years of 1920 and 1924 - 5 but fell

in all other years.

Despite the post-war economic crisis at the start of the decade, the general strike mid-decade, and the world economic crisis at the end, output in general rose 21 per cent; more precise estimates of GDP became available through the National Income Blue Book (Table 8) to complement series by Feinstein and Lomax.

The year 1921 became disastrons for ferrous metal output, which virtually halved, slowly recovering by 1923 - 4 to the 1920 level, only to crash again in 1926, before doubling in 1927 then easing back to 1920 levels again. Industrial output as a whole followed a similar roller-coaster course, howbeit far more moderately.

Credit clearings rose by a quarter in both 1920 and 1921, when bank rate stood at 7 per cent. They slumped in 1922, remained recessed in 1923, recovered in 1924 and 1925, dipped in 1926, rose through 1927 to a new prosperity level in 1928, but slowed their increase again in 1929.

The financial world remained in turmoil throughout the 1920's, starting with a post-inflation crisis during the primary post-war recession: then came the partition of Ireland in 1922, followed in 1923 - 24 by a crash in commodity markets; and in Germany, collapse of the Deutschmark under hyper-inflation leading to setting up the Weimar Republic.

No sooner was England back on the gold standard (howbeit at an unrealistically high rate) when the General Strike caused an emergency situation (1926).

There followed the great American boom of the roaring twenties, reinforced by exaggerated speculation and ending in 1929 with the Wall Street collapse and the onset of general depression in America. The investment domino-effect in Europe was very considerable, and the decade ended with steeply rising unemployment, fallen production, and a mood of deep depression.

'D' The Forth Decade - 1930 - 1939

These years of the great depression enjoyed drier, warmer weather, with harvest yields gently rising and falling every third year. Agricultural land fetched only £23 per acre.

Population rose more slowly than before, only 3.1 per cent in this decade, nevertheless passing 40 million in England and Wales. With the total in employment in the UK at 23.6 million in 1939, output generally followed population increase over these years, which saw a decline in the rate of

marriages up to 1934 and a recovery from 1935.

The Morley Committee in 1930 examined the various Acts related to housing, and in 1932, local authority housing subsidies were abolished. In 1938, rent control was abolished above the level of ratable value. Housebuilding continued its boom in the more prosperous areas, only diminishing its surge in 1939.

Flow-line methods were introduced into factories producing consumer goods. Precision-tooled machines replaced those 'fitted' by engineer-craftsmen. Electric motors replaced gas engines. Cars and buses competed with railways in transportation of passengers. Steelworks were developed extensively in the East Midlands, supported by large-scale company housing projects for mobile worker-families. By 1929, only 20 remained out of the 96 car manufacturers producing vehicles in 1922.

In 1934, the British Iron and Steel Federation was established. Parliament set up Assistance Boards under the Depressed Areas Act, and in 1935, Conservatives won the General Election. In 1936 Edward VIII married Mrs Simpson and abdicated the throne in favour of his brother George VI. Television programmes were begun by the British Broadcasting Corporation in 1936, the year after Watson - Watt invented radar. 1937, the Queen Mary cunarder was launched. A cotton industry Reorganization Act was passed in 1939, the year when Churchill's Coalition government took over from that of Chamberlain.

Bankruptcies continued to rise in the early 1930's in tandem with patents sealed, both of which indices fell in the mid-thirties, when their values coincided. The British economy was moving in step with technical innovation, which had became a crucial factor in international competition and the viability of British firms.

Feinstein's estimates of GDP 1920 - 1938 revealed a declining output to 1926 - 7, a slight rise until the collapse of 1931 - 32, then a gradual rise to 1938 - 9. Hoffmann's figures to 1935 were more buoyant. Lomax's figures for 1930 - 34 showed very depressed levels, but quite strong growth thereafter. Official estimates recorded overall 19 per cent increase of industrial output up to 1937.

World industrial depression featured in 1929 - 31 (League of Nations Report 1931 p 140). In the UK, coal output had declined since 1913 (287 m tons) 1923 (267 m tons) 1933 (208 m tons) to 1938 (227 m tons); coal exports had sunk to just above are third of previous levels. Whereas in 1914, 96.6 per cent of the world's shipping burned coal, by 1938 the percentage had dropped to 54.

Steel, depressed since 1919, recorded a peak output of 12.6 m tons in 1937,

due to the effects of shipbuilding, engineering and arms production, and a growing car-industry. Shipbuilding, which slumped in 1930 following a mild recovery since 1927, slowly revived after 1933. By 1937, manufacturing share of total output increased from its 1924 level of 28.3 per cent to 32.8 per cent, despite the slump in the early 1930's.

Electrical engineering, including production of consumer durables such as electric cookers, vacuum cleaners and refrigerators, increased its customers from 730,000 in 1920 to 8.9 million by 1938. Motorcar production, centered on Birmingham, Coventry, Oxford and London, engaged 220,000 persons in an output of 95,000 vehicles in 1923, and 380,000 persons in an output of 511,000 vehicles in 1939. Only 1 in 8 were exported. There was a 33 per cent tariff on imported vehicles.

In the early 1930's, India and Japan were successfully making their own cheap and colourful cotton clothes by modern methods, causing a decline in Lancashire industry. There also occurred a small decline in British woollen industries. Adoption of mass production techniques in the motor industry was copied in subsidiary, allied and other more diverse sectors, especially that of arms production in Birmingham.

It was only in 1934 - 5, that prices in general began to recover, while those of copper and minerals took longer to respond to recovery in demand. Credit clearings picked up from a trough in 1931 - 32 early in 1933, and increased quite firmly except for 1937 and 1939. *The minimum lending rate at the Bank of England went down as far as 2 per cent in 1932, at the depth of the General Depression.*

Very high unemployment accompanied the slump in output, prices, trade and expectations. The collapse of the Credit Anstalt in 1931, the Report of the Committee on National Expenditure, and rumours that 'gold was leaving the Bank of England' finally took Britain off the gold standard.

Free trade was ended at the Ottawa conference in 1932. In 1933, Hitler's, German Nazi Party seized power and began their regime of propaganda, intimidation and international aggression. This nationalistic aftermath to the world crash replaced efforts for increased international cooperation. In the United States, President Roosevelt introduced his 'New Deal' 1932 - 35.

A minor recession in the UK occurred in 1937; the Munich crises of 1938 was accompanied by a formidable loss of gold from the Bank of England's reserves; chaos broke out in the world's markets as the Second World War began in September 1939. Figures relating to the war period which followed until 1945 are incomplete, and some remain secret or suppressed. It was clear that a transition had ended, and the industrial world was once again

engaged in deadly conflict.

The financial crisis in central Europe was the proximate cause of the run on sterling and the National Government's decision to float the pound on September 21, 1931. This in turn was a repercussion of the American Smoot-Hawley tariffs intended to protect depressed US agriculture and the absence of action by the Federal Bank to increase the money supply; Germany also ceased reparations payments due to the fragility of its banking system.

Generation D - The Overview 1900 - 1940

By the turn of the century, weather and harvests were beginning to play a far less influential role vis a vis the national level of economic activity. The agricultural sector as a whole had diminished markedly, and wide trading networks made up for its deficiencies. Imported grains, frozen foodstuffs, tinned goods and tropical produce became available to domestic consumers.

While population growth continued at over ten per cent per decade until World War I, *slaughter of the rising generation on the battlefields of Europe effectively cut those rates of increase by much more than half subsequently.*

New houses financed by Building Societies increased gradually to become one quarter of the total supply by 1915, and although war reduced the level of activity, this trend was coupled with ever-greater rates of annual completions spurred on again by local authority housing subsidies and council house building during a major surge 1924 - 1938, thus bolstering the long years of industrial depression and of unemployment.

Lead, tin and copper mining became replaced by imports. Electric power became widely used in workshops, with individual motors replacing gas engines. Internal combustion engines, petrol and diesel, were developed; and aircraft production increased hand-over-fist as power, flight duration, carrying capacity and civil, marine and military uses proliferated. Aluminum industrial development was large-scale.

Many well-known firms emerged, specializing in one branch of engineering (eg Tangyes hydraulic equipment in Birmingham). *Machinery and machine tool-makers were generally the last to suffer a recession and the last to recover cyclically.* Except in war-time, substantial over-capacity overhang the ferrous metal industries. Precison mass-manufacture and assembly lines were introduced, and techniques of systematic management applied.

Liberalisation of international trade may have encountered foreign tariff

barriers and the entrepreneurial gains of the first industrial revolution became exhausted. But the wider transformation of matter for productive use of the second industrial revolution continued the transfer of wealth into automative aeronautical and engineering companies.

Between 1883 - 1913, steel production rose 83 - fold, and costs were cut by 85 per cent. Thereafter generally, mechanization, standardization, innovations in machinery and instrumentation, ever-increasing capital intensity, new sources of energy and power; new mettallurgical materials and electro-chemical ways of preparing old materials were accompanied by an increasing division of labour. Electrical equipment proliferated.

Between 1870 - 1900, cut-price competition caused many firms to fail; perhaps the worst national catastrophe regarding the level of bankruptcies occurred in 1920 - 21, when post-war depression disrupted trade and markets, and financial panics combined to eliminate thousands of companies.

The UK matrix of accreted growth had become ever-more confining with the transfer of supremacy to the United States of America: the UK economy was an elaborate centerpiece of a jig-saw of market shares, resources and technology of a dozen other developing economics, whose fluctuations in output reflected both external struggles and internal developments. Large invisible earnings inflated national income, but *the depression years revealed the precarious hold on real wealth of many British investors.*

During WWI, Britain had become a debtor nation for the first time. When in 1932, pound sterling came off the gold standard, an accelerating trend of price inflation, eventually to became almost exponential, began its upward trajectory. Rearmament 1938 - 39 may have rescued a flagging economy from further recession, but its ominous portent cannot be hidden from the annals of history.

UK EMIGRATION 1841 - 1931

Migration figures rest on two estimates - these of Weber (1841 - 1931) providing annual averages (and thence the rates of the increase or decrease) and those of Thomas, (1876 - 1913), contrasting numbers and percentages of commercial and professional migrants with total emigration.

The waves of emigration from the United Kingdom were particularly responsive to periods of boom in the United States and increased substantially when there was an expansion in transatlantic construction of railways or buildings. (Adams 1982 P 64 - 5)

The other side of this picture consists of the harvest shocks to incomes; the levels of domestic building and industrial production relative to the supply of labour; and the effects of rumours of discoveries of gold and other minerals and of general overseas opportunities for self-advancement.

Decade	Average Annual Emigration			
1841 - 51	8,100			
1851-61	32,700		Total	Commercial
1861-71	32,600		Emigration	Professional
1871-81	25,700	1876-80	378,919	52,100
	(13.8%)			
1881-91	81,800	1881-90	1,283,827	121,700
	(9.5%)			
1891-1901	12,200	1891-1900	896,114	111,600
	(12.7%)			
1901-1911	75,600	1903-1910	312,012	31,800
	(9.4%)			
1911-1921	85,800	1911-1913	171,441	25,400
	(14.8%)			
1921-1931	56,200	1876-1913	3,042,313	342,600
	(11.3%)			

Weber (estimates) that 4,107,000 persons left the United Kingdom over the review period of 90 years, averaging 45,628 per annum in a range of 8,100 up to 85,800. The declining cost of voyages increased possibilities of emigration for many people on low incomes.

'E' The First Decade - 1940 - 1949

Starting, as in previous war years, with a very cold winter in 1940, there followed between 1942 - 49 a series of much drier than usual years, broken only by a wet 1946 and in 1947, amid a long, cold winter, the coldest February on record.

Partly due to the war-time effort, agricultural output rose by 7.8 per cent between 1940 and 1943, fluctuated in other years, but in 1948 alone increased by a bumper 4.9 per cent as a pendulum effect from the 2.9 per cent decrease in 1947. Agricultural land fetched £47 per acre.

United Kingdom population estimates topped 50 m in 1948, and the population in employment reached 23.4 m. Unemployment oscillated in the range 1.2 - 3.0 per cent.

House construction during war-time virtually ceased, and by 1947 the effects of under-supply, neglect, and severe bombing had resulted in a stock situation where there was a chronic shortage of 1.3 million more households than new houses added: a deficiency continuing throughout this generation. Building licences and controls hindered efforts to overcome this terrific backlog.

By 1940, electricity had replaced gas as the major power source for lighting, and its uses continued to amplify. Man-made fibre development continued. The exigencies of conflict induced great transformations in metal ore processing and production and in the development of operational research techniques for strategic battle situations and defence precautions. Bureaucracy also proliferated.

A coalition government led by an indomitable Winston Churchill spurred the Allied Forces to victory over first Germany then Japan. A second Labour Government was elected under Attlee in 1945 and was returned again in 1949. Beveridge's famous 1942 Report laid the foundations for the welfare state, and the Natural Health Service was begun in 1946. In 1944, Butler brought in his Education Act. In 1946, coal mines, railways and the Bank of England were nationalized; in 1947, electricity and road transport industries; in 1948, steel industry. The Trades Unions Act abolished certain restrictions regarding strike action, also in 1946.

The balance of trade and payments during the war period bore little resemblance to normal transactions. Post-war, imports rose from 61 to 84, exports from 46 to 151 index points, as Britain took advantage of its surviving facilities while erstwhile opponents and/or competitors had to refurbish their facilities anew. This opportunity could not last indefinitely,

and neither could Marshall Aid.

Output in the war years had increased nearly 13 per cent 1940 - 1941, and a total of 20 - 2 per cent 1940 - 1943, thereafter declining until 1945, when it again stood at levels reached in 1939, not exceeded until 1949. Engineering production rose from an already high level in 1946 to a peak 56.4 points in the same-interval, the real surge starting in 1948. (Hoffman's indices provide higher percentage changes than Feinstein's).

Prices rose only in the years of accelerated output, actually declining in 1946 - 7. Copper prices per long ton rose continually; more strongly upon resumption of freed metal market trading after the war. Credit clearings rose steeply throughout this decade, the peak increase of 14.8 per cent occurred in 1943. The Bank minimum lending rate stayed at 2 per cent per annum.

Economic crisis disfigured 1940, the year of Dunkirk. There followed the blitz on London; the Battle of Britain; the U-Boat offensive; Pearl Harbour; the Desert and Burma Campaigns; plans for the Allied invasion of Europe in 1944; the hail of V1 and V2 missiles onto the South-East of England and counter destruction of German parts, cities and military installations throughout Europe. Peace and Allies occupation agreements were signed with Germany in 1944 and Japan in 1946, following A-bomb detonations over Hiroshima and Nagasaki.

Colossal debts; the 1947 Marshall Plan, the devaluation of sterling, (with UK gold reserves at 1688 levels); and rationing of food and clothing continued; the Berlin Wall was built as part of the Iron Curtain dividing Europe; *an atmosphere of gloom, crisis and restriction prevailed. Although many businesses were indeed founded; investment rose; and property was cheap, war weariness continued beyond the end of the decade.* In 1947, India achieved her independent nation status.

£ m Output at the Censuses of Production 1907 - 1949

(Gross at selling value)

	DATE				
	(1907)	(1924)	(1930)	(1935)	(1949)
Metal Manufacture	147	280	214	245	1,059
Engineering, Shipbuilding and Electrical goods	149	285	316	343	1,707
Vehicles	27	118	145	206	899
Metal goods not elsewhere specified	46	79	81	105	450
TOTAL (all SIC classifications)	1,765	3,243	3,371	8,543	13,281

Average annual rate of growth in manufacturing (percentage)

1900 - 13 + 1.7% 1920 - 1937 + 2.9% 1946 - 62 + 3.6%

Population growth gradually slackened between 1830 and 1900, then dropped below half its previous lowest rate of increase during and until after the First World War. No doubt *increasing population acted as a yeast to slowly leaven the dough of rising output, land values, prices, employment, wage and unemployment. No apparent correlation existed between decennial industrial production and population change figures.*

'E' The Second Decade 1950 - 1959

Apart from the three years 1953, 1955 and 1959, rainfall resumed the heavier precipations seen in most previous decades. Harvests increased, nevertheless, due to far greater farming efficiency: but oscillations continued.

Population in England and Wales rose to 45.4 million by 1959; the UK workforce to 24.8 million by that date, from 23.6 million in 1950; unemployment stayed at low levels until 1955, but nearly reached 500,000 by 1958.

A 300,000 new house building completion target was set in 1951, but a sharp decline in local authority housebuilding began in 1956, the year before subsidies were withdrawn, controls lifted, and rents rose substantially. Construction spurted ahead again in 1959.

Factories started to be built in advance of requirements on special trading estates, among them large frozen food factories. Promotion agencies were formed for the use of certain building materials. Road networks were improved and land drainage works undertaken. Aircraft construction was pursued, and large hangars erected. A transfer to mass production techniques occurred in manufacturing industry.

Coal declined abruptly as an energy source for powered machines and equipment, and in 1954 the UK Atomic Energy Authority was formed. Titanium was produced in 1952; in 1954, Salk's polio vaccine came into use just one decade after the introduction of sulphonamides. In 1955, Cockerell patented a novel form of transportation, the Hovercraft, which made its first passenger service crossing to the Isle of Wight in the summer of 1959; the MI motorway was opened to traffic that same year.

The 1951 South Bank Exhibition displayed British goods and inventions, and helped lift low morale. Conservatives won the 1952 General Election: in 1953, Queen Elizabeth II was crowned in Westminster Abbey; the conquest of Mount Everest by Sir Edmund Hillary and Sherpa Tensing was announced during the magnificent coronation procession attended by leaders of all Commonwealth countries.

Rates of Growth of Total Industrial Output of the United Kingdom

1782 - 1792	3.8 per cent per annum (HIGHEST)
1792 - 1811	2.6
1811 - 1839	3.1
1839 - 1860	3.2
1860 - 1877	3.0
1877 - 1913	1.6 (0.5 - 2.4)
1920 - 1960	3.1 (2.8 - 3.7)

Source: K S Lomax

The collections of articles edited by Zarnowitz (1972) and Bronfenbrennen (1969) queried an assumption that depressions were a thing of the past, because the basic cycle had changed in nature since the Second World War, and had became a growth cycle.

Since the late 1960's a number of major economies had experienced depressions and we have therefore, seen a return to the more traditional business, as opposed to growth cycle, in the British economy.

The European Coal and Steel Community and Euratom were established 1952 - 3, and in 1957 six major European countries signed the Treaty of Rome setting up the European Economic Community, without British membership. Britain continued with her Commonwealth and with membership of the European Free Trade Association.

Rationing ended in the United Kingdom in 1952. The Independent Television Authority was set up in 1955. In 1956, the Restrictive Trade Practices Act became law. In 1957, the Government boosted national industrial development programmes. In 1959, conservatives again won the General Election, and Macmillan then Hume became Prime Minister.

GNP increase from £17,560 m to £20,856 m between 1951 - 1959: Gross fixed capital formation also rose, from £2,461 m to £3,752 m, of which £1,091 m and £1,775 m respectively went into building and works during this **decade of post-war reconstruction.**

The years 1952 and 1958 evidenced falls in both industrial output and fixed capital formation, howbeit against a quite rapidly rising trend of c 20 per cent during the decade. Feinstein, Lomax, Hoffmann and official statistics nearly agreed about these magnitudes.

Metal production as a whole increased (76.1 in the Index in 1900, 255.2 in 1957; ferrous metals only went from 77.7 to 235.5, non-ferrous metals from 66.8 to 361.4) Engineering output as a whole increased (79.3 in 1900, 342.9 in 1957). Metal goods production also increased (115.1 in 1920, 71.4 in 1921; 289.5 in 1955, 269.9 in 1957). In 1958, the USSR competed with metal exports on world markets.

On retail prices, the Government attempted to act contracyclically through damping demand by means of taxes on consumption. Copper per long ton prices rose substantially in seven years, only falling once in 1959. Commodity prices peaked in 1952. Real rates of return altered with frequent changes in interest rates.

"It is certainly a sobering thought that if recent government submissions to OECD of planned prospective growth rates from 1960 - 8 are projected twenty to twenty-five years ahead, Britain would find herself operating by 1980 or 1983 at a productivity level 25 to 30 per cent below that of the principal European rivals." Britain's Growth Performance: The Regina of the 1950's, Ch. 6 (p 123) Knapp and Lomax (1972)

Bank MLR moved up from 2.5 per cent in 1931 to a peak of 7 per cent in 1957, then fell in stages to 4 per cent by the end of 1958. Credit clearings rose every year by amounts fluctuating between 1.7 and 15.4 per cent, reaching

peaks in 1951, 1953 and 1959.

The Korean War, with suspension of Marshall Aid following repayment of the National War Debt - then a threat of a collapse in sterling, as huge losses of gold were sustained from the reserves - obsessed 1950 - 51; worldwide and sudden dips in consumer expenditure in 1952 and 1958 temporarily depressed industrial expansion. Severe credit squeezes were applied, with a foreign exchange crisis in 1955 and 1957 and the Suez Crisis and fiasco in 1956. Hire purchase controls were introduced in 1959.

A series of strongly reinforced national independence campaigns waged in overseas territories effectively brought to a voluntary end the former British Empire before the close of this decade.

'E' The Third Decade 1960 - 1969

The years 1960 and 1966 - 68 were average wet years, the remainder average dry years. Better harvests were received in 1962 and 1964 - 5 and 1967, but poorer harvests in the intervening years, so according with the longer established patterns. Winter 1963 was very cold.

The 1961 census gave the United Kingdom population as 46.1 m, an increase more than fivefold since 1801, the first census. By 1969, the figure reached 48.5 million: The workforce increased to 25.4 million by that date; strongly cyclical unemployment peaked in 1962 - 3 and 1967 - 8 it see-sawed up and down around 480,000 persons. A 'wage freeze' was applied 1962 - 64: it was the era of the 'Phillip's curve'.

Construction activity, which increased by 50 per cent 1948 - 1963, was slowing down due to local brick shortages and the necessity to import cement. The Government introduced further measures to encourage industrial building and issued a Housing White Paper. Timber was de-restricted; industrial development certificate approvals also increased. Fixed investment in dwellings rose by one third from the 1960 level before the end of 1967. By then, public housing's proportion of the total of new starts had risen, whilst private provision had declined.

Technical innovation was centred on the space satellite programmes conducted by the superpowers. In the UK, Telstar satellites were put into orbit and nuclear powers stations commissioned. A measles vaccine became available from 1960 - 1, and a rubella vaccine 1962 - 3. An Iron and Steel Act was passed in 1964, the year when the £ was devalued to $2.40 cents.

Agreements and a convention with EFTA were signed in 1960. In 1961, South Africa quit the British Commonwealth. In 1962, the EEC 'Six' became the 'Ten'. That same year, Parliament passed the Commonwealth Immigration Act. Official restraints to curb consumer spending were reimposed in 1962. In 1964, Labour won the General Election with Wilson as Prime Minister. People were promised a 'white-hot technological revolution'.

A system of tax allowances for investment which subsidised and encouraged projects with a poor rate of return may have been a contributory cause to the poor rates of return on fixed capital in manufacturing. (Economic Progress Report. HMT May 1984). Since 1955, the US, Canada, W Germany and the UK had all experienced fluctuating profit decline; starting from its lower initial level, none more so than the UK, where company real expenditure on investment and stocks had exactly reflected fluctuation in real disposable income since 1963, the latter directly reflecting 'stop-go' fiscal and monetary policies tied to the balance of payments and supporting until 1975, a fixed parity for £ sterling instead of a floating exchange rate.

UNEMPLOYMENT %

	UK	WM
1977	5.5 - 5.7	5.1 - 5.3
1978	5.6 - 5.3	5.0 - 4.9
1979	5.3 - 5.0	4.9
1980	5.3 - 7.1	5.2 - 8.9

Unemployment - (wholly unemployed excluding school leavers) - *showed the most markedly undulating time series up to 1968*, When the rate of increase progressively absorbed the former wave-like motion into an exponential curve with minor abatements.

A policy of comprehensive schooling was adopted by the Labour Government and labour-controlled local education authorities. Rhodesia made its UDI in 1965, and the wholesale granting of independence to former colonies continued. The Trade Unions Commission was set up in 1965 ; then also the first business schools opened their doors to trainee managers. 'The National Plan' was produced by the National Economic Development Office, but abandoned as soon as the projected growth-rates failed to materialize. In 1967, the Confederation of British Industry began its survey of business expectations.

The percentage rate of return on capital of industrial and commercial companies declined from above 11 per cent to about 8 per cent in 1969. But capital formation in iron and steel, non ferrous metal, engineering and

shipbuilding and metal goods industries generally increased by 25 per cent up to 1969. Manufacturing fixed investment was far more stagnant up to 1968, when it too rose.

The indices of industrial production, engineering and the textile industries took a gentle, fibrillating but rising secular trend up to 1970. *'Stop-go' fiscal and financial policies upset industrialists and resulted in considerable loss of capacity during a period when competitor nations achieved great growth.* Nonetheless, average annual growth stood around 3 per cent, and prices rose on average under that amount.

Bank MLR in the range 5 - 8 per cent was changed by 0.5 or by 1 per cent 24 times during the decade in (vain) attempts to 'fine-tune' a 'managed' economy. Credit clearings increased every year in the range of 7 up to 26.3 per cent (1956).

Alternate restrictive measures and growth spurts dogged the decade. A rearamment drive, and the US War in Indo-China, plus in 1963 another dip in world consumer expenditure, coupled with poor export performance, led to a sterling crisis and long-delayed devaluation in 1968, with further intermittent crisis thereafter[3].

In the middle and late 1960s in mechanical engineering, about 17.5 per cent of sales were patent-based, and that about 4.5 per cent of revenue was spent on research, development and design. These are both hugh proportions compared with most other industries, yet additions to revenue from licencing products, processes and 'knowhow' amounted to no more than 1.5 per cent.

Individual inventors in small firms made little innovative contribution in industries of high capital intensity (Freeman 1982), but rarely, they did influence a particular company's profitability.

'E' The Forth Decade - 1970 - 1979

Poor harvests and damp summers characterized the early decade until the sudden drought of 1976; this was followed by indifferent years, and a very cold winter in 1979.

Population continued to increase, rising slowly from 48.6 m in 1970 to 49.1 m in 1979. The labour force rose more rapidly, however, from 25.3 m to 26.8 m, while unemployment rose from around 550,000 to above 1.25 million. Manufacturing employment declined five index points.

From 1970 onwards, house prices (or the cost of housing) was included in the retail price index (but not land value increase as a separate entry). The average cost of good agricultural land per acre had risen to £800 by 1972, but had dropped to £450 per acre by 1975, rising to over £1000 per acre in 1978, and £1,425 per acre in 1979.

The decade is too close to the present to allow adequate discrimination to be applied to the best of inventions, innovations, technical applications and developments and their diffusions. Space exploration, atomic fusion, heart transplants, plastic surgery, drug therapies, applied robotics, CAD/CAM engineering systems and integrated management of productive innovation stood out as prominent trajectories, along with transistorised semi-conductors, video facilities, micro-processors and advances in telecommunications and information technology, missile inertial guidance systems and genetic 'cloning'. The first flight of 'Concorde' took piace in 1976.

The General Election of 1970 returned Conservatives with Heath as Prime Minister; but the following year the collapse of Rolls Royce and the Industrial Relations Act together caused a crisis. This was exploited by the 1972 Miners' strike, exacerbated by the collapse of the London and County Securities Company, and by unemployment reaching 1 m; extended by materials shortages and the reorganization of local government in 1973; and culminated in a return of Labour Government in 1974, first under Wilson, then Callaghan in 1975, after a second 'snap' election.

Several theories had been offered, including competition from newly industrialised countries, increasing world economic interdependence, and the effects of the OPEC oil price shock of 1973 and 1979. An alternative explanation *(Mandel - 1980) ascribed the upswing of a long wave during the 1950's and 1960's and its downswing in the 1970's and 1980's as the determinant trend around which business cycles evolved.*

The Prices and Incomes Board was abolished; a Pollution Control Act was brought in, and in 1975 a first national referendum was held, resulting in a firm majority in favour of Britain remaining a member of the EEC. A (so-called) 'social contract' was struck through negotiation with hitherto hyper-militant trade union leaders.

A Bill to devalue powers to regional assemblies in Scotland (subsequently Wales and Nothern Ireland) was defeated. A Commission for Racial Equality was set up in 1976. In 1977 - Silver Jubilee year for H M The Queen - full customs Union with the EEC was achieved.

A pay freeze was reintroduced in 1977 to curb rampant inflation starting in 1975 and reaching 27.2 per cent in 1976. A further General Election in 1979

returned Conservatives on the basis of a monetarist manifesto, with Mrs Thatcher as the first woman Prime Minister. Pledges were made to reduce public expenditure and inflation.

Returns on investment in mechanical engineering and in metals and metal forming fluctuated between 12 and 14 and 18 and 19 per cent (mid-decade). *The economy began to move in concert with other European economies, all synchronized in action and reaction with movements in the United States economy. The long-established pattern of alternating peaks and troughs remained evident; unevenly timed and spaced-as always.*

Capital formation in iron and steel, non-ferrous metal, engineering shipbuilding and metal goods industries showed an approximate 100 per cent increase over five years, exactly parallel to that of manufacturing as a whole between 1974 - 1979. (CSO Monthly Statistic No 421, HMSO London No 421). Business optimism did change from a zero position in 1978 to a deep depressive negative of -70 per cent by 1980 (CBI Quarterly Trends Survey, 1985). Yet real fixed investment had peaked in 1979 (Economic Progress Report No 177, May 1985)[4].

Real GDP since 1970 had followed a cyclical course, peaking in 1972 - 3, bottoming out during 1974, rising in 1975 to a middle plateau sustained until 1978, then plunging down again in 1979 - 80. Output per head in manufacturing traced an inverse profile to these movements, whereas rising unemployment configured. *It was the 'prospect' for 1980 and beyond which brought all indices down so hard at the end of our study period.*

The index for manufacturing output wavered 1970 - 1972, barely reading 28.5 in 1973, only to fall to 23.1 by 1979. The index for overall production followed a higher but similar course. *The cyclical trough appeared at its worst in 1974 - 75: from then onwards (bar 1978) net industrial fixed capital formation fell year on year. Was it the negative downswing of the Kondratieff (Beckman 1983)?*

The demand for oil became extremely erratic, increasing by as much as 57.82 bn barrels in 1973, falling by 8.66 bn barrels in 1975. The main feature of oil was its OPEL controlled 'price-hike' in 1972 - 74, followed by another strong rise in 1978. These price movements unsettled the world economy and prevented adequate recirculation of payments. Inflation soared in most countries as one consequence, moving in the UK from 4.6 per cent in 1970 to 31 per cent in 1979.

Bank rate was altered - sometimes by only 0.25 per cent - no less than 83 times during this decade. Credit clearings increased in every year within the

range 7.4 to 25.5 per cent. A balance of payments crisis in 1974 led to support moves by the International Monetary Fund tied to a bundle of disciplinary policies.

In 1971 the US suspended the gold convertibility of the dollar. Financial crisis attended the oil 'price-hike' and the Yom Kippur War of 1973. World consumption dropped again in 1974, and world industrial fixed capital declined by 12 per cent in 1975, an inflation - crisis year. Sterling neared collapse in 1976, necessitating sudden rescue by the World Bank and the IMF. Unemployment started soaring in 1977 and in 1978 IRA bombings began. At the end of the EEC transitional tariff arrangements in 1979, the UK refused to join the European monetary system.

Overview of Generation Period E - 1940 - 1979

The Second World War probably produced in the United Kingdom a greater economic, financial, social and psychological shock (and subsequently a sense of alieniation and discontinuity with previous generations and the national history of struggle and development) *than did even the First World War - itself ending an era.* Statistical series that were not stopped by either 1913, 1919 or by 1939, were stopped in or after 1948. The new era of short-run statistical series and frequently altered bases began to hold sway, and valuable long-run series became lost to view for much of the remainder of our study period.

Amid great changes, the English weather went on as before: it improved over the war years (yet with February 1947 the coldest on record) with drier years in 1953, 1955, 1959, 1961 - 64, 1969 and especially 1976, ending in 1979 with another very cold winter after a succession of poor summers. Better than usual harvests were recorded in 1941 - 42 (Land-girls pushed up agricultural output), in 1949, 1959, 1962, 1964 - 5, 1967, and 1974 - 1977. Poor yields appeared in 1947, 1954, 1964, 1968 and 1971 - 73.

The populations of England and Wales continued to grow slowly at c 2 per cent pa up to 1971, but stabilising at a 0.3 per cent increase 1971 - 1981 (as did the numbers in employment) giving totals of 43.3 m and 23.8 m in 1940; 44.8 m and 23.4 m in 1949 (1.5 per cent unemployment); 45.4 m and 24.2 m in 1959 (0.4 m unemployed); 48.5 m and 25.4 m (0.6 m unemployed) in 1969. Male life expectancy at birth reached 70 years m 1978.

The population of working age in Great Britain (including those unemployed in education, training, the Services, disabled, sick, vagrant or self-employed) reached a peak in 1947, then declined to 31.2 million in the mid 1950's; climbed to 32.4 m peaks in 1967 and 1973, then descended sharply to 31.7 m in 1974 before surging to 32.5 million again in 1980 (65.5 per cent of the population). Unemployment had then reached 7.5 per cent.

(OECD/White Paper on Employment figures quoted Financial Times 29 March 85).

The seasonally adjusted Index of Employment in manufacturing industries (1980 = 100) declined steadily from 122 to 103.5 in 1979 - only once, in 1973/4 - marginally reversing this downward trend.

The role of the oil-finance cycle (basically a commodity cycle) in gyrating the whole world economy and hence the GDP growth rates of individual nations was illustrated (Lomax 1980, 1982) using OECD area data 1961 - 1980. Excess demand for oil led to sharp rises in oil prices and the accumulation of financial surpluses in OPEC with deficits in other industrialized nations, who pursued mainly restrictive domestic policies to redress their balance of payments. Oil prices fell once demand was lowered by the inevitable recession and soon reached a point where a risky surge in industrial activity based on lower oil prices was again possible. This soon restored the financial unbalance and uncertainty to its previous level.

Thus unstable energy prices fluctuated, with differing effects on the volatility of output, balance of payments, interest rate and exchange rate and inflation of developed and lesser developed national economies and their creditworthiness.

The third industrial revolution headed by information technology and communication systems (depending on the silicon or arsenic-gallium, semi-conductor and the use of the super microchip with its exponential digital storage capacity and processing power) also embraces: thermo-nuclear fusion (CERN and JET); micro processors controlling power converters, thyristors, transistors etc; artificially intelligent communications and data management systems utilising solid state lasers, fibre optic semi-conductors 3D design holograms, and LDS molecular beam epitaxy; remote sensing radar, artificial space satellite systems, bathymetry; industrial multi-robot assembly lines and CAD/CAM systems with programmable tools in automated FMS; electrochemical machining, electro beam welding; molecular and opto-electronics and electron rheology; the (ESPRIT) biotechnology utilising enzyme catalysis, micro organisms etc and biochemistry utilising bio-sensors for medical diagnosis and genetic engineering and immunotoxins.

The danger was that new technology won only patchy profit improvements even in computer integrated manufacture and carried a high failure risk compared with medium, low and no technology. This arose because of companies' limited abilities to simplify operations, plan resources, remove waste, and function within a flexible overall system. *Upon such micro-specific situations depended the historical trends in international pattern*

of technological advantage extrapolating their current trajectories. The recent recession had emphasized the keen competition between high technology producers and the need for new skills, overall reviews of business strategies and structures, effective training of technologists and managers, and above all for an incremental, planned approach to introducing the most cost efficient systems. Support for greater links between universities and industry had came from the Government, who, as always, were then obliged to hold back the programme due to stringencies.

However, it would not have accorded with a long view to take these decade changes as symptoms of uniform increase: the graph of the population of working age in Great Britain between 1944 and 1980 forms a 'dipped' saddle-shape 1947 - 1967, the fifties covering the broad seat before the 'pommel' years and lip of 1973. In 1947, the minimum school leaving age was raised from 14 to 15 years, and in 1973 from 15 to 16 years: both episodes presaged substantial falls in the numbers of persons counted as 'of working age'.

Apart from very adverse conditions in the winters of 1947 and 1962 the output of the construction industry and the production of bricks both combined their rise, increasing by around 60 per cent between 1958 and 1967, when the post war-time restrictions were finally lifted. Between 1972 and 1980, building costs and commercial property rents fluctuated by about 30 per cent, with rents growing faster than building costs and so encouraging developments in the years 1972 - 74 and 1978 - 80.

Innovations included the first flight by Whittle's jet aircraft (1941) explosion of the first atomic bomb on Bikini Atoll (1945); the widespread adoption of automated production in the 1950's; the patenting of the Hovercraft (1955); opening of the M1 motorway (1955); the first manned space flight (1961); opening of Aldermaston nuclear power station (1962) and launching of Telstar - the first communications satellite; then (1969) the first man on the moon and, during the 1970's, the developments of lasers silicon semi-conductors, microchips, biotechnology, optical fibres, robotics, so as to inaugurate a third industrial revolution *rapidly diffused to most industrial sectors*.

Total inland energy consumption rose from 250 to 355.9 million tones coal equivalent between 1959 and 1979, with natural gas and indigerously produced oil rising very strongly indeed 1971 - 1979. GDP rose more than 1.5 times, and output of all manufacturing from 68.0 to 104.1 index points. Engineering metals output declined from 118 index points to 103.1 between the same dates. Motor vehicle production, after deep recession 1960 - 61, peaked in 1964.

Energy consumption in iron and steel declined 1963 - 1974 from 7,497 to 3,481

million therns, while in engineering and other metal trades, it increased slightly from 3,485 to 4,119 million therms.

Coal output declined from 176 million tons 1965 - 69 (average) to 125.2 million tons 1974 - 75) and the number of collieries in operation sank from 404 to 246.

Gross fixed capital formation in GDP doubled 1960 - 1970, and increased 3.5 times (at current prices) during the inflationary decade 1970 - 1979. The total for manufacturing rose by 32 index points, and the value invested for fabricating metal products, machinery and equipment rose from £826 m to £1,360 m.

The motivational effects of Budget incentives such as tax allowances, employment premiums, and direct grant aid under regional assistance policies distorted cyclical pending patterns. The long-term average return an capital invested of 5 per cent (Economic Progress Report, HMT, July 1985) rose gradually to a real 7 per cent return due to this tax subsidy, thus discouraging a more efficient usage.

The concentration of industry between 1949 and 1978 grew from a 22 per cent share of net total output by the largest 100 companies to 39 per cent (Prais 1976).

Peaks in the (alleged) business cycle occurred in March 1960 December 1964, May 1969, May 1973 and May 1979; troughs in October 1958, January 1963, March 1969, February 1972, August 1975, May 1981. The share of manufacture in GDP declined steadily while the index of retail prices rose from 36.1 in 1959 to 165.8 in 197. *In all years except 1952, growth peaks and troughs became short leading indicators of those relating to inflation. Prices for engineering and allied industries stagnated after 1974, often resulting in negative returns and bankruptcies.* Europe and Japan seemed to be synchronising cycles with the USA between 1950 and 1980 (Kaletsky, 1984 (p 14). Year on year inflation peaked in mid 1976 at 28 per cent.

Between 1960 and 1973 output per person in manufacturing increased at 3.6 per cent a year, between 1973 and 1979 the rate of increase slowed to only 0.7 per cent. But after 1979 the rate improved to 3 per cent. Yet since 1979 the output of manufacturing industries has fallen at a rate of 2.4 per cent a year, while between 1960 and 1973 it increased by an annual 3.1 per cent.[5]
The fluctuating but constantly sagging industrial and commercial companies rate of return (net pre tax profits, current replacement cost as % of capital employed) between 1961 and 1980 displays descending peaks from 11 per cent in 19-60, at 1964, 1969, and 1974, then a major fall from 8.5 per cent to 4 per cent, followed by a rise to 6.5 per cent in 1978 and a descent to 3.25 per cent in 1980 - effectively less than one third of the level in 1960.

APPENDIX 2.A.4

Relevance of Science and Technological Innovation

As many viewpoints as there are authors exist on the connection between climate, harvests, population and wealth creation. All are agreed that it was science especially physical science - that had opened up such seemingly illimitable prospects for industry; also that Malthusian predictions of famine and Marxian predictions of economic collapse had thereby become confounded.

But while technology could facilitate opening up new territories and natural resources, it could not, said Schumpeter (1912), create a new world or make the old one bigger. As the Club of Rome Report (Meadows et al - The Limits to Growth) pointed out, exponential increases in growth involving the exploitation of finite resources had to the limited if mankind were to avoid disaster.

The Leontief recipe of a planned input/output economy did not however take account of enlargement of the production possibilities frontier through technology, experience and increased organizational efficiency, nor of the inevitable lags, cumulants and errors arising in a distribution system lacking a means of customer feedback.

Knowledge was seen by Clark (1923) as the only instrument of production not subject to diminishing returns. Indeed, as Rostow (1940) remarked, the pursuit of scientific knowledge displayed an inner logic of its own; Smookler saw only oblique linkages to the craft skills described by Ashton as its concomitant.

Kuznets (1979) argued that technological innovations constituted the major source of modern economic growth, but did not specify their connection with scientific progress. He did outline how innovations might prove commercially to be unsuccessful and by abruptly ending product life-cycles, increase risks of bankruptcy both in established firms and in new firms, both in cases when unsuccessful new products are tried and when old one's suddenly fail as a consequence of competition with the new.

It was Kay (1982) who observed that current transactions may inhibit innovation, and encourage what Williamson (1975) described might replace Adam Smith's 'invisible hand' - ie: opportunism with deceitful intent.

In order to induce some (smaller) business to adopt new technology to suit changed economic conditions, Ballard (1981) said deliberate counselling may be necessary, and Aston University's Technology Transfer Unit

provided an extension to this idea. In the TUC case, they considered direct involvement in technology 'plant' bargaining as a means of participating in the economic growth engendered by innovations. There was a need to guarantee effective demand for the enhanced output, and this involved high levels of employment.

Science and economic competitiveness exhibited a closing long-term relationship with each other, with the future depending increasingly on research and development(Fasella (1983)). Toffler (1981) enlarged on the idea of 'future shock', comprising accelerated change, with an apparent compression of events due to greater mobility of people, impermanence of structures, more rapid changes in attitude, loose morality, abundance of new information, methods and technologies . . . and unpredictability of events leading to social stress and resistances.

With some italianate exaggeration, Girifalco (1983) wrote that the flow of growth in an economy was no longer the slow, continuous and incremental affair of the first industrial revolution but had itself accelerated to become a 'dramatic series of bursting tidal waves of innovation and technological development, substitution and diffusion, with each crest higher than the last.'

Mansfield (1983) disagreed: true enough the frequency of innovation had more than doubled in the last 100 years, but its rate of increase was tailing off as in a typical s-curve of a capitalistic industry. There remained an 'exit-problem' for post-peak-technologies, structures, investment commitments and employed people.

As Matthews (1962) remarked, the array of determinants influencing the behaviour of investment over the cycle is in part a product of the character (not merely the average rate) of past growth. The process of growth itself required changes in just those relations which Harrod-Hicks dynamic theories assumed to be constant. The cumulative process inherent in a private enterprise economy tended to magnify structural changes into the fluctuations called (major) business cycles. It was Gordon (in his 'Business Fluctuations', Chapter 10) who had attempted such a synthesis (1961).

An historical perspective was needed for assessment of the possible origins of scientific advance, with their lagged innovatory applications and variously staggered diffusion patterns, said Ray (1973). Could economic upsurges be attributed to inventions having such wide and erratic gaps, and such differing effects between economies?

If innovations come in clusters, as Schumpeter (1912) described in his dynamic theory of entrepreneurial economic development, and Mensch

(1983) expounded in his 'stalemate' exposition - (Freeman (1983) preferred constellation as a desription, and was concerned with employment effects) - their consolidation and their diffusion might have explained alterations to trends in specific industries.

It would not have explained alternating moods of confidence and timidity regarding current and future trading conditions for the whole economy: the annual effects of new technology hardly would figure in the indexes for gross national product or general price levels; consumption and savings at the macro-level were not much influenced by the normal business cycle relevant to changing prices (Tinbergen 1959).

Piatier proposed a bacteriological model to explain the rapid expansion and subsequent saturation of markets with innovations. Pasinetti stated he did not believe in any independent force generating equilibria, and *saw only random improvements at micro-level accidentally converging to produce on appearance of cyclical type in macro-economic indexes.*

A taxonomy developed by Coombs (1986) UMIST, fitted a series of innovation clusters into technical trajectories in certain industries occurring under the specific technological regimes derived from scientific advance under prevalent paradig ms. Short operational cycles involving internal company factors could be fitted to investment cycles involving strategies, budgets, and structures for research and development, which in turn became part of business cycle trends of industrial development and long cycle patterns of regional growth.

Parry-Lewis (1963) had noted that the absorption of capital associated with applying innovations might have suggested a rising capital/ output ratio, but this had not been the case generally 1870 - 1914. For, he said, technical progress may be capital-saving or labour-saving, or both, or even neutral between factors.

At all events, inventions had no economic significance until they had been commercially applied. Patent statistics did not differentiate between investments that were or were not successful, or between innovation, demand-induced or replacement investment. A count of patents was no useful guide to cyclical growth - some innovations had been taken from abroad and some domestic innovations had never been patented.

Considerable criticism had attached to Menschian data supporting the Schumpeterian theory of innovation as the cause of the business cycle and of economic growth.

Clark, Freeman, Soete (1982) attacked the heavy reliance on samples of events taken by Jewkes et al (1958) based on inventions not innovations, and excluding some important non-conforming, short lag-time entries. The British Library list of 400 selected UK innovations since 1734 prepared by Baker was preferable, (also Hufbauer's PhD thesis listing 1,000 patents 1691 - 1911.)

The fact that basic science leading indicators preceded those of invention, investment and production had been demonstrated by Walsh et al who under-scored their uneven application over various sectors of industry. Rosenberg (1974) added the observation that 'diffusion was not a carbon-copying process but had involved a whole series of further inventions.

Another critique of data-bases stems from Kleinknecht (1984) who said that Mahdavi (1968) had not weighted his sample of innovations by their subsequent importance nor distinguished between product, process and other types. He criticised Menseh's hypothesis that depressions trigger clusters of innovations (derived from Schumpeter's 'necessity is the mother of invention' notion) by an analysis of empirical evidence which showed the so-called 'swarming effect' to resemble a 'random walk'.

Mansfield (1983) drew attention to the cumulative effect of numerous small, overlooked innovations, and stated that neither booms nor slumps had been favourable to innovative activity, which appeared continuous. Any link with 'long-waves' required further evidence that innovations accelerated growth. Rosenberg and Frischtak (1984) grouped Rostow, Mandel and Forrester as believing against the evidence that so-called innovations clusters were disciplined by 'long-term movements inherent in capitalism'.

Synchronous timing of the appearance (ie adoption) of innovations depended on actual and expected improvements in performance and cost reduction over a planned investment period, when demand was estimated to become sufficiently strong to overcome inertia. The diffusion process itself required a supportive infrastructure, a period of accommodation to the innovation, and a will to supplant existing commitments. *Favourable cyclical conditions were thus pre-requisites to the later economic effects derived from innovation.*

A threshold diffusion model proposed by Davies (1979) postulated firm-size as a critical factor; while diffusion itself was held to determine price and profitability as it evolves by Metcalfe (1982), who played down market-determination of supply and demand, since most innovative firms had become oligapolistic or were monopolies.

Any evolution of that kind could hardly be considered automatic, as Soete (1983) explained, since older technology firms often held the competitive edge over ability to cut prices via à vis the minimum level required for break-even by new technology enterprise risking large sums of recently committed capital investment in research and new equipment. This was de Wolff's (1912) law of the retardation of progress.

Moreover, crucial but minor improvements to existing technologies in even 'retarded' firms may cut prices so as to 'defeat' newcomers and propel innovations abroad. Indeed, *internal retardation factors had been a major influence in the international diffusion of technology from each advanced country's economy.*

Like the life cycles of products described by Abernathy (1984) and those of industries by Ansoff (1972), most technologies may also have life-spans during which they wax and wane along a s-curve, wrote Sahel (1982).

Nations, too, said Ray (1983) may assume a rota of temporary technological leadership as a reflection of their innovative capacities and their assumed manifestation in economic growth (ignoring political factors and comparative advantage in trade). Mandel and Forrester had disputed innovation to be a cause of long-cycles as sociologically-based manifestations.

Freeman (1982) considered that the historically uneven incidence of cycles and long-waves in various countries had meant that technical developments did not necessarily cause economic fluctuations, but a developing synchrony of movements might lead to an opposite conclusion.

Research at SPRU had revealed neither acceleration nor clustering of innovations, other than the family-tree or diffusion trajectory type. Freeman, Clark, Soete (1983) favoured the Smookler market-led demand model to explain uneven 'swarming' effects of the latter type. They pointed out that *the technologies of differing industrial sectors operated on differing time-scales. The cycle was thus a conjunctural appearance derived from many causes.*

'Proof' of the Kondratieff long cycle remained in question so long as one referred either to price (van Duijn 1983) or output (Marchetti 1983): only Delbeke (1982, 1983) had integrated both in his study of the Belgian economy. This shift out of price indices into the real economy was necessitated by the inflation after 1932, when major economies left the gold standard.

Fitting technology diffusion into waves of historic expansion (Freeman 1982) is like someone donning a suit of clothes already tailored to his measurements: of course, "it fits!" Kuczynski (1978) believed the process was world-wide, while Gomulka (1971) referred to western industrial economies as a 'pump of diffusion' for an envelope of inter-related clusters of innovations lifting other economies to their next 'stage of growth' (Rostow 1960).

Technical Progress and Innovations

If growth and cycles are to be explained by the same single factor, there is a strong argument that the essential element of such an explanation is that there should be revolutionary advances in technique which occur discontinuously.

From each major innovation (such as steam power, railways, electrification, the internal combustion engine) there will result a succession of investment booms based upon application of not only the main technical advance but also a cluster of minor innovations in a wide range of activities made possible by the major breakthrough.

Since the commercial application of these innovations depends upon favourable economic conditions (a receptive capital market, optimistic expectations etc) this fact in itself leads to innovations taking place in swarms, usually in cyclical upswings. But there is a world of difference between 'showing discontinuity in innovations and demonstrating that innovations cause business cycles. (Parry Lewis 1963)

In any cyclical upswing the lead had normally been taken by one or two relatively new industries, which displayed above average rates of growth in output, profits, employment and new capital formation. Possibly the underlying discoveries and inventions they exploited as innovations to products, processes and machines had been made practical only recently after lying dormant for decades.

The association of diffuse innovational activity with upswing periods cannot be taken as proof that innovation caused upswings. Innovations included managerial style, organizational structure, marketing, and financial aspects as well as operations. Timing had to be right.

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APPENDIX 2.A.5

Comments on Official Statistics

An illustration of the complexity attending research into long-run, comprehensive, internally consistent statistical data was provided by explanatory notes prefacing some official series of statistics.

One example, Census of Population and Employment 1801 - 1981, covered Great Britain 1801 - 1841, but also Scotland thereafter. The changed administrative Counties of the 1890's altered the registration areas' boundaries, but large core populations were not affected. Some of the employment statistics were substantially affected under industrial classifications where large firms and/or rural areas had been redistributed.

Methods of industrial classification were formed in three distinct stages; an unreliable period 1801 - 1841, based on family occupation; the so-called 'A' series 1841 - 1911, based on individual activity and/or employment in industry; and the 'B' series 1901 - 1981, (overlapping with 'A') based on standard industrial classifications revised at frequent intervals.

Since 1841, sub-division of 27 industrial orders had been sub-divided into minimum list-headings (MLH). Under the 1968 system (which proved the most prolific in providing recent historical statistics,) the main metal industry classifications and sub-headings useful to this thesis were:

SIC	Order No	No: MLH^s
Metal Manufacture	VI	31
Mechanical Engineering	VII	20
Instrument Engineering	VIII	4
Electrical Engineering	IX	5
Vehicle Production	XI	7
Metal Goods not elsewhere specified	XII	29
	Six Orders	96 MLH^s

Distinctions were made between producers and dealers and distributors in the MLH^s, the contents of which were rearranged at virtually every Census, resulting in very many transfers between categories 1851 - 1971, with a complete recasting of SIC^s in 1980 following revisions in 1948 and 1968.

Lack of clarity and precision dogged metal industry classifications as much as other categories (quite apart from whether respondents were employed, multi-employed, under-employed, unemployed, self-employed, retired or

simply temporarily idle). Although a long-running series of use to economic historians, employment figures did not closely evidence company populations, and therefore were not acceptable as surrogates.

Difficulties of achieving internal consistency with long-runs of official figures are underscored by the chamelion character of Census of Production tables 1907 - 1970, which only in the last two years achieved this desirable attribute.

Many and frequent were changes of every type in previous years, including the interval of time between each Census and whether it was full, and detailed or partial and/or restricted in its information. Section 3 of the Census of Production Act 1906 had specified the matter about which information was to be obtained, and with numerous modification, these held until 1947, when a new Statistics of Trade Act provided for comprehensive annual data to be collected for 'Economic Trends'. This was published as one of several surveys of trade and business carried out by the Government Economic and Statistical Service.

From 1930 onward, Northern Ireland held it's own Census of Production. Gaps in the records 1913 - 23 occurred again 1938 - 46, during war years when no information was made available. The SICs introduced in 1948 were altered 1958, 1968, 1970 and 1980, eventually into a uniform and comparable presentation. Thus recent is the availability of coherent databases.

Sampling techniques introduced for the first time in 1952 were extended in later years' Census enquiries. The format of the questionnaire was reduced to one page and the content frequently altered following recommendations from an active multi-partite committee in the post-war period.

Scope, definitions, thresholds of exemption, and the numbers of industry groups used in compilation all varied greatly; separate industry reports were published and from these about 80 per cent of firms surveyed agreed that their names and addresses could be published in a Directory of Businesses. The self-excluded 20 per cent 'disappeared' as a resource for postal enquiries, interviews, and research.

So many and great were the inconsistencies between Reports published prior to 1968, that the Business Statistics Section of the Department of Industry undertook re-estimation with the aim of improving historic usefulness of the series, and to eliminate a mare's nest of anomalies.

After intense and prolonged effort, a comparable record was obtained for only 18 from 63 years, 14 of which were in the post-war period. The other years had to be abandoned. This example demonstrated very clearly the

unreliability not only of 19th century historical statistics but also those of the 20th century.

Broad estimates of gross national product and of net output per person employed covered all of these years in the SIC Orders entailing the production, use and distribution of metal and metal products. Taking the example of Order VI metal manufacture, and its six sub-headings, it could readily be appreciated that the rate of growth fluctuated in some other years, but since the record was erratic and discontinuous, it was impossible to attempt to trace cycles except in the decade 1948 - 58, when the record briefly become more complete.

Since the aggregate estimates comprise many sometimes incomplete, unreliable and anomalous SIC and MLH survey results, they too must remain of doubtful validity and reliability. Nevertheless, many far-reaching improvements have recently been introduced for providing monthly, quarterly annual and longer-run indices on a comparable, adjusted basis.

'UK Economic Indicators' now covers economic activity, an umbrella term for industrial production, manufacturing output, engineering orders, retail volume, retail value, unemployment and vacancies. The matrix proposed in this thesis (for its own purposes) is obviously more extensive. In the official figures, the index for metal manufacturing is found under 'output', and provided by the Central Statistical Office.

Missing Evidence

Many potentially important facts may have been lost forever to the research; partially recorded, or neglected, destroyed, never published or never known to chroniclers, archivists or historians. They cannot be quantified, but when even those records that do survive are biased, partial, incomplete and inconsistent, it might be borne in mind that much evidence remains missing and unusable.

The possibility open to the economic historian of making estimates of the values of missing variables would depend for its feasibility on the theoretical basis linking existing with missing variable data, and the amount of trust which could reasonably be conferred upon the available evidence.

It is also possible that missing information would radically alter the degree of confidence in existing information, and possibly upset some accepted theories and viewpoints. It remains for the historian to assess the likely importance of missing evidence and, if the contiguous evidence provides a reliable base, to guesstimate its value.

APPENDIX 2.A.6

Growth and decline in the UK Metal Industries

A brief and not repeated glimpse of the UK metal industry in the hey-day of its late 19th century development is afforded by Annual Reports of the Chief Inspector of Factories. It appears that in the post-depression recovery periods of 1889 - 90 and 1895 - 6, establishments increased from 22,010 to 30,458 (by 8,448 or 38.4 per cent) and employees from 1,393,571 to 1,441,079 (by 47,508 or 3.4 per cent). This reflected both the small size of new establishments and higher overall levels of capital intensity in the industry.

Details were provided for numbers of factories and numbers employed in smelting, founding, galvanising, and machine tools; for processed article manufacture, brass finishing, file, saw and toolmakers, cutlers, instrument makers, locksmiths and type founders. This practice, begun following The Factories and Workshops Act 1895, was discontinued with the Annual Report of 1900, but resumed in a different form with the first Census of Production published in 1903. Prior to these dates detailed information appears to be confined to fragmentary reports in publications such as 'The Engineer' and 'The Ironmonger' dating from the mid-19th century.

Britain's relative decline in production of pig-iron and steel was evident between 1870 and 1930; it was partly due to the development of the world economy with overseas competitors enjoying greater resources, faster population growth, increased rates of industrialization, tariff protections, higher savings available for investment; partly due to the higher costs, taxation and social charges facing British industry, and the non-industrial outlook of British financial and commercial banks.

In particular it was also due to lack of vision, entrepreneurship, and the accumulation of reserves needed to properly locate and update methods, plant, and organization of production and distribution, so as to offer the best goods at competitive prices and thus afford higher profits, wages and re-investment. This 'Laisser-faire' attitude underlay tardy adoption of the Bessemer process, which could utilise extensive British deposits of phosphorus ores, instead of costly imported material.[1]

Charts showing mineral production in the United Kingdom 1950 - 1980 depicted the erratic plateau, and after 1956, the precipitous plunge of iron ore output, from about 17 million tons to under 875,000 tons Imports and the use of scrap also halved in volume 1973 - 1980, as did pig-iron production. Alloy metals declined somewhat, apart from nickel; and among static or declining ferro-alloys, spagolosen alone increased (sixfold) in volume; while zinc fell 60 per cent and refractory bricks and shapes

varied from 60 per cent to 20 per cent down. Titanium was produced in Birmingham in addition to refining of the traditional gold, platinum group and silver metals.[2]

This downward trend in iron ore production, principally in Great Britain, had persisted since the peak of 18,128,000 tons in 1882, reaching only 470,000 tons in 1982: pig iron and crude steel output fluctuated, but tended to increase. (UK Mineral Statistics, British Geological Survey, HMSO 1983 p7,101, 103)

APPENDIX 2A.7

Influences Upon Metal Prices

Prices, as every economist avers, are affected by demand and supply of goods, services and factors of production. The 'Introduction' to Edward's and Robbins' (1979) book affords greater detail: markets for gold, silver and platinum "are governed as much by currency fluctuations and investment considerations as by supply from mines and consumption by industrial consumers." (p 18)

Taking the argument farther, they declared that strikes, wars, technical innovations, environmental considerations, the price of fuel, changes in stockpile limits, new mines, and freight rates were all reflected in prices. Even more important in the short-term were the judgment, or even whim, of the merchant, producer, consumer or investor.

The smaller the metal market, the more susceptible it was to manipulation. Independent major product and by-product markets distorted ordinary supply and demand balances and created erratic, volatile conditions, making investment very risky. Increasing costs of extracting, refining and distributing finite reserves of one, plus a growing demand, led to stockpiling difficulties and attempts at control by producers.

The national and political interests of interventionist governments were also involved. There was need for guaranteed returns, commodity price stabilisation, and of sharing the world's wealth more fairly at the same time. There had occurred a growth of multi-national groups in the industry, expanding vertically into every aspect.

Moreover, metals tended to be more closely linked with economic trends than did other raw materials, since their demand depended to a large extent on fluctuations in industrial activity. The ability of substitutes and synthetics was also altering the prospects and affecting metal prices.

As other industries, the metal industries returned the closest interest in price movements affecting their raw materials and recycled products. Trading in futures markets gradually became more widespread in the industry when improved communications opened up the facilities to distant users.

Cycles in prices had thus become more than ever subject to moods and expectations of speculators, hedgors and investors in commodity exchanges, and ever more international in their susceptibility to sudden change, quota agreements, and arranged price floors and ceilings.

Appendix 2

2.5.3.C

Footnote 1

Technological trajectories consisted of those involving heavy industry; those centred on light industry and the finishing trades; and those concerned with armament. Over thirty sub-divisions existed in the metal trades of these; the gun trade alone had over fifty different specialist suppliers.

Footnote 2

COST-REDUCING METHODS INTRODUCED POST 1887

Brassfounding	- stamping or pressing substituted for casting
Cost-iron hollowware	———————— stamping and finishing, covers etc
Tinplate	- powerpress for bowls etc
Electroplate	- spinning on the lathe
Jewellery	- press technique
Edge tools	- automatic machining
Umbrellas	- automatic machining
Cut nails	- great improvements to existing machinery
Nut and bolts	- great improvements to existing machinery
Gun trade	- rifles drilled from steel tube and 'stripped' on latte

Prime mover for all such machines became the gas-engine, having by 1883 a marked effect in increasing the number of factories.

Footnote 3

CYCLE TRADES

Originating in 1869 - 70, the Birmingham bicycle trade steadily increased its employment and output as its technology improved from many innovations. Some major examples were ball-bearings (1873), tangent wheel (1874); chain drive (1876); steel tubing for frames (in use 1875); differential gear (1877) - rear chain driven 'safety model' 1885; Dunlop's pneumatic tyres (1888) (invented 1845) free wheel (1897); three-speed gear (1903) and numerous accessories throughout this period. A bicycle boom 1895 - 97 was ended by American competition, and a trade slump ensued (1898).

2.5.3 E

Footnote 1

"It's also certain that, for example, the West Midlands economy - now the worst in the UK, with Birmingham earning an unenviable first place on the scale of social deprivation - has failed for the reasons spelled out by Ken Spencer, local research director for the ESRC study. Its apparent success in the motor industry only two decades ago camouflaged its over-dependence on the metal sector. Prosperity bred a non-innovative management style, and a record of low output, poor productivity and bad industrial relations was not designed to win the new investment which could have pulled it out of it's sudden despond."

MT January 1986

Anita van de Vliet, 'The Inner City Crisis'

2.A.6

Footnote 1

Thirteen local metal industry organizations were approached for archival information; but only limited time-span, institutional membership was available from but two of these locally-based institutions. Details of active firms were available, but not of life-spans or rates of failure. The organizations concerned were:

1 Amalgamated Society of Boilermakers
2 The British Hardware Federation
3 British Jewellery and Giftware Federation Ltd
4 British non-Ferrous Metals Federation
5 Engineering Industries Association
6 National Association of Drop-forgers and Stampers
7 The National Brassfoundry Association
8 West Midlands Bolt, Nut, Screw and Rivet Employers' Association
9 West Midlands Engineering Employers' Association
10 Trade Union Resource Centre
11 Transport and General Workers' Union
12 Amalgamated Union of Engineering Workers (Foundry Section)
13 British Forging Industry Association

Footnote 2

<u>BIRMINGHAM COMMERCIAL LOBBY</u>

Set ever to influence the flow of legislation in its favour, in 1821 the Chamber of Commerce resolved to petition for free trade with all countries 'in Amity with his majesty and so emphasized the benefits of reciprocity to the Select Committee on Foreign Trade.

Other active areas of policy were those of bad debts, insolvencies, and the emigration of skilled artisans, together with machinery export and the need to lower duties on imported metals (1924 - 5).

Stagnant trade, with financial distress among over-stocked firms, was noted in 1826, the year

when Bank of England booms were obtained against two-thirds of the value of goods in bonded warehouses. Depression continued in 1827 - 8. In 1833, Patent law amendments were resolved, but in general 1832 - 1840 was a dormant period, all energies having become focused on the Great Reform Bill and the Factory Acts.

1837 was another year of much commercial distress, and the 1841 - 54 trade depression was attributed to currency laws - specifically the 1844 Bank Charter Act. Economic distress and great unemployment and privations preceded the Repeal of the Corn Laws in 1846.

In 1855, the Birmingham Chamber was firmly reestablished, and by 1859 was seeking amendments to the law of copyright. In 1860, the Association of Chambers of Commerce was formed. A memorandum was sent to W E Gladstone, Prime Minister, concerning the injustice of levying tax on incomes 'derived from precarious sources', which had been assessed at a different rate from that levied on 'realised property'. Bankruptcy and insolvency law also preoccupied the Chamber.

Appendix 3.A.1 Letter to local organisations

RK/B10/I

21 May 1985

Dear Secretary,

Company Failure/Closure Statistics

Having already undertaken some research into available statistics on company failures/closures and new start-ups in the metal trades and industries of the Birmingham area covering the years 1780 - 1980, I am now nearing a point of completion of this part of work for a PhD at the University of Aston in Birmingham, but would like to make my coverage as good as possible.

I understand that your organization may also possess valuable listed and/or tabular material both for historical events and for more recent years. Accordingly, if your could tell me where in your books and records it might be possible for me to retrieve additional information of this kind, I should be grateful for access sometime during the next few weeks.

Could you places let me know the situation?

Yours truly,

Robin Kimmerling BA
Room SW911 Doctoral Programme

APPENDIX 3A2

A Chronology of Important Insolvency Legislation in the UK

1852	Company (Winding Up) Act
1856*	Joint Stock Companies Act
1861	Bankruptcy Act
1862*	Joint Stock Companies Act
1869	Bankruptcy Act
1883	Bankruptcy Act
1887	Deeds of Arrangement Act
1888	Company (Winding Up) Act
1890	Company (Winding Up) Act
1900*	Companies Act
1907	Companies Act
1908	Companies Act
1913	Companies Act
1914	Bankruptcy (Consolidation) Act
	Deeds of Arrangement Act
1926	Bankruptcy (Amendment) Act
1948	Companies Act
1967	Companies Act
1968	Theft Act
1976	Insolvency Act
1980	Companies Act
1984	Insolvency Act

Some early important dates re: insolvency information

1841	Householders became responsible for Census returns
1865	London Gazette began record of all liquidations
1866	Dun's record of insolvency started in America
1880	Report of the Registrar of Bankruptcies
1884	London Gazette began full enumerated listings
1886	Report of the Royal Commission on Trade Depression
1891	Official record of company insolvencies begun by BOT
1901	First Census of Production survey of companies

APPENDIX 3A3

Insolvency Statistics for England and Wales - an explanatory memorandum

Insolvency, which normally occurs when a person or company is unable to pay debts on the due date, is included in the statistics only when it has been acknowledged voluntarily or has been determined by the Courts.

Insolvent persons, who are said to became bankrupt are dealt with under the Bankruptcy Act 1914 and the Bankruptcy (Amendment) Act 1926 or they may make arrangements with their creditors under the Deeds of Arrangement Act 1914.

Insolvent companies, which are said to go into liquidation, are dealt with under the Companies Acts 1948 and 1967.

Insolvent partnerships are dealt with in conjunction with the insolvencies of the individual partners under the Bankruptcy Acts.

Tables for Bankruptcies give figures for receiving orders, administration orders, and deeds of arrangement, of which receiving orders are by far the largest component.

A receiving order is made by the court on the petition of a creditor if it is satisfied that the person has committed an act of bankruptcy . . . or on the petition of the person himself.

Administration order . . . relates to deceased insolvents

Deeds of arrangement . . . relate to agreements between debtors and creditors that are reached, without recourse to the courts, under the Deeds of Arrangement Act 1914.

The official receivers, in thirty-six offices throughout England and Wales, report receiving and administration orders to the Insolvency Service in the Department of Trade and Industry as they occur. Annual figures for both bankruptcies and company liquidations are published in the Annual Abstract of Statistics, the Bankruptcy General Annual Report, and in the Companies Annual Report.

There are two types of company liquidation that involve insolvency: compulsory liquidations, which stem from winding-up orders by the courts following petitions to them; and creditors' voluntary liquidations, in which the company and its creditors come to terms without court proceedings. Quarterly figures of winding-up orders are provided by the Insolvency

Service, adjusted as far as possible for recalls and stays. The nineteen industrial categories under which statistics are grouped indicate the company activity primarily responsible for the insolvency.

Recent situation

The Commission of the European Communities issued a Draft Convention and report 'Bankruptcy, winding-up, arrangements, compositions and similar proceedings' in its Bulletin Supplement 2/82: 'A Revised Framework for Insolvency Law'. Cmnd 9175. HMSO London, June 1983 was issued by a Review Committee under Sir Kenneth Cork; this was followed by a White Paper on Insolvency Reform in February 1984 and an Insolvency Bill in that autumn. It covered four main areas: 'Phoenix' companies, unsecured creditors; wrongful trading; and simplification of procedures.

Historical data from official sources was limited by the fact that no companies were legally obliged to submit accounts to the Companies Registration Office prior to 1908, after which date non-private companies were required to submit accounts. Those companies dissolved before 1932 had their files kept in the Public Records Office in London. As from Companies Act 1948, all non-private companies and certain private companies were required to submit accounts, the number of private companies exempted being approximately 250,000. No separate lists were maintained of private limited companies with Birmingham addresses.

APPENDIX 3A4

Closure Rate Studies

Many studies have produced generalisations on rates of closure and the characteristics of establishments and enterprises that have been closed. Smith and Taylor are particularly appropriate: they write (p 662):

"First, closure rates are only loosely related to the phases of the business cycle (Beesley 1955; Churchill 1959; Gudgin 1978; Kaplan 1948), possibly as a result of the relative insensitivity of small firms to external economic conditions. Second, closure rates tend to vary inversely with the age of a business . . . (Henderson, 1980; Whitelegg 1976). Building on the work of Beesley (1955) Churchill (1955) Collins (1972) and Wedervang (1965) Gudgin (1978) confirms with his East Midlands data that closure rates in the first years of the lives of firms tend to be very high - especially in the first two years - but, after the first five years of operations in the North American context and after the first ten years in the European context closure rates begin to level off."

Henderson (1980) found Scottish plants to be most prone to closure in the first five years of their existence. O'Farrell (1976) questioned the validity of the proposition, maintaining that frequencies of closure amongst grant-aided plants in Ireland were independent of the number of years those plants had been in operation.

Other tendencies noted by Collins (1972) and Wedervang (1965) was a consistent, inverse relationship between establishment size and closure rates; all authors (except O'Farrell) noted the tendency of closure rates to vary between industries, and Henderson found that the dependence of an industry on investment demand was positively related to closure rates, (thus confirming the views of economists as diverse as Kalechi, Kahn, Haberler and Samuelson).

Fluctuations in investment demand were seen to engender instability in industries supplying capital goods and thus to increase the vulnerability of those industries to plant closure. However, 'managerial' reasons for closure may have overriden in most cases the classical economists' viewpoint.

One hundred cases of bankruptcy had been studied by Borough (1976), mostly small privately owned companies. Most were found to be under-capitalised; in seven cases, excessive drawings of remuneration by directors had taken place; a number continued to trade after losses had extinguished their capital; and in 71 cases, failure was attributable to financial mismanagement (see also Chesterman 1977).

Woodruff and Alexander (1958) added, from their study of ten successful and ten unsuccessful small firms: uncertain management, lack of diversification, no product development, inadequate financial records, no sound sales programmes, being tied to single large customers, "and even dishonesty" (p 643).

"Additional factors promoting the closure of apparently commercial and technically viable companies have been recognised by John (1976) as the 'gaps' that exist in finance markets, not only the classical 'MacMillan gap' (Thomas 1978) but also the highly significant venture capital gap (Taylor and Thrift 1981) and possible adverse discrimination created by government policy."

Smith and Taylor then highlighted the tendency for the production of many firms to be controlled by single monopoly customers (monopsonists) vide Crook (1964) and the foundries EDC Report (1979).

Diversity of ownership had given way to multi-plant, multi site enterprises liable to implement branch-plant closures and (after several years) take-over related closures which increased market power without increasing efficiency [cf: Mueller, (1979)]. Empirical Support had come from Dicken and Lloyd (1977), Henderson (1979), Massey and Meegan (1979) and Smith (1981).

APPENDIX 3A5

ROC Research at DTI - a review

Regional openings and closures

Following introduction of industrial development certificates in the mid-1960's, the Department of Trade and Industry published a number of important papers on company openings and closures in relation to inter-regional transfers (Howard 1968, Nunn 1980 especially). The Record of movement (ROM) became supplement by a Record of Closure (ROC) subsequent to a revision of basic definitions and rearrangement of regional assistance and administrative boundaries in 1976 (following the earlier revision in 1966).

The scope and coverage of the data had altered in that the 50 areas of ROM became superseded by the use of 170 groups of Employment Exchanges (travel-to-work areas) within the 62 planning sub-divisions of the United Kingdom; and subsequently since the end of 1971, by the new local authority District and County boundaries arising from the reorganization of Local Government in 1974.

Nurnn's article took the monitoring of openings and closures up to 1975, with analyses of birth and death rates in the period set in the context of the cyclical behaviour of the economy.[Ref.1]

TABLE 3A5/1

Openings			Employment	
Total		Per Annum	Total PA	Per Opening
1945 - 65	3,014	144 pa	30,000	208.0
1966 - 71	6,998	1,166 pa	25,000	21.4
1972 - 75	3,863	966 pa	20,.000	207.0

Approximately 80 per cent of all new openings employed less than 100 persons at 1975, although the remaining 20 per cent accounted for nearly two-thirds of all employment. The high job levels of the first 20 years were literally decimated by the record of the next 10 years. Large numbers of new openings in the middle years (1966 - 71) had not resulted in more jobs per opening by 1975. As the size of transferred unit declined, so the share of ROC by small firms rose more quickly than that of all other units.

A positive link between size of company and the propensity to survive was also evident from CSO statistics showing sub-sectoral reductions in firms

and employment in the West Midlands 1965 - 75. Previous DTI research quoted by Nunn showed that company 'maturity' is generally reached during the first ten years of life of a new opening.

The annual birth-rate of manufacturing units derived from ROC had varied between 1 - 5 per cent of the stock of all units in the sector 1971 - 75. Birth rates and closure rates were not uniform over time, region, industry or size of plant.

The West Midlands region, receiving only 1.5 per cent of inward migration but contributing 2.1 per cent of outward movement, could not be considered typical of other regions, each of which had its own industrial profile. My research was thus further limited in the scope of its general applicability.

Nunn concluded, "the volume of openings during the period 1966 - 1975 appears to have shown a markedly similar pattern of fluctuation to that of the trade cycle; but as the long term rate of growth of manufacturing output declined after the early nineteen-sixties, so has the level of movement in terms of employment." [p 35 (IV)]

One might add that, because of closures, the expected employment effect in 1978 of new openings 1966 - 75 was (not 213,000 but) 154,000 additional jobs in the regions. The overall average increase of employment in surviving firms after five years, taking closures into account was 73.3 per cent; (96.3) comprising sub-total increases for branches 134.3 per cent (161.8), transfers 32.3 per cent (47.7 per cent) and enterprises new to manufacturing 69.3 per cent (89.2 per cent) and demonstrating consistent differential rates of growth in employment.

The closure profile for all openings was as follows:

Employment Year of Opening	Percentage of Survivors	Percentage of Failed Firms
0	100	0
1	99.5	0.5
2	98.0	2.0
3	95.3	4.7
4	92.6	7.4
5	89.5	10.5

Thus 10.5 per cent had failed after five years, a much lower ROC than that for non-immigrant companies, but tending to increase the national level of insolvencies to the extent that without regional policy aid they might not have taken place. On the other hand, if they had not taken place, even greater regional ROC might have occurred in neighbouring firms which

again would have swollen the national figures.

This demonstrated a far higher survival rate than any found elsewhere. Nunn's general conclusion was that considerable variation had been observed in the rate of growth of different cohorts of openings over time. Whilst the profiles suggested that manufacturing units experienced self-sustained growth for an initial period as a consequence of being newly opened, there was contradictory evidence as to how long this effect lasted and the extent to which it was subject to the influence of the economic cycle. *What seemed clear was that plants at similar stages of development grew more rapidly during the nineteen sixties than the seventies, and that the economic trends and cycles were significant factors contributing to differential rates of growth.*

Industrial analysis of new openings had indicated that they occurred in virtually all industries but that a handful were of key importance ie: engineering, textiles, food and clothing. Inter-regional movement involved 2,350 new openings over the ten years since the beginning of 1966, generating 205,000 jobs at 1975. Adjusted to maturity it was estimated that this represented 3 per cent of manufacturing employment in the United Kingdom (1975).

The death rate of manufacturing units employing more than 10 had displayed more significant volatility than the birth rate in the period 1971 - 75 and had remained persistently higher. Overall, the volume of openings appeared to have "shown a markedly similar pattern of fluctuation to that of the trade cycle..." (p 35) In the West Midlands, 330 firms had opened from all origins 1966 - 1971, and 120 1972 - 75. In the same years, 411 and 169 firms respectively had left the region.

The extent to which annual turnover of establishments increased in importance in an area as the time period analysed lengthened - ie as more of the new openings succumb - was clearly illustrated by Macey (1982) in GES Working Paper No 55, Table 2.14, Variations of the Components with Time (p 31):

TABLE 3A5/2

	Component 'In situ'		Employment Changes as % of Initial Employment 1954-74	1969-74	5 year 'Average'
1	Openings	A	30	7	7
2	Expansions		18	11	12
3	Contractions	B	16	12	11
4	Closures		38	11	10

By 1974, employment in new openings fell to 30 per cent of its initial level in 1954, as the result of (A - B) above. The rôle of small firm closure has varied both by means of the number of firms, their employment, and their percentage of all new companies. Table 2.3 (p 17) shows the twenty-year fluctuation and is compared with the 1935 figure for firms with less than 200 employees as a share of manufacturing employment.

TABLE 3A5/3

Year	1935	1958	1963	1968	1970	1971	1972	1973	1974	1975	1976	1977
%	38	24	21.3	20.8	21.3	21.0	21.5	20.7	21.5	21.9	22.6	22.5

Sources: Bolton Report; Wilson Committe; Census of Production 1977

In the West Midlands, firms in the 201 - 500 employee size-bands performed better in employment generation terms than those in the 500+ size-band. A general conclusion reached by Macey was that beyond a certain duration, the age rather than the growth of a company correlated better with its employment generating capacity. The performance of size-bands in the West Midlands was the inverse of the norm in other regions.[Ref.2]

Illustrating typical proportions of self-employed bankruptcies and company liquidations to totals of insolvencies recorded annually by DTI, the following table gives also both numbers and percentages in 1983 for manufacturing and engineering.

TABLE 3A5/4

CATEGORY	Nos	Per Cent
A Bankruptcies	2583	100
S/E Bankruptcies	1935	76.5
S/E Manufacturing	109	4.2
S/E Engineering	48	1.9
B Liquidations	3397	100
C Insolvencies	5980	100
D Bankruptcies: Insolvencies =		43.2%
E Liquidations: Insolvencies =		56.8%

The Census of Production 1971 had provided the most recent summary available within our study period of the relative weights of manufacturing industry and of metals and engineering in particular to the total recorded activity of the national economy. These proportions altered from one quarter and one year to another, but retained their structural formation over the decade (and possibly very much longer).

Evidence of an overall cyclical movement in the insolvency indexes, and a generally upward trend between 1960 and 197 was found in charts 1 - 4 of 'Economic Trends', HMSO, November 1974, Appendix III p 102 - 3. These changes were probably induced by a rise of over 40 per cent in GDP and of 60 per cent in the number of 'live' incorporated business on the Companies Register during the same time period.

Each industrial classification and main list heading was found to exhibit its own proportion within the total of insolvencies between receiving orders and liquidations, and a slightly oscillating proportion of both within total manufacturing. The distribution of company liquidations between industries was probably accounted for mainly by the number of firms in each industry and differences in their degree of risk. This again raised the

question whether insolvency ratios remained constant in relation to specific company populations.

TABLE 3A5/5

INSOLVENCIES PER COMPANY STOCK 1963 - 82

INSOLVENCIES PER COMPANY STOCKS 1963 - 82

Year	Insolvent	Stock	Year	Insolvent	Stock
1963	6524	444,365	1973	6492	583,929
1964	5870	480,264	1974	9438	582,826
1965	6357	503,767	1975	12669	576,653
1966	7312	511,962	1976	13146	606,098
1967	7921	509,899	1977	10316	611,560
1968	7468	499,969	1978	8988	675,357
1969	8282	499,345	1979	8037	719,662
1970	8776	503,232	1980	10928	751,642
1971	8299	512,191	1981	13747	788,847
1972	7400	527,048	1982	17767	950,000
Decade Ave. 1963 - 72	7421	499,204	Decade Ave. 1973 - 82	11153	684,657
Insolvencies: Stock 1.49%			**Insolvencies: Stock 1.63%**		

Average Insolvency : Stock 1963 - 82 = 1.57%

Source Compiled from DTI Insolvency Statistics, England & Wales. British Business. 1983

Analysis of company statistics (Gangly 1983 Op Cit) also showed an annual growth trend in the stock of survivors of around 1.84 per cent annum. Between 1974 - 82 the net gain in new companies was 394,666: actual figures for registrations as against deregistrations averaged 155,641 and 131,451, leaving an addition of 24,190 pa.

Percentages of the stock deregistered each year ranged from 7 - 11 per cent, with an average of 9.1 per cent per annum of the companies existing in 1973,

43.4 per cent had deregistered by 1982. The annual percentages failing and surviving showed fluctuation:

TABLE 3A5/6

Year	0	1	2	3	4	5	6	7	8	9	10
% Annual Failed	0	5.5	5.7	6.5	8.6	4.8	4.0	3.3	3.0	2.0	n.a
Cumulative	0	5.5	11.2	17.7	26.3	31.1	35.1	38.4	41.4	43.4	n.a
% Surviving	100	94.5	88.8	82.3	73.7	68.9	64.9	61.6	58.6	56.6	n.a

Sectoral analysis revealed that production companies manifested low survival rates; 62 per cent had a lifespan between registration and deregistration of between 24 and less than 30 months; only six per cent survived between five to nine years, at which time only one in 100 survived. From a total of 1,400,777 companies registered, 837,377 were production companies, of which 583, 400 were registered and deregistered between 1973 - 82.

Common to all companies was their extreme vulnerability from months 6 - 18, when over 30 per cent were likely to fail. Production company failure and survive rates also varied:

TABLE 3A5/7

Years	0	1	3	5	9
Interval	0	10.4	17.3	10.5	4.0
Cumulative	0	10.4	27.8	34.0	38.0
Survival %	100	89.6	72.2	66.0	62.0

Both companies and unincorporated businesses in the 2.65 million businesses registered over this decade showed survival rates of around 58 - 60 per cent of the original stock in 1972 after ten years. It appeared that production companies, with increasing lifespan, experienced 8 - 12 per cent failure per annum, with an average of 9.2 per cent per annum.

One had, notwithstanding, to take into account the marginal effect of limitations on the data. For example, in general new registrations were not all genuine 'births' and not all births were registered; while traders

deregistering were not all firms going out of business and not all firms going out of business deregistered for VAT purposes. (These conditions were taken as consistent throughout the decade).

Some other points concerned the possibility of a lag in the data influencing the shape of the curve of registration and deregistrations. This arose in connection with differences between the actual and the formal dates of each event - also that raising registration and deregistration 'threshold' (in line with EEC Directives) necessarily occurred a step behind inflation and this had contributed to the rising levels of registered traders regardless of the underlying situation.

A table showing the balance of starts over stops by turnover and sector in the UK 1980 - 83 gave a detailed summary of changes in the numbers of firms, both total and in the production subsector, classified by size of annual turnover.

From these it could be seen that large companies fared worst in the depletion of stock due to failure, and the medium-sized firms best. A further analysis showed up the differences between Board of Trade (1980) and Inland Revenue (1981) figures in totals of 'stock, starts, and stops' in 1979.

TABLE 3A5/8

A PRODUCTION

Turnover	Board of Trade			Inland Revenue		
£'000	Stocks	Starts	Stops	Stocks	Starts	Stops
0	9,041	1,353	1,373	8,736	1,042	1,345
1 - 13	13,787	2,334	3,477	16,121	2,521	2,903
14	1,256	362	200	-	-	-
15 - 49	26,375	4,409	3,667	26,871	4,802	2,846
50 - 99	18,204	2,250	1,611	19,330	2,537	1,411
100 - 499	35,332	3,002	1,875	36,495	3,068	1,905
500 - 1999	14,025	727	605	14,033	641	633
2000 +	6,352	263	291	6,244	235	343
TOTALS	124,372	14,700	13,099	127,832	14,846	11,386

TABLE 3.A.5/9

B All SECTORS

Turnover	Board of Trade			Inland Revenue		
£'000	Stocks	Starts	Stops	Stocks	Starts	Stops
0	85,182	12,345	11,500	82,012	8,890	12,060
1 - 13	172,976	24,759	43,321	203,687	25,496	36,246
14	19,870	4,936	3,209	-	-	-
15 - 49	424,106	60,974	50,955	424,214	62,397	40,698
50 - 99	237,230	20,116	17,185	248,923	26,950	15,257
100 - 499	277,239	23,572	12,299	288,599	22,702	11,342
500 - 1999	64,769	3,939	2,306	66,048	3,649	2,370
2000 +	22,389	1,104	871	22,378	941	952
TOTALS	1,303,761	157,745	141,646	1,335,961	151,025	118,925

A contrast was noted between Board of Trade figures and those for Inland Revenue during 1980 and 1981, when lifespans of the respective 12,919 and 10,747 production sector firms which deregistered from the company populations of 139,970 and 112,652 were compared as percentages:

TABLE 3A5/10

Year		1980 Board of Trade (Σ)	1981 Inland Revenue (Σ)
	0 < 6	7.0	6.1
1	6 < 12	8.9 (15.9)	6.9 (13.0)
	12 < 18	9.4 (25.3)	8.5 (21.5)
2	18 < 24	7.6 (32.9)	7.6 (29.1)
	24 < 30	6.0 (38.9)	6.3 (35.4)
3	30 < 36	5.3 (44.2)	4.8 (40.2)
	36 < 42	5.1 (49.1)	4.5 (44.7)
4	42 < 48	4.2 (53.3)	3.8 (48.5)
	48 < 54	3.5 (56.2)	3.9 (52.4)
5	54 < 60	2.9 (59.7)	3.3 (55.7)
	60 < 66	2.6 (62.3)	2.7 (58.4)
6	66 < 72	26 (64.9)	2.5 (60.9)
	72 < 78	2.2 (67.1)	2.0 (62.9)
7	78 < 84	9.6 (76.7)	1.8 (64.7)
	Over 84 months	23.3 (100)	35.3 (100)

The difference between the figures arose from 1R inclusion of voluntary VAT registrations (and subsequent deregistrations) before the actual threshold of eligibility (£18,700) had been reached in numerous cases. Thus Inland Revenue percentage figures were lower because their populations were larger (even excluding exempt and zero-rated firms) than those of BOT.

This anomaly was overcome, wrote Pom Ganguly, statistician in the DTI Small Firms Division (British Business 18 May 1984), by including

"all registrations and deregistrations, but to show these in individual bands of turnover" (p 10),

as supplied regularly by Customs and Excise to the Business Statistic Office.

A further article in British Business for 10 February 1983 took the sectoral analysis on a regional basis, discriminating between unassisted areas such as

the West Midlands; special development areas; development areas and intermediate areas; and derelict land clearance areas.

It had already been voted that production sector failures had been prominent in the West Midlands, where 52.2 per cent of new starts and 55.5 per cent of deregistrations had occurred on derelict land, the remainder elsewhere.

The stock of companies in the West Midlands in 1982, after 14,335 new 'starts' and 10,942 'stops', was estimated at 120,468. National totals for that year were 154,114; 121,785; and 1,321,842. The regional figures as a percentage of the national totals were 9.3, 9.0, and 9.1 per cent respectively.

There was currently no means of ascertaining whether these proportions held constant over long time periods, since the relevant statistics did not exist; but it seemed reasonable to postulate that they did, with minor oscillations.

In the production sector, 58.9 per cent of starts and 58.7 per cent of stops took place in unassisted areas; a further 21.8 per cent and 23.8 per cent in 1982 took place in derelict land clearance areas; the remainder were parcelled between the three types of development area. The sector as a whole, after 16,417 'starts' and 11,587 'stops', comprised a stock of 130,278 firms. The sectoral figures as a percentage of the national totals for that year were 10.7 per cent, 9.5 per cent, and 9.9 per cent respectively.[1]

Relative numbers of receiving orders, creditors' voluntary liquidations and compulsory liquidations between 1960 - 1974 were seen to move broadly together in England and Wales.

Like company profits, company liquidations were cyclical, with a fall in profits generally associated with a rise in liquidations (as in 1960 - 61, 1965 - 66, 1968 - 70 and especially in 1973) and a rise in profits with a fall in liquidations (as in 1962 - 64, 1966 - 68, and 1970 - 73). This association of changes in number of insolvencies and changes in company profits became inconsistent in 1967 - 1973.

Comparing the year-on-year percentage changes in total company liquidations and receiving orders with those in the gross domestic product and the index of production over the two and a half cycles illustrated, **an increase in the rate of growth of economic activity was generally associated with a fall in the number of insolvencies, although this association also was not completely consistent over the period as a whole (eg 1967 and 1971). Both increased activity and higher profits were necessary to survival.**

While a relatively few large companies accounted for a considerable proportion of total gross trading profits, most companies that went into liquidation 1960 - 1974 were very small; so it was not obvious that their prosperity should have been closely related to company profits as a whole.

It seemed that while changes in the number of insolvencies generally reflected changes in the level of economic activity, that relationship was not particularly close. Thus the series of insolvencies, used as a leading indicator of changes in aggregate economic activity, displayed a rather short and erratic performance in this role. (cf 'Cyclical indicators for the UK economy' in the same issue of 'Economic Trends')

The total number of companies registered in Great Britain had risen almost continuously over sixty years reported 'Barclays Review', February 1983, and in December 1951 stood at 788,846 of which only 8,018 were public companies. During the whole period 1920 - 1980, according to Board of Trade 'Companies In' statistical series, only in 1968 - 9 do the numbers of companies registered with share capital undergo an absolute fall.

Around 65 per cent of all companies registered were small, of doubtful viability, having nominal share capital of £100 or less. The upward trend of registrations to record levels was partly to be explained by large numbers of unemployed people using redundancy payments as capital. Creditors' voluntary liquidation accounted for most of this increase **from 1978 - 80, when Inland Revenue calculated that the average failure rate was 1.5 per cent of stock.**

Between 1956 - 80, insolvencies appeared inversely related to the business cycle as measured by the gross trading profits of commercial and industrial companies over that period. International comparisons 1971 - 81 confirmed co-fluctuation of indices up to the 1979 oil/currency crisis, after which the graphs of British, West German and American insolvencies rose sharply, whereas those of France and Japan continued as previously.

Financial considerations alone were seldom the whole reason for closure of plants and insolvencies of companies. Directors may have wished to retire, sell out, buy-out and transfer assets, rationalise production in profit centres following mergers or take-overs, (invited or uninvited), re-appear as 'phoenix' companies, (creditor-dodgers) squeeze suppliers of more than one product or raw material, raise prices by curtailing supply in imperfectly competitive markets, and to discontinue for a host of other reasons including foreign competition.

Conversely, plants and companies may be kept in existence longer than business sense permits in order to 'safeguard' jobs, salaries, status, assets, products, dependent companies and specialised markets defensively or in

the hope of an economic upturn that will raise demand, sales turnover and profits, 'all else being equal': or to act as loss-makers, mitigating taxation liabilities incurred elsewhere.

Company Law, its reform, the European Community Company Law Harmonisation Programme, and many more particular matters such as accounting and disclosure, share purchase rights, payment of dividends, duties of directors, etc, as developments in 1980 showed, had involved and were continuing to involve a complex web of interests other than the Houses of Parliament, the Government, the Department of Trade and Industry and the main industrial organisations; they included the Council for the Securities Industry, the Consultative Committee of Accountancy Bodies, the Senate of the Inns of Court and the Bar and the Law Society, as well as constituency groups.

Thus now, (and presumably also previously) pressures for change were widely based and required time for consultation, debate and legal process before their implementation. Responding often to a long-felt need, past changes in Company Law, when they came, bore little specific relation to other events of that particular date, however noticeable an economic effect they may have engendered shortly after they came into force, (or had gained compliant acceptance by the majority of companies, if this took a while longer).

Work carried out at Companies Registration Office included in 1979 and 1980, some 17,821 and 22,588 changes of company name, 62,958 and 66,104 new incorporations, 8,299 and 10,984 liquidations notified and 805 and 1,349 receiverships notified. Almost half as many firms as made annual returns and registered accounts needed reminder letters (233,000) from the office.

One needs to ask oneself whether firms registering for VAT or deregistering after failure either need or get such reminders, and thus how valid are any of the figures put out by the office and notified through the Department? Only if omissions were fairly consistent would they not have affected the relative outcomes.

The a-typicality of any one year was instanced by the Insolvency Service

"In England and Wales during 1980 there were 2,935 winding up orders made by the Courts, the highest number recorded in any year since the Companies (Winding-up) Act 1890 was enacted, compared with 2,064 made in 1979 and the previous highest number of 2,511 made in 1976" (p 7):

APPENDIX 3A6

Development of Regional Policy 1934 - 1980

Encouragement of company formation and migration in Great Britain has been spatially selective since the 1934 Special Areas (Development and Improvement) Act made provision for industrial estates and loans to industry in the depressed employment areas. These areas were extended post-war, and controls upon development in the more prosperous areas were strengthened by a system of Industrial Development Certificates. (Regional Industrial Policy DTI London 1984).

Policy was progressively strengthened from 1958 onwards with the introduction of various investment incentives (which during the 1960's tended to become more generous); the strengthening of IDC control; and, in 1967, the introduction of the Regional Employment Premium (REP). Further incentives were introduced in 1972, together with the Regional Development Grant (RDG) and Regional Selective Assistance (RSA). In 1977, REP was abolished; after a succession of weakenings, the requirement for IDC's was suspended in 1982. (cf: Lee 1979 revised 1984)

The areas eligible for assistance have varied over time, but did not include the West Midlands during our study period. (Indeed, Birmingham City Council actively promoted the outward migration of industry in order to decongest its outworn inner areas and to redevelop them with housing and commercial premises during the 1970's.) Development areas were introduced in the 1960's; in 1970, assistance was extended to Intermediate areas (Marquand 1980).

In the period up to 1980, the following policy instruments were available to industrialists, having a reverse effect on company formation, survival and expansion in non-assisted areas, such as the West Midlands:

1 Assisted Areas - where regional development grants, regional selective assistance, rent-free periods, office and service industry grants and training and employee - aimed assistance were available for qualifying investment projects.

2 Enterprise Zones - where certain administrative, statutory and tax requirements had been removed.

3 Urban Aid - where local authorities had been invited to plan investment projects in cooperation with the private sector (cf: Housing Associations and the Inner City Partnership scheme in Birmingham).

4 Steel Closure Areas - where help was available from BSC (Industry) and the European Coal and Steel Community to compensate for large-scale redundancies in the steel industry.

5 Freeports - where goods could be imported, stored, processed, manufactured and exported free from customs duty.[Ref. 1]

6 EEC - substantial aid available from the Regional Development Fund to support projects undertaken by manufacturing industry which would create or safeguard employment in assisted areas (limited to 35 per cent of population by EEC Rules).

Effectiveness of Regional Policy

How effective had regional policy been in the post-war period? A study of evidence related to policies targeting on manufacturing industry - forgetting the efforts of New Town Corporations and local authorities in non-assisted areas - showed that by the early 1980's, the variety and complexity and diversity of sources of financial aid to industry had become so great that many business-men either misunderstood or were ignorant of the incentives to which their firms were entitled. (Rees and Miall 1983).

Survey evidence (Howard 1968) (Moore, Rhodes and Tyler 1985) showed that between 250,000 and 445,000 more jobs, predominately in the 1960's rather than in the 1970's, were created by migration to Assisted Areas 1945 - 1981. Studies of new firm formation lacked comprehensive data over time, although many had been undertaken at the local rather than regional level. Among determinant characteristics of the local economy were the firm/plant size structure; entry conditions; and buoyancy. (Storey 1982)

The only comprehensive evidence on new firm foundation covering all regions and sectors is that provided (Ganguly 1982) using VAT registration data, followed by analysis of the stock of businesses by region and industry (Ganguly 1983). At that date, the stock of businesses held in the development areas remained lower than their share of employment, 16 per cent as against 21 per cent, revealing an obstinate regional disproportion despite nearly 50 years of regional policy.

Survey evidence suggests that regional incentives, together with the availability of labour, played a significant role in the decision-making of a majority of companies in the indigenous manufacturing sector in the 1970's; although the importance attached to incentives clearly varied. About half of respondents said they had brought forward the date of technical change, and about 15 per cent declared that RDG was an important factor in their decision. (Thwaites, Edwards, Gibbs - 1982)

In the decade 1972 - 3 to 1983 - 4, metal manufacturing companies in the UK received allowances totalling £48,516m for plant and machinery and grants of £151,728m for building and works, making a total of £200,244m from a national total of £4,437,548m.

Designated as an Intermediate Area late in 1984 in token of the severe decline of its main industries, the West Midlands received £68.65m from a national total of £5,505.15m.

It is questionable whether financial aid to regionally located companies is effective in providing long-term benefits. Critics of locational policy (among them the Birmingham Incorporated Chamber of Industry and Commerce) have claimed that:

- it has lowered national efficiency by making companies locate in inappropriate places
- it is inappropriate in any climate of widespread unemployment and spare capacity
- it may harm local communities in the long term by encouraging over-dependence on large branch factories
- frequent changes to policy instruments weaken the impact
- it has not responded adequately to changes in circumstances such as the decline of the West Midlands
- so many places are still eligible for some type of aid that its impact is diluted
- policies run by different government departments are insufficiently coordinated.

A further problem may be that up-rooting companies and encouraging company formation, even when initially successful, may precipitate a higher rate of closure among both migrant and residual firms in subsequent years. This may be due to dis-establishment of commercial connections and expiry of incentives designed to offset disadvantages of relocation on the one hand, and to the weakening of industrial fabric in the traditional heartlands on the other. *More companies means, within a decade, more closures.*

Regional policy was estimated (Ashcroft and Taylor 1982) to have been most effective in the period 1960 - 71, when about 24,000 jobs were created

nationally each year. In the first half of the seventies, this fell to 21,000 per annum and in the second half to 19,000.

After a while, the cumulative effects of jobs increasing as a result of inward regional investment diminished; as the rate of closure applicable to immigrant companies began to tell, most new jobs become replacements, and thus even successful relocations had only a 'plateau effect' on employment. It is also difficult to assess the precise effects of various regional policy instruments upon decisiontakers of 'footloose' firms.

The particular aspect of failure at the lower end of the size scale was investigated in South Hampshire (Mason 1984) in a Discussion Paper which followed up an earlier study, undertaken in mid-1983, of 52 new manufacturing firms, all started since 1975.

It was found that adverse economic effects of the 1979 - 83 depression did not appear to have had as detrimental an impact on the panel of firms as might have been anticipated. Although 23 per cent of the original group of firms had closed, some were already in difficulty, due to internal problems, when first interviewed early in 1981.

Moreover, less than half of the surviving firms claimed to have been adversely affected by the recession. The upper quartile of the panel made the greatest contribution to employment generation and economic development. This result indicated that *policy should become more selective with assistance to the small firm sector.*[Ref. 2]

Further research (Smith 1979) showed the following effects: a number of companies involved in inter-regional mergers had been liquidated shortly after acquisition: the rate of new firm formation in a region with a relatively high level of external control of manufacturing business may be reduced, as may research and development, use of supportive services, availability of managerial appointments, and the formation of technologically innovative firms.

Externally controlled branch plants may be more valuable to contraction and closure than plants closer to the company's headquarters, particularly in times of low economic activity. (Nunn 1980). Branch plants producing more mature goods may be vulnerable to closure when demand for their output falls because they have a marginal role and are not essential to the company's survival (Killick 1983). The older the branch plant had been established the more vulnerable to closure it generally became.

On the other hand, supporters of locational policy point out that:

- economic activity can be encouraged by directing activity to areas where resources, particularly labour, are underused;

- social and political problems arising from an unbalanced distribution of growth and unemployment are reduced;

- housing and labour market problems hinder workers moving to the work to obtain a less unsatisfactory distribution of unemployment, so work has to be moved to the workers;

- they are required to attract internationally mobile projects to the UK;

- they give access to the EEC Regional Development Fund;

- without them, regional inbalances would have become incalculably worse due to the decline in manufacturing employment and to a period of slower national economic growth.

It has to be admitted that the onset of recession became a major scenario - change factor 1979 - 80, as the cycle turned once again.

The spatial distribution of openings of manufacturing industry is evident in the following:

TABLE 3A6/1

THE HIERARCHY OF DESTINATIONS IN RELATION TO ORIGINS

		1966 - 71		1972 - 75	
		No of Openings Per Annum	Proportion Total Employment (1975)	No of Openings Per Annum	Proportion Total Employment (1975)
1	Within the same Local Authority District/ Travel-to-work Area	347	28.5	203	26.7
2	Within County/ Sub-division	174	13.3	120	12.8
3	Within Region	202	15.9	147	18.0
4	Within United Kingdom	268	26.3	189	23.3
5	Origin Abroad	43	4.5	33	5.5
6	Enterprises new to Mfg	366	11.5	274	13.7
	Total	1,400	100.0	966	100.0

It can be seen that enterprises new to manufacturing have formed a small, although useful, proportion of these relocational characteristics.

From the following it can be seen that the number of moves bore no constant relationship to the number of persons subsequently employed, but demonstrated fluctuations, as illustrated in both the diagram 3A? and 3A? relating new openings of manufacturing industry and the economic cycle, and employment in new openings of manufacturing industry and the economic cycle, both (1966 - 75).

THE VOLUME OF INTER-REGIONAL MOVEMENT[1]

THE VOLUME OF INTER-REGIONAL MOVEMENT [1]

Year	Number of moves (per annum)	Employment (per annum) ('000s)
1945 - 51	140	38.9
1952 - 59	70	18.1
1960 - 65	145	34.3
1966 - 71	250	24.6
1972 - 75	186	18.1
1976 - 80 [2]	80	4.2

Notes:

1 An inter-regional move represents the opening of a new plant in one region but with its origin considered to be in another region, or abroad. It can take the form of a new branch opening or a complete transfer.

2 The statistics for this period may need to be revised upwards. Particularly employment associated with moves, as newly opened plants can take at least four years to complete the build up of the labour force.

Source: Department of Trade and Industry

APPENDIX 3A7

A Profile of the West Midlands in 1978

Geographical Region

The postwar industrial profile of the West Midlands - about which some information is available - serves as a complement to that of development of the Government's regional policies to Assisted Areas outside the West Midlands.

The West Midlands Region includes Herefordshire, Shopshire, Staffordshire, Warwickshire and Worcestershire, with Birmingham as its capital city located in its eastern centre. The West Midlands County includes Wolverhampton, Walsall, Sandwell, Dudley, Solihull and Coventry, comprising a conurbation of 899 sq miles inside the Region's geographical area of 13,013 sq miles.[1]

Historical Background - Extract from 'Priorities for Economic Regeneration in the West Midlands', West Midlands Enterprise Board Ltd, Paper Jan 1986.

"For much of the period from the end of the Second World War to the mid-1960's, the West Midlands stood at the top of the regional 'league table' of employment and earnings. This wealth was very largely created by an industrial structure strongly reliant on manufacturing, with the concentration of industrial activity being in the 'metals complex' sector. This term covers the manufacturing, working and subsequent assembly of metal and metal fabrications (specifically industries VI, VII, VIII, IX, XI and XII under the Standard Industrial Classification).

A whole range of companies contributed to the region's manufacturing capacity, varying in size from small family-owned firms to a growing number of large businesses, increasingly of a holding company/subsidiary type of organisation associated with the advantages of scale. Whilst there was a range of trades contributing to the manufacturing base of the region, all employing a wide variety of skills and knowledge, there appears to have been little diversification among manufacturers of finished products. Although this was in some measure the result of management decisions within existing companies, it is also true that Government attempts at regional planning, with an emphasis on obtaining an even spread of employment, clearly had an important effect on the growth of new industries away from the West Midlands in Assisted Areas where they enjoyed considerable financial benefits. Accordingly, manufacturers of components in the region became increasingly dependent on existing finished product manufacturers - predominantly in the automotive field."

The role of the motor industry in the UK economy became the subject of an independent consultants' report issued by The Society of Motor Manufacturers and Trades Ltd and undertaken by Professor D Mackay, Heriot-Watt University, Edinburgh. In 1982, around seven per cent of manufacturing jobs were directly involved in the West Midlands motor industry and its backward linkages and as many again indirectly by means of the multiplier spending effect. (PEIDA Planning and Economic Consultants Survey, January 1985)

Regional Demography

In 1978, [Regional Statistics (1986) Edition] the West Midland population stood at under one tenth of the national (5,154,000 to 55,836,000). The metropolitan county included half that number, and provided employment for 1,338,000 as against 2,186,100 jobs in the Region as a whole. Engineering employment in the county was 39.5 per cent of the economically active population compared with 31.7 per cent in the Region. Average unemployment stood at 6.7 per cent and 6.2 per cent respectively.

Over half the business located in the West Midlands were situated in unassisted areas; just under half in derelict land clearance areas. They comprised roughly 9.5 per cent of the existing UK companies of all sizes. (Business Statistics Office, Newport, Location of businesses, assisted area status, Table 10.5 1981). They included 13.3 per cent of the UK production industries, having a total net output of £5,444.1m in 1976, about 12.3 per cent of the UK total (as against on all regional average of 9.9 per cent). Regional output per employee at £5,475 was below the national average of £6,083.[2]

See Pocket Nos II --2o

TABLE3.A.7/1
WEST MIDLANDS METAL INDUSTRY
OUTPUT COMPARED WITH UK OUTPUT

SIC	Sub-sector	West Midlands Net output	per employee	United Kingdom Net output	per employee
Order VI	Metal Manufacture	£695.9m	£5,938	£2903.7m	£6,177
Order VII	Mechanical Engineering	£699.8m	£5,530	£5442.1m	£5,934
Order XII	Metal goods not elsewhere specified	£834.3m	£5,039	£2735m	£5,239

TOTAL : £ 1534.8 = 13.9 per cent of £ 11,080.8 million

Productivity in the main areas of traditional strength was thus below the national average per employee. In 1978, about 44.7 per cent of the regional workforce were in manufacturing employment; 70.7 per cent in metal sub-sectors: About 14 per cent of national manufacturing employment was held in the Region. *Thus at that time metal industries were over-manned and under-productive, but very important locally - a situation likely to give rise to closures and unemployment during recession.*

A recent Government Report has analysed the percentages of the United Kingdom workforce employed in the West Midlands conurbation in each sector, using the 1968 SIC Orders III to XIX. The overall figure of 8 per cent concealed a remarkable series of concentrations surviving in the metal industries, as follows: metal manufacturing and metal goods (22 per cent); mechanical engineering (7 per cent); electrical engineering (8 per cent); vehicle production (19 per cent); other (4 per cent): total, 60 per cent. This underlines the continuing importance of this sector in the Region. ('Employment Gazette', October 1982 and August 1983)

Intensive new capital investment in the region stagnated around 1965 - 66: up to 1975, it averaged around 11 - 11.5 per cent of the national (ie:

substantially below its industrial proportion in the economy), afterward increasing to around 17.5 per cent until the slump of 1979.

Between 1975 - 82, 313,000 jobs in manufacturing were lost to the region, of which 240,000 had been in the metal order: nearly half the foundry industry disappeared, and all branches were seriously undermined.

In 1978, these sectors had been responsible for 40 per cent of regional GDP and 49 per cent of all regional investment: (national regional averages were 29 per cent and 32 per cent respectively - CSO Regional Trends 1980). By 1982/3 average unemployment reached 15.8 per cent.

This rate of decline was not confined to the West Midlands, but experienced nationally. Indeed, up to 1975, the West Midlands remained relatively stable, and even in the metal industries differed less than the national average in closures and redundancies.

Overall decline was nevertheless severe, and with declining output in all main metal orders 1978 - 80, the long-run loss of employment 1961 - 1981 was accentuated; although already evident 1949 - 59; a period when the stock reduced from 2,269 - 2,170 firms.

TABLE 3.A.7/3

UK EMPLOYMENT LOSS 1961 - 81 (000'S)

Employment Sector	1961	1981	Loss	
Metal Manufacture	643	323	-320	-c 50%
Engineering	3,654	2,814	-840	-c 23%
All Manufacturing	8,540	6,087	-2,453	-c 29%

The total loss in the UK of 3,613,000 jobs between 1961 - 81 was mirrored in those of the West Midlands, where the main acceleration occurred in the later years. The importance of this change is evidenced below: its relevance to company closure rates is that contraction of employment often involves shut-downs.

Table 3.A.7/4

THE IMPORTANCE OF MANUFACTURING INDUSTRY IN THE WEST MIDLANDS

	1982 No. of Firms	%	1975 Employees	%	1982 Employees	Reduction/ Increase	% Reduction/ Increase	% Contraction/ Expansion
All Industries	49,336	100	2,229,000	100	1,905,000	-324,000	-100	-14.5
All Manufacturing Industries	9,254	18.8	1,052,000	38.8	739,000	-313,000	-96.6	-29.8
Metal manufacturing, engineering and allied industries	6,756	13.7	750,000	26.8	510,000	-240,000	-74.1	-32.0
Other manufacturing industries	2,498	5.1	302,000	12.0	229,000	-73,000	-22.5	-24.2
Service Industries	35,797	72.6	989,000	52.5	1,001,000	+12,000	+3.7	+1.2
Other Industries	4,285	8.7	188,000	8.7	165,000	-23,000	-7.1	-12.2

(Source: Department of Employment Gazette and West Midlands County Council "Statistics 1982").

Marshall's Employment - Based Thesis

An employment-based approach to the identification of long-waves in regional development 1841 - 1971 was researched by M Marshall (1984) based on C H Lee's (1979) (recalculated) standard planning regional (post-1974) employment data A (1841 - 1911) and B (1901 - 1971) and E Mandel's time-segmented long-wave model and chronology 1841 - 1967.

Marshall observed that the Victorian boom had been associated with the rise of metal manufacture and mining but that the patterns of development had differed across regions: the West Midlands had been a long-wave 'carrier region' in this sector, which had influenced employment activity rates unevenly across regions.

A schematic typology developed over three longwaves, each comprising upswing and downswing phases, proved over-simplistic in relation to empirical history - metal manufacturing employment had revealed a 90-year followed by a 40 year wave of values expressed as a percentage of total employment, a pattern reflected by a slightly declining and fluctuating regional trend over 130 years at a level from five to three per cent above the national average.

The classifications 11 'vehicles' (1871 - 1971) and especially 12, 'metal goods not elsewhere specified', displayed remarkable peaks in the mid 1950's and early 1920's respectively.

The West Midlands had provided an example of the replacement 'pattern in his typography; each of the three long waves being led by a fresh industrial sector: mining in the Victorian boom; metal goods in the imperialist long-wave; and vehicles in the postwar period, each buoyed up by a long-standing metalworking tradition in the Region.

Sectoral employment patterns, although differentiated in their total regional impact an employment, yet appeared to move symbiotically, with universal growth 1841 - 51, a plateau 1851 -1871 followed by a decline to 1881; thence a rising trend to 1911, followed by a steep decline in the war years, thereafter a general rise to 1929, mixed movements over 1931 - 3, and a fairly steep rise and high plateau in the 1940's, 1950's and early 1960's, until final general decline in the late 1960's and in the 1970's. *This pattern was of considerable interest since it appeared to mirror trends in company formation and failure,* (as researched between 1856 and 1944) as one had expected it would on account of the close links between employment and company lifespans. Indeed, **employment as an indicator must be considered secondary and indirect compared with that of company survival.**

Metal Industries Employment 1952 - 75

These watershed years of change from growth to decline are mapped in detail per industrial Order in Table. It can be seen how great a number of jobs was lost in the West Midlands metal industries between 1952 - 1975, compared with the national average. Although in overall percentage terms its relative change was slightly less than the national average, yet in some categories (especially Orders VII and XII) losses were substantially more.

The West Midlands' share of national metal industries employment[3] fell slightly between 1952 - 75, having fluctuated between -0.7 to +0.9; its social impact was greater due to an above average regional and local dependence on jobs in these industries. In 1948, this sector accounted for 44.6 per cent of employment.

The Table also shows conflicting changes both in employment between sub-sectors and in comparisons between regional and national trends, thus illustrating the difficulties encountered in interpreting composite cyclical movements appearing at higher levels of aggregation.

While employment is considered a surrogate for company activity, it does not necessarily maintain co-movement with either company formation (expansion, size, profitability etc) or the rates of closure of plants, establishments and firms: declines in sub-sectoral employment may indicate loss of vitality as well as the incidence of insolvencies, or even result from labour displacement by new technology and its transfer to other sub-sectors. It did not seem unreasonable to suppose that misfortune did tend to reduce the stock of companies and to reduce overall longevities.

Comparing 1962 with 1978, Birmingham 'lost' 283 ;manufacturing establishments. It is not easy to determine from the fragmentary statistical records whether the outward migration of population from the Birmingham conurbation preceded, coincided with, or followed this decline in industrial employment after 1965 - 66; nor whether deliberate policy was more influential than the attractions of better housing, easier mortgages, and the greater mobility of employees. Unemployment remained generally well below the national average until 1973.

Between 1951 - 1981, records show that new value of regional output and numbers employed both rose, but productivity fell; the percentage of employees in West Midlands manufacturing in June 1965 (50.8 per cent) had reduced to 36.7 per cent by June 1983 (-28.8 per cent of its previous total) employment in the metal industries fell and continued to fall beyond 1980; population fell to nearly its 1931 level in Birmingham in 1981; by then, regional unemployment averaged 11.8 per cent. Table summarises these

changes, which facilitate an appraisal of economic conditions.

Recent DTI research (Ganguly 1984) provides valuable information about the West Midlands regional analysis of starts and stops of firms registered for VAT; it shows differences in the sectoral mix of business between regions and also between sectors within regions.

In 1982, 9.3 per cent of new registrations and 9.0 per cent of deregistrations occurred in the West Midlands, where 9.1 per cent of the total of company, stock was located. This compared with regional production industry starts of 11.6 per cent and stops of 10.8 per cent in the West Midlands, and 10.8 per cent and 9.8 per cent in all unassisted areas. Regional starts and stops as proportions of the regional stock were 11.9 and 9.1 per cent (14,335 and 10,942 from a VAT registered company population of 120,468 firms).

Addendum on the Black Country

Traditionally involved in heavy foundry, iron production and manufacturing in metal, the Black Country lost an estimated 71,600 jobs 1978 - 81, thereby losing 26 per cent of manufacturing employment and 14 per cent of total employment in its area.

Metals manufacturing and vehicles employment experienced a 32 per cent and 39 per cent decline respectively in the period 1978 - 1981. In 1978, nearly 54 per cent of employed people in the Black Country were in manufacturing: (West Midlands 49 per cent; UK 32 per cent). 60 per cent of all local firms were based in the Black Country; 437 out of 1,100 surviving companies employed less than 50 people.

Almost 70 per cent of manufacturing employment in the Black Country is concentrated in mechanical engineering, metal manufacturing and metal goods, and these sectors saw the most rapid decline. The areas chiefly concerned are Dudley, Sandwell, Walsall and Wolverhampton.

A survey[Ref.] published in spring 1986 provides some explanation:

"Worldwide changes in supply and demand and the rise of new competitors, together with the advent of new technologies and service industries and the decline of heavy engineering and metal based trades, have brought changing business conditions nationally and in particular to the Black Country."

This had resulted in closures when poor financial performance, accompanied by low volumes of production and capacity utilisation, lack of resources to develop new production processes, and inability to adjust capacities to lower levels of demand, forced companies into insolvency.

APPENDIX 3A8

Closures in the UK foundry industry: a mini-study

Foundry Industry failure rates

National rates of ironfoundry closure in the UK had shown very marked temporal variations which, as previous studies had evidenced (Beasley 1975, Churchill 1959) appeared only 'loosely and poorly related to phases of the business cycle'. Johnson's (1976) data for bankruptcies and liquidations in England and Wales had shown these closure rates for ironfoundries, at least until the mid 1970's to have been comparable with the level of closure for England and Wales as a whole. Only the rate for 1969 stood out as a deviation from this pattern, probably due to denationalisation of tied foundries and to divestments made by British Rail.

Differences in definition of closure made inter-study comparisons problematic; but granted there were some lagged effects due to late reporting, the following comparative table can be set up:

Table 3.A.8/1

Author	Date	Est: Morbidity pa	Type of Sample
Sant	1975	1.9 - 8.2 per cent	Mobile plants 1950-and 1962
Townroe	1975	2.2 - 4.0 per cent	Mobile plants 1967-1970
O'Farrell	1976	up to 2.9 per cent	Grant-aided, Ireland 1967-72

The peak of closures in 1969 corresponded exactly with a major upswing in ironcastings production; declining closure rates accompanied the next resurgence of production in 1972 - 3, before the slump of 1974 set off closures reaching to a new peak in 1980, this time a recession year.

The 1969 closure peak anti-cyclical as it was, may have resulted from a spate of mergers, especially in 1968, (involving Allied Ironfounders, Glynwed, Birmid Industries, Qualcast Ltd, AEI and GEC). This suggested that rates of foundry closure were related not only to phases of the business cycle (if they were) but also to merger waves, phenomena which Reid (1976) had already shown to be only partly related to one another, as reported by Smith and Taylor (p 648).

National and Regional Closures

The national trend in closures tended to mask regional closure rates of ironfoundries (annual average per 1000 population) in the post-war period.

The following table compares the West Midland Closure rates with the national:

Table 3.A.8/2

Region / Dates*	1945 - 1950	1950 - 1956	1956 - 1960	1960 - 1965	1965 - 1968	1967 - 1973	1974 - 1980	
1. West Midlands	31	15	31	42	85	42	38	**
2. United Kingdom	35	17	32	47	82	48	44	
Difference (1 - 2)	-4	-2	-1	-5	+3	-6	-6	#
3. Birth Rates (U.K)	58	7	5	3	14	4	5	

(*Note: uneven intervals)

** Comparison of recorded closure rates per 1000 of foundry population.

figs. are those notified

It can be seen that, except in 1965 - 68, the West Midlands fared better than the overall average: ie less closures but since 1950, 'births' have had little impact upon morbidity.

Smith and Taylor proposed that spatial variations in ownership structure may have had a direct bearing upon rates of ironfoundry closure. This table compared the West Midlands and UK percentages of group-owned plants:

Table 3.A.8/3

	1967	1974	1984
WM	47.6	57.6	53.0
UK	42.9	49.4	46.7

The relationship did not appear to be that greater concentration resulted in more closures, but rather the reverse in this Region, unlike the Assisted areas, where independence and high closure rates were associated. The total numbers of new ironfoundries recorded during the same periods as these closures were 36, 38 and 74: this overall sum of new iron foundries contained 13 in the Development areas, 20 in Intermediate areas and 41 in non-Assisted areas.

The role of ownership in changing patterns of regional closure between 1945 - 1980 was emphasized by Smith and Taylor (1983). Previous studies had explored aspects of the significance of plant size, age of plant, industrial structure, and organizational type for plant closure (Atkins 1973; Gudgin 1978; Henderson 1979, 1980; O'Farrell 1976; Townroe 1975; Sant 1975).

Their figures remained incomplete because the spatial scale of each study was local; they dealt only with recently started firms; they included plant transfers and inter-regional relocations; highlighted the inner city dimension of plant closures at the expanse of the wider conurbation and region; and included firms whose employment fell below eleven persons, counting these as closures.

Conjoining my own figures of foundry closure (derived from official records of the Foundry Industry Training Board 1969 - 81 (under MLHs 313, 321, 322, 333) held at the centre for Urban and Regional Studies at the University of Newcastle upon Tyne) with those of Smith and Tylor, facilitated the following:

TABLE 3A.8/4

Dates	UK foundry closures per time period	Population balance including new opening
1945 - 1968	1597	3350
1967 - 1974	678	1753
1977 - 1981	627	1075
	2902	448
New openings 1945 - 1981 were 1246		798 remaining

It must be emphasized that these figures are those known to FITC and other sources. Some foundries ceased but continued as firms trading in ancillary activities. The results, obtained by hand-counting entries an index cards, are approximate: a number of cards existed with insufficient information written on them to be included in the count.

A small sample of 90 firms from all regions for which starting and finishing dates were available produced the most important result of an average longevity for foundries started up between 1972 and 1983 of only seven years. A considerable number of new openings 1977 - 1981 had failed. A smaller sample of 14 West Midlands foundries survived 6.1 years in the period 1967 - 1980.

The following table summarises foundry closures, openings, net losses and remaining populations, comparing the West Midlands and the United Kingdom (own research data) between 1977 - 1981 inclusive.

TABLE 3A8/5
FOUNDRY INDUSTRY POPULATIONS

1977 - 1981		West Midlands	UK
Ferrous	Closures	50	648
	Openings	22	91
	Net Loss	18	537
Non-ferrous	Closures	57	148
	Openings	29	62
	Net Loss	28	86
Steel	Closures	10	64
	Openings	3	29
	Net Loss	7	35
Total	Closures	117	860
	Openings	54	182
Total	Net Loss	63	678
1977	Population	361	1753
1981	Population	298	1075

In oral interview during November 1984 with M Duffield, ex Aston University TPU researcher then working at Snow Hill House, Livesey Street, Birmingham, it emerged that although the foundry industry had 'missed out' on prewar 'flow-line' systems, mechanization mainly in the 1950's had produced a vibrant, expanding industry, the productivity of which had peaked around 1970; since when a change had set in, and decline had become continuous, very largely through high dependence on the region's motor industry, itself in decline due to foreign competition.

A regular five-year cycle had been detectable since the growth-phase starting in the 1950's; but in 1974 this had resulted in a slump under changed trading conditions; closure of small tied and jobbing foundries and amalgamations between larger ones had become continuous. The record of foundry closures was available through the Centre for Urban and Regional Development studies at the University of Newcastle upon Tyne. A visit was made in February 1985.

The foundry industry database at Newcastle consists of around 800 card-indexed establishment (not all firms), and provides name, UK location, ownership in 1969, 1974 and 1981; size and market; employment and occupational data; and whether ferrous or non-ferrous. Foundries are listed alphabetically and by region.

Their limitation is that all entries were 'levyable' foundries at those dates, and therefore excluded very many small ones outside scope. Since many craft iron foundries, (some 'tied') are traditionally 'very small - less than 11 employees and under £25,000 total remuneration to employees - and are known to experience high failure rates, the figures derived from careful counting in the index are deficient in this respect.

Between 1967 - 81, approximately 627 of the 800 foundry establishments were closed 117 of the population of 328 in the West Midlands, 21 in the study area of Birmingham; of these eight were iron foundries, nine non-ferrous, and four high-alloy steel: the regional remainder were located in the Black Country, or at Coventry, Worcester or Burton-upon-Trent. Some of these losses were offset by new openings. **My own compilations from the index provide a national incidence of failure of 78.4 per cent 1967 - 81 (annual average 4.9 per cent) and for the West Midlands' share 35.9 per cent (annual average 2.2 per cent).**

TABLE 3A8/6

	Year	1967	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	Σ	% 1967 Pop.
A	W. Midlands	6	10	6	5	4	6	8	12	15	5	1	6	11	8	14	14	117	35.9
B	Birmingham	(0)	(2)	(4)	(1)	(1)	(2)	(1)	(0)	(1)	(0)	(0)	(1)	(3)	(2)	(1)	(2)	(21)	N.A
C	National	52	52	30	40	48	47	34	13	14	21	18	38	57	62	54	84	627	78.4
	A as % C	12	19	20	13	8	13	24	15	36	24	6	16	19	13	26	17	18.7	-

This table shows that 1980 and 1981 were peak years for closures in the West Midlands; but in Birmingham and its area only three foundries closed,

much the same as in other years: it was nationally that the crisis became most evident, and the percentage figures could be misleading year or year, as populations changed. It was the cumulative effect which accentuated the 1979/9 - 1982/3 depression years, when the numbers of closures virtually doubled in the Black Country. The national population of foundries reduced from 1753 in 1967 to 1075 in 1981.

Great Britain in 1980 possessed approximately 650 ferrous iron foundries employing 80,000 people and producing an output of 2.1m tones. Only sixteen years previously, there existed 830 ferrous iron foundries employing 106,000 people and producing 3.5m tones.

Between 1950 - 70, a cyclical pattern of output with 2.5 years between peaks occurred; but thereafter more perpetual rates of decline set in until the widespead collapse of 1979 - 80. Demand flagged both for traditional malleable iron and the new spheroid graphite (S G) product. Output of steel castings also declined between 1953 - 1948, between sharply defined cyclical peaks of four year periodicity.

In the decade 1973 - 1983, more than half the extant foundries in the United Kingdom closed, and total production fell by 57.9 per cent. Almost one third of remaining foundries employed less than 20 person (Business Statistics Office Report, DTI, 1984). Few foundries had increased productivity in any principal customer sector: general output fell heavily for automobiles and engineering; for ingot moulds, building, pressure pipes and fittings and for miscellaneous usage, while scrap remained abundant.

Customer orders fell by 39 per cent 1975 - 80; by 1979, over five grey iron casting foundries were failing every month, even though high quality, high integrity, high investment foundries tended to succeed better. In many instances, the high costs of redundancy payments to the workforce seemingly were all that kept even the latter firms from closure.

It was not clear over the entire complicated period whether cyclical peaks and troughs of output coincided with rises and falls in the level of firm closures throughout this foundry industry. The latter remained very vulnerable, especially in the small craft sub-sector, to heavily fluctuating output trends in their customers' industries, most markedly that of textile machinery and - most important to the West Midlands - in the car industry. Preference for lighter castings and metal substitutes, many of both from abroad, had prevailed, the local slump in supply orders reflecting import penetration by rival producers.

It seemed that recessionary troughs in the trade cycle had hit iron castings slightly earlier than they had reduced the general level of manufacturing

production, but decline had continued over successive cycles, with taxation cutting into wildly zig-zagging profit margins.

Revised health and safety regulations affecting this antiquated industry had sometimes amounted to more than 75 per cent of necessary future investment, all the more serious because of the short working life of plant and equipment; high maintenance and replacement costs; and the oligopsonist domination of hard-pressed, large (and often single) customers.

The foundry industry, magnifying the condition of British manufacturing as a whole, was caught on the horns of a dilemma: either firms went under because they were unable to compete during periods of economic revival, not having invested sufficiently; or, having re-equipped to produce good quality castings more efficiently, foundries became more vulnerable to closure because of price competition when high interest charges had to be met. An alternative was to rationalize closures throughout the industry.

Under the Lazard scheme of voluntary closures carried out in the interests of industrial rationalization and greater stability in the steel foundry sub-sector, the West Midlands 'lost' 6,500 metric tones capacity from a GB total of 23,050 (28 per cent) between 1972 - 82. The total output of steel castings from the region almost halved, which meant that many specialist castings were no longer available from domestic sources. (Steel Castings Research and Trade Association, Sheffield 1983)

Under the Government's scheme of assistance to ferrous foundries, DTI statistics up to 31 March 1980 showed a strong contrast between applications for financial aid made, sustained and approved with an offer. Firms in the West Midlands had made 126 applications out of the national total of 347 (project costs £66.5m out of £123.9m), of which 27 regional (76 national) schemes were rejected or withdrawn (project costs £6.7m and £109.1m respectively): actual offers of assistance taken up were only £13.2m (£23.4m) of which only £3m had been paid out (£6.3 million nationally). This low take-up was due in part to closures in the recession, in part to the size of projects involved and the 80 per cent proportion of cost required from the companies themselves; and partly to misunderstandings about the scheme.

Moreover, instead of carrying firms over what was supposed to have been a cyclical trough in demand, it turned out that reduced demand had become permanent, and decline structural. Due to poor market forecasting, these new financial liabilities precipitated further insolvencies, for greater mechanisation could in most cases only pay off in terms of unit costs through longer runs during an economic upturn. Customers, exploiting a situation of cut-throat competition within an industry with 50 per cent over-capacity in relation to current or future demand, had pressed for large price reductions. In consequence, many firms were unable to cope with the

financial strain, and collapsed.

The non-ferrous metal foundry industry, too, was found to be a particularly sensitive sector during cyclical downturns. Firms had somehow to survive lean periods and take advantage of good times; but the latter had increasingly shown insufficient returns to finance rationalisation, and the modernization, reorganization and automation required to compete with specialist production for which some demand had remained.

Installing robotic equipment and other forms of advanced manufacturing technology might reduce costs but was no guarantee of company success or even survival. The scale of activity had to be right, and a radical review undertaken of all aspects of a company over a three to five year implementation period. ('Engineering Business', March 1985). Some firms might even 'cling on' indefinitely, although not viable, undercharging because they did not intend to survive for long.

West Midlands Foundry Sub-sector

The West Midlands foundry industry presented itself as a well-documented 'mature' sub-sector where notable contraction had taken place in recent years; one where introduction of new technology was thought to have considerable significance in relation to domestic costs and to foreign competition, to materials substitution and to overcapacity: and these had already given rise to extensive partly planned rationalisation. *Closely tied to metals, the foundry sector was peculiarly prone to cyclical recessions and also long-term post-war structural decline,* reinforcing reduced demand, diminishing profits, 'price wars' and the need for marketing.

Its modern structure was split according to the types of metal used into ferrous (iron and steel castings) and non-ferrous foundries, the latter including aluminum, zinc, magnesium and other light alloy foundries, brassfounders (including various different alloys of copper and other metals) and a miscellaneous group of specialist alloy foundries. In 1980, total output was £1.8m from 1420 establishments employing 121,500 people.

Import penetration had increased with the demise of specialist and small craft foundries, of which 26 per cent closed in the two years 1980 - 2. Between 1975 - 1980 the overall reduction in numbers of ferrous establishments was 14 per cent. Between 1972 - 81 the numbers reduced from 1503 down to 1264 non-ferrous establishments (16 per cent). Only 20 per cent of all foundries employing over 1000 persons survived, and only 44.5 per cent of foundries with 501 - 1000 employees. (sources: Trade Associations and NEDO)

Both ironfounding and aluminum production had declined in Europe 1975 - 1980, but nowhere more than in the UK. All sectors of the ferrous and non-ferrous product-market demands had declined. (Sources: Financial Times; Steel Castings Research and Trade Association and Light Metal Founders Association). Between 1972 - 79, only investment castings had grown and there was room only for two semi-automated, large-scale, high quality production plants in the country. The industry had pronounced dependence upon the orders of major buying companies, especially in vehicle manufacture and mechanical engineering.

An interesting comment is quoted in Dickson and Fleck (1983)

> *"the biggest concentration of 'craft' foundries was to be found in the West Midlands and Yorkshire and Homberside, and our detailed studies showed that this level of concentration affected the price structure of individual foundries. Thus foundries with little local competition seemed to get away with relatively inefficient operations because they could afford to charge more; whereas in traditional foundry areas, competition was so intense that it affected the survival prospects of all the local foundries". (p 24) SCF/WP/F-EDC 1977*

(p 29) "Some of the larger foundries examined suffer because of their size; they have higher overheads, more remote management, possibly more formalised and hence less flexible manning, and less ability to respond quickly to customer requirements."

(Steel Casting Foundry Working Party - Foundry Industry Economic Development Committee Report - 1977 (p 24 - 29)

The situation in the foundry industry was clearly one of both cyclical change and absolute decline, largely unredeemed by financial assistance and new technology, with heavy closures both nationally and regionally.

If survival depended on specialisation, modernity and a progressive attitude, few firms could qualify, and many waited in a reactive stance hoping for idle capacity to become used when an upturn arrived. When it did not, they failed. If investment had become overdelayed, it became far more difficult to balance earnings and expenditure: competition pushed foundries away from breakeven, and having remortgaged their premises, many borrowed further only to repay debts.

This invaluable background prompted many of the questions included in the postal enquiry reviewed in Chapter Four; it also supplied information about underlying causes to the failure rates of this subsector, with its average company longevity of 6 - 7 years.

APPENDIX 3A9

Studies of Scottish Longevities

The Early Scottish Limited Companies 1856 - 1895 a synopsis by Professor P L Payne (Scottish Academic Press - Edinburgh, 1980) compared in fine scholarly style the longevities of Scottish firms with those found in English companies by H A Shannon in his article (Economic History II, 1932, p 396) 'The First Five Thousand Limited Companies and Their Duration'.

Both economic historians had taken the dates of the first and subsequent Joint Stock Companies Acts (1956, 1962, 1880, 1886) as their measure. Payne compared his sample with Shannon's and adopted similar methodology to the latter in his book 'The Limited Companies of 1856 - 1883'. Payne's sample consisted of 2,936 firms with records filed at West Register House, Edinburgh, each having been formed between 1856 and mid-1895, and dissolved before 1970; (apart from 311 survivors continuing to trade after that date).

Shannon and Payne both pragmatically accepted the date of certificate of Incorporation Issued by the Registrar as that signalling the 'birth' of a company. Determining the date of 'death' was far less certain, but Payne adopted Shannon's panel of five modes of demise:

1 'Abortive' Trading less than one year, conducting little or no business, making no returns, capital remaining unsubscribed. (Included 65 Scottish and 150 English companies during the period).

2 Sold, amalgamated or reconstructed (including companies that were taken into public ownership under subsequent Nationalization Acts) over one third of the 343 Scottish firms in this category were in the manufacturing sector.

3 Wound up compulsorily, or under supervision, or by reason of liabilities - in short, insolvent, and under a Court Order.

4 Wound up voluntarily, without any reason being given, usually because the company's prospects were unfavourable (or, more rarely, because the company had fulfilled the purpose for which it was started) comprised the great majority.

5 Dissolved in disregard of legal forms, or unknown, and struck off the Register . . . retrospectively. As Payne remarked, 299 companies, 8.7 per cent of the sample population, ". . . simply withered away, to be struck off the Register many years after their effective lives had ceased". (This

delay due in part to erratic 'returns' made by five out of seven companies on the Register).

D H MacGregor in his article 'Joint Stock Companies and the Risk Factor' (Economic Journal XXXIX 1929 p 494) declared in similar vein:

"The formal dissolution of these companies may be delayed for as much as a generation, as the public statistics show; but the winding-up order terminates their operating life".

Just as formal British Company happenings had been recorded in the 'London Gazette', so Scottish company 'births' and 'deaths' and 'orders' upon filing of petitions were recorded in 'Edinburgh Gazette'.

Payne borrowed from the United States Central Statistical Board Standard Industrial Classification (Washington Dc 1939 - 40) for his eight main categories of companies, and modified it to suit 19th century Scottish conditions. As did Professor G Heberton Evans, in his 'Business Incorporations in the United States 1800 - 1943', Payne took the main object of a company as stated in its Memorandum or Articles of Association as the criterion for classification.

The purpose of Payne's paper as he said was "to show how many Scottish companies were formed in each year in the second half of the nineteenth century, what they sought to achieve, how long they lived, why they passed out of existence, and just how much capital was involved. In addition, an attempt has been made to determine the magnitude of one mode of Scottish overseas investment and the possible relationship between the size, length of life and growth of the incorporated firm."

This went further than numerical work accomplished by Shannon, MacGregor and Geoffrey Todd (Some aspects of Joint Stock Companies 1844 - 1900) Economic History Review IV (1932 - 33) p 46 - 71, and followed the earlier study, based on Parliamentary returns, made by Leone Levi (Journal of Royal Statistical Society, XXXIII, 1870 p 1 - 41, and XLIX, 1886, p 214 - 264).

Presenting a chart of the annual number of companies formed in the United Kingdom and in Scotland before the First World War, Payne commented:

> "The periodicity will be immediately apparent. The correspondence between peaks and toughs of company formation and the trade cycle is equally clear when the turning points of the latter are superimposed upon the curves. (Calendar year reference dates as tabulated by Arthur F Burns

and W C Mitchell, 'Measuring Business Cycles' (New York: NBER 1946 p 49)

Crude though the annual data are, they suggest that peaks in company formation occurred at or shortly before the upper turning points of the general cycle. Similarly, years characterised by relatively low company formation, tended to be those at or near (generally preceding) the lower turning points. The evidence suggests a high degree of correlation between movement in incorporation and general business activity (my emphases) and tends to confirm the findings of Alfred Marshall and D H MacGregor. G H Evans, following a more rigorous analysis of a much larger American population, came to the same conclusions."

Evan's observed (p 88)

"one might almost have been led to predict that peaks in incorporation would follow peaks in business. Promoters, however, seem to sense the approach of a recession, or at least grow wary, and curtail incorporating activities while prosperity still has a high degree of momentum. Their heavistress doubtless contributes towards bringing on a recession. On the other hand, their preparations for a revival precede and upturn and most certainly contribute to the spirit of optimism that characterizes expansions."

Payne (p 23 - 4) also remarked on this 'spirit of optimism':

"There is no such close correspondence between dissolutions and the general movements of the economy. It might have been expected that a graph of company deaths would produce something like a mirror image of births, attaining peaks at times of depression and troughs during periods of prosperity."

It did not occur in the case of the Scottish companies: like the majority of 19th century businessmen believing that things would get better, it took a relatively long period of unprofitable activity before they reluctantly became convinced that their companies had little prospect of future prosperity."

The great buoyancy of limited companies vis à vis unlimited underscored this tendency to procrastinate, as did the heavy costs of winding up.

"This meant that distressed companies possessing any freedom of action tenaciously held on, so that when they were forced into liquidation not only did they have large and ruinous liabilities but the unfavourable business conditions which had contributed to their terminal illnesses had frequently given way to a cyclical upturn."

"Since nearly half (46 per cent) of the early Scottish companies formed between 1856 and 1895 and that had been dissolved by 1970 were wound up voluntarily and an additional 9 per cent simply withered away, it is hardly surprising that there is but little coincidence between the pattern of total dissolution and the trade cycle. The very term 'voluntary liquidation' implies the possession by the Board of at least some latitude in turning the initiation of winding up proceedings. Firms wound up compulsorily had no such powers of manoeuvre."

Payne's Table 4 showed the percentage of already incorporated companies failing by year and mode of dissolution: erratic oscillation was noticeable of from 0.1 to 3.1 per cent between 1896 and 1970. There was a clear inverse relationship discovered between the number of companies dissolved compulsorily and the general course of business.

Equally apparent was a marked positive correlation between the course of the trade cycle and movements in the series of those 125 companies sold, amalgamated or reconstructed (36.4 per cent of total) (much easier to affect during a period of prosperity), many as 'going concerns' to English proprietors mainly based in London.

The 215 abortive companies were distributed throughout the period without any apparent relationship with the trade cycle. (Presumably, incompetence had no season, and non-financial factors such as the plausibility of the company's objectives, the standing of its directors, degree of competition already existing in the product-market weighed in the outcome). A total of 65 Scottish abortive companies belonged to the manufacturing sector from a total of 215 for all sectors (30 per cent). These represented but 7 per cent of the population, far less than the comparable figure for companies registered in London.

An average length of life of 16.4 years was found for Scottish companies formed 1856 - 1895 and dissolved by 1970. The rate of increase in the number of Scottish companies in existence during this period was shown (Table 6, 7 and Graph). Both indicated higher rates in Scotland than in England (although the mean figure did conceal very wide distribution of between 11.3 and 38.9 per cent, with considerable infantile mortality.

By comparison, Levi's estimates in the Journal of the Royal Statistical Society, 1870, misleadingly gave English companies an average life of 18 months in 1865, whereas Shannon found that well over 27 per cent of the 2004 English companies in existence in 1865 had died within 3 and 57 per cent within 9 years: Scottish figures were 16 and 32.7 per cent respectively.

"Alternatively, of those English companies in existence in 1865, only a quarter survived into the early 'nineties, whereas about a quarter of the Scottish companies of 1865 were still in existence on the eve of the First World War."

Scottish companies tended to survive longer than English ones in the period up to 1930, with initially lower rate of decay, then similar rates, with all "life expectancies tending to increase with the passage of years". By 1970, 11.0, 15.4 and 18.4 per cent of all companies in existence at the end of 1875, 1865 and 1894 remained in operation in their original form (despite the relatively heavy mortality occasioned by nationalistion in the late 1940's). (see Ericksen (1949)

The comparative survival of English and Scottish companies (Table II) showed MacGregors and Payne's figures for periods of from 1 year to 49 years after formation in 1880. English companies displayed consistently lower percentage survival than did their Scottish counterparts. At 20 years survival, the comparison was English 30 per cent, Scottish 45 per cent.

The author Essex-Crosby 'Joint-Stock Companies in Great Britain', (p 24) had found that between 1862 and 1884, survivors represented 40 per cent of the registrations.

"In 1885, the number of companies on the register in England and Scotland was 8,924 . . ."

A figure of around 38 per cent emerges as a probable overall survival rate after 20 years in the period 1856 - 1900.

"On the basis of Todd's estimates, one would guess", Payne added, "that after the mid-eighties the survival trends of English companies were becoming increasingly similar to those of Scottish companies."

Size, Growth and Length of Life

Shannon remarked (p 410):

"as companies grow older, their connections and goodwill expand and tend to keep them stable and free from insolvency . . . companies appear to reverse human experience: with them, old age is partly a reason for expecting longer life."

Confirmation was made by P E Hart and S J Prais (1956) "The analysis of business concentration: a statistical approach", Journal of the Royal Statistical Society) (p 168 - 75) who indicated that during the first fifty years of the 20th century British firms expanded largely by internal growth and

that each increment of growth appeared to be associated with a decrease in the probability of death.

Both authors echo Alfred Marshall, 'Principles of Economics', 8th ed, MacMillan, London 1920 (p 316)

"And as with the growth of trees, so was it with the growth of business as a general rule before the great recent development of vast joint stock companies which often stagnate but do not readily die."

A questions naturally arose "Did larger firms live longer than small ones?" Did those firms beginning with a large capital grow proportionately faster than those which started with smaller capital? The amount of capital called up might increase systematically over a period - how define 'starting capital'? How take the nature of the firms activities and the general economic environment into account? These matters had to rest beyond immediate scope.

Payne had said that to "explain company longevity necessitates going beyond numerical aggregates to the quality of entrepreneurship possessed by company directorates, and data on this intangible factor is not to be found in the company files." (p100)

Lowenfeld 1909 had observed that "Railways, Banks, Insurance companies, Breweries, Telephone, Water , Gas, Telegraph and Shipping companies as a rule live long, whilst Mineral Water, Drapery, Cycle, Mining and Oil companies generally have short-lives."

Average life-span for all dissolved Scottish companies in Payne's sample was 16.4 years, compared with which manufacturing as a whole was 14.9 years, and iron and steel and products with machinery and with transportation equipment averaged 13.1 years. Not only was survival influenced by spatial considerations, but also by industrial category.

"The influence of the trade cycle", Payne concluded, "and the timing of promotional and incorporation activity appears to have been much the same in Scotland, England and America."

Statistics for business failure in Scotland had been used for many years as a barometer of economic activity (Moss and Hume 1983). Total numbers of insolvencies, bankruptcies, sequestrations and limited liability company liquidations had been published in the Parliamentary paper and elsewhere since the eighteenth century. Unlike England, where only a small sample now are preserved at the Public Record Office (in the Chancery series B2 and B9), the Scottish Record Office's Court of session series is continuous since

1772, and separately filed since 1839.

The Archives Department of the University of Glasgow (at that date) had indexed 31,000 entries 1839 - 1913, which form the accompanying graph, the configurations of which resemble closely those of my own graph of Hoffman's Index of bankruptcies for England and Wales, 1742 - 1936, presented as extended by myself 1937 - 1980.

The Scottish configuration corresponded to the trade cycle with major peaks at the time of bank failures and war, especially the City of Glasgow Bank failure of 1878. The incidence of failure due to over-trading during upturns appeared to be slight, with upward movements corresponding to booms only in 1857, 1866, 1899, and 1901.

"The general downward trend", commented Moss and Hume, "after 1880 is probably to be explained by the performance of the economy in the 1880's as businesses recovered from the shock of the 1879 depression, and by an increase in the number of businesses seeking the protection of limited liability, whose failure resulted in liquidation or receivership rather than the sequestration of the partners. Between 1880 and 1890 the number of companies on the Scottish registers almost doubled from 611 to 1192 and there was a similar increase in liquidations."

These were: 1850's - 3904; 1860's - 5162; 1870's - 5581. There were differences in the overall positions of various towns within the survey, and also various trades, with the bulk of failures falling among small shopkeepers engaged in the food trades, and their fortunes corresponding to the trade cycle, as did agriculture generally. The building sector and minerals pursued an a-typical course, but crashed together in 1878 - 9, when two-thirds of firms 'went to the wall'.

A different contention altogether was held by R G Rodger (1975) in relation to his thesis on Scottish building bankruptcies between 1856 and 1913: he declared (p 75):

". . .far from being a helpful adjunct to trade cycle history, bankruptcy data are of much greater significance in isolating both the background circumstances of business failure and the internal workings of industry."

Moreover, sequestration was only a partial indicator of bankruptcy and thus of business failure, (only one of five modes identified by Payne), although a series of statutes in 1772, 1814, 1839 and 1856 had specified the terms, conditions and procedures for independent supervision of both debtors' and creditors' interests through the Court of Session, Rodger suggested that the Bankruptcy (Scotland) Act of 1856 was a milestone either side of which

separate analyses should be conducted.

Rodger's own study covered 3,810 Scottish building firms 1857 - 1913. He remarked that notification of bankruptcy proceedings did not correspond with the actual timing of business failure. So a lag was introduced into the timing of peaks and troughs, thus complicating cyclical analysis. Nevertheless, the turning points and intra-cyclical variations of Rodger's series corresponded closely with those of Moss and Hume, and there appeared to exist a close trade cycle and building cycle connection.

However, absolute numbers took no account of the secular trend and economic composition of the burghs or the balance between town and country and could have produced misleading conclusions regarding the importance of trade or building cycles to the prospects for business success. Payne, too, had found but little coincidence between the cyclical pattern of total dissolution and the trade cycle as representing general movements in the economy.

Crude numbers of failures attached equal importance to the bankruptcy of large and small firms, and therefore varied in significance. As a 'barometer of economic activity' the bankruptcy data needed, it seemed, more than a fair share of caution.

Further finely detailed work on closure rates 1977 - 9 of the 1856 firms in Scottish manufacturing industries using 3-digit Minimum List Headings (Hamilton 1985) following earlier research (Henderson 1980) covered all types of business. Relevant findings were that most closures involve new businesses, typically less than five-years olds. [Churchill 1975, Bowell 1972 (p 57 - 59) Collins 1972]. The relationship between industry growth and closure rate would depend on the strength of that existing between growth and new entry.

Hamilton found that over the cross-section of industries the general nature of this close relationship was unclear and the empirical literature lacked consensus (Beesley 1955; Caves and Porter 1976; Gudgin 1978 p 189 - 190). A positive association was needed between closure rate and the proportion of (very) small business in an industry (Marcus 1967). Other things being equal, vulnerability to closure was a negative function of absolute size and so closure rates should be higher in industries comprising many small units. This rate was found to be 48.5 per cent, or between six and nine time that for larger firms.

It had to be borne in mind that the vulnerability to closure of all sizes of businesses varied with the economic cycle, and because such longitudinal effects could not be incorporated in cross-section analysis, it was all the more important to appreciate the sensitivity of closure rates to fluctuations over

time in economic activity. There were marked inter-industry variations.

During Hamilton's study period, Scotland's unemployment rate increased by 46 per cent; insolvent companies by 57 per cent,

"and notwithstanding the 22 per cent increase in the number of registered companies, as 30 per cent rise in the rate of insolvency. This illustrated the vulnerability of companies to downturns in the economy and sums up the general economic situation at that time."

Scottish Journal of Political Economy Vol 32 No 3 November 1965 (p 333 - 341)

The Scots, as Payne curtly remarked, apparently even resisted the urge to invest in dubious projects promoted during periods of unusual optimism. The hypothesis was tested that companies incorporated during periods of cyclical upswing might be less carefully planned than those projected during depression years.

It was expected that the former, feverishly spawned during boom conditions, might carry a taint from birth which would make itself manifest in a relatively short life; that during the growing excitement of an upswing the habitual prudence of the Scottish investor might have been swept aside. This idea proved to have no foundation: if anything, companies formed during upswings enjoyed a slightly longer length of life than those incorporated during downswings.

"A need for fixed capital beyond the accumulated wealth of the founders and their successors, many of whom wished to withdraw from active participation in the firms that had been instrumental in creating their fortunes, coupled with a desire to reduce their financial responsibilities when the inevitable reaction to the boom set in, brought about the creation of such limited companies (as)..." (p 56 - 7)

APPENDIX 3A10

'London Gazette' as secondary source for early bankruptcies

Bankruptcy figures (TS Ashton 1953) derived from 'London Gazette' 1738 - 41 and 1786 - 1800, with those of The Gentleman's Magazine 1732 - 37 and 1743 - 1785, display violent, unpredictable oscillations about a sharply rising undulating trend, so probably reflecting the dire effects of land enclosure upon cottagers and the upset of the Napoleonic Wars upon the English business community. The graph movement of the crude year-on-year figures would seem to show a natural fluctuation in the 1730 - 1760 decades, ascending into a further four decades of frenetic ups and downs.

Apart from the disadvantage that dates of origin of companies were not found provided in 'London Gazette', this twice weekly publication offered an unsurpassed but extremely diffuse record of officially notified failures of individuals, partnerships and companies between 1780 - 1980.

The information owed its form to pre 1780 legislation and to Bankruptcy Acts 1869, 1883, 1890, 1914 and 1926 and Companies Acts 1856, 1862, 1890 and 1948.

The population of enterprises to which London Gazette legal announcements related was never specified, although from 1891 onwards firms were listed and enumerated.

The year 1780 gave a typical early-dated breakdown of entries as follows:

TABLE 3A/10/1

BANKRUPTCIES	1780	1781	1782	1783	1784
General Total (2027)	205	276	371	406	769
Manufacturing Sector (20)	Nil	5	3	6	6
Metal Trades (GB) (71)	12	8	10	15	26
Birmingham (General) (18)	3	4	4	7	Nil
Birmingham (Metal Trades) (10)	1	1	1	3	4
	221	284	389	437	805

Thus from a sample of 2027 failed business, 20 (1 per cent) were in the manufacturing sector; 71 (3.5 per cent) in metal trades; 18 (0.9 per cent)

located in Birmingham; 10 (0.5 per cent) in the Birmingham metal trades, and this was typical of proportions between national and local levels. Only six out of 120 craft occupations were associated with metals at that date.

The ten Birmingham metal trades failures were:

1780 (1)	Samuel Freeth	Edgetool maker, malt mill-maker, dealer and chapman
1781 (1)	Samuel Wilson	Gunsmith, dealer and chapman
1782 (1)	Thomas Holland	Plater, dealer and chapman
1783 (3)	Ralph Gee and Richard Amphleth	Bucklemakers, platers, dealer and chapman
	Henry Mear	Refiner, dealer and chapman
	Joseph Hall	Watch and clockmaker, dealer and chapman
1784 (4)	Thomas Bolton	Bucklemaker, plater, dealer and chapman
	Joseph Tyndall and Thomas Beck	Needlemakers, partners, dealer and chapman
	William Bacchus	Steel toymaker, dealer and chapman
	David Dick	Plater, dealer and chapman

By 1790, from a total of 891 failures, 60 were in Birmingham and 50 in the metal trades; and so the proportions shifted from quinquennium to quinquennium, with metal trade numbers growing with the company population from decade to decade.

Our research ascertained that City of Birmingham library early bankruptcy records, based on legal announcements in the London Gazette, provided a fairly consistent form of enumeration between 1780 and 1850, as well as a rich mine of historical information through official announcements and despatches. However, these sources provided specific coverage relating to business failures requiring legal procedures, and not by any means saturation coverage of morbidity among partnerships and companies as a whole, when no debt problems arose, or no notification was required (eg: family firms).

At the start of the study period (1780) officially notified bankruptcies covered approximately 150 different trades and occupations, only 1:16 of which concerned the use of metal (excluding [a dozen or more] ironmongers). Industry was very much on an individual or craft workshop basis, largely concerned with processing agricultural products, and this continued over

several generations, more especially in Birmingham.

Because of the large number of tomes involved in this archival aspect of one's own research, and the scattered disposition of the unlisted relevant information, the enquiry was conducted on a quinquennial sample basis, taking June and July and December and January of each year, and multiplying by three.

Although the increase in the overall and in the specific numbers of bankruptcies was considerably unsteady between 1780 and 1850 - presumably parallel to the unrecorded growth of company populations and trading partnerships over that period - the proportions between general and specific bankruptcies remained fairly constant as percentages of the total number of business failures recorded in each time period: viz: - manufacturing and metal trades each 3 - 6 per cent; all Birmingham bankruptcies c 1 per cent; all Birmingham metal trade bankruptcies c $^{1}/_{3}$ per cent, or less.

Such small figures did not readily lend themselves to the construction of long-run time series bearing any meaningful relationship to the general trend of bankruptcies. It did appear that, although the growth of the Birmingham metal trades over this period was very considerable indeed (cf: Tummins), the increase in bankruptcies kept on a par with general increase in bankruptcies in metal trades overall; and therefore, given far greater growth, Birmingham's business climate appeared also to possess greater stability than that of the average industrial location. (A comparison with movements in Hoffmann Index confirmed this general impression).

Legislation affecting the recording of bankruptcies and allied definitions of business failure, or ceased trading, receivership etc, and altering the scope of what was included, was passed in the form of Bankruptcy Acts in 1775, 1869, 1883, 1890, 1914 and 1926 and of Companies Acts dated 1862 to 1890, and 1948. Definitions and procedures were changed, making impossible strict comparisons between the intervening time periods.

Unfortunately, neither archival nor current sources of information about bankruptcies give the dates of origin of the companies, firms, or partnerships listed; nor did they include estimates as to the size of company populations, and therefore of the ratio of failures to survivors on an annual basis; nor any guide as to longevity in specific industrial sectors, so that trends in longevity could be mapped by year/decade of company origin, and by location, sector and size of undertaking.

Thus, despite changing compositions of records and of industrial structures, the Hoffmann index of bankruptcies, based on team research into the London Gazette and other assorted sources of information, probably provides a reasonable guide to the courses of both regional and national levels of business failure 1780 - 1956.

J Parry Lewis "Building Cycles and Britain's Growth" MacMillan London 1963

1856 Companies Act - cotton firms registered and existing "Whereas eight new joint stock companies were registered in the English cotton industry in 1856, and only another eleven during 1857 - 9, the first year of the new decade saw 45 registrations and in 1861 there were 63 - a number exceeding the total formed in the next ten years. The total number of cotton factories rose from 2210 in 1856 to 2887 in 1862, while house-building, at its trough in 1857, rose in sympathy as both population and income responded to the prosperity of the regions."

From my calculations of year on year percentage changes in Hoffmann's Index of bankruptcies, it appeared that a number of abnormal peaks were discernible in the peak year series, (which had staggered natural reciprocals in the trough year series complementing them). These years were 1794, 1809 - 13, 1815 - 18, 1826, 1829 - 30, 1838, 1848 - 9, 1856 - 7, 1867 - 9, 1879, 1886 - 8, 1891 - 4, 1921 - 4, 1927, 1932 - 3, 1937, 1948, 1954 - ie *without regular periodicity*.

Since Hoffmann's Index already displayed an interesting relationship with trends in patents sealed; and as technology increasingly had assumed a determining role in competitive survival of companies; it was also suspected that technical change and technological diffusion would themselves bear on the national long-run rate of economic activity; (although not necessarily assuming any immediate, direct influence on the year on year changes in that activity in the short-run.

APPENDIX 3A11

Predictions of failure from financial ratios

Tafflers' z-score and other methods

The z-score method outlined by Taffler (1983) provided a company profile which could be matched against those for failed and for successful companies to indicate distress. It was developed from a sample of 46 companies going bankrupt between 1969 - 76, and plugged a gap in both theory and practice. his research with varimax - rotated partial component Analysis (PCA) was undertaken with 80 ratios for 92 concerns.

Seven factors accounted for 91.6 per cent of the variance in the data set. They were: profitability, financial risk, working capital position, liquidity, asset turnover, value added contribution, and creditors' position. The probability of a firm failing these 'tests' going bankrupt was about six times greater than for a firm selected at random.

The underlying logic was to divide company finance into inflows; reservoir, including liquid assets; and outflows: the smaller the size of the reservoir of working capital, the smaller the fund flow (and profit) from operations, the larger the claims on resources by creditors, the greater the funds flow required for operations of the business, and the more highly variable the inflow, outflows and claims on the business.

As the economic climate changed, the z-score adjusted and the percentage of companies at risk would vary. These tools, not readily available to businesses at large during our study period, relate to future bankruptcies. They highlight another important variable - the state of the art of management.

As part of a larger study concerned with developing an operational model to predict the financial performance of small UK manufacturing companies, a number of barbed criticisms were developed which together questioned the capacity of small companies' end-of-year statements to reflect 'the true state of company performance'. Steele pointed to the need to cater for a diverse multiple readership; to accounting conventions contrasted with actual practices; effects of inflation on and adjusted inter-year and inter firm comparisons; excess conservatism in small owner - directed enterprises: inconsistent classification of items in the financial statement, and understated profitability therefrom due to directors' remunerations, with limited seasonally biased data generally.

Steele quoted Robson Rhodes (1982) who suggested that the high failure rate of businesses financed under the Government loan guarantee scheme was partially attributable to lack of caution in bank lending. At the time, the banks were entitled to recover 80 per cent from the government in the event of loan default.

Limitations of prediction methods based on financial ratios arose from accounting conventions concerning asset depreciation and the effects on nominal profits; from the effects of inflation; the tendency of accountants towards 'excess conservatism' in the presentation of statements; and inconsistent classification of items in the financial statements between companies with annual turnover amounting to less than £250,000 were exempt from disclosure rules; and seasonal bias arose due to the static end-of-year balances not necessarily representing levels during the year.

Nevertheless, financial ratios could be likened to "instrument readings which measure certain aspects of business health" (p 5). Two investor considerations were maintenance and increase of the value of the capital invested and second, income from the capital invested. From this standpoint, (in)solvency could be measured long-term and short-term by the excess of total and current liabilities over assets respectively.

Beaver (1966) had demonstrated that cash flow to total debt performed better than the current ratio as a test of solvency. His 'defensive interval' measure provided "an estimate of the number of days that existing levels of cash and debtors could finance the projected daily operating expenditures of the firm." (p 7) and combined both short and long term concepts.

The overall measure of financial performance was the Return on Capital employed, howheit involving many definitions and numerous ratios (cf: Dupont system - described by GA Lee in 'Modern Financial Accounting', Nelson, 1981 - utilising sales to capital employed and profit to sales, both seen as measures of 'efficiency').

The lack of distinction was noted between actual short term and long term liabilities; also the desirability of using 'total assets' rather than return on capital employed. Profit before deduction of interest and directors' remuneration might have been a superior numerator. (But which accounting convention was envisaged, historic or current cost?)

Financial ratios were likened to instrument readings which measure two interdependent and critical aspects of business health: the ability of a company to survive and grow, and the efficiency of its financial performance. These were derived from two investor considerations a) maintenance and increase of the value of the capital invested (solvency), b)

income from capital invested (performance and growth), as reflected by the net worth - current, (Short term) or total (long-term) excess of assets of 'net worth over liabilities'.

Ambiguities about the liquidity of short term assets had led to replacement by the 'defensive interval' measure, estimating the number of days that existing levels of cash flow to total debt could finance the projected (daily) operating expenditures of the firm. Financial performance revolved round a firm's ability to generate income and (in the case of quoted companies) the value of its shares. Modifications to return on capital employed (divided under the Duport system into sales to capital employed and profit to sales), were required as sales figures, being legally exempted, were not often disclosed in financial statements of small companies.

In summary, financial statements were found to be based upon conventions which rely heavily on arbitrary judgments and opinions, so only facilitated a comparative 'static' analysis of company performance and took no account of seasonal fluctuations, "window dressing" and other year end bias. Steele suggested profit before deduction of interest and directors' remuneration as a superior numerator.

In Chapter 2, 'Major studies of failure prediction', Steele lists Romsey and Foster (1931), Fitzpatrick (1932), Smith and Walker (1935) as among the earliest, with Merion (1942), Moore and Atkinson (1961), Seiden (1962) showing systematic differences between failed and non-failed companies on a unvariate basis; more recent were Beaver (1966) and Altman (1968). Beaver concluded from a study (of 76 predict failed and non-failed US firms over 36 industries) that reported financial data and ratios had the capacity to predict company failure up to 5 years prior to the event.

Beavers approach was criticised (Neter, 1966) on the grounds that the paired sample design did not provide a random selection. It was more important to identify exactly which 'non-failed so far' firms would fail.

Altman (1968) argued that the financial status of a company is essentially multi-dimensional and consequently, introduced the use of multiple discriminant analysis. "The purpose was still to assess the quality of ratios as indicators of company performance (p 15)". Altman concluded that the discriminant ratio model proved to be accurate in predicting bankruptcy correctly in 94 per cent of the initial sample of 66 'paired' manufacturers, and up to two years prior to the event.

In criticism (Zavgren 1983) it was shown that discriminant techniques select the final variables which are relevant to the particular characteristics of the sample rather than of the general characteristics of the population. Johnson

(1970) claimed that Altman had not proved that ratios have predictive power, but only (ex post) that bankrupt and non-bankrupt firms have dissimilar ratios.

Joy and Tollefson (1975) postulated that (ex ante) predictive power requires inter temporal validation and not merely time coincident cross validation. Altman and McGough (1974) had already obtained results showing an 82.4 per cent level of accuracy one year prior to bankruptcy, and developed (1977) the Zeta model later utilised by Taffler (1983).

Work with 60 firms by Deakin (1972) had already produced results favouring the 'Cash Flow to Total Debt' ratio except for the third year prior, when the ratio of Total Debt to Total Assets was the most accurate predictor. Rationale suggested that as failure approaches, negative net income impairs the firm's cash flow and total debt increases.

The limitations of these studies remained evident - they were all sample specific. Libby (1975) utilised factor analysis (principal component analysis) to identify as a first step five independent sources of variation within Deakins' 14 variable set, typified as profitability (net income/total assets) activity (current assets/sales) liquidity (current assets/current liabilities) asset balance (current assets/total assets) and cash balance (cash/total assets) and obtained good results.

However, as Altman pointed out (1982) the results may have been overstated because in practice the bank loan officers (who carried out the predictive exercise) would not know the prior probabilities of the sample. Deakin (1977) built on Libby to produce both 'linear' and 'quadratic' results of 94.41 per cent and 83.92 per cent overall accuracy on a sample of 143 firms, with validation carried out on 1780 firms. Two years prior to date only were considered. Deakin concluded that financial ratios in a discriminant model can predict business failure with a high level of accuracy, but did not investigate further cases of conflicting evidence.

Edminster (1972) used the technique with one 'tri-annual' sample of 42 loss borrowers and 42 non loss borrowers from the US Small Business Administration and one sample of one-year comprised of 562 firms in each category. He set up four hypotheses to test ratios as predictors, utilising a zero:one regression technique.

All the results showed an overall accuracy of at least 90 per cent in classification of companies, with a 'grey area' designated for the remainder to be subjected to further investigation. Edminster concluded that the predictive power of ratio analysis depends on both the choice of analytical methods and the selection of ratios. His validation test may not be adequate because the characteristics of the initial and secondary samples are the same.

Blum (1974) developed a failing company model which the Courts would utilise to assess objectively the likelihood of business failure when this had been proposed in defence of a merger under US Anti-Trust law. A paired sample of 230 firms 1954 - 1968 was tested with variables derived from the three common factors of liquidity, profitability and variability, again with good results and conclusion that this FCM model had the same level of accuracy as Beavers best ratio:- cash flow to total debt.

In his discriminant studies, Blum utilised a simple cash flow framework in order to mitigate "search bias" in the selection of variables. Taffler (1982) concluded that dramatic changes in the UK economy and major changes in the system of company taxation questioned his model's subsequent intertemporal validity. The volatility of ratios from one year to the next also precluded any form of statistical analysis.

During 1978 - 79 the Bank of England (1982) supported a project to develop a model derived from financial data which would predict company financial distress. The sample consisted of 38 failed and 53 non failed large quoted industrial companies. A number of financial ratios were combined, included fund flow ratios. The single ratio of cash flow to current liabilities was found to be a significant discriminator.

Later work on classification by Earl and Marais (1982) reported 93, 87 and 84 per cent accuracy for the three years prior to failure respectively. Criticisms centred on marked variations in profitability between companies due to different depreciation and asset revaluation policies; delays in financial statements (especially in failing companies - Wittred and Zimmer (1984) found they become larger): more especially, "experience showed that problems in failing companies tend to multiply in very short space of time." (p 33)

Based an initial work by K Chandresekaran (1980), the UK export Credit Guarantee Department Study (1983) hoped to discover whether a discriminant function derived from a sample of clients would be an improvement on other z-score models. The sample consisted of 36 failed and 36 non failed firms paired by industry and size. All 36 firms had failed in or around 1980.

Extracted from statements, 22 financial ratios were calculated. Although results from this and other models tested with the same data were comparable, the conclusion that the ECGD Model was 'data dependent' and needed periodic recalibration was (inevitably) recommended. A statistical technique which does not require normally distributed data - 'conditional logit analysis' - (cf Hamer 1983) gave results similar to those of discriminant

analysis. No indication was given as to whether size of company selected or structure of financial statement was representative of the sample frame.

Booth's (1983) study was designed to test the value of decomposition measures in the discriminant analysis approach following work by Levi (1969) and Walker (1979). A paired sample of 84 companies matched by asset-size, industry and financial statement data was involved. he concluded that the model had little useful predictive ability - decomposition measure of failed and non-failed firms did not differ significantly.

Wilcox (1976) aimed to adopt the "gamblers' ruin model" as a theoretical basis and then apply the data. A paired sample of 52 firms which failed between 1955 and 1971 was selected and matched by industry, size and availability of data. This model also produced high overall levels of accuracy and "focused upon the dynamic factors that determine a firm's financial risk and hence its success or failure. In addition, the model highlights the controllable factors for remedial action by management."

Hamen's (1983) study was designed to compare the performance of various failure prediction models when applied to the some data set. The sample consisted of 34 paired and matched manufacturing firms. For each variable set, the three methods - linear discriminant, quadratic discriminant, and logit analysis - yielded comparable results. Chi-test showed that the results were not sensitive to the choice of variables, financial ratios and statistical techniques.

Other studies by Elam (1975), Diamond (1976), Ohlson (1980) attempted refinements, but these "did not produce a significant improvement in predictive accuracy over previous studies."

The evidence suggests that failure prediction models developed from a 'pure empircist' approach are data dependent and more attention should be given to the development of a theoretical framework. As regards statistical methodology, continuous refinements have not produced significantly better results. (eg: Zavgren (1983) criticism of Diamond's pattern recognition model).

Multiple discriminant analysis

Statistical Technique The difficulty with the univariate approach is that classification can take place for only one ratio at a time. The potential exists for finding conflicting classifications of any given firm according to various ratios. Most of the variables are highly correlated. This makes it difficult to determine overall group difference without the danger of redundancy and inconsistency. One approach is to make an arbitrary choice of the best predictor. However, the financial status of a firm is actually

multidimensional and no single ratio is able to capture these dimensions. Hence Altman (1968) pioneered the use of multivariate discriminant analysis in corporate failure prediction, which resolves this problem but does not necessarily produce consistent results.

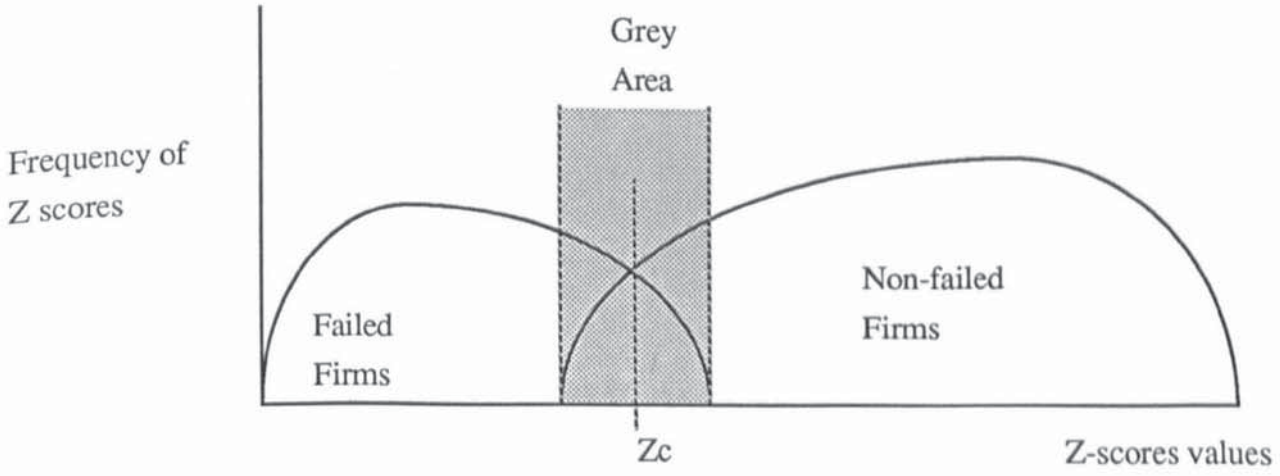
Discriminant analysis is used for statistically distinguishing between two or more groups. The technique at its simplest, forms linear combinations of ratios which best discriminates between the groups being classified. The 'discriminant functions' are of the form,

$$z = \text{Constant} + C_1 \text{ (ratio 1)} + C_2 \text{ (ratio 2)} + \ldots + C_n \text{ (ratio n)}$$

where Z_1 = overall discriminant score
$C_1 \ldots C_n$ = coefficients which may be positive or negative.

Thus the multidimensional nature of the firm is reduced to a single overall score. If Z_c = cut off score, a company is classified as non failed if $Z_i > Z_c$ or to the failed group if $Z_i < Z_c$. The cut off point Z_c is chosen based upon the prior probabilities and the cost of misclassification. In figure A1, the shaded areas to the left of Z_c represents the number of non failed companies misclassified as failed (Type II error) and conversely, the shaded area to the right of Z_c denotes the number of failed companies misclassified as non failed (Type I error).

A1 DISTRIBUTIONS OF FAILED AND NON FAILED FIRMS



APPENDIX 4.A.3

Q2 - Classified Sub-Headings A - Z (46)

Process - Engineering

Bearing Manufacturers
Bolt and Nut Manufacturers
Brassware Manufacturers
Diecasting and Casting
Diesinkers and Stampers
Dust and Ventilating Plant
Enamellers
Forgings and Stampings
Heat Treatment (Metals)
Metal Polishing
Metal Spinning and Pressings
Precision Engineers
Stampers and Piercers
Steelmakers
Tube and Section Benders

Manufacturing - Fabrication

Electroplate Manufacturers
Engineering Machine Shops
Furnaces - Industrial
Machine Toolmakers
Steel Fabrications
Tool Manufacturers and Suppliers
Welders

Manufacturing - Assembly

Car and Coach Bodybuilders
Cycle Manufacturers
Fork Lift Truck Manufacturers
Lift Manufacturers and Repairers
Scaffolding Erectors

Manufacturing - Production

Fan and Blower Manufacturers
Fixings and Fastenings
Hardware Manufacturers

Hydraulic Plant and Equipment Manufacturers
Machine Tool Accessories
Metal Smallware Manufacturers
Motor Cycle Accessories
Pipe, Tube and Fitting Manufacturers
Press Tool Manufacturers
Radiator Manufacturers
Roller Shutter Manufacturers
Scales and Weighing Equipment Manufacturers
Screw Manufacturers
Spring Manufacturers and Suppliers
Trophies and Medals Manufacturers
Truck, Barrow and Trolley Manufacturers
Precision Turned Parts

Each of the above classifications had 13 or more companies listed under it, and therefore one or more firms in each was circulated with Questionnaire No 2. (The above minimum list headings in the revised 1980 Standard Industrial Classification bore numbers 32000 - 37400).

COLOUR CODING OF Q2 DISTRIBUTION

	Colour	Category	Location	Sent	Returned %
a	Blue	Local metal-workers	Birmingham	110	13 (11.8%)
b	Yellow	Local metal-users	Birmingham	26	10 (38.5%)
		Local metal-users	Outside Birmingham		
c	Purple	WMCC Assisted Companies	Region	12	3 (25%)
d	Green	Steel and Ferrous Foundries	Region	31	3 (9.7%)
		Ferrous Foundries	Birmingham	17	1 (5.9%)
		Non-Ferrous Foundries	Birmingham	12	2 (16.7%)
		Foundry - Engineers	Birmingham	9	1 (11.1%)
e	Pink	Engineering Employers Federated	National	~~44~~	11(25%)
f	White	QI List of 100+ Companies	Birmingham	72	24 (33%)
				333 =	68

With deductions for envelopes returned to sender the overall response rate was 21.3%

CODING OF REPLIES

The back of each coloured questionnaire sheet and the back of each envelope was coded with a numerical identification number, thus enabling respondents to be checked against address lists.

These numbers were then superseded by an alphabetically based series when the answers were batched together under separate headings.

CRITERIA FOR DETERMINATION OF COMPANY SIZE*

	Nominal Capital	Nos Employees	Sales Turnover
SMALL	£100+	1-49	£10K - £1M
MEDIUM	£1,000+	50 - 499	£1M - £50M
LARGE	£10,000+	500 - 4999	£50M - £500M
GIANT	£1,000,000+	5,000 - 50,000	£500M - £5,000M

* Based on Bolton Report and other studies

APPENDIX A4/4

Questionnaire No I of Postal Enquiry

Numerical summary of valid replies received

A total of 72 companies were circulated; from which 24 valid replies were received by first class post; thus yielding a response rate of 33 per cent from centenarian Birmingham companies in metal industries.

Question 1

Main *activity* of business: (counted with secondary and tertiary activities)?

	No: Replies	
Basic		
1 Foundry	1	
2 Process Treatment	5	**14**
3 Engineering	8	
Manufacturing		
4 Fabrication	4	
5 Assembly	8	**26**
6 Production	14	
Service		
7 Merchanting	4	
8 Wholesale Supply	3	**11**
9 Retailing	2	
10 Other services	2	

Question 2

Which category of *ownership* best describes your company?

1	Private Partnership	None
2	Family Enterprise	2
3	Private Limited Company	13
4	Unlisted Public Company	None
5	Public limited Company	3
6	Financial Holding Company	None
7	Division of Corporation	2
8	Group Subsidiary Company	4
9	Multi-national Company	None
10	Part of a Conglomerate	None

Question 3

Are your company *premises* mainly:

1	Freehold	19
2	Leasehold	1
3	Mixed	3
	(No reply)	1

Question 4

In which *location* is your registered office?

1	Birmingham	21
2	West Midlands	1
3	Another Assisted Area	1
4	Unassisted Area	None
5	Outside UK	None
	(No reply)	1

Question 5

Roughly what proportions of your companies' products:

1	consist mainly of metal?
2	are produced by automated methods?
3	could be produced using robotic systems?
4	might become replaced by non-metal substitutes?
	(2/24 companies: No reply)

Question 6

		Replies	Non-replies
a	Does your company posses a written company history?	10	14
b	In what year was it published?	10	14
c	Which anniversary (if any) did this mark?	10	14

d	In which year was year company founded?	22	2
e	By whom?	22	2
f	Where?	21	3
g	When did your company became incorporated?	19	5
h	When did your company 'go public'?	5	(19)
i	What were your original products?	20	4
j	Do you now hold internat-ionally recognised patents?	7	(17)
k	How recent is your latest installation of new technology and/or equipment? (which year?)	16	8
l	When was your last internal reorganisation?	15	9
m	Has your company changed name since it began?	10	(14)
		187:	125

Question 7

Some writers on company history contend that firms evolve, in terms of their 'control', generally as follows: I, II, III.

Does this theory fit the history of your firm?

Yes	16
No	6
Doubtful	2

(No reply	None)

At which stage I, II, III, is your firm now?

Individual Founder I	2
Private Shareholders II	15
Public Shareholders III	7
(No reply	None)

Question 8

While most companies operate simultaneously at many levels, there may exist a sequence to the policy emphasis given at each stage of development:

1 operation
2 marketing
3 transportation
4 finance
5 administration
6 corporate strategy
7 global relations

a Do you think this sequence has been followed in the case of your company?

Yes	4
No	10
Doubtful	2
(No reply	8)

b At which phase of policy emphasis is your company now?

One	3
Two	6
Three	2
Four	4
Five	3
Six	3
Seven	None
(No reply	3)

Question 9

Why, specifically, in your view, has your company *survived* so long, when so many others have failed?

Summary of 23 replies (one 'No reply')

Because:

1 We have kept in the forefront of new technology.
2 Ability to continuously pioneer specialist work in a range of new materials.
3 Unique craft skills of a flexible customer-tailored products.
4 Minimal competition and own designs exclusive within their field (Not posing a threat to anyone).
5 Pride in producing competitive quality products by modern methods at the right time and right price.
6 Maintenance of high standards of service to existing customer network, retaining confidence by means of fair prices.
7 Determined marketing, including withdrawal from narrow/declining product markets and switching into broader, long-lasting opportunities.
8 Hard work and gradual evolution under keen competent, sensitive and adaptable management.
9 Conservative attitude to spending, change, with profits ploughed back into new investment and maintaining business at its optimum size.
10 Consistent family control and involvements with dynamic direction and motivation to provide a friendly and personal service.

(This condensed summary of an assortment of written answers varying from staccato through laconic to euphoric and verbose has a milesian and jingoistic flavor (mainly absent from the originals) due to the pre´cis process.)

Question 10

Does your company

		Yes	No	NR
a	Coordinate *policy* from a central office?	20	2	2
b	1. Undertake regular short-term internal *forecasts*?	19	3	2
	2. What period ahead do they cover			(8)
c	1. Make regular *predictions* about trading conditions for your industry and your region?	6	10	8
	2. How far ahead do they go?			(8)
d	1. Make your own *projections* regarding the future state of the national economy?	6	17	(1)
	2. What time period do they encompass?			(9)

e Are your company's *expectations* altered by your recognition and monitoring of business cycles?

Greatly	5
Moderately	7
Marginally	4
Not at all	7
(No reply	1)

f Do your business *strategies* consider economic fluctuations?

Explicitly	3
As part of an ongoing review	12
Not considered important	8
(No reply	1)

Question 11

a Which *economic fluctuations* seem the three most important when planning the survival and prosperity of your company? (1-3)

Financial	12
Industrial	8
Political	4
Economic	12
(No reply	36)

		Yes	No	NR
b	Do the cycles known to you behave predictably?	9	7	8
c	Is there a trend which repeats periodically?	6	10	8

d What in your opinion causes the cycles in which you are most interested?

Financial	1
Industrial	1
Political	5
Economic	3

APPENDIX A4/6

Summary of Some Replies to the Survival Question 9

Category	Epitomé	Rating of Survival Stance
Product (OI)		
1	Pride of product.	Passive-High
2	Quality Product at right time and right price with 20 year surveillance of annual cycles in metal prices.	Proactive-Medium
3	Endeavouring to remain competitive and discovering new replacement markets.	Passive/Reactive-High
4	Wide range of established specialist products supplied in limited quantities.	Reactive-Medium
5	A very wide range of products.	Passive-Low
6	Competing consumer products.	Passive/Inert-High
7	Marketable products plus ability to adapt	Reactive/Active-High
8	Unique craft skills, minimal competition, production designs for customers held and used exclusively.	Active-Medium
9	Developing and manufacturing a specialised range of products for use in a particular field of activity, which while it has grown over the years, is not regarded as one of high volume coupled with short product life.	Active/Reactive-Low
10	Continued product development to permit modern methods of manufacture and accommodate up to date marketing techniques whilst maintaining the highest level of quality.	Active Reactive-High

Category		Epitomé	Rating of Survival Stance
Product (O2)			
1	We produce a limited product which gives a solid base to the foundry itself.		Passive/Reactive-Low
2	Excellent products which achieve quality and reliability standards expected.		Active/Reactive-Medium
3	Broad product base, reaction to markets, development of export business, coupled with active management and a comparatively non-militant workforce.		Active/Reactive-High
4	Product innovation originally: in last two decades, management flexibility.		Active-Med, High
5	We specialize.		Reactive-Medium
6	Supply of highly specialised product for which there is a continual requirement. There is no competition, but we fight with price, quality and delivery together with technical back-up.		Reactive/Active-High
7	Product excellence and technological expertise.		Active-Medium

Category		Epitomé	Rating of Survival Stance
Technology (O1)			
1	Operation at the forward end of technology, making specialized equipment for many industries through 'core' expertise.		Reactive/Active-Med/Low
2	Continued investment in newest technology combined with determined marketing.		Active-Med, High
3	Related pioneering work in new materials; well designed products, large customer network.		Active/Reactive-Medium
4	Constantly Maintaining technological progress and good service to customers.		Active-Medium
Technology (O2)			
1	Anticipated change and kept up-to-date via US associate company technology.		Active-Med, High
2	Product technology backed by inter-national marketing in stable long-term markets.		Active-Medium
3	Abreast of-the-times technically and commercially and providing up-to-date client/		Active-Med, High

	customer service.	
4	Development of ideas proceeding in live with constant trend of family commitment over 50 years.	Active-Med, High
5	Technological innovation.	Active-Medium
6	Specialised investment in indispensable technology for market niche.	Proactive-Med, Low

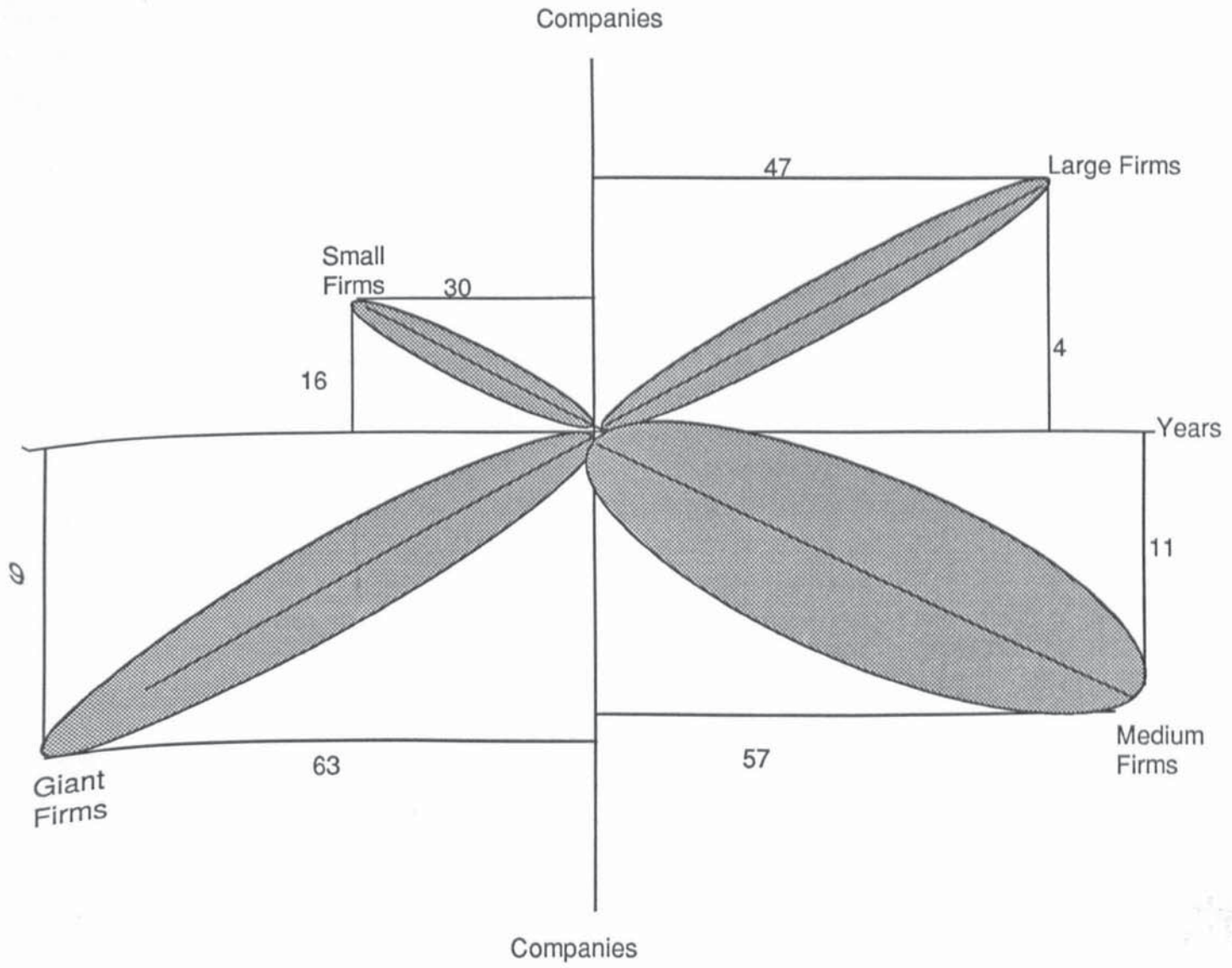
Category	Epitomé	Rating of Survival Stance
Marketing (O1)		
1	Stable relations with customers and workforce with a policy of gradual evolution by keen and sensitive management having a conservative attitude to spending and investment.	Passive/Reactive-Low
2	Combination of recognition of new market opportunities and response to declining markets by withdrawal.	Proactive/Reactive -Medium
3	High levels of customer confidence in over delivery and quality performance. We work hard, don't get bagged down in business theory and have very competent middle managers.	Active-High
4	Friendly, personal service, based on price and kept deliveries by owner and son.	Active-Medium
Marketing (O2)		
1	Small unit in large market.	Passive-Medium
2	Sole supplier of small quantity service.	Reactive/passive-Medium
3	Making and marketing own product.	Active-Med, High
4	Service to customers and a flexible attitude to production.	Reactive-Med, High
5	Special knowledge of limited market.	Reactive-Med, Low
6	Customer service combined with quality products.	Active/Reactive Medium
7	Early involvement in a buoyant market established a strong UK presence in a business less affected by recession than most - until recently.	Active/Reactive-Medium

Category		Epitomé	Rating of Survival Stance
Management (O1)			
1		Prudent management.	Reactive-Medium
2		Hard work and ploughed-back profits.	Active/Reactive-High
3		We recognized long ago that any company has an optimum size is.	Passive/Reactive-Medium
4		Never big enough to be a threat to anyone.	Passive/Reactive-High
5		Consistent family control plus a resolve not to be stamped into radical change.	Passive/Inert-High
6		Personal involvement of owners in specialised concern. Size of business has been limited.	Reactive/Passive-Medium
Management (O2)			
1		No reason.	Inert-Low
2		Original company did not survive.	Inert-Low
3		Keen pricing coupled with a first class delivery service and strict control on credit given.	Active-High
4		No response	Inert-Low
5		Role of previous chairman enabled company to flourish but salvage operation now in process as company is oiling through effects of bad management.	Active/Reactive-High
6		Gave up direct sale products to concentrate on basic and converted site into developed factory estate.	Proactive-Medium
7		Kept small and flexible and give a service second to none.	Reactive-High
8		Young managers and employees adapting to new methods backed by total commitment of the family to business survival.	Active/Reactive-High

Category		Epitomé	Rating of Survival Stance
Management (O2)			
9		No response.	Inert-Low
10		Willingness to keep overheads and costs in line with the business that can be obtained.	Reactive-High
11		Large reduction in workforce, discontinuing improfitable lines, transferring some part of the former business; concentrating capital	Proactive/Active-Med/High

	expenditure in most profitable areas; keeping unit costs low and monitoring cash flow.	
12	No response.	Inert-Low
13	Effective information and management control systems, prompt management active to reshape workforce and reorganization to deal with fundamental change in basic technology.	Proactive-Med/High
14	Good management; even above well-established market share of product innovation.	Active/Proactive-Med/High
15	Newly founded. (on - a)	(Perforce) Inert-Low
16	Not surviving.	Passive-Low
17	No response.	Inert-Low
18	Exceptional hard work by senior directors; moderate wage levels from top to bottom, including directors; excellent quality and design of product; loyalty by majority of workforce.	Active/Proactive-Med, Low
19	Major corporate strategy revision; energetic management, move into robotic products.	Proactive-High
20	Good management prepared to change with times and to take and implement difficult decisions.	Active-medium
21	No response.	Inert-Low

Diagram 4A.6/1 Leaf-Pattern of Company Longevity



The Breadth of each 'leaf' signifies the ratio of the range of answers to the total longevity for each size f company.

APPENDIX A4/7

Foundry - Process Sub-sector Analysis (Q2)

Sixteen respondents in this sub-sector came from the mixed distribution categories, twelve listing foundry work as their main activity, four each under the headings steel, ferrous and non-ferrous. Four other companies listed process treatment as their principal activity. Six out of the sixteen gave engineering as a secondary or tertiary activity. Ten were private limited companies, two each public companies and group subsidiaries and one each a family concern and a multi-national corporation. This spread accorded well with the survey sample intended.

Companies grouped themselves as to size (based on the reference matrix forming Appendix A4/3) as follows: seven were small; five small to medium size; two medium to large; two giant firms. The average nominal capital for a small firm from this sample was £100,000; for a giant corporation, £40m. Averaged sales revenues were £30,000 in smaller companies, £1m in medium-sized: the largest of the giants was a group subsidiary recording £175m annual group sales turnover; the other had £155m sales and owned 72 subsidiary companies. Size was very apparent.

Four companies held leasehold property, twelve owned freeholds. Just one mentioned this aspect as a possible reason for their survival. Another firm, assisted by the West Midlands County Council, enjoyed preferential access to a leasehold premises on beneficial terms.

The entire response was 'on target' in that all or most of their products were made from metal. Use of automated methods was evidenced by only seven companies, which is possibly a reflection of the type of work actually undertaken. The use of robotics was mentioned by a minority. Ten firms answered that some or few of their present products might be replaced by non-metal substitutes, thus indicating their vulnerability to change and/or competition in their present practice.

Acquisition of internationally recognised patents did not figure heavily in the sample - only four out of sixteen companies confirmed this point. Installation of new technology had been undertaken by thirteen firms, in nine cases during the then current year. A similar pattern emerged from the latest internal reorganization, with six in 1984 and five in the five years previous. All the large firms, (having available more staff/time?) figured amongst the most progressive. (This result may derive from the probability that mainly 'active' firms responded to the Questionnaire!)

It is possible to summarize that the foundry-process sub-sector portrayed on extremely variegated but alert sample of metal handling companies modernising themselves in 1984 - 5; incidentally, a recovery year following three of near-crisis had succeeded a more prosperous era 1977 - 79, when recession struck.

Engineering Sub-sector Analysis (Q2)

Six companies classified as general metal working and five avowedly engineering firms (having a membership of the Engineering Employers' Federation in 1980) together with one each of firms classified as local metal user and foundry comprise this sub-sector. Every one of the thirteen companies entered engineering as their main activity, and seven listed either manufacturing production or assembly as their secondary activity.

Categories of ownership were distributed between four private limited companies, three family enterprises, three group subsidiary companies, two public limited companies and one multi-national corporation. Eleven of these owned freeholds, the other two having mixed freehold and leasehold tenure of sites and premises.

By size, four (or five) were ranked small firms; (two) or three medium; three large and three giant companies. The average nominal capital of the small firms was £3K, of medium of firms £310K, large £520K but of the giant corporations £27.5M. Average employments of these firms by respective sizes were 16; 213; 4,533; and 44,587 persons. Average sales turnovers in 1980 were £0.5m, £2.8m, £178m and £827m. The dramatic escalation of these figures reflects the scales of operation and the degrees of capital intensity required to produce high value outputs having high returns through equipment which depreciates rapidly.

Ten respondents confirmed that all or most of their products were of metal; seven claimed that most or some could be automatically produced, four that few or none could. Three did not reply, possibly indicating either uncertainty or discomfort with this. Only ten companies coordinated policy from a central office; three did not; three others did not respond. *Twelve avowed that they undertook short-term internal forecasting over periods ranging from one month up to twelve; one did not; three others did not respond.*

Seven companies denied making regular predictions, six confirmed, but with time-spans ranging from four months up to five years. As for *projections about the future state of the economy, 'Noes' out numbered 'Ayes' by eight to five,* time periods for the latter ranging from six months up to five years.

Four companies did not consider economic fluctuations to be important in forming their strategic policies; one explicitly averred that they were very important; seven others considered them as part of an ongoing review. Eight companies saw a trend which repeated periodically, five others did not. In each question, at least three companies (not the same three) failed to answer.

Tapered responses continued into the final section, where four firms did not reply to questions relating expectations, cycles, predictability and causes together. One company answered that expectations were 'greatly' altered through recognition and monitoring of business cycles; four; 'moderately'; three 'marginally'; then four 'not at all'.

Thus three-quarters of respondents recognised a degree of relevance of these questions; only three thought that cycles behaved predictably, but nine did not; and herein lies a major difficulty: in retrospect, cycles appear with noticeable regularity, but in prospect conflicting signals make any decision on this basis a risky proposition. **Hence the reluctance to admit cycle theorists into the strategic planning process and the preference for continuous review.**

Manufacturing Sub-sector Analysis (Q2)

Six out of twelve companies in this manufacturing sub-sector were metal-using firms in Birmingham; surprisingly, there were another four listed as members of the Engineering Employers' Federation; two more were firms assisted by the West Midlands County Council before its demise in March 1986. In nine cases, their principal activities were in manufacturing, either production (4) assembly (3) or fabrication (2); three other firms were centred one each in merchanting, wholesaling and other services, with manufacturing as a secondary activity. The four EEF member companies listed engineering as only their secondary or tertiary activity, with some form of manufacturing coming first.

Half the sample were public limited companies, two private limited companies, are a family enterprise, one a multi-national corporation and two group subsidiary companies. None were sole traders, private partnerships, unlisted public companies, financial holding companies, or parts of a conglomerate organization.

An unusual, even balance between freehold and leasehold sites and premises was instanced in this sub-sector, with two respondents having mixed hereditaments. One firm, (a multi-national), possessed over 60 sites, dispersed, and including all three categories of tenure.

Although three firms had nominal capital of £100, the average for small firms was £20K, for medium-sized firms £196K, while one giant (national corporation) quoted £230m. The six small firms employed an average 20 persons each (range 3 to 47); the two medium-sized 140 persons each an average; the four giant corporations employed an average 25,240 persons each. One owned over 120 subsidiary companies. Sales turnovers covered the vast range of £875 pa up to £1,423m pa (multi-national). The average for non-giant firms was £2.6m sales turnover per annum.

Respondents' indications about the possible use of robotics were conservative, eight firms replying that 'some' or 'few' products and /or processes might become involved, two that 'none' would, with three non-replies. One company said that 'all' its existing products might become replaced by non-metal substitutes; ten others thought 'some', 'few' or 'none' might be replaced. Internationally recognised patents were held by eight out of the thirteen firms. The more global the scope of operations, the more likely it seemed that firms would possess these patents.

New technology had been introduced by eleven of the companies 1982 - 5 (nine in 1984 - 5), with two non-replies. Internal reorganization had been carried out by twelve companies (eight 1984 - 5). Those firms active enough to return the questionnaire also demonstrated a highly progressive innovation profile.

Average company longevity for the batch was 72.1 years, the four oldest firms averaging 117.5 years each; but the longevity range beginning at 15 years and extending to 153 years at 1980 itself demonstrates how misleading an average from a small sample might become. All the above firms still survived as companies during 1985 - 6.

Historically, seven firms had changed name since foundation, four had not; (two did not reply). Ten recognized the Chandler development stages, two denied them. Three companies each were at stages one and two, and six at stage three of this hypothetical model.

Only four respondents confirmed the policy emphasis sequence, but all bar one were able to place their current position on the scale, resulting in a distribution: three (operation), one (marketing), two (both operations and marketing), one (finance), two (corporate strategy) and one (global relations). These positions reflected the size and/or current preoccupation of these firms. (one did fail to answer this question).

Ten companies agreed that policy was coordinated from a central office, three that it was not: (one non-reply). Eleven companies undertook regular short-term internal forecasts, eight having time horizons of twelve months

in a range spanning from three months up to five years. Nine companies made regular predictions about trading conditions for their industry and region having an average time horizon of three years in a range spanning one to ten years. Four did not.

Projections regarding the future state of the economy were made by six firms, while seven did not do so; time periods encompassed averaged four years. Only one firm explicitly considered economic fluctuations when forming business strategies (an extraordinary situation in such a fluctuation prone industry). Eight firms did so as part of an on-going review, while three did not consider it important. *Ten firms saw no periodically repeating trend, although three did so.*

Expectations about business prospects were 'greatly' or 'moderately' altered in eight instances, 'marginally' or 'not at all' in five, with twelve negative declarations against the possibility that cycles behaved predictably. Regardless of whether cycles do in fact behave predictably, answers to these questions by this batch of respondents evidenced a strong belief to the contrary - *a belief which might be interpreted as confirming the active or reactive stance of management rather than the practice.*

This sub-sector also showed a much more even-scoring response as to which years 1968 - 84 were boom years, which were crisis. Some busy firms did well in years when many others experienced lean times, especially 1980 - 84.

This sample, too, was very much a target, in that eleven firms declared that 'all' or 'must' of their products were metal. Curiously, responses concerned with automation of production, robotic applications, and non-metal substitution were much more tapered than in other batches, with nearly 80 per cent majorities in the negatively - weighted bands of response, 'some', 'few', and 'none'.

Only four firms, moreover, held internationally recognised patents, three of them EEF giant firms, one a WMCC - assisted company of medium-size. Introduction of new technology also appeared to be somewhat less recent, although half to sample had done so within the past two years, and as many as nine had carried out internal restructuring in 1984 - 5.

Only three of this batch possessed written company histories. Their average longevity was 41.4 years; the three oldest having survived on average 84 years in a range going, in 1980, from three to 97 years. Eight firms had changed their name since foundation, often in step with an altered pattern of ownership.

Opinion was evenly divided about recognition of the Chandler thesis; only

four firms were prepared to assent to the proposed sequence or evolution in policy emphasis. Seven firms avowed that they were in private ownership, with organizing line managers putting in administrative systems; three were publicly owned and served by boards of directors controlling teams of career managers. The spectrum of policy emphasis was: marketing (4), corporate strategy (2), administration (1) and global relations (1). Since four failed to reply, it would be invalid to generalize here.

Ten firms coordinated policy from a central office, nine undertook regular internal forecasts covering periods of from one month up to five years; seven mode regular predictions concerning the state of their industry and region spanning from one to ten years, (average overall four years). Nine firms did not make projections regarding the future state of the national economy: the three firms which did so covered time horizons of one, three and ten years.

While two firms did not consider economic fluctuations important as an element of their business strategies, three did so explicitly (two giants and one small firm), while the remainder did so as part of an on-going review. Only three recognised any periodically repeating trend; but nine acceded that expectations were moderately or marginally altered by their recognition and monitoring of business cycles; however, none of these nine believed cycles to be predictable.

It seems that this manufacturing sub-sector also experienced more definite prosperity 1973 - 79 than did the foundry, process treatment and engineering sub-sector of questionnaire No 2, but nevertheless experienced a far more grave extent of crisis in the years 1950 onwards.

APPENDIX A4/8

Miscellaneous Summaries

A breakdown of the sample showed 35 private limited companies, eight each for family enterprises and public limited companies, one division of a corporation, ten group subsidiaries and three multi-national companies. The sample did not include sole traders or private partnerships, unlisted public companies, financial holding companies or divisions of a conglomerate.

Private limited company form was recorded by 62.5 per cent of the QI sample, 49 per cent of the Q2 sample, yielding an overall average of 54 per cent of companies. Percentages for freehold tenure were 79 per cent, 68 per cent, yielding 72 per cent.

The following ranges of averaged estimates of company size were also derived from both questionnaires: nominal capital £3,700 to £7.5 million; employees 22 to 33,000; sales turnover £274,000 to £859 million; numbers of subsidiaries one to 62, covering small, medium, large and giant companies.

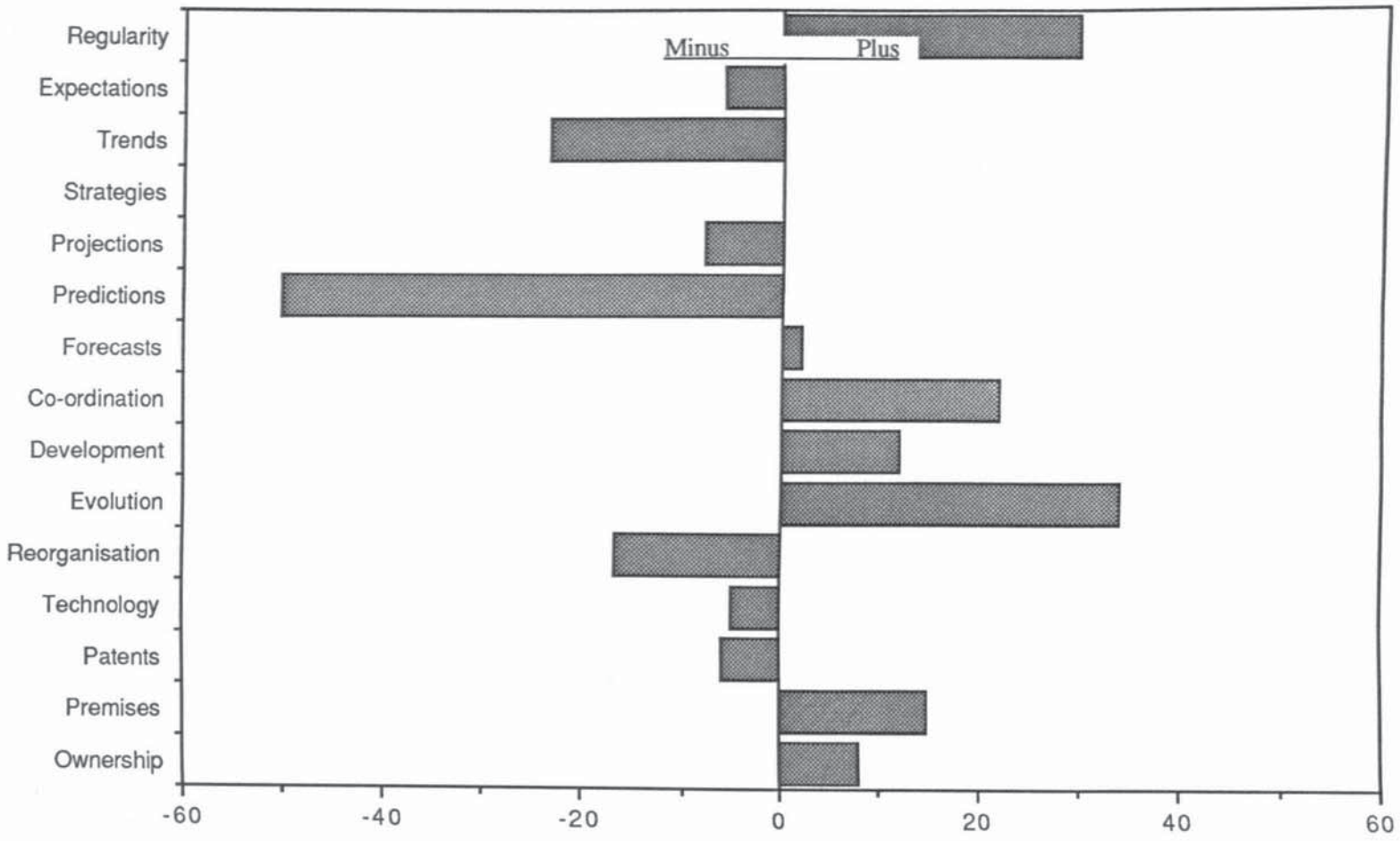
Answers to Question 6b, c, d, showed that all or most products were produced through automated methods by 18.5 per cent of companies; 7.7 per cent agreed that robotic systems could be used on all or most of their products; 9.2 per cent that all or most products could be replaced by non-metal substitutes. Around 20 per cent of respondents marked 'non-applicable' as a reply. Advanced production methods tended to be favoured by the larger companies; small and medium sized firms preferred renewal of conventional plant and equipment by a 3 - 1 majority.

While 9.5 per cent of firms were wholly engaged with metal goods, only 27 per cent utilised automation, only 9.6 per cent contemplated the use of robotic systems, and just over 7.3 per cent conceded that a proportion of their products could be substituted by non-metal replacements.

Diagram 4A.8/1

Questionnaires compared (Differences of percentages)

QI from Q2 (Converted)



APPENDIX A4/9a
OUT-TURN OF QUESTIONNAIRES No 1& No 2

Nos.	Subject	QI	Foundry	Engineering	Manufacturing	QII
1	Sectoral activity	all/24	GF FF NFF PT 4 4 4 4	13	12	41
2	Ownership	private 54%	private 65.20%	private & family 54%	PLC 50%	private 46%
3	Premises	Freehold 83%	Freehold 75%	Freehold 85%	Freehold/leasehold 50%	Freehold 68%
4a.	Nominal Capital	n.a	S £100K M- L- G £40M	S £3K M £310K L £520K G £27.5M	S £20K M £196K L- G £230M	S £3-100K M £196-310K L £520K G £27.5-230M
4b.	Empolyees	n.a	n.a	S 16 M 213 L 41533 G 44587	S 20 M 140 L- G 25240	S 16-20 M140-213 L 4533 G 25-44500
4c.	Group sales	n.a	S £30K M £1m L- G £175M	S £32K M £2.8m L £178M G £827M	S £875K M £2.6m L- G £1423M	S £30-875K M £1-2.8m L £178M G £175-1423M
4d.	Subsidiaries	n.a	1 - 72	n.a	1 - 120	1 - 120
6j.	Patents	33%	25%	61.50%	25%	Av.39%
6k.	Technological innovation	67%	81%	85%	50%	Av. 72%
6l.	Reorganisation	62.50%	69%	92%	75%	Av. 79%
7	Evolution	agreed 67%	agreed 25%	agreed 25%	devided 50%	agreed 33%
8	Development	denied 59%	denied 75%	denied 75%	denied 66%	denied 71%

APPENDIX A4/9b

Nos.	Subject	QI	Foundry	Engineering	Manufacturing	QII
10a.	Policy co-ordination	96%	62.50%	77%	83%	Av. 74%
10b.	Forecasts	80%	75%	85%	75%	Av. 78%
10c.	Predictions	4.50%	37.50%	69%	58%	Av. 55%
10d.	Projections	26%	31.50%	46%	25%	Av. 34%
11a.	Strategies	Percent 13/52/85	Percent 6/44/50	Percent 6/12/82	Percent 25/58/17	Average 12/38/50
11c.	Trends	denied 44%	divided 50%	denied 77%	denied 75%	Average 67%
12a.	Expectations	50%	31%	61.50%	75%	Av. 56%
12b.	Regularity	agreed 39%	agreed 19%	denied 92%	denied 100%	Average 91%
12c.	(numbers) Causes	F. N. P. Ec 12/8/5/12	n.a	n.a	n.a	

M: medium L: large G: giant company
F: Financial N: Industrial P: Political
Ec: Economic

OPINIONS ARISING FROM QUESTION 11a & 11d

CAUSES OF CYCLES

Financial (unknown)

Observation: Regular patterns over 20 years in price of gold; Sterling; Deutschmark rate of currency exchange; level of UK business activity, with performance January to March each year setting the trend.

Industrial (unknown)

Observation: Ratio of office staff to 'direct hands' over 1939 - 84 period adversely affecting profitability, production and employment of the individual enterprise.

Political

National and World-wide effects of government policies, especially the distortions caused by pre-election boosts and past-election recessions.

Economic

Availability of money for investment in capital goods of all kinds in step with variations in perceived demand nationally and internationally for the products of an industry.

FLUCTUATIONS OF INTEREST

Financial

Currency exchange rates metal and commodity prices spectrum of interest rates prices of gold and silver.

Industrial

Energy consumption and costs, level of business activity, modernization programmes. Production of rival companies, competition from Third World, market changes. Variation in overheads.

Political

Policies of party in power, election past or pending, level of taxation. Government spending plans, consistency of economic strategies.

Economic

Growth in output (GDP), levels of trade, rates of inflation, consumer demand, levels of wages, employment/unemployment.

APPENDIX A4/10

Technical Modernity, Progressiveness and Performance

Technical modernity, comprising company attitudes to eg: automation and the possibilities of robotics and material substitution, allied with the numbers of patents, produced scores which assumed the suitability of all respondents for these innovations, which may not have been the case. The aim was, however, to represent an overview from the replies received, and in this the size of respondent companies again played a part; if only in ability to pay for the specified technology.

Progressiveness involved the actual introduction of new technology, implementation of reorganized structures, possibly name changes, and also responses to stage of development control and the sequence of policy emphases. *It was distinguished by management attitudes which had results both tangible and intangible.*

Performance, which could not be calculated from arbitrary figures of nominal capital nor from the number of subsidiaries owned due to the skewed effect of giant firms, was derived from the ratio of employees to sales turnover. The scores for the four size groupings of companies are ranked in descending order, as follows:

TABLE 4.A.10/2

Score £'000 Employee: Sales Turnover	**Size** Groups of Companies
1:83	MEDIUM
1:40	LARGE
1:26	GIANT
1:12.5	SMALL

This result shows outstanding performance from medium-sized companies and relatively poor performance per employee of the giant firms.

APPENDIX A4.10/1

QUALITATIVE PENTAGRAM

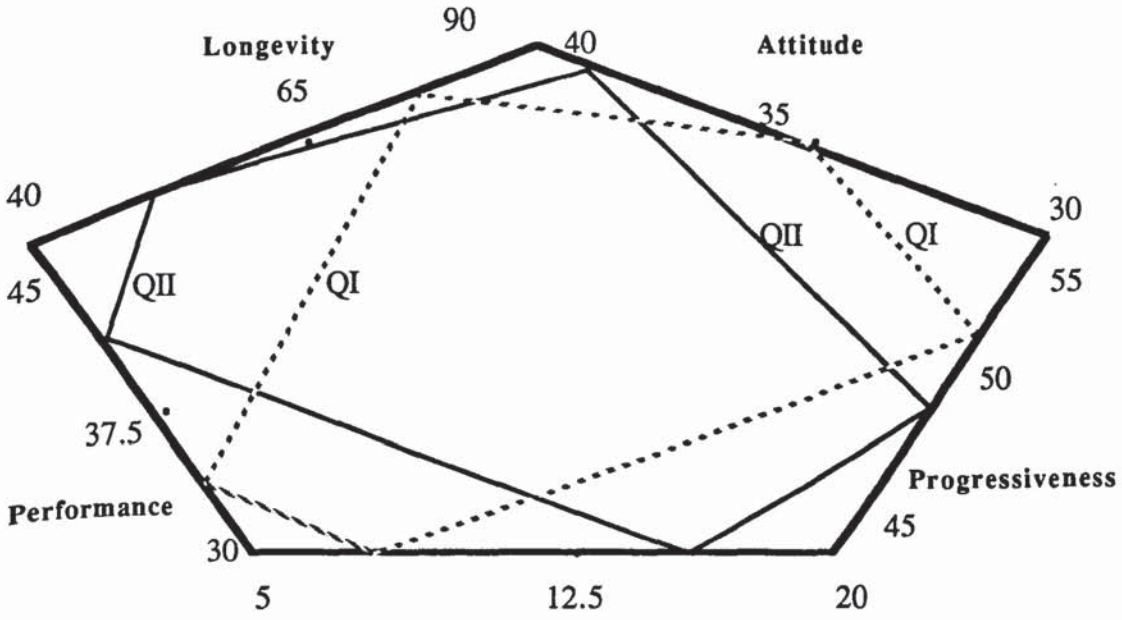


Diagram 4A4/1

LONG-SURVIVING FIRMS (QI) (24)

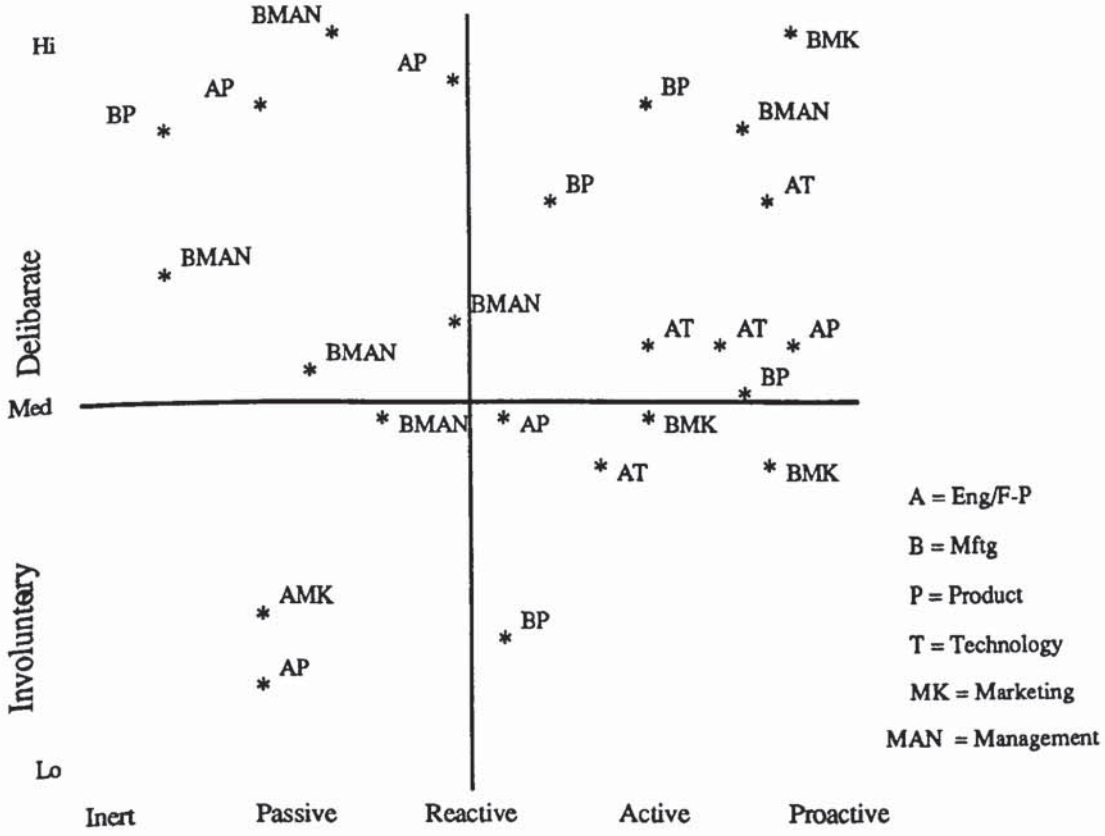
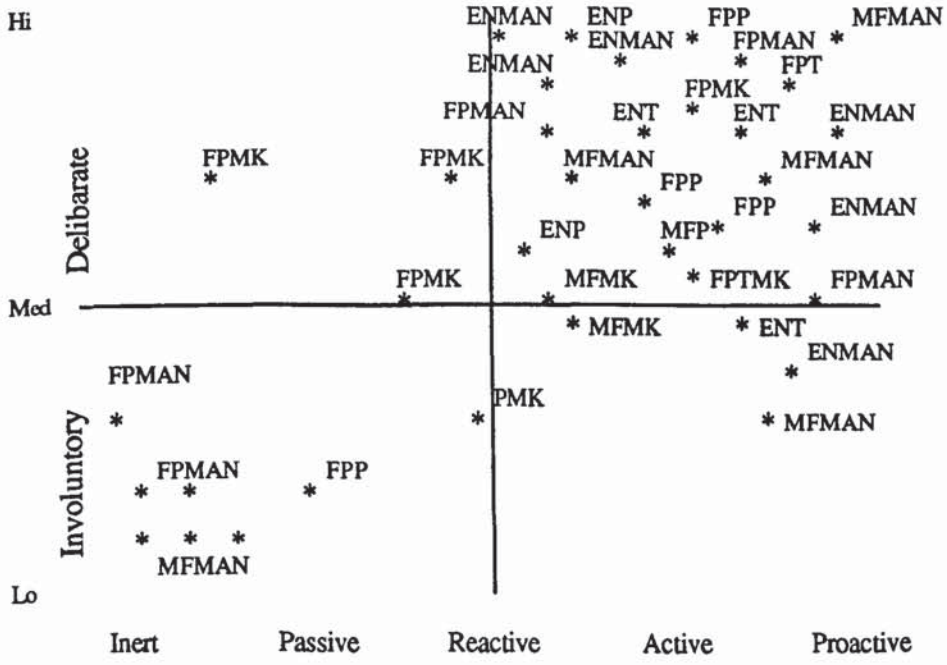


Diagram 4A.4/2

MAIN SAMPLE (QII) (40)



FP = Foundry process

EN = Engineering

MF = Manufacturing

P = Product

T = Technology

MK = Marketing

MAN = Management

APPENDIX A4/5

Modifications to Questionnaire II

The outcome of Questionnaire I encouraged pursuit of the full postal enquiry through the second issue of basically the same question format. It also pointed to the need to replace the page I panel concerned with location of the respondent with a much more useful set concerned with four conventional estimates of size of a company. These were based on nominal capital, sales turnover, number of employees and also the number of subsidiaries owned by the parent company. A database for calculating business ratios was thus offered to any reader requiring this information, but most importantly, an overall size calculation could be made about a company and thus an assessment of whether size influenced the answers to other questions.

The wording and format of Question 8 was also slightly changed to facilitate response, and the questions on page 3 were regrouped to proved a more clear-cut and logical sequence. This would prevent confusion between fluctuations, trends and cycles which may have influenced a few respondents to Questionnaire I.

An important additional question was added: 12d) 'Which years were most significant for your company in terms of boom and crisis?' This question was intended to focus attention on the respondent's actual experience of variation, and enable comparisons to be made between firms in the same sub-group and from one sub-group of the sample to another. Furthermore, an aggregated result could be graphed to show what companies reported had been the experienced changes over the years, strongly revealing a general fluctuation. Thus despite some reluctance by respondents to acknowledge theoretically that cycles may 'exist', in practice, they were able to confirm that they

did so.

Question Formulation and Answer Recording

Although the above strategy objectives were integrated with the chosen format of a Questionnaire, it was never claimed that the latter could provide an objective instrument for research: it remains an imperfect tool on account of inexactitudes in human communication.

These shortcomings may be exploited to permit introduction of both overt and covert reliability checks, memory cues and other prompts and indicators which may help at the analysis stage. For example, foundation dates of companies may be cross-checked against the anniversary dates of company histories, (and vice versa!)

The key word(s) of a question may be printed in italic or bold type: or the layout of a set of alternative answers may follow a logical sequence, for example from primary through secondary to tertiary industry.

Thus the formulation and presentation of questions even at this superifical level may influence that answers one receives.

It was thought legitimate so to tabulate the possible answers as to facilitate both analysis and cross-reference. An element of subjective judgment does enter into even the most simple question formulation and answer recording device.

A limited account of space for a written reply to fundamental questions may increase an unfortunate tendency towards vague and generalised replies of little explanatory worth. The sheer size and diverse complexity of some organizations preclude simple answers containable in allotted spaces on the Questionnaire sheet. Even allowing space for free comment

upon open-ended questions in some parts of the Questionnaire, or providing a Likert scale for mutually exclusive categories of reply, does not overcome the restrictions involved in the yes/no ticked box format which seems requisite in order to extract factual replies in most instances.

Some ease of reply and clarity may be achieved by ordering questions in a logical and incremental sequence, perhaps gradually focusing on the key area of enquiry. The respondent reading the sequence may soon understand the implications not stated explicitly, and form some kind of attitude towards them which obstructs a clean response. Thus an occasional break in logical chain may prove useful in preventing the building-up of any prejudice.

There may also exist a choice between choosing to select categories of information with known parameters against devising categories of one's own tailored to a specific purpose, but ones not easily recognized by the respondent. The high or low salience of the topic under enquiry may also influence respondents' thinking, as may also the connotations to each individual of the precise wording used in each question. Deliberate loading of questions may thus produce undisciplined responses, just as veiled threats perceived in a question or an assumption unperceived by the questioner may also distort the neutrality of an answer. Large numbers of responses may either neutralize of exaggerate these tendencies.

Indeed, the long-surviving company questionnaire became issued as a pilot study to the main questionnaire, which itself came to incorporate in its distribution a list of the country's 44 largest surviving federated engineering employers. This provided large firm element of the survey which could have been lacking in a purely local sample of small to medium size Other elements added were a short list of twelve firms assisted by the former West Midlands County Council, and now by the West Midlands Enterprise Board (which has absorbed some

members of the County's former Economic Planning Unit). These firms presented an opportunity to prove the relevance of the study to start-up and expanding local firms without much history behind them.

Other additions to the core survey were a number of ferrous, steel and non-ferrous foundries in the Black Country, tied economically to Birmingham but located outside its boundaries. *Saturation coverage in distribution of the Questionnaire was accorded each of these additional lists. It was felt that this move was justified by the purpose of the study and by its non-probalistic character, as also by the previous industrial history of the area.*

In this manner it was hoped that the Research Design might minimise bias or distortion arising from sampling method or the age, size, specialty and location of firms, and that the subsequent analysis and interpretation could be taken to typify the current industrial profile of opinion. It was evident that if the answers were in doubt, the experiment could very readily be replicated under a set of homogeneous and simultaneous conditions differing little if at all from those prevalent at the time of the original experiment.

THE UNIVERSITY OF ASTON IN BIRMINGHAM

Business Cycles, Long Waves, and Company Longevity in Birmingham Area Metal Industries 1780 - 1980

Robin John Spencer Kimmerling

Doctor of Philosophy

1987

Pocket I

[ADR]

RIL/QIR
February 1985

Dear Company Secretary

Results from Questionnaire No I

I write to thank you very much indeed for sparing valuable time to complete my Questionnaire No I. Plead find attached a numerical summary and other sheets, as promised, which are derived from the answers received.

One salient point, not evident from the numerical summary sheets, has emerged very clearly in qualitative analysis - the distinctive character and specific interests of individual companies.

If you company possesses a company history, could you places arrange to send a copy, and invoice me accordingly? On completing my research this copy will be donated to the Library at the University of Aston where I study.

The care which you took to answer my questions has contributed significantly to the reward and pleasure of the research.

Again, many thanks for your cooperation.

Yours truly

R J S Kimmerling BA, MBIM, DMS (Dist)
RJSK/PS/39/44

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1987

[ADR]

RK/CS/Q2

March 1985

Dear Company Secretary

A small part of current research in the doctoral programme at the Aston Management Centre comprises an historical investigation, which I am carrying out under the supervision of Dr Jennifer Tann, into the influence of economic fluctuations on company longevity between 1780 - 1980.

An important aspect of this research is to discover to what extent contemporary organizations, faced with a turbulent environment, take business cycles and economic trends into account when formulating and revising their strategies for survival and profitability.

The only companies selected to take part, if they will, in this stratified survey of 120 firms, are those thought most likely to provide interesting answers by reason of their location, specialities size, technology, stage of development and vulnerability to fluctuations.

Accordingly, I should be most grateful if you could arrange for someone to spare a few minutes to complete the enclosed questionnaire No 2, and return it to me in the envelope provided sometime within the next seven working days.

Thanking you in anticipation of your co-operation and assistance.

Yours truly

Robin J S Kimmerling BA MBIM
RK/DJ/51/46

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1987

RK/B10/I

21 May 1985

Dear Secretary,

Company Failure/Closure Statistics

Having already undertaken some research into available statistics on company failures/closures and new start-ups in the metal trades and industries of the Birmingham area covering the years 1780 - 1980, I am now nearing a point of completion of this part of work for a PhD at the University of Aston in Birmingham, but would like to make my coverage as good as possible.

I understand that your organization may also possess valuable listed and/or tabular material both for historical events and for more recent years. Accordingly, if your could tell me where in your books and records it might be possible for me to retrieve additional information of this kind, I should be grateful for access sometime during the next few weeks.

Could you please let me know the situation?

Yours truly,

Robin Kimmerling BA
Room SW911 Doctoral Programme

THE UNIVERSITY OF ASTON IN BIRMINGHAM

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Doctor of Philosophy

1987

QUESTIONNAIRE NO 1

1. Please state, by ticking the appropriate boxes, in which *general area* lies:

   a) the main activity of your business?
   b) secondary activity? (if any)
   c) third activity? (if any)

	1.	2.	3.
1. Foundry			
2. Process Treatment			
3. Engineering			
4. Mftg Fabrication			
5. Mftg Assembly			
6. Mftg Production			
7. Merchanting			
8. Wholesale Supply			
9. Retailing			
10. Other Services			

2. Which category of *ownership* best describes your company?

1. Private Partnership	
2. Family Enterprise	
3. Private Limited Company	
4. Unlisted Public Company	
5. Public Liability Company	
6. Financial Holding Company	
7. Division of Corporation	
8. Group Subsidiary Company	
9. Multi-national Company	
10. Part of a Conglomerate	

3. Are your company *premises* mainly

1. Freehold?	
2. Leasehold?	
3. Mixed?	

4. In which *location* is your registered office?

A	BIRMINGHAM
B	W. MIDLANDS
C	ANOTHER ASSISTED AREA
D	OUTSIDE U.K.

5. Roughly what proportions of your company's *products*:

   a) Consist mainly of metals?
   b) are produced by automated methods?
   c) could be produced using robotic systems?
   d) might become replaced by non-metal substitutes?

Tick	a	b	c	d
ALL				
MOST				
SOME				
FEW				
NONE				
N.A.				

6. a) Does your company possess a written company history?
   b) In what year was it published?
   c) Which anniversary (if any) did this mark?
   d) In which year was your company founded?
   e) By whom?
   f) Where?
   g) When did your Company become incorporated?
   h) When did your Company 'go public'?
   i) What were your original products?

Continued overleaf

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Robin John Spencer Kimmerling

Doctor of Philosophy

1987

j) Do you now hold internationally recognised patents?

k) How recent is your latest installation of new technology and/or equipment? (which year?)

l) When was your last internal reorganization?

m) Has your company changed name since it began?

		Year
Original Name		
First Change		
Second Change		
Present Name		

7. Some writers on company history contend that firms *evolve*, in terms of their 'control', generally as follows:

Stage	Owner	Management Control
I	Individual Founder	Charismatic leadership on the job
II	Private Shareholders	Organizing line managers put in administrative systems
III	Public Shareholders	Served by Board of Directors with team of career managers

a) Does this theory fit the *history* of your Company?

b) At which stage is your company now?

8. While most companies operate simultaneously at many levels, there may exist a sequence to the policy emphasis given at each stage of *development*:

1. OPERATIONS	Raw materials purchasing. Production, technology, control.
2. MARKETING	Sales promotions and advertising market share and penetration.
3. TRANSPORTATION	Integrated, cost-effective network.
4. FINANCE	Financial strategies for public flotation, mergers, acquisitions.
5. ADMINISTRATION	Decentralization, rationalization and various forms of integration.
6. CORPORATE STRATEGY	Resource and revenue maximising across area and state boundaries.
7. GLOBAL RELATIONS	Legal and political negotation with trading blocks and nations.

a) Do you think that this *sequence* has been followed in the case of your Company?

b) At which phase of policy emphasis is your company now?

9. Why, specifically, in your view, has your company *survived* so long, when so many others have failed?

THE UNIVERSITY OF ASTON IN BIRMINGHAM

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Doctor of Philosophy

1987

10. Does your company

	Yes	No
a) Coordinate *policy* from a central office?		
b) i. Undertake regular short-term internal *forecasts?*		
ii What period ahead do they cover?		
c) i. Make regular *predictions* about trading conditions for your industry and your region?		
ii. How far ahead do they go?		
d) i. Make your own *projections* regarding the future state of the national economy?		
ii. What time period do they encompass?		

11. a) Do your business *strategies* consider economic fluctuations?

explicitly	
as part of an on-going review	
not considered important	

b) Which *economic fluctuations* seem the three most important when planning the survival and prosperity of your company?

	3

c) Is there a trend which repeats *periodically*?

Yes	No

12 a) Are your company's *expectations* altered by your recognition and monitoring of business cycles?

greatly	
moderately	
marginally	
not at all	

b) Do the cycles known to you behave *predictably*?

Yes	No

c) What in your opinion *causes* the cycles in which you are most interested?

d) Which years v ere most *significant* for your company in terms of boom and crisis? (In order of occurence).

	Boom	Crisis
1		
2		
3		
4		
5		
6		

Kindly return *within seven days* to Robin Kimmerling, Room SW911, University of Aston, Gosta Green, Birmingham B4 7ET.

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1987

Confidential March 1985

QUESTIONNAIRE NO 2

1. Please state, by ticking the appropriate boxes, in which *general area* lies.

a) the main activity of your business?
b) secondary activity? (if any)
c) third activity? (if any)

1. Foundry
2. Process Treatment
3. Engineering
4. Mftg Fabrication
5. Mftg Assembly
6. Mftg Production
7. Merchanting
8. Wholesale Supply
9. Retailing
10. Other Services

	a	b	c

2. Which category of *ownership* best describes your company?

1. Private Partnership
2. Family Enterprise
3. Private Limited Company
4. Unlisted Public Company
5. Public Liability Company
6. Financial Holding Company
7. Division of Corporation
8. Group Subsidiary Company
9. Multi-national Company
10. Part of a Conglomerate

3. Are your company *premises* mainly

1. Freehold?
2. Leasehold?
3. Mixed?

4. a) What was authorised (or nominal) capital in 1980?
b) What was number of group employees in 1980?
c) What were group sales (including exports) in 1980?
d) How many subsidiary companies were owned in 1980?

	1980

5. Roughly what proportions of your company's *products*.

a) Consist mainly of metals?
b) are produced by automated methods?
c) could be produced using robotic systems?
d) might become replaced by non-metal substitutes?

Tick	a	b	c	d
ALL				
MOST				
SOME				
FEW				
NONE				
N.A.				

6. a) Does your company possess a written company history?
b) In what year was it published?
c) Which anniversary (if any) did this mark?
d) In which year was your company founded?
e) By whom?
f) Where?
g) When did your Company become incorporated?
h) When did your Company 'go public'?
i) What were your original products?
j) Do you now hold internationally recognised patents?

Yes	No

Continued overleaf

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Doctor of Philosophy

1987

k) How recent is your latest installation of new technology and/or equipment? (which year?)

l) When was your last internal reorganization?

m) Has your company changed name since it began?

		Year
Original Name		
First Change		
Second Change		
Present Name		

7. Some writers on company history contend that firms *evolve*, in terms of their 'control', generally as follows:

Stage	Owner	Management Control
I	Individual Founder	Charismatic leadership on the job
II	Private	Organizing line managers put in administrative systems
III	Public	Served by Board of Directors with team of career managers

a) Does this theory fit the *history* of your Company?

b) At which stage is your company now?

8. While most companies operate simultaneously at many levels, there may exist a sequence to the policy emphasis given at each stage of *development*:

At which phase of policy emphasis is your company now?

1. OPERATIONS	Raw materials purchasing. Production, technology, control. Stockholding
2. MARKETING	Sales promotions and advertising Market share and penetration. Integrated, cost-effective transportation
3. FINANCE	Financial strategies for public flotation, mergers, acquisitions.
4. ADMINISTRATION	Decentralization, rationalization and various forms of integration.
5. CORPORATE STRATEGY	Resource and revenue maximising across area and state boundaries.
6. GLOBAL RELATIONS	Legal and political ngotiation with trading blocs and nations.

9. Why, specifically, in your view, has your company *survived* so long, when so many others have failed?

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1987

10. Does your company

		Yes	No
a)	Coordinate *policy* from a central office?		
b)	i. Undertake regular short-term internal *forecasts?*		
	ii What period ahead do they cover?		
c)	i. Make regular *predictions* about trading conditions for your industry and your region?		
	ii. How far ahead do they go?		
d)	i. Make your own *projections* regarding the future state of the national economy?		
	ii. What time period do they encompass?		

e) Are your company's *expectations* altered by your recognition and monitoring of business cycles?

greatly	
moderately	
marginally	
not at all	

f) Do your business *strategies* consider economic fluctuations?

explicitly	
as part of an on-going review	
not considered important	

11. a) **Which** *economic fluctuations* seem the three most important when planning the survival and prosperity of your company?

	1
	2
	3

		Yes	No
b)	Do the cycles known to you behave *predictably*?		
c)	Is there a trend which repeats *periodically*?		

d) What in your opinion *causes* the cycles in which you are most interested?

12. **Do you wish to receive a summary copy of the *results* of this survey?**

Kindly return *within seven days* to Robin Kimmerling, Room SW911, University of Aston, Gosta Green, Birmingham B4 7ET.

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REGION: WEST MIDLANDS

Local authorities	*Employment exchanges*
Sub-division: Central (All sub-division)	
	Bridgnorth, Bromsgrove, Burton-on-Trent, Cannock, Chelmsley Wood, Evesham, Kidderminster, Lichfield, Madeley, Malvern, Oakengates, Pershore, Redditch, Rugeley, Stafford, Stourport, Stratford-on-Avon, Tamworth, Uttoxeter, Wellington, Worcester
Sub-division: Central: North	
Shropshire (part) *Urban districts.* Dawley, Newport, Oakengates, Wellington *Rural districts.* Bridgnorth, Shifnal, Wellington	
Staffordshire (part) *County borough.* Burton upon Trent *Municipal boroughs.* Lichfield, Stafford, Tamworth *Urban districts.* Cannock, Rugeley, Uttoxeter *Rural districts.* Cannock, Lichfield, Seisdon, Stafford, Tutbury, Uttoxeter	
Sub-division: Central: South	
Warwickshire (part) *Municipal borough.* Stratford-upon-Avon *Rural districts.* Alcester, Meriden, Shipston on Stour, Stratford-upon-Avon	
Worcestershire (part) *County borough.* Worcester *Municipal boroughs.* Bewdley, Droitwich, Evesham, Kidderminster *Urban districts.* Bromsgrove, Malvern, Redditch, Stourport-on-Severn *Rural districts.* Bromsgrove, Droitwich, Evesham, Kidderminster, Martley, Pershore, Tenbury, Upton upon Severn	
Sub-division: West Midland conurbation	
Staffordshire (part) *County boroughs.* Dudley, Walsall, West Bromwich, Wolverhampton *Urban districts.* Aldridge-Brownhills	Aston, Bilston, Birmingham, Brownhills, Cradley Heath, Darlaston, Dudley, Halesowen, Handsworth, Oldbury, Selly Oak, Small Heath, Smethwick, Solihull, Stourbridge, Sutton Coldfield, Tipton, Walsall, Washwood Heath, Wednesbury, West Bromwich, Willenhall, Wolverhampton
Warwickshire (part) *County boroughs.* Birmingham, Solihull *Municipal borough.* Sutton Coldfield	
Worcestershire (part) *County borough.* Warley *Municipal boroughs.* Halesowen, Stourbridge	

THE UNIVERSITY OF ASTON IN BIRMINGHAM

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Robin John Spencer Kimmerling

Doctor of Philosophy

1987

REGION: WEST MIDLANDS (*continued*)

Local authorities	*Employment exchanges*
Sub-division: Coventry Belt	
Warwickshire (part) *County borough.* Coventry *Municipal boroughs.* Nuneaton, Royal Leamington Spa, Rugby, Warwick *Urban districts.* Bedworth, Kenilworth *Rural districts.* Atherstone, Rugby, Southam, Warwick	Bedworth, Coventry, Leamington and Warwick, Nuneaton, Rugby
Sub-division: Rural West	
Herefordshire Shropshire (part) *Municipal borough.* Shrewsbury *Rural districts.* Atcham†, Clun and Bishop's Castle, Ludlow, Market Drayton, North Shropshire†, Oswestry†	Hereford, Kington, Ledbury, Leominster, Ludlow, Market Drayton, Oswestry†, Ross-on-Wye, Shrewsbury, Whitchurch
Sub-division: North Staffordshire	
Staffordshire (part) *County borough.* Stoke-on-Trent *Municipal borough.* Newcastle-under-Lyme *Urban districts.* Biddulph, Kidsgrove, Leek, Stone *Rural districts.* Cheadle, Leek, Newcastle-under-Lyme, Stone	Biddulph, Burslem, Cheadle, Hanley, Kidsgrove, Leek, Longton, Newcastle-under-Lyme, Stoke, Stone

† Intermediate area

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PERSONS, BY SEX, ENUMERATED PRESENT IN BIRMINGHAM

AS CONSTITUTED AT TIME OF ENUMERATION

(with Associated Size of Area Covered)

Census, 1801 - 1981

Year	Size of Area (Hectares)	Males	Females	Persons	% Intercensal Population Increase(1)
1801	3,437	...	...	70,670	.
1811	3,437	40,518	45,235	85,753	21.3
1821	3,437	51,028	55,694	106,722	24.5
1831	3,437	71,756	75,230	146,986	37.7
1841	3,437	88,572	94,350	182,922	24.4
1851	3,437	113,913	118,925	232,638	27.2
1861	3,437	143,996	152,080	296,076	27.3
1871	3,437	167,636	176,151	343,787	16.1
1881	3,437	194,540	206,234	400,774	16.6
1891	5,115	231,361	246,752	478,113	19.3
1901	5,115	252,084	270,120	522,204	9.2
1911	17,645	400,546	439,656	840,202	60.9
1921	17,645	434,678	484,766	919,444	9.4
1931	20,699	476,072	526,531	1,002,603	9.0
1951	20,699	533,828	578,857	1,112,685	11.0
1961	20,699	544,624	562,563	1,107,187	-0.5
1966	20,881	524,890	539,330	1,064,220	-3.9
1971	20,881	501,617	513,053	1,014,670	-4.7
1981	26,430	...	...	1,006,527	-0.8

Note: (1) *Some changes due mainly to boundary extensions.*

Source: Censuses of Population.

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GROWTH OF BIRMINGHAM IN AREA

1838 - 1974

Date	Locality Becoming (or Ceasing to Be) Part of Birmingham	Hectares
Pre-1838	Birmingham Town	1,213
1838	Deritend Township	37
	Bordesley Township	761
	Duddeston-cum-Nechells Township	374
	Edgbaston Parish	1,052
	Birmingham Borough	3,437
1891	Balsall Heath Local Board District	184
	Saltley Local Board District	455
	Little Bromwich Hamlet	440
	Harborne Local Board District	599
	Birmingham County Borough	5,115
1909	Quinton Parish	339
	County Borough After 1909 Change	5,454
1911(1)	Aston Manor Borough	388
	Handsworth U.D.	1,484
	Erdington U.D.	1,874
	Yardley R.D.	3,072
	King's Norton and Northfield U.D.	5,373
	County Borough After 1911 Change	17,645
1928	Part of Perry Barr U.D.	1,249
	County Borough After 1928 Change	18,894
1931	Part of Minworth Parish	239
	Part of Castle Bromwich Parish	690
	Part of Sheldon Parish	794
	Part of Solihull Parish	82
	County Borough After 1931 Change	20,699
1964	Part of Solihull C.B.	1
	Part of Billesley Ward	)
	Part of Sheldon Ward	) - 2
	Part of Hall Green Ward	6
	County Borough After 1964 Change	20,692
1966	Part of Aldridge U.D.	1
	Part of Bromsgrove R.D.	135
	Part of Halesowen M.B.	46
	Part of Meriden R.D.	7
	Part of Smethwick C.B.	3
	Part of Sutton Coldfield M.B.	44
	Part of West Bromwich C.B.	9
	Part of All Saints' Ward	-11
	Part of Harborne Ward	- 4
	Part of Perry Barr Ward	- 1
	Part of Rotton Park Ward	-13
	Part of Sandwell Ward	- 4
	Part of Soho Ward	-22
	Part of Stockland Green Ward	- 1
	County Borough After 1966 Change	20,881
1974	Sutton Coldfield M.B.	5,549
	BIRMINGHAM METROPOLITAN DISTRICT	26,430

Note: (1) Boundary change effected partly in 1912.

Footnote: Minor boundary changes noted in the table do not appear on the map on page 1.

Sources: Ordnance Survey; Public Works Department.

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