The Production Cycles of the Scottish Construction Industry, 1802-2002

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INTRODUCTION

The Scottish construction industry has developed enormously over the past two centuries. Whilst retaining its vital role in support of the nation's life, it has also experienced fluctuations and been affected by both internal and external changes. This research aims to look for these fluctuations in its history and review statistical evidence in order to address the following questions:

- Does the Scottish construction industry demonstrate a cyclic nature in the last two centuries?
- What influence any such cycles?
- How do the cycles and any influences compare with the rest of the United Kingdom?

There are some studies of the Scottish house building industry but this paper will include all construction sectors, to provide a new, fuller historical picture, as a context for other research into the history and trends of the industry in Scotland. This assemblage of data for Scotland will also enable policy makers and practitioners to concentrate on any particularities.

Theoretical contexts

What are business cycles and why might they matter in the Scottish construction industry context? The OECD/NBER (1997) definition of a business cycle, as a "Recurrent sequence of alternating phases of expansion and contraction in the levels of a large number of economic time series", requires a cycle duration of at least fifteen months between peaks, ignoring extreme values if they are brief and fully reversed. In macroeconomics, business cycles are considered in relation to benchmark reference cycles, of such indicators as GDP and industrial output. The purpose of such study is evidently to enable predictions of future trends and behaviours.

Fayolle's (2001) historical summary of the theory of business cycles proposes a number of periods corresponding to different concepts (theorist and empirical) of cycles, starting with

"Period 1: positivist cohabitation", when Clement Juglar's nineteenth century studies showed coincident economic cycles for the UK and France and a move from inverse (Parry Lewis 1965) to synchronous cycles for the UK and the USA. The Harvard "Barometer" or index of business conditions claimed correlation between investment confidence and the general business situation, and also to theories of alternating inflation and deflation. The second period embraced empiricism, based on the work of the United States National Bureau of Economic Research, which defined a cycle as data that showed synchronous movements for many economic activities. This period covered analyses of the 1930s depression and attempts to explain it, and identified cycles by length: short trade cycles (3 years: Kitchin cycles) and long trade cycles (10 years: Juglar cycles); and cycles by data type: classical cycles (economic activity) and growth cycles (deviation from the long-term trend of economic activity). The third period, after the war, brought Keynesian views that investment stimuli trigger peaks and vice versa. The present period includes proponents of Neo-classicism, uncertainty and stochastic systems, so that current thinkers consider cycles to inhabit a duality space,"…at the intersection of the approaches inspired by regulationism and evolutionism…" (Fayolle 2001).

As in any field, the relative utility of each method is debated and Fayolle suggests that business cycle theory may be considered as a collection of explanations for each set of data, rather than a theory. Explanations thoroughly applicable to a series of fluctuations in one time, industry and place may not apply elsewhere. Hence, it is necessary to search the literature for considerations of economic cycles in the UK construction industry, and Scotland specifically.

Review of previous research

The literature coverage of the Scottish construction industry is mainly concerned with house building. Cairncross (1953) provides many detailed insights into the house building industry of Glasgow between 1870-1913, but his analysis of the building cycle and what influenced it were dependant upon house building statistics alone and do not include the other types of construction, nor activity beyond Glasgow. Glendinning and Watters (1999) give a more recent detailed coverage of the modern house building industry in Scotland. An overall consideration of the other types of work undertaken by the construction industry, such as infrastructure and commercial or industrial structures does not seem to have attracted the economic historians. Morgan (1999) reviews some of the legislative influences, and considers some of the sociological aspects of the family firm which characterise the industry throughout its history. However, he too notes the extent to which historians have felt able to neglect the industry which provided the context for Scottish urban society in particular. Histories of building in Britain tend to cover mainly London (Bowyer 1973) or, at best, only England and Wales (Powell 1980), neglecting Scotland and its differences or influences entirely.

Using the Glasgow example, Cairncross shows how building cycles are in different phases to the general trade cycle and the phases of house building to not match those of factory building, although in Glasgow they do relate to shipbuilding phases. The cycles for commercial and industrial building tend to be more in phase with the trade cycle but the residential building cycles are generally divergent. He discusses the cases for whether the supply side or the demand side drive the residential construction sector and argues that neither is very responsive in the short term, because the organisation required to put up buildings is necessarily a longer term process than for other products. Demand, as measured by the number of occupied houses, fluctuates over short cycles, with peaks in 1864, 1873, 1882, 1890, 1899 and 1914 and a deep depression in 1908. These generally relate best to the fluctuations in the shipbuilding industry in Glasgow at those times and the consequent fluctuations in inward migration and marriages. However, those demand peaks were not reflected in the supply, which if anything seems to fall during booms. Only the long building cycle has coincident peaks of demand and supply, in 1876 and 1902. The migration cycle follows the external cycles of prosperity outwith Scotland and so follows, to some extent, the investment abroad by British investors. When foreign activity is in a depression, neither labour nor capital leave Scotland and so are both available for local use, e.g. for building, just at the time when people are not migrating and so more people are around to require housing.

Cairncross believed that a cyclical process is subordinate to the process of growth and arises from it. Barras (1987) some thirty years later thought the reverse to be true, with building cycles of various lengths being the cause of unstable property markets, creating the cyclic tendency of urban development itself. He believes that each of the long (Kondratieff waves, as defined by Schumpeter in 1939) cycles is stimulated by technological change but that supply and demand control the short-term cycles. The housing industry itself (Stewart 2002) agrees that supply is “exceptionally unresponsive to increases in demand” and that this is worse now than in the past, but that plentiful supply can create demand in the form of new households, as Cairncross pointed out.

However, Rodger (1986) disputes the strength of external events in influencing the Scottish building industry cycles. The 1878 collapse of the City of Glasgow Bank put two-thirds of Glasgow builders into bankruptcy but the international Baring crisis in 1890 went unnoticed in the Scottish building industry. Rodger argues that the structure of the industry was the direct cause of the cycles: the predominance of small, underfunded firms was much higher in Scotland than in England and led to “exaggerated instability”. However, Parry Lewis points out that the building industry, whilst itself suffering, can smooth out sharp downtrends in the general economy, as the work often continues to contribute to the economy after everything else has declined.

METHODS

The first methodological choice was to decide what data to seek in order to demonstrate the existence of building cycles in Scotland. Data was chosen from non-monetary based sources as far as possible: outputs in numbers of units or floor area, employee numbers etc, in order to avoid having to adjust to current values, for inflation etc. Hence annual data was sought on house building output in numbers of homes constructed, industrial and commercial structures output in terms of floor area or numbers of factories. Data which imply output or expectations, such as numbers of planning permits (known as "linings" in Scotland) have also been used. As Parry Lewis (1965) points out, it is difficult to select a single type of data which will accurately represent the amount of work being carried out at any one time, particularly in the construction industry with its inherent delays. Planning approvals indicate intention rather than output. Output in terms of finished buildings only shows up after months or even years of work have been done. Output in money value terms disproportionately represents expensive finishing work and under-represents earlier structural work. The Scottish Parliament uses gross value added and employment to measure activity in the industry (SPIC 2000)

The convention in some literature is that "building" refers to house building and that "construction" refers to industrial, commercial and infrastructure building, including roads etc. This review assumes that all data relating to either sector may be relevant and the two terms will here be used interchangeably to imply all the work of the two sectors. The data from "building" and "construction" will reflect the same effects, even if some of the cycles from one sector lags or leads another. Also, workers and companies with skills and experience suited to house building can transfer those to "construction", as the market demands. Sometimes these internal transfers are short-term – a bricklayer works on a housing project and then works on an industrial project- or long term – the major firm Wimpeys used to be known for road building but divested itself of that part of its work some years ago and now concentrates on house building. However, the practical effect of the fluctuating workload, for the whole industry and its workers, is best reflected in the combination of data from both sectors. No de-trending was carried out and growth (% change) data is not used, so this paper may be considered to be using "classical" cycles (OECD 1997).

Assessment of cycles was by visual inspection. Various theoretical systems of analysis are used in dynamic economic studies, but they have their fashions and critics and are complex in use and interpretation. Most aim to smooth out the intrinsically jagged nature of time series data graphs, but in doing so may hide potentially important detail. For instance, HP filtering results in detrended smooth long term curves (Ball et al 1996 give some extreme examples of such smoothed long-term curves). These may (or may not, depending on which supporters or critics you read) show useful long term trends and cycles, but at the expense of the short term cycles

which may be of more interest to managers running real-life building firms, who can only look forward a few years at the most.

In macroeconomics, business cycles are considered in relation to benchmark reference cycles, of such indicators as GDP and industrial output. In this case the construction industry in the UK will be used for comparison, although not in the sense of a benchmark being a target for the Scottish industry to aim for. The purpose is to see if there are differences and what implications they might have.

EVIDENCE OF CYCLES

Housing

The draconian Highland Clearances (from 1750) forced rural families to go to the large urban centres and to the fishing villages. The first official census, in 1801 demonstrated to the authorities that there had been a major increase in pre-industrial revolution urban populations **(fig.1)** and that there was a need to develop the burghs and increase fishing villagers' and urban workers' housing. Urban housing **(fig.2)** in Glasgow experienced two major peaks: 1870s, 1890s.

The construction industry was very busy at the start of the twentieth century, with nearly 10% of the total workforce employed in construction. The Increment Duty Act of 1910 severely affected income from the feu duties and ground rents on which many speculative builders relied for their reserve income (Morgan 1999). The sharp decline in the value of the building work in Edinburgh for which applications had been approved by the Dean of Guild Court was from about £1m in 1904 to £0.4m in 1910 **(fig.3)**. The depression was severe in all parts of Scotland, as speculative home building had been a mainstay of the trade for some time.

Many larger firms survived the building slump at the start of the century by moving into property management and factoring, resulting in a very small industry remaining to deal with demand between the wars. Mergers and takeovers saw the disappearance of some previously important names, such as Brand, Morrison and Mason, and collapses of formerly strong family firms.

During World War I almost no houses were built and that, combined with the natural replacement needs of homes built in the 1860-70s, led to the huge postwar demand for working class housing which could only be met by the public sector. Parry Lewis (1965) argues that only this combination of causes could have forced such a change (<6% prior to World War I to >60% by 1922). However, the surge in demand forced by the migration to urban munitions

factories also forced the legal restrictions on rents, to the point where speculative building for rent became less attractive to builders.

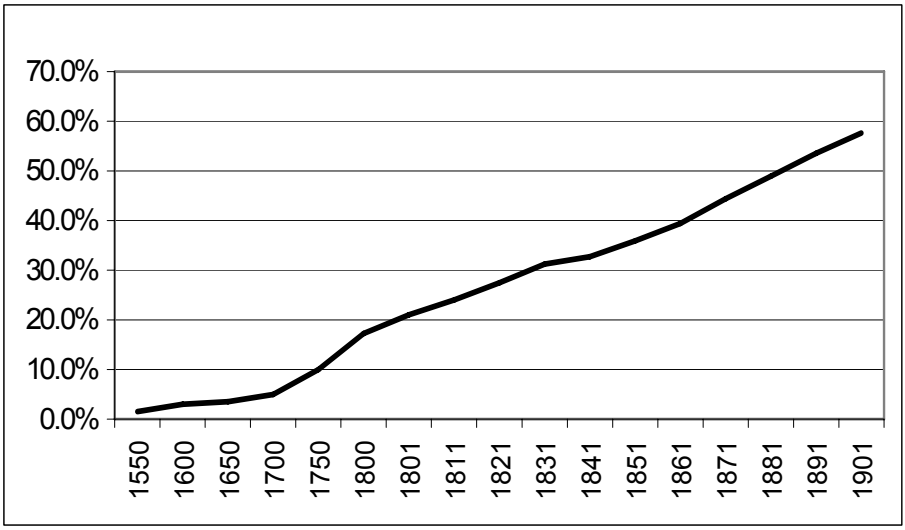

Figure 1. Urban population of Scotland % (Devine 1988)

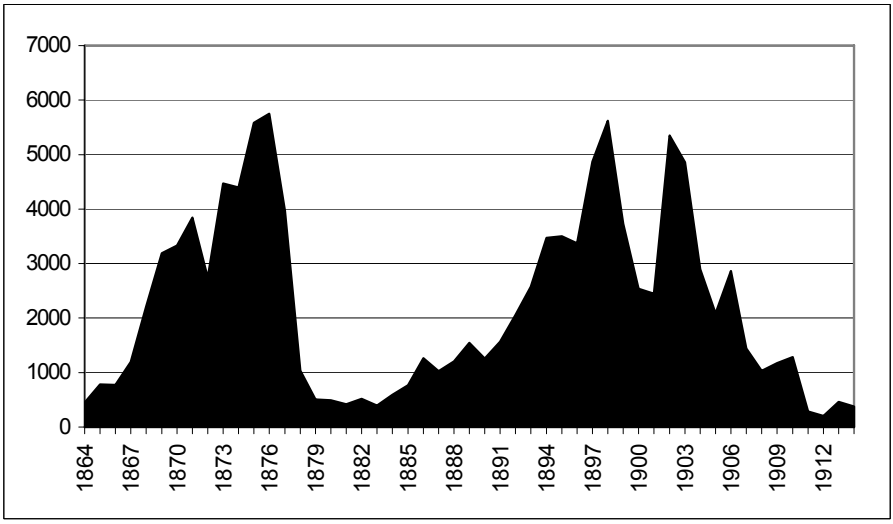

Figure 2. Number of homes for which plans approved in Glasgow (Parry Lewis 1965)

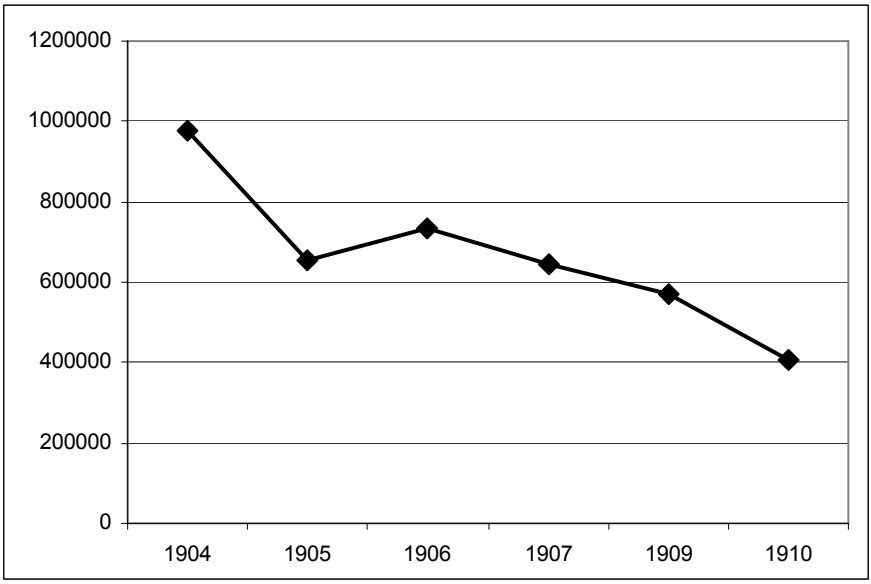

Figure 3. Value (£) of all building work approved in Edinburgh (Dean of Guild Court)

Some speculative and replacement building took place during World War II, but only about 32,000 homes were built. Many stronger firms, including some quite small ones, were able to get government contracts, such as for hospitals, workers' hostels and military installations. Glendinning (1999) believes that this interdependency between the construction industry and government put at least a temporary halt to the boom and bust cycles that had been previously so problematic. Wartime planning for post-war reconstruction envisaged a far more controlled, social, mode of delivery for housing. The Scottish Special Housing Association was a focus for the government's plans for hundreds of thousands of new permanent homes, although its role was resisted by the large local authorities, such as Glasgow, with their direct labour forces. The Town and Country Planning Act 1947 placed all responsibility for planning approval with local authorities. The Bruce redevelopment plan for Glasgow advocated peripheral estates and from 1945-9 Glasgow built 12,000 homes.

Rationing of building materials had to be introduced in 1947 just to ensure that those contracts already in progress could be completed before new work was started. In 1951 the overcrowding and housing shortage triggered a building boom that lasted until the oil crisis of 1973: new towns, new town centres, shopping centres (e.g. St James in Edinburgh and Overgate in Dundee), office blocks, and widespread projects for low rise peripheral housing created enormous amounts of work for the construction industry. By 1955, with costs and supplies of

men and materials becoming easier, the government was able to remove restrictions, but public contracts continued to be the main source of work for most firms. Despite the credit squeeze of the early 1960s construction continued apace with both housing and industrial/commercial development creating a lot of work. The combination of an economic boom and simultaneous credit squeeze led to house building becoming problematic for many firms, which chose instead to meet the demands for industrial and commercial building. The demand for public housing remained strong, with smaller family units becoming usual. With local authorities limiting land availability, multi-storey flats seemed the only way at this time.

The oil crisis of 1973 led to a fall in construction output of 22% 1973-81, particularly in the public sector. Value added and employment data (SPIC 2000) from this period onwards show construction as more cyclic and with a slower upward trend than the rest of the Scottish economy. Thatcherite government policies, to encourage private ownership, changed the direction of the house building industry so that, from the 1980s, far more private, speculative house building became the norm, although commercial and industrial construction stabilized and fell. Although the rate of owner-occupancy was low in Scotland, by 1996 it had largely caught up with the rest of the UK (Gibb 1999[1]). In 2000 the Scottish Executive's Economic Report described the Scottish construction industry as less cyclic than it had been in the mid 1980s, and also less cyclic than its UK and European counterparts.

The Scottish house building market was also less overheated than that of the south east of England, where land shortage and house price inflation caused problems. As competitive tendering forced profit levels very low, some firms moved into the PFI field where long-term stability was guaranteed by maintenance contracts (Tallis 2004).

Infrastructure and other non-commercial construction

The urbanization of the population was also supported by improvements in infrastructure. In 1803 the Commissioners for Highland Roads appointed Thomas Telford to rationalize General Wade's road system and extend it into the NE, proposing more than 1,000 bridges on 780 miles of road. It was also suggested that 200 new towns and planned villages should be developed at major junctions and river crossings. This major work extended into the mid-nineteenth Century, a period of unparalleled infrastructure development, with roads, rail, canals, water supply and sewers being constructed throughout Scotland. In 1859 the Loch Katrine water supply to Glasgow was inaugurated and in 1865 Edinburgh's sewage system was laid, followed by Glasgow's in 1892.

The 1872 Education Act Scotland introduced compulsory elementary education, leading to the building of many Board schools. The Dean of Guild Court's report of 1887 remarked upon the substantial contribution to the building trades' activity from the construction of schools, hospitals, museum and university buildings and other major public works in Edinburgh. In 1890 the iconic Forth Rail Bridge opened. From 1780 to 1955 the dominance of shipbuilding and shipping required constant developments of quays along the Clyde and other ports of Scotland **(fig.4)**.

Data for infrastructural development is also not easily collated. The data for roads built 1987-2001, for example, shows such extreme peaks and troughs that it is hard to analyse what is happening. This may be because the project is not included in statistics until complete. Unlike houses, where it can be said that a certain number of houses have been built even if the whole scheme is not finished, with a road, waterworks or other infrastructure, the outcome is not there at all until the whole thing is finished. As with other datasets, the units and definitions for road construction change almost yearly, making chronological comparisons even harder. This is unfortunate because a major road project is an important part of the construction workload at the time and can absorb a lot of workers from other parts of the sector.

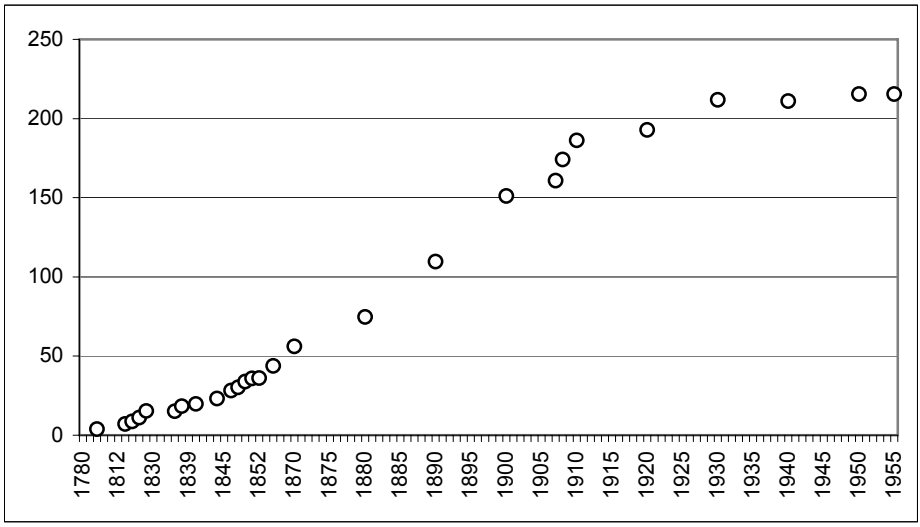

Figure 4. Infrastructure: quays built on Clyde (units of 100 yds) (Cunnison & Gilfillan 1958)

Commercial and Industrial Construction

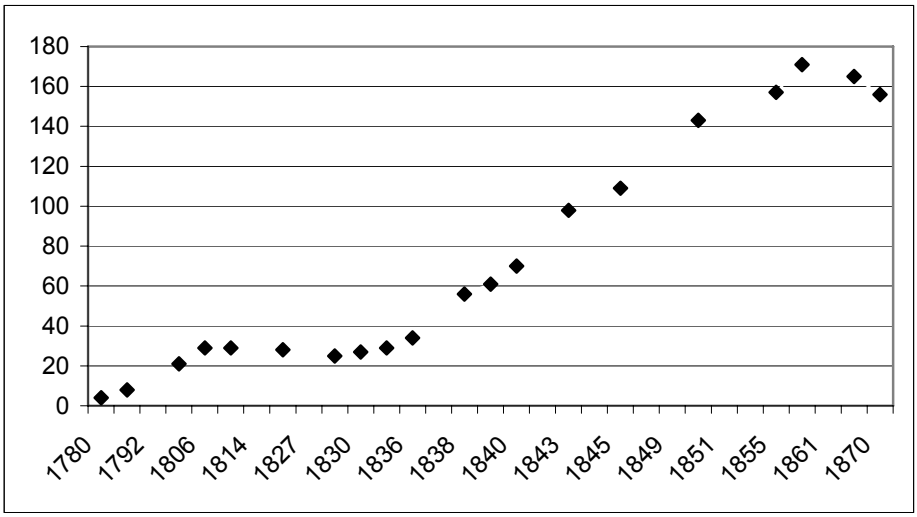

Figure 5. Industrial Construction 1780-1870: Iron-making furnaces in Scotland (Lythe and Butt 1975)

One of the problems with trying to describe the functioning of the construction industry in Scotland is the paucity of data covering all its activities. Many sources do not even seem to recognise it as an entity in the same way that, say, manufacturing is recognised as an industry. Hence, evidence of activity in construction outwith the house building arena has often to be deductive. Abundant sources refer to the need to house the flood of workers pouring into the industrialising areas but few refer to the vast amount of building required to accommodate the work they came to do. The remaining factory and warehouse buildings of the nineteenth century are still conspicuous for their sheer size and even for their beauty. By looking at figures **(fig.5)** for the numbers of iron smelting furnaces and cotton mills a rough idea can be obtained of the trends in non-domestic construction, although not detailed information such as the floor area produced.

Although the textile industry declined during the latter part of the nineteenth century in Scotland, and there were fewer large mill buildings requiring to be built, the metal trades were, by then, on the rise. Iron and steel works, plus the metalworking industries they supplied, such as ship and locomotive construction were expanding and requiring new premises. Most builders would expect to move between the domestic and the commercial fields of construction as the market required, which may be one of the reasons why Cairncross found that house building cycles do not correspond with business cycles.

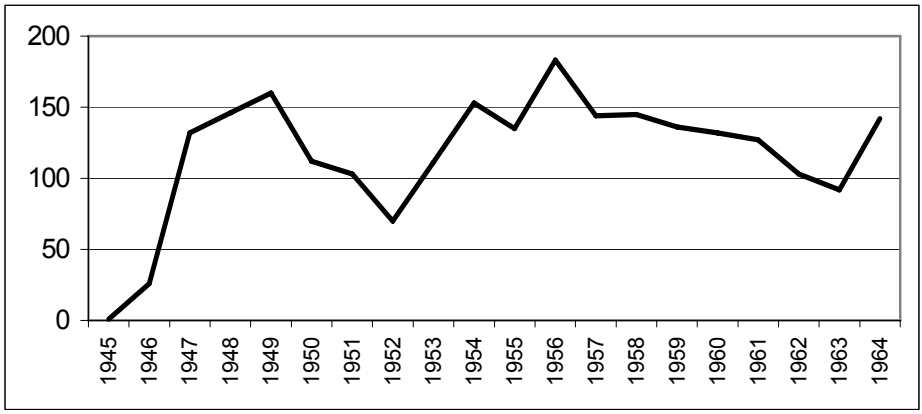

Figure 6. Number of new factories completed in Scotland 1945-1964 (Scottish Home Dept)

Figure 7. Industrial and other non-housing construction (CSO & Scottish Office)

After World War II Scotland saw a boom in industrial building, reflecting continuing shipyard and other metal industry work, followed by the move to lighter industries, particularly in electronics in the "Silicon Glen". There were industrial construction peaks **(fig.6)** in 1949, 1956 and 1964 and a general upward trend throughout the post war period, with further surges **(fig.7)** in around 1990 and 2000. All this industrial and commercial construction was within a business environment which was seeing the steady decline of traditional manufacturing industry. The

statistical data available are not sophisticated enough to show percentages of industrial buildings, offices and retail space, but we can surmise that the latter two categories are likely to have dominated, in line with the emergence of a service economy.

Employment

Unemployment peaks and troughs in the industry generally lag by about a year behind the investment cycle. Although the building depression of 1910 saw a sharp drop in building employees **(fig.8)** and a slow downward trend in the greater general depression of the 1930s, the construction industry actually survived the latter rather better than the manufacturing trades.

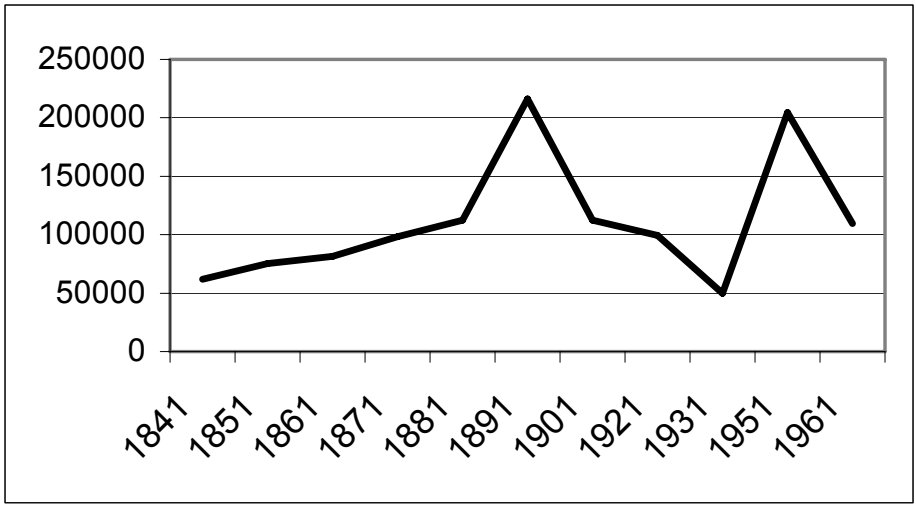

Figure 8. Construction employment in Scotland (Census reports 1841-1961)

Perversely, unemployment is also particularly likely during building booms when severe materials shortages can lead to lay-offs. Both world wars saw house building in particular stopped almost entirely, putting many building workers out of work. In World War II they were also prevented from entering other employment or even the services, due to being placed on Reserved Occupations lists, and the unions had to fight hard to get this changed. Later on in the war building workers were needed to deal with urgent repairs and a national apprenticeship scheme was started. The number of building operatives had dropped from 26,000 to only 3,600 during the war but this rose again in the postwar building boom, but has steadily declined ever since, with the introduction of mechanization leading to a smaller more skilled workforce **(fig.9)**.

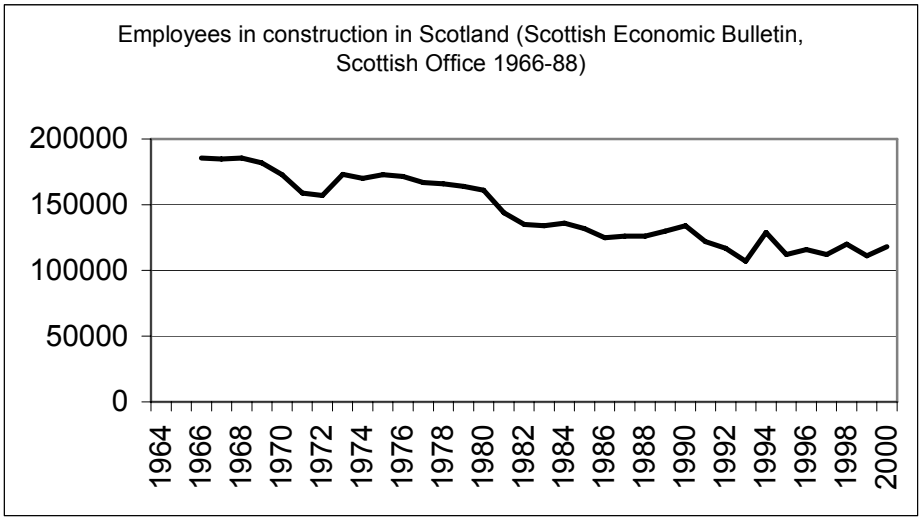

Figure 9. Construction employment in Scotland 1964-2000 (Scottish Office)

A particularly detrimental side-effect to the cyclicity of the construction industry is that most of the small and medium sized firms regard training of new entrants as too risky economically (Langdon 2002), as they may not be able to find suitable work for apprentices for a consistent period.

Comparing the UK and Scottish Construction Industries

There is no easy source of data which compares the performances of the construction industry in the UK as a whole with that in Scotland alone, for the whole period under examination. In the early part of the period there is detailed housing data assembled by Cairncross for Glasgow, but nothing similar for the rest of Scotland. Later, where regional data are available, there often arises the problem of different categories, as in the two figures below. The value of construction *output* for the whole UK is given **(fig.10)** whereas the value of *new orders* for Scotland is given **(fig.11)**. The latter is not necessarily as definite as the former, since not every new order results in completed output. Furthermore, the data categories for each are also different. Hence these can only be assumed to indicate respective trends over the period.

On that basis, the analysis of the post-war trend is generally upwards in both cases, but with less dramatic peaks and troughs in Scotland. The largest peak (1990) is the same for both but the earlier boom in the late 1960s in the UK was not as significant in Scotland. On the other

hand, Scotland had a building boom in the late 1970s, at a time when the rest of the UK was apparently in a building slump.

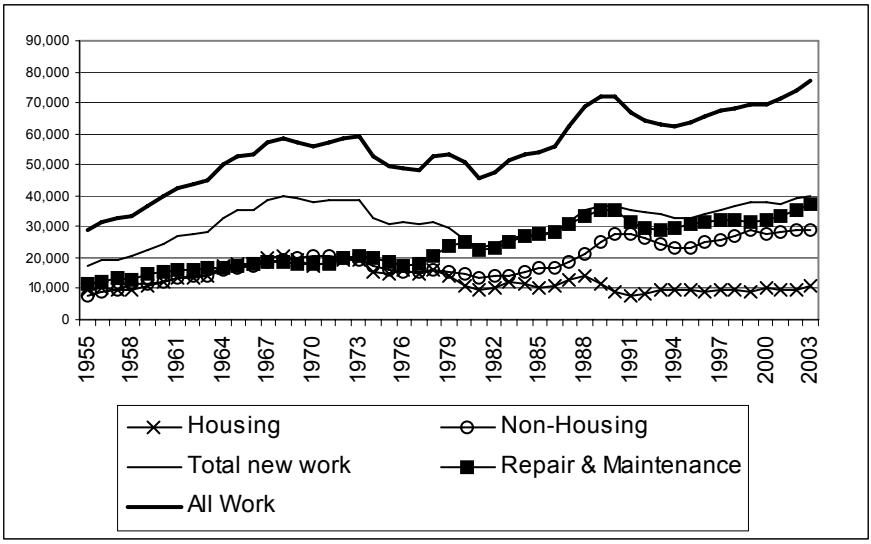

Figure 10. Construction output in UK 1955-2003 (£millions) (DTI 2005)

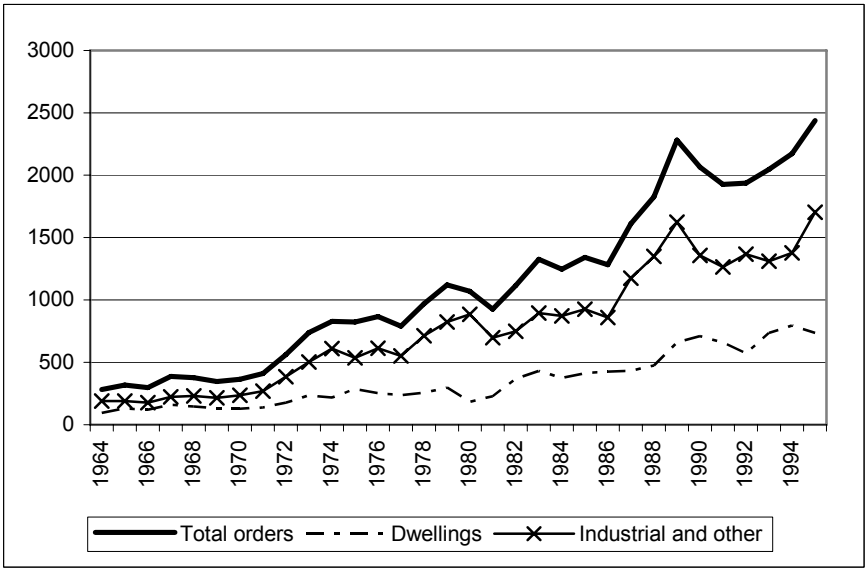

Figure 11. Value of new orders received in Scotland, 1964-1995 (£ m) CSO & Scottish Office)

In both cases it can be seen that the non-housing component is driving the peaks, especially the early 1990s peak. In some periods the peak of one sector of the industry is juxtaposed with a trough in the other sector. This demonstrates the importance of looking at all the work being done by "building" or "construction" firms in order to get a fair idea of the overall workload. Firms and individuals (in most trades) can try to be as versatile as possible in order to move between the house building and industrial/commercial sectors as well as some contracts in the civil engineering sector.

Comparing the two datasets by means of a logarithmic graph **(fig.12)** enables the disparate ranges to be seen together and confirms that the Scottish industry workload fluctuated over the period but was steadily rising at a steeper rate than the industry in the UK as a whole. This is not necessarily to be read as an unequivocally beneficial situation for Scotland, as the historical record shows that booms can create corresponding downturns.

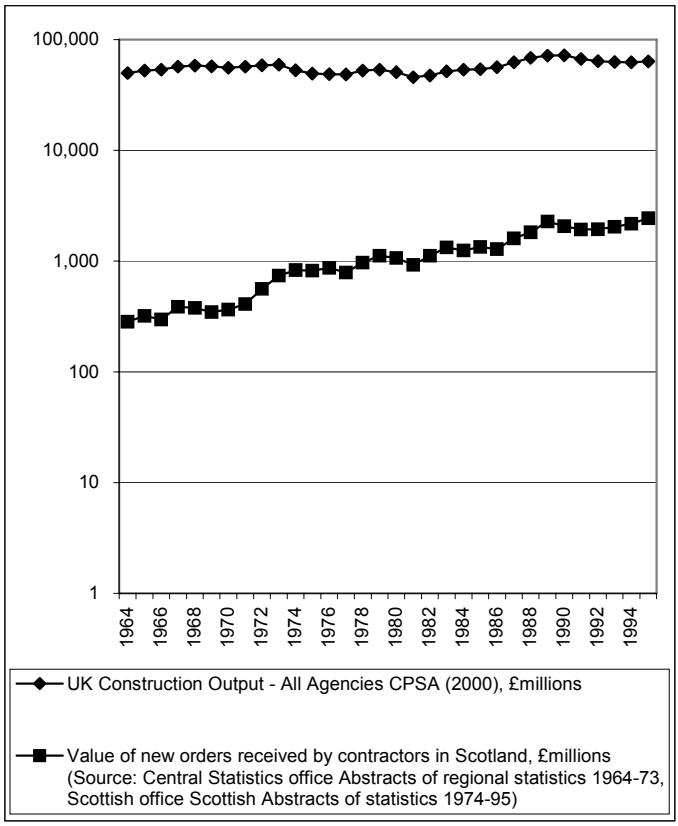

Figure 12. Logarithmic comparison of UK total construction output and Scottish new orders

DISCUSSION

Scotland is fortunate in that it retains physical evidence of building activity from the very earliest times: from Neolithic stone structures like Skara Brae (about 4 000 BC), through Iron Age brochs and roundhouses (200 BC), Norman and medieval churches and castles, to the development of medieval Royal Burghs and Georgian New Towns. Examples of all these surges in building activity remain to remind us that political and social changes have always triggered construction and hence some kind of cyclic outcome. However, quantitative data is difficult to obtain for those times and this paper is therefore concerned with the recent past, from the beginning of the nineteenth century, when statistical accounts and censuses started to be available. The figures given in the previous section show the variations in a number of data sets. There is nothing that covers the whole period. Methods of data collection and definitions change and even the variable about which data has been collected may disappear: the period in which cotton mills were built in Scotland was relatively short and even the mill buildings are now disappearing. Hence, all the individual data sets have been brought together in a single figure **(fig.13)**. This has necessitated some adjustments of units for each so that they all fit on a single scale, but the reader is invited to look at the trends rather than absolutes. Parry Lewis (1965) points out that to aggregate too many data can lead the analysis away from actual behaviour to the point of uselessness. Each data set contributes a particular detail to the "story" of the cyclical pattern, there has been no attempt to create any kind of index from the data.

Some studies of business cycles dismiss the dips during the war periods as aberrations. This is to ignore reality, not only because such shocks to the system may always be just around the corner, but also because both world wars resulted in substantial surges in public sector housing in the following periods. If the study of industrial history in general, and building cycles in particular, is to be of practical use, it must not get so taken up with theory that it gets too far away from what really happens.

The bold arrows **(fig.13)** indicate where the "long wave" or Kondratieff cycle peaks occur and coincide with technology changes: early industrial revolution – cotton and iron; post World War I heavy industry and rebuilding, post World War II light industry and reconstruction, 1970s electronics etc. The cycles in the industry continue to have both long and short cycles, the latter being indicated **(fig.13)** by light arrows and occurring at five to ten year intervals. Both long and short cycle peaks have shapes described as "Steepness asymmetry": steep rise and gradual or stepped decline. Ashworth (1999) ascribed this type of asymmetry to the effects of the difficulty for small firms in obtaining credit, which would certainly fit the typical historical reality for the many small firms which comprise the industry throughout the period. Even long-term planners, such as government departments are at the mercy of the five year political cycle. Funding for many public-sector projects is on an annual basis, which creates

payment and sustainability difficulties for the industry, a situation now in part overtaken by design-build-manage schemes. However, the steeper "Up slope" to a peak, compared with the "Down slope" to a trough suggests that the construction industry may have the positive attributes of being able to respond quickly to an improving market for its services, whilst also having an intrinsic buffer (the long time that buildings take to build) to delay the worst onset of the bad times.

In the same way that quantitative data displays cyclicity, so qualitative data about behaviour can also show repetitive responses to situations. The loss of ground rent income to speculative builders, in the early twentieth century, pushed many into becoming property managers and factors. Factors are professional property managers who act in the interests of residents in terms of all common elements relating to a building or development (i.e. maintenance, repair and gardens or grounds). They are particularly Scottish and are engaged by most owners of tenement properties. The market instability and decline in profits achievable by Scottish house builders in the late twentieth century encouraged some of the biggest firms to seek stability and higher profits by going into other sorts of property management, such as Private/Public Partnerships or Private Finance Initiatives. Overall the housebuilding industry in Scotland may be less cyclic than in the rest of the UK, but it has also shown less growth (Scottish Executive 2000) in output compared to the rest of the Scottish economy and to the UK construction industry.

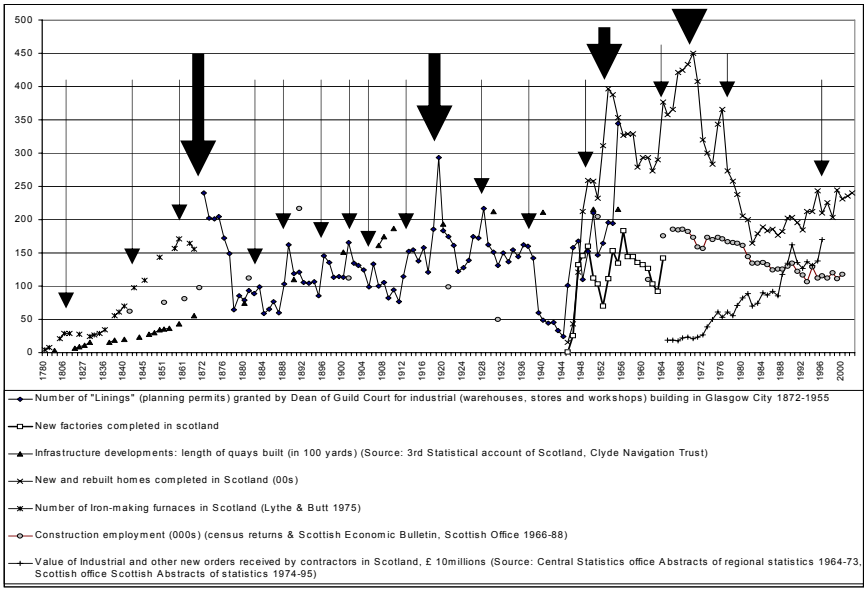

Figure 13. Combined statistics for Scottish construction industry 1780-20

CONCLUSIONS

It can be seen from the accumulated data above that the Scottish construction industry seems always to have been highly cyclic. The statistics also demonstrate that the Scottish industry is more cyclic than the rest of the UK.

Reasons for the various cycles have varied at different times:

1. Nineteenth century was typified by large numbers of financially precarious and/or incompetent small firms who relied on informal credit and were working to impossibly tight profit margins. This meant that the small to medium firms were highly likely to go bankrupt in the slightest downturn. The industry to which house building cycles most closely approximated in Scotland was the Clyde shipbuilding industry, itself susceptible to steep fluctuations.
2. Early twentieth century saw multiple government and local authority fiscal interventions and changes of policy. Forward planning within the industry, always difficult, became even harder and the industry retreated into ultra-conservatism in an effort to be sure of a market. Scotland was even later than the rest of the UK to move towards technological change in this field, even when urged by subsidies. This then left many firms in a weak position to respond to change.
3. Late twentieth century is seen as moving from some very severe fluctuations from the 60s to the 90s into a period of less cyclicity, at least compared with the rest of the UK. Low growth and poor innovation may be the prices being paid for a more stable situation at the end of the 20th century.
4. The industry does, however, demonstrate resilience, with quick responses to upturns and slow descents as work decreases.

This assembly and review of statistics over a long period sets the context in which other historical and behavioural studies of the industry in Scotland can be studied.

REFERENCES

Barras, R, 1987. “Technical change and the urban development cycle”, *Urban Studies,* 24, pp. 5-30.

Ball, Morrison and Wood, 1996. “Structures investment and economic growth: a long-term international comparison”, *Urban Studies*, 35, no. 9, pp. 1687-706.

Bowyer, J, 1973. *History of Building,* London: Crosby, Lockwood, Staples.

Cairncross, AK, 1953. *Home and Foreign Investment 1870-1913*, Cambridge: Cambridge University Press.

Census reports for Scotland,1841-1961.

Construction News, Editorial, Jan. 2005.

CSO. Central Statistics Office Abstracts of regional statistics 1964-73, Scottish Office Scottish Abstracts of Statistics 1974-95.

Cunnison, J and Gilfillan, JBS, (eds.), 1958. "Clyde Navigation Trust" in *The 3rd Statistical account of Scotla*nd, Glasgow: Collins.

Dean of Guild Court's reports, *The Scotsman,* 26 Dec. 1905, p. 2; 27 Dec. 1907, p. 5; 27 Dec. 1907, p. 5; 1 Nov. 1910, p. 5.

Dean of Guild, 1887. The Edinburgh building trade in 1887, *The Scotsman,* 20 Dec. 1887, p. 5.

Devine, T M, 1988. "Urbanisation" in Devine, TM and Mitchison, R, (eds.), *People and society in Scotland Vol 1 1760-1830*, Edinburgh: John Donald and ESHSS.

Fayolle, J, 2001. *The study of cycles and business analysis in the history of economic thought*, Luxembourg: Euro stat colloquium.

Gibb, K, 1999[1]. "Rebirth of the Market 1975 – present day and beyond", in Glendinning, M and Watters, D M, (eds.), *Home Builders,* Edinburgh: Royal Commission on Ancient and Historical Monuments of Scotland.

Gibb, K, 1999[2]. "Regional differentiation and the Scottish private house building sector", *Housing Studies,* 14, no. 1, pp. 43-56.

Glendinning, M, 1999. "Prefab homes 1939-59", in Glendinning, M and Watters, DM, (eds.), *Home Builders,* Edinburgh: Royal Commission on Ancient and Historical Monuments of Scotland.

Glendinning, M and Watters, D M, (eds.), 1999. *Home Builders,* Edinburgh: Royal Commission on Ancient and Historical Monuments of Scotland.

Langdon, 2002. *Rethinking construction in the Scottish housebuilding industry,* Davis Langdon Consultancy for Communities Scotland.

Lythe, SGE and Butt, J, 1975. *An economic history of Scotland 1100-1939*, Glasgow: Blackie.

Morgan, N (1999), "Construction Industry", in Slaven, A. and Checkland, S, (eds.), *Dictionary of Scottish Business Biography Vol 2*, Aberdeen: Aberdeen University Press.

OECD, 1997. *Cyclical indicators and business tendency surveys*, OECD working paper vol. V, Paris: OECD.

Parry Lewis, J, 1965. *Building cycles and Britain's growth*, New York: St Martin's Press.

Powell, C, 1982. *Economic History of the British Building Industry 1815-1979*, London: Methuen.

Rodger, R, 1986. Structural instability in the Scottish building industry 1820-80, *Construction History,* 2, pp.48-60.

Schumpeter, J.A, 1939. *Business cycles: a theoretical, historical and statistical analysis of the capitalist process*, Ohio: McGraw Hill.

Scottish Executive, 2000. Scottish *Economic Report, January 2000*.

Scottish Home Dept. and Scottish Statistical Office *Digest of Scottish Statistics.*

Scottish Office, 1966-88. *Scottish Economic Bulletin*.

SPIC, 2000. The Construction Industry, Scottish Parliament Information Centre (SPIC) research note 00/37, 22 May 2000.

Stewart, J, 2002. *Building a Crisis - Housing under-supply in England,* Home Builders Federation.

Tallis, W, March 2004. "Major Contractors Group", in *UK construction industry overview*, Corporate Watch UK.

Websites

Ashworth, P, 1999. *Testing for asymmetry and non-linearity in UK business cycles: some univariate evidence for GDP and components of aggregate demand*, National Institute of Economic and Social Research, ESRC award no. L116251026. [Online] Accessed March 2005: http://www.st-andrews.ac.uk/~res2000/papers/pdffiles/tuesday/Ashworth.pdf

DTI, 2005. Output and Employment in the Construction Industry. [Online] Accessed 24 May 2005. http://www.dti.gov.uk/construction/stats/ottimes.xls

Home Builders Federation: http://www.hbf.co.uk/index.php?id=480 (to access J. Stewart's paper).

Scottish Executive Economic Report, January 2000, accessed from Internet, November 2005: http://www.scotland.gov.uk/library2/doc10/ser2-09.asp

Corporate watch UK: http://www.corporatewatch.org/?lid=277 (to access UK Construction industry overview 2004).