# The economic disturbance theory and the merger activity in Britain — an empirical investigation

A. Pouris
University of Cape Town, Rondebosch

This article is an empirical exploration of the hypothesis, advanced by Gort (1969), that mergers are the result of disturbed expectations owing to economic and technological shocks. The importance of this theory lies in the fact that it attempts to explain the observed cyclic pattern of merger activity and to provide a link between the neoclassical set of explanations and the timing of mergers. The tests point out that changes in merger rates over time and among industries in Britain are not determined by changes in technology and/or stock prices. Residual contributions are the comprehensive discussion of the availability and sources of data on mergers and stock price indices in the United Kingdom, and an indication, with policy implications, that merger activity may affect the performance of the stock market adversely.
*S. Afr. J. Bus. Mgmt.* 1985, 16: 103 – 108

Hierdie artikel is 'n empiriese ondersoek van die hipotese geformuleer deur Gort (1969), dat samesmeltings die gevolg is van veranderde verwagtinge wat deur ekonomiese en tegnologiese skokke veroorsaak word. Die belangrikheid van hierdie teorie berus daarop dat dit poog om die sikliese patroon van samesmeltingsaksies te verduidelik en dat dit verder ook poog om 'n verband tussen neo-klassieke verduidelikings en die tydsbepaling van samesmeltings, te voorsien. Die resultate toon dat veranderinge in die voorkoms van samesmeltings oor tyd en tussen industrieë in Brittanje nie veroorsaak word deur veranderinge in tegnologie en/of aandeelpryse nie. Die artikel bevat nie alleen 'n omvattende bespreking van die beskikbaarheid en bronne van data oor samesmeltings en aandeelpryse in die Verenigde Koninkryk nie, maar bevat ook 'n aanduiding — met beleidsimplikasies — dat samesmeltingsaktiwiteite die aandelemark se prestasie negatief mag raak.
*S.-Afr. Tydskr. Bedryfsl.* 1985, 16: 103 – 108

**A. Pouris**
Present address: 501 Rusdon Park, College Road, Rondebosch, Cape Town, 7700 Republic of South Africa

Accepted May 1985

## Introduction

One of the puzzling characteristics of mergers is that they appear in large waves coincidental with general economic advance and prosperity. Researchers have noticed that behaviour and various explanations have been discussed (Nelson, 1959, 1966; Reid, 1968; Beckenstein, 1977; George & Silberston, 1976). The most well-known explanation is given by Gort's economic disturbance theory of mergers (Gort, 1969).

Gort advanced the hypothesis that 'forces which generate discrepancies in valuation are decisive in determining variations in merger rates both among industries and over time.' He justified his theory on the grounds that environmental disturbances and shocks generate evaluation gaps by altering, at random, the ranking of expectations of investors and render the future less predictable on the basis of information about the past. The envisaged shocks cover a wide spectrum, but the rapid changes in technology and the movements in security prices were found to be most important.

In this article Gort's economic disturbance theory of mergers is tested using data from the UK. Firstly I discuss the relation and the direction of causality between merger activity and stock market prices, and secondly the relation between technological change and merger activity.

In contrast with Gort, who offers empirical evidence only for the determination of variation in merger rates among industries, I examine both legs of his hypothesis. That is, that the suggested variables determine variations in merger rates both among industries and over time.

## Merger activity and stock market prices

In the merger literature, a great deal of attention has been devoted to the correlation of merger activity and stock market prices. However, the majority of studies use data exclusively from the USA. In this article I use data from the UK.

I attempt to answer two questions. The first asks whether there is a relation between merger activity and stock price indices and the second, whether such a correlation is the result of a causal relation running from the stock market to merger activity or not. Firstly, I discuss the availability and sources of data and then present the methodology and the results.

### Data

*Statistics on mergers*

Ideally, merger statistics are compiled by a government agency with the aid of statutory merger disclosure requirements and an efficient financial press. However, in the UK there are reliable official statistics only from 1954 onwards. Even so, important gaps exist in 1961 and 1969.

Between 1954 and 1961, the figures are related to companies with a stock exchange quotation and they are based on the accounts of companies whose financial years end within the 12 months to 5 April. Since 1961, companies with assets of £0,5 million or with incomes of £50 000 or less were excluded. This reduced merger activity by an estimated 6,6% relative to the earlier years. Another change in the data of this period (1954 – 1961) appears in publications after 1971, as the improved treatment of consolidations introduced by the Department of Trade and Industry has been applied retrospectively to these statistics, including merger consolidations, considering the larger firm as acquirer and the smaller as acquired.

In 1969, the basis of the official statistics changed from company accounts to reports in the financial press. This change enabled a number of improvements to be made. In particular, it was possible to date mergers by the calendar year and the quarter in which the transaction was finalized, rather than by the accounting year, to exclude acquisitions of foreign companies by the UK-quoted companies, and to widen coverage to include more non-quoted companies.

A longer historical series of mergers in the UK has been compiled by Hannah (1976). The series is derived from business and industrial histories, year-books, company accounts, and reports in the financial press, covering the period 1880 – 1969. The author recognizes the bravery of her attempt and points out that 'it would be rash to suppose that such heterogenous sources had produced a series which was comparable in coverage at all points in time'. The most important discontinuities occur in 1919 and 1938, therefore, the figures for the three sub-periods 1880 – 1918, 1919 – 1938 and 1939 – 1968, are not comparable.

*Statistics on index number of securities*

In contrast with the limited availability of data on merger activity, reliable stock indices for shares listed in the UK exist since 1867. The main sources of the indices are, the 'Royal Economic Society' (RES) and the 'London and Cambridge Economic Service' (LCES) for the earliest period (up to 1940) and the 'Financial Times' and 'Institute of Actuaries' for the most recent period.

For the purpose of this article I use three series of indices. The first is the pre-war index number of British securities published in the Royal Economic Society's Memorandum No 47, 1934. This index is a simple arithmetic average of the percentage price changes of the shares of the most important companies traded in London and in the chief provincial Stock Exchanges. The index covers the period from July 1867 to June 1914. In the above-mentioned Memorandum, the index is extended up to 1933 by Kitchin. I employ this index for the period 1880 – 1933.

The second index has been published in 'The British Economy Key Statistics 1900 – 1970' by the 'Times' newspaper, and covers the period 1900 – 1970. This index has been deduced from four sub-indices, namely:

1900 – 1924 The LCES Index for 80 industrial companies. Arithmetic average of end-of-month prices.

1924 – 1949 The LCES Index for 92 industrial companies excluding finance and property companies. Arithmetic average of mid-month prices.

1949 – 1962 Moodies Services Ltd. Index for 60 equities selected to represent the whole London market excluding mines and plantations. The geometric mean of the prices quoted on Fridays.

1962 – 1970 The FT Actuaries 500 industrial share Index. Financial and property companies are excluded. Figures are arithmetic averages of working days.

I employ this index for the period 1933 – 1970.

For the most recent period 1970 – 1980 I use quarterly data of the FT Actuaries 500 share Index as published by the Financial Times newspaper. This index is the joint responsibility of the Institute and the Faculty of Actuaries and the Financial Times, and has as a base date 10 April 1962. The quarterly data are simple arithmetic averages of the daily index (closing prices of stocks).

*Statistics on number of registered companies*

The number of registered companies with a share capital in existence at the end of each year has been taken from the Annual Abstracts of Statistics HMSO (various) and from various 'Papers of the House of Commons'. There are breaks in the years 1925 and 1962.

## Methodology and Results

*Variations of merger rates over time*

*The relation between number of mergers and stock price index.* Firstly, I attempt to find whether there is a relationship between merger activity and stock-market prices over time. I examine the relationship between the series of the aggregate annual number of mergers and the series of annual average stock price index for the UK over the period 1880 – 1968. I use both series on level (no changes) so that the results of my test are immediately comparable with similar studies for the USA (Weston, 1953; Nelson, 1959). To avoid the breaks, I divide the whole period into three sub-periods, 1880 – 1918, 1919 – 1938 and 1939 – 1968. Also, to avoid the fact that the data are not reliable in a numerical sense, I use non-parametric tests. The tests in use are the Spearman Rank correlation coefficient (*RS*) corrected for ties and the Kendall Rank correlation coefficient (*T*) corrected for ties as well. Both tests require that the variables under examination be measured only in ordinal scale. The generalized form of *T* coefficient (partial correlation coefficient) is used to neutralize the effect of the changes of the number of companies on the relation between merger activity and stock price index.

In Table 1, findings of the relationship between number of mergers and the stock price index are summarized as expressed by the Spearman Rank correlation coefficients for the three periods. The first column shows the period under examination, the second column the Spearman Rank correlation coefficient, the third column the *T* statistic, and the fourth column contains the number of observations. For all three periods a highly statistically significant relation has been found between the number of mergers and the stock price index.

In Table 2, the Kendall Rank correlation coefficient and the Kendall partial Rank correlation coefficient which eliminate the effects of variations of the number of companies in the UK upon the relationship between number of mergers

**Table 1** Spearman Rank correlation coefficient (RS) between number of mergers and stock price index (1880 – 1968 UK)

| Periods | Coefficients (RS) | *T* statistic | Sample size |
|---|---|---|---|
| 1880 – 1918 | 0,615[a] | 4,74 | 39 |
| 1919 – 1938 | 0,7[a] | 4,158 | 20 |
| 1939 – 1968 | 0,93[a] | 13,39 | 30 |

[a]significant at the 0,1% level

**Table 2** Kendall Rank correlation coefficients (*T*) between number of mergers and stock price index (*Tm.si*), number of companies in the country and number of mergers (*Tc.m*), and the Kendall partial Rank correlation coefficients between number of mergers and stock price index with the number of companies in existence (*Tm.si,c*) as constant

| Periods | *Tm.si* | *Tc.m* | *Tm.si,c* |
|---|---|---|---|
| 1885 – 1918 | 0,45 | 0,23 | 0,39 |
| 1939 – 1962 | 0,793 | 0,74 | 0,45 |

and the stock price index, are shown.

Table 2 shows the Kendall Rank correlation coefficient between the number of mergers and the stock price index (*Tm.si*), the correlation coefficient between the number of companies and the number of mergers (*Tc.m*), and the partial correlation coefficient (*Tm.si,c*).

No results for the period 1919 – 1938 are reported because of the breaks in the series of the number of companies and stock price index.

The *Tc.m* is statistically significant for both periods ($z = 1,916$ for 1885 – 1918, significant at the 0,028 level and $z = 5,1$ for 1939 – 1962, significant at the 0,001 level). The *Tm.si* is statistically significant at the 0,001 level for both periods.

Tests of significance of the observed *Tm.si,c* (partial correlation coefficient) are not possible because the sampling distribution of the Kendal partial Rank correlation coefficient is not known as yet. However, the high figures for *Tm.si,c* indicate that a relation exists between mergers and stock price index even when the effects of the variation of the number of companies in existence are neutralized.

*The causal relationship between mergers and stock prices.* Having found a positive relation between merger activity and stock price index, I turn to the question of causality. Gort (1969) has suggested that the causality runs from the stock market to mergers. However, Reid (1968) argues that the causality runs the other way around from mergers to the stock market. A non-causal relationship between mergers and stock price index has been suggested by Hindley (1972). His argument is that factors which influence the stock market and the general level of economic activity usually influence mergers and the relationship between merger activity and stock market is spurious. Unfortunately, Hindley does not explain which are the underlying factors and does not offer any proxies for the underlying sediment. Therefore, his suggestion cannot be tested empirically. However, while the focus is Gort's argument, the rejection of a causality running from the stock market to mergers' activity, would indirectly support Reid's direction of causality.

The direction of causality can be detected through the Granger's 'causality' test. I employ this technique and because of the availability and quality of data I restrict my study to the period 1969 – 1980 for which reliable quarterly data are available.

*Granger's 'causality' test*

Granger's 'causality' test examines the data to determine whether changes in the number of mergers are endogenous to changes in the stock price index, while changes in the index are exogenous to changes in mergers.

Clearly, it is unrealistic to say that merger activity, in say 1978, depends on actual share prices in 1979. However, if a close relationship appeared, then there may be a case for saying that share prices in 1979 reflected merger activity in 1978, in other words, that the link was from merger activity to share prices and not vice versa.

To perform this test, first the quarterly changes in the number of mergers (DM) on the quarterly changes in the stock price index (DI) in the contemporaneous quarter and past ten (lagged) quarters are regressed; and then, similarly, the quarterly changes in the stock price index on the quarterly changes in the number of mergers in the contemporaneous quarter and past ten quarters are regressed. In order to determine whether the estimated coefficients are sensitive to the lag length and to identify statistically redundant lags, the structure was shortened gradually to zero lag. At each stage a *F*-test was applied to determine whether the omitted lags were significant.

The maximum length of lags has been chosen as 2,5 years, half the average period of cyclical movements in the post-war UK economy ('New Contribution to Economic Statistics' 9th series CSO). A length longer than 2,5 years would confuse the issue as the effects of the upward phase of the leading series on the lagging one would not be able to be distinguished from the effects of the downward phase.

The results of the regressions are summarized in Table 3. The regressions $DM = f(DI)$ are statistically significant only for lags 0 and 1, while the regressions $DI = f(DM)$ are significant almost up to two years with the exception of lag 3. Taking into consideration that mergers are dated in the quarter in which the transaction is finalized, and making the reasonable assumption that the day of decision for the merger preceeds at least two quarters of the day of finalization, we can reject any 'Gortian' causality running from the stock price index to mergers. Conversely, there is an indication that Reid's hypothesis that mergers have a negative influence on share prices, can find support. The coefficient of lags 4, 5, 6 and 7 have negative signs and the overall coefficients of determination are 0,331, 0,387, 0,389 and 0,398 for the regressions up to lag 4, 5, 6 and 7 respectively. However, further research is required in that direction.

**Table 3** Causality tests between changes in the stock price index (*DI*) (quarterly) and changes in the number of mergers (*DM*) (quarterly)

| $DM = f(DI)^b$ | | $DI = f(DM)^c$ | |
|---|---|---|---|
| Lags (*n*) | *F* statistic | Lags (*n*) | *F* statistic |
| 0 | 5,33[a] | 0 | 5,33[a] |
| 1 | 4,93[a] | 1 | 3,64[a] |
| 2 | 2,69 | 2 | 3,10[a] |
| 3 | 2,59 | 3 | 2,24 |
| 4 | 1,90 | 4 | 3,67[a] |
| 5 | 1,63 | 5 | 3,68[a] |
| 6 | 1,48 | 6 | 3,01[a] |
| 7 | 1,30 | 7 | 2,56[a] |
| 8 | 1,26 | 8 | 2,19 |
| 9 | 1,28 | 9 | 1,87 |
| 10 | 1,26 | 10 | 1,62 |

[a]Significantly different from zero at the 95% level

[b] $DM_t = \text{const} + \sum_{k=0}^{n} a_k \cdot DI_{t-k}$

[c] $DI_t = \text{const} + \sum_{k=0}^{n} a_k \cdot DM_{t-k}$

where *n* shows the lag with the maximum length included in the regression.

## Variations of merger rates among industries

To test Gort's hypothesis that changes in the price of shares determine the variations in merger rates among industries, two methods are employed.

First, I use the method Gort used to test his own hypothesis for other variables apart from stock prices (as stock price indices at the three-digit level of industry were not available). The test is a cross-section regression with dependent variable the merger rate — that is, the ratio of aggregate number of mergers in each of the two-digit levels of industry detail over the period 1970 – 1980 to the number of firms in the industry in 1975 — and independent variable the stock price index (31 December 1975) of the industries, at the two-digit level of industry detail, on level. The number of firms in each industry in 1975 is conceived as a proxy for the average number of firms in the industry over the entire period and the stock price index is used on level to justify Gort's argument that 'valuation discrepancies of the type needed for acquisitions to occur will be far more frequent in periods of high than in periods of low security prices'.

The second (cross section) regression is employed to confront the argument that 'rapid changes in the price of company shares . . . represent a break with the past . . . and . . . differences in the values placed on them by various investors will increase'. The dependent variable — merger rate — remains the same as in the previous test but the coefficient of variation of the extreme annual change of the index of shares of the industries on the two-digit level of detail is used as independent variable.

More specifically, I create a time-series with the highest and lowest prices of the stock indices of the industries as they are classified in the two-digit level of detail, for the period 1969 – 1979.

From each of these series I generate a coefficient of variation — standard deviation divided by the mean — and I use these values as observations for the independent variable of the cross section regression.

The results of the two regressions are reported in Table 4. The $T$ statistic in both regressions indicate that the slopes are not significantly different from zero. Therefore, Gort's argument that share price indices can explain the variations in merger rates among industries can be rejected.

**Table 4** Results of testing the hypothesis that merger rates among industries are determined by the level and variability of the stock prices

| | Regression 1[a] | Regression 2[b] |
|---|---|---|
| Slope | 0,69 | – 1,652 |
| $T$ statistic | 0,454 | 1,185 |
| Size of sample | 12 | 10 |
| $R^2$ | 0,02 | 0,149 |

[a]Merger rate = $f$ (stock price index on level)
[b]Merger rate = $f$ (coefficient of variation of extreme annual change of the stock price index)

## Merger activity and technological change

Gort argues that rapid technological change makes the record of the past information useless for the prediction of the future. To quote him:

> 'Changes in technology may lead either to new products or to new processes of production for the same products. Demand for new products is difficult to predict from past experience, and so are cost, to the extend that average total unit costs depend upon volume of output. Conversely, when production processes change frequently, future costs are difficult to forecast from past costs; and to the extent that cost changes are reflected in price changes, future prices and outputs are also independent of past prices and outputs. In short, when technology changes rapidly, the record of the past necessarily contributes less to the formation of predictions about income. In consequence, the variance in the valuations of investors rises and the frequency of mergers increases accordingly.'

In the following analysis, I test Gort's hypothesis as far as the dependence of merger rates on technological changes is concerned, with data from the UK. I discuss the data, the methodology and the results of my tests.

## Data

Measuring technological change is the subject of much debate and there is dispute concerning the definitions and the value of the various proxies suggested by the students of technological change.

Here, I do not discuss the dispute which by itself requires a long investigation, but I adopt the same proxies that Gort used to test his theory although I am sceptic on the value of these proxies.

As measures of technological change Gort uses the technical personnel ratio and the changes in labour productivity. The former proxy requires the existence of a relationship between effort and result while the latter assumes that labour is the only factor of production.

The unrealistic assumption that labour is the only factor of production, introduces biases in the results of studies using changes in labour productivity as a proxy of technological change. In industries which are labour intensive, technological change will be overestimated as small automation for example, could substitute many workers and productivity could increase disproportionately, while the opposite will be true for capital intensive industries.

Technical personnel ratio is defined as the number of scientists and engineers in the private industries, who spend more than half of the working week on R & D activities during the calendar year under investigation, per 10 000 employees. Figures on employment in general are from the 'Annual Abstract of Statistics' (CSO various). Data for the number of scientists engaged in R & D per industry are obtained from the Business Monitor No 14, 'Industrial Research and Development Expenditure and Employment' (1975).

Change in labour productivity is measured by the production index for 1975 (and 1980) with base year 1966 (and 1970) multiplied by the ratio of number of employees in 1966 (1970) to the number of employees in 1975 (1980). The production indices were obtained from the 'Annual Abstract of Statistics' (CSO various).

Merger rate in the cross section analysis is defined as the ratio of aggregate number of mergers in each of the two-digit manufacturing industries, as they are classified by the CSO in the 'Standard Industrial Classification' (1968), over the period 1969 – 1980, to the average number of firms in the industry (for the same period).

Information on number of acquisitions by industry was obtained from the Business Monitor MQ7, 'Acquisitions and Mergers of Industrial and Commercial Companies' HMSO (quarterly issues).

The 'orders' of the Standard Industrial Classification (1968)

I use, are from III to XIX (Appendix A), but the order IV (coal and petroleum products) has been aggregated with the order V (chemicals and allied industries) and the order VII (mechanical engineering) with the order VIII (instrument engineering). The reason for the above aggregations is the limitations of the available data for the number of research scientists in these industries owing to disclosure conditions.

The number of firms in each industry has been obtained by the Business Monitor PA1002 'Report of Censuses of Production' (various).

In investigating the assertion that changes in technology determine the merger rates over time, I use the time series of the number of innovations per year (1750 – 1955) as it has been developed by Mensch (1979). Innovation is defined by Mensch as the creation of new products and businesses out of previous inventions.

Merger rates are defined as the aggregate number of mergers per year in the UK (1880 – 1960) (Hannah, 1976) divided by the number of companies in existence in the UK in the same period.

The number of companies in existence per year is from various 'Papers of the House of Commons' and the 'Annual Abstract of Statistics'.

## Methodology

First I test the hypothesis that technological changes determine merger rates among industries and then the assertion that technological shocks determine merger activity over time.

To test the hypothesis that technological changes lead to valuation discrepancies which in their turn determine the merger rates among industries, I follow Gort's steps.

Gort states his hypothesis in the functional form of:

$$Y = F(T)$$

where $Y$ = merger rate and $T$ = measure of technical change.

Thus, I perform the above regression in linear form expecting a priori statistically significant results and a high correlation coefficient (Gort found $R = 0{,}737$ for the technical personnel ratio and $R = 0{,}519$ for productivity change).

Merger rates are defined (as in the previous tests) as the ratio of aggregate number of acquisitions per industry in the period 1969 – 1980 to the average number of firms in the industry during that period.

The technical personnel ratio in 1975 and the productivity change during the periods 1969 – 1975 and 1970 – 1980 are perceived to be measures of technological change.

To test the hypothesis (not tested by Gort) that technological changes determine merger rates over time, it is needed first to establish the existence of a relationship between merger activity and a proxy of technological change and then to prove that the causality runs from technology to mergers and not vice versa.

If no relationship can be established between technological change and merger activity, there is no need to proceed further. To find the degree of association between the two variables, (merger rate – number of innovations), I employ the Spearman Rank correlation coefficient and give a diagrammatic exposition of the two time series.

## Statistical results

Table 5 shows the results of the regressions testing the hypothesis that changes in technology determine the merger rates among industries. (Data from Appendix A). Only the regression with the technical personnel ratio as independent variable gives a slope statistically different from zero at the 95% confidence level. In this respect, my results support Gort's finding that the acquired companies belong to the technology intensive industries.

**Table 5** Results of regressions testing the hypothesis that changes in technology determine the merger rates among industries

| | Equation 1[a] | Equation 2[b] | Equation 3[c] |
|---|---|---|---|
| Intercept | 41,34 | – 1,18 | 0,72 |
| Slope | 0,16[d] | 0,414 | 0,43 |
| $T$ statistic | 2,006 | 1,075 | 1,21 |
| $R^2$ | 0,26 | 0,087 | 0,108 |
| Size of sample | 14 | 14 | 14 |

[a]Equation 1: (merger rate) = $f$ (technical personnel ratio)
[b]Equation 2: (merger rate) = $f$ (productivity change 1966 – 1975)
[c]Equation 3: (merger rate) = $f$ (productivity change 1970 – 1980)
[d]Statistically different from zero at the 95% confidence level

Figure 1 shows the series of the number of innovations per five-year periods (1870 – 1955), and the ratio of the number of acquired companies to the number of firms in existence for the same five-year periods.

A verification of Gort's hypothesis requires, initially, the existence of a relationship between the two series. However, no such relationship can be detected. Innovations are observed to cluster at 50-year intervals, the last being in the 1930's and no such clustering is apparent in the merger ratio series. Two peaks in the merger ratio 1885 – 1890 and 1895 – 1900 can be loosely conceived as the result of the first wave of innovation, however, the third detectable peak (1915 – 1920) in the merger series preceeded the innovative activity in 1930 – 1935. The conclusion derived from observation of Figure 1 is also supported by the Spearman Rank correlation coefficient between the number of mergers and number of innovations in 15 five-year periods (1881 – 1955) (Appendix B). The coefficient is found to be – 0,23 while the critical value at the 0,05 level of significance is 0,440. Therefore, no association exists between number of mergers and number of innovations.

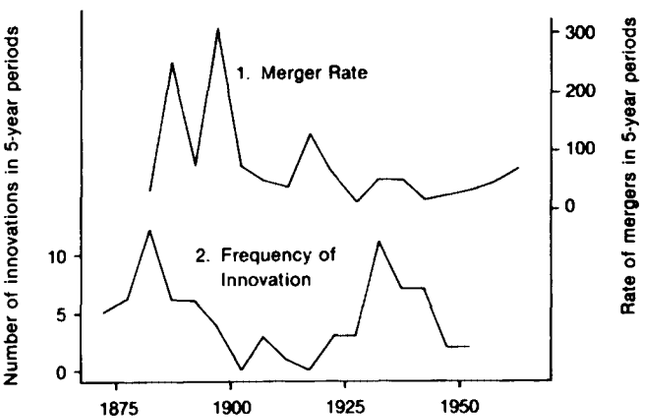


**Figure 1** Merger activity and frequency of innovations 1875 – 1955.

Although there is some dispute concerning the definitions and dating of the innovations used, it can be concluded that at least Mensch's proxy of technological change with all its deficiencies does not conform with Gort's hypothesis that merger rates over time are determined by technological change.

## Conclusions

In this article I tested Gort's hypothesis that forces which generate discrepancies in valuation are decisive in determining variations in merger rates both among industries and over time, with data from the UK.

In contrast with Gort, who provides empirical support only for the hypothesis that discrepancies in valuation determine variations in merger rates among industries, I tested both legs of his hypothesis.

Evidence was found that stock price variations do not affect merger rates over time. On the contrary, merger rates seem to affect the performance of the stock market negatively.

Similarly, it was found that there is no immediately detectable relationship between technological change and merger rates over time. Thus, Gort's hypothesis that discrepancies in valuations caused by technological changes and stock price variations determine variations in merger rates over time, can be rejected.

As far as the determination of merger rates among industries is concerned, the evidence is less clear. Technological change, as proxied by the technical personnel ratio, seems to explain about 26% of the variation in merger rates among industries. However, when technological change is proxied by change in labour productivity, no statistically significant results can be found. Without wanting to emphasize the value of proxying technological change by the personnel ratio, it is argued that labour productivity change is not a reliable proxy for technological change in the UK for the period under examination.

Finally, changes in the stock price indices in the two-digit level of industry detail, were unable to explain any variations in the merger rates among industries.

Gort's theory seems to be unable to explain the merger activity in the United Kingdom.

## Acknowledgements

This article is based on the author's M Sc dissertation in Economics at the University of Surrey, Guildford, England. The author is indebted to Mr H. Katrak. Any errors and omissions are the author's alone.

## References

Beckenstein, A.R. 1977. *Merger Activity and Merger Theories: An Empirical Investigation*. Mimeo University of Virginia.

George, K.D. & Silberston, A. 1976. The Causes and Effects of Mergers. In: *Markets, Corporate Behaviour and the State*. Jacquemin, A.P., DeJong, H.W. Martinus Nijhoff.

Gort, M. 1969. An Economic Disturbance Theory of Mergers. *Q. J. Econ.*, vol. 83, 624 – 659.

Hannah, L. 1976. *The Rise of the Corporate Economy*. London: Methuen & Co Ltd.

Hindley, B. 1972. Recent Theory and Evidence on Corporate Merger. In: *Market Structure & Corporate Behaviour*. Ed Cowling, K. Gray Mills Publications Ltd.

Mensch, G. 1979. *Stalemate in Technology*. Ballinger Publications Mass., USA.

Nelson, R. 1959. *Merger Movements in American Industry 1895 – 1956*. Princeton: Princeton University Press.

Nelson, R. 1966. Business Cycle Factors in the Choice Between Internal and External Growth. In: *The Corporate Merger*. Eds Alberts, W. & Segall, J. University of Chicago Press.

Reid, S.R. 1968. *Mergers, Managers and the Economy*. McGraw Hill Book Company.

Royal Economic Society. Ed. 1934. *An Index Number of Securities 1867 – 1914*. Memorandum No 47, Smith, K.C. & Horne, G.F.

Times Newspaper Ltd. Ed. 1972. *The British Economy Key Statistics 1900 – 1970*. Published for the London and Cambridge Economic Service.

Weston, J.F. 1953. *The Role of Mergers in the Growth of Large Firms*. Bureaux of Business and Economic Research University of California.

## Appendix A

Data of merger ratios and proxies of technological change

| Order | Merger ratio | Prod change 1966 – 1975 | Prod change 1970 – 1980 | Tech pers ratio |
|---|---|---|---|---|
| III | 64,6 | 95,51 | 133,07 | 28,53 |
| IV – V | 89,2 | 151,17 | 127,21 | 239,828 |
| VI | 79,2 | 99,86 | 87,69 | 11,976 |
| VII – VIII | 45 | 127,32 | 131,79 | 38,984 |
| IX | 74,4 | 147,81 | 147,94 | 207,031 |
| X | 17,1 | 126,57 | 82,77 | 34,482 |
| XI | 59,6 | 110,25 | 99,89 | 181,818 |
| XII | 21,5 | 112,62 | 92,59 | 11,07 |
| XIII | 82,1 | 154,93 | 118,01 | 0,00 |
| XVI – XV | 31 | 134,55 | 130,05 | 25,943 |
| XVI | 66,6 | 139,38 | 126,52 | 37,037 |
| XVII | 16,56 | 125,32 | 107,49 | 0,00 |
| XVIII | 27,8 | 112,73 | 117,25 | 8,944 |
| XIX | 38,1 | 125,31 | 133,19 | 15,479 |

Classification order

| | |
|---|---|
| III | Food, drink, tobacco |
| IV – V | Chemicals, coal, petrol prod |
| VI | Metal manufacture |
| VII – VIII | Non-electric engineering |
| IX | Electrical engineering |
| X | Ship building |
| XI | Vehicles |
| XII | Metal goods not elsewhere spec. |
| XIII | Textiles |
| XIV – XV | Leather, clothing |
| XVI | Bricks, cement, etc. |
| XVII | Timber, furniture, etc. |
| XVIII | Paper and publishing |
| XIX | Other manufacturing industries |

## Appendix B

Number of mergers and innovations in 15 five-year periods (1881 – 1955) (Mensch, 1979 & Hannah, 1976)

| Periods | Number of innovations | Number of mergers |
|---|---|---|
| 1881 – 1885 | 12 | 20 |
| 1886 – 1890 | 6 | 273 |
| 1891 – 1895 | 6 | 119 |
| 1896 – 1900 | 4 | 802 |
| 1901 – 1905 | 0 | 249 |
| 1906 – 1910 | 3 | 204 |
| 1911 – 1915 | 1 | 228 |
| 1916 – 1920 | 0 | 820 |
| 1921 – 1925 | 3 | 514 |
| 1926 – 1930 | 3 | 1192 |
| 1931 – 1935 | 11 | 587 |
| 1936 – 1940 | 7 | 705 |
| 1941 – 1945 | 7 | 305 |
| 1946 – 1950 | 2 | 485 |
| 1951 – 1955 | 2 | 778 |