A Note

ON MEASURING AND MODELLING INNOVATIVE NEW ENTRY IN SWEDISH INDUSTRY

Ove GRANSTRAND

1. Introduction

New entrants are defined here as new firms or new business units of existing firms, which appear on the market with a product. Some of the new entrants are innovation-based, that is, they are based on product and/or process innovations, while the rest are imitation-based, that is they are based on existing products and processes. The new innovation-based firms are launched as a result of autonomous entrepreneurship, while the new innovation-based business units of existing firms are said to be launched as a result of corporate entrepreneurship. Schumpeter's definitions of innovations and entrepreneurs are used here. However, technological innovations will be dealt with in what follows.

Naturally, the distinctions between innovations and imitations, between new firms and new business units and between autonomous and corporate entrepreneurship are not always empirically clear, but can be taken here as a first approximation. Defined in this way the importance of studying new entrants derives from the importance of studying innovations and imitations.

The purpose of this paper is to give some empirical data and modelling aspects as a background to papers about simulation models which incorporate new entrants, see Eliasson's and Winter's papers in this volume, New innovative entry in the Swedish economy has not yet been built into the MOSES-model as a standard feature and Eliasson's excuse for not having it is simply lack of empirical information. [See Eliasson (1978, pp. 52–55) and (1983, p. 298).] Thus, there is unfortunately no simulation run available yet. However, Eliasson in his paper in this volume is very explicit in his conclusion that innovative entry is imperative for procuring diversity in the economy and that diversity is needed in order to stabilize macroeconomic progress. We find in this paper that innovative entry has been rapid in Swedish industry and that the data we present should be sufficient to engineer a realistic entry feature into MOSES.

2. Rates over time

In a recent study McQueen and Wallmark (1983) have shown, contrary to common belief in Sweden, that the annual rate of major technical innovations (major in terms of generated sales) in Swedish industry has grown at an average rate of 5% during the period 1945–1980. In all, 100 innovations were studied.

No bunching tendencies were found among the dates for patent applications or the dates of first commercial applications. Over the period, new firms were founded to exploit the innovations in 20% of the cases. The remaining 80% were generated and exploited by existing firms, typically by the old Swedish innovation based large firms, founded around the turn of the century, that is, ASEA, Ericsson, SKF, AGA etc. In fact the dominance of the old Swedish giants as bulk source of technical innovation seems to have increased significantly during the 1970s [Eliasson (1984)]. Dahmén (1970) found a similar pattern in the dominance of corporate entrepreneurship for the interwar years in Sweden. This pattern does not hold for the pre-WW1 period, however. The pattern is also found to vary between sectors.

There is no sign of a declining annual rate of major innovations in the old, large firms. On the contrary. Moreover, these firms are among the biggest R&D spenders among Swedish firms. There is a slight tendency towards an increasing annual rate of formation of new firms based on major innovations. Also there is a slight tendency towards an increase over time in the share of those major innovations, which form the basis for a new firm. However, it seems that there is an increase over time in the rate of acquisitions of small, innovation-based firms made by large firms [Granstrand and Jacobsson (1983)]. In a small sample of 13 such acquisitions made between 1960–1980, the median age of the small firm at the time of acquisition was 10 years. Clearly an increasing rate of such innovation take-overs may decrease the rate of innovation-based new firms, which enter and remain independent during some stage of adolescence.

The rate of growth 1980 in sales, as generated by the innovations studied by McQueen and Wallmark (1983), has a very skewed frequency distribution with a long right-hand tail. There is, surprisingly enough, no difference between these rates for the innovations in the new firms, compared to the innovations in the old firms. Thus, the sales performance of autonomous entrepreneurs does not differ from the sales performance of corporate entrepreneurs.

The distribution of major innovations by sector over the period corresponded roughly to the sector distribution of R&D expenditure. The distribution of new innovation-based firms by sector over the period showed no simple pattern.

What about the rate over time of new firms based on minor innovations and new firms in general in Swedish industry? Du Rietz (1980) found a declining rate of formation of new firms in the plastic, metal and engineering industries after a peak in the mid-60s. Du Rietz could not find any link between the rate of innovation and the rate of new firm formation after WW2 in Sweden, similar to the strong connection found by Dahmén (1970) for the interwar years. Probably the lack of evidence for such a connection in Du Rietz (1980) is due to the choice of measures to represent the rate of innovation and the number of innovation-based new firms. Utterback and Reitberger (1982) have studied roughly half the number of innovation-based (note again that technological innovations are referred to here) new manufacturing firms in Sweden, which were formed between 1965 and 1980 and were surviving with at least 20 employees in Sweden in 1980. 60 firms were studied. It is difficult to distinguish between new firms which are innovation-based and those which are not, but to get an idea of the share of new firms, which actually are more or less innovation-based, consider the situation during 1965–1974. 4,200 manufacturing firms were incorporated during this period in Sweden. 550 of these had at least 20 employees in Sweden in 1980. 250 of these 550 were in the engineering industry, 200 of these 250 were founder-owned. 50 of these 200 could be classified as innovation-based, although often not based on major or radical innovations [Utterback and Reitberger (1982, p. 26)]. To Utterback and Reitberger the rate over time of formation of new innovation-based firms as well as their share of all new firms, appears to have decreased in the 1970s. However, this is a doubtful proposition since no correction of the rate was made for the effects of the survivor sampling technique.

3. Characteristics

In order to have an impact on the average performance of the total population of firms in an economy, a new entrant must have deviant characteristics in some respects. Table 1 gives some average characteristics of 3 samples of firms, (1) the sample of innovation-based new firms in Utterback and Reitberger (1982), here called the STU sample, (2) a reference sample of all companies formed in Sweden after 1965 and surviving with at least 20 employees in 1980 and (3) a sample of essentially old innovation-based firms selected from the database for the MOSES model.

As seen from table 1 the innovation-based firms have high rates of sales growth. The foreign markets are important sources of growth, even in early years. The high share of foreign sales is another distinguishing feature of the innovation-based firms, new as well as old. Moreover, the innovation-based firms have superior economic performance in terms of net margins and returns on their own capital. A break-down by degree of innovativeness of the new firms shows significantly higher gross and net margins and returns on own capital for highly innovative new firms. A comparison between

Table 1[a]
Comparisons between the sample of innovation-based new entrants and other samples of companies (median values).

Variable	Total STU sample[d]	Reference sample[e]	MOSES sample[f]
Number of firms	60	191	15
Age (in years)	10	10	67
Sales in 1980 (MSEK)	18	12	6,708
Sales growth 1979–1980 (%)	33	20	16
Foreign sales 1980 (MSEK)	11	n.a.	5,667
Foreign sales share 1980 (%)	60	n.a.	72
Employment in 1980	49	33	22,950
Employment growth 1979–1980 (%)	11	4	1.8
Basic salary per employee (MSEK)	0.071	0.066	n.a.
Gross margin 1980 (%)[b]	10.0	10.0	11.8
Net margin 1980 (%)[c]	6.7	4.0	7.1

[a]Source: Utterback and Reitberger (1982), Annual reports, MOSES database.
[b]Profit (before depreciation and tax) divided by sales.
[c]Profit (before non-recurrent expense/income, allocations and tax) divided by sales.
[d]New innovation-based firms formed 1965–1980 and surviving with at least 20 employees in 1980.
[e]New firms formed 1965–1980 and surviving with at least 20 employees in 1980.
[f]A selection of old innovation-based Swedish firms.

different vintages of firms shows declining rates of sales growth, margins and returns for older vintages.

Other distinguishing features of the innovation-based new firms in the STU-sample are (1) a high degree of initial subcontracting, (2) high R&D intensity, (3) high marketing intensity, (4) a tendency for high performers to make direct investments abroad, specially in large markets such as the U.S. and Japan, (5) low initial, financial gearing ratio, (6) a dependence upon patents for high performers, (7) low exposure to local competition and high exposure to international competition, (8) product performance rather than price as a dominant means of competition, (9) large shares of emerging markets captured by the highly innovative firms and (10) new products competing functionally rather than merely substituting for old ones.

Moreover, the founders of the new innovation-based firms in the STU-samples were generally found to be young, well educated and said to be driven by the need for achievement and autonomy just as much as by personal profit motives. (Cf. the possibility that a distribution of the need for autonomy, power and personal profits in a pool of potential entrepreneurs influences the pattern of autonomous entrepreneurship versus corporate entrepreneurship.)

The above characteristics are the average in the sample. In general, it can be said that there is a high degree of skewness in the distribution of characteristics in the STU-sample (as well as for samples of innovations in general). There is a long tail. A few high performers account for most of the deviant features.

4. Causes and effects

Du Rietz (1980) gives an account of the factors which determine the formation of new firms in general. Determinants behind the formation of innovation-based new firms and behind innovation rates are not well understood, and there is no place to deal with them here. It is important to note, however, that inventions and innovations may or may not bunch in time and space, but what counts is the bunching of imitators and adopters of an innovation.

Finally, what kind of effects on the average performance of the firms in a population could result from the innovative entry of new firms with the above-mentioned deviancy in performance characteristics? Theoretically, one (among many) conceivable effect is that variety in the firm characteristics in the population of firms is maintained through innovative entry. This — Eliasson argues in his paper — is necessary for long-run macro stability in the economic growth process in the sense that the population of firms and the supply structures will be less collapse prone in response to severe disturbances. [See Eliasson (1983).] Some light on this will hopefully be provided by a planned 'entry study' on the MOSES model.

5. Modelling of new entrants

In developing simulation models of an economy, such as the MOSES model, one might choose to proceed from the simple to the complex (more variables and relations). The MOSES model is a comprehensive, multi-firm, multi-market (labour, capital, product), discrete and deterministic simulation model of the Swedish economy. Moreover, the MOSES model is a hybrid model in the sense that the model is both intended to be theoretically based to generate new ideas and hypotheses and to be empirically based and useful. In a state where received economic theory is deficient and empirical work is fragmented, as is the case regarding technological change, it is difficult to combine theoretical and empirical consistency and usefulness. Some considerations in this direction will be presented below, especially in the light of the studies of innovations and new entrants in Swedish industry.

5.1. Representing technological change and innovations

The first main question is how to enter technological change (and technical change) in the model. The preferred way so far in MOSES work has been to enter it exogenously and let it be manifested in the upgrading of labour and capital productivity in new investment vintages that enter endogenously through the individual firm investment decision. Alternatively it may be entered only in the upgrading of capital productivity, as in the Nelson and Winter model [see Winter (1983, this volume)]. In the latter case a direct drive from technical change to output growth is established.

If a fraction (possibly stochastic) of resources then are fed back from output to investment in R&D and further linked (possibly stochastically) to the upgrading of capital productivity, growth will tend to be selfperpetuated. This is a parsimonious way to model technological change, which may be feasible for a single sector model. Among other things it leaves room for treating the important issues of the relative roles of new firms versus old firms as sources and carriers of technological change in a sector and the birth and death processes of firms in the sector as done in Winter (1983, this volume).

Representing technological change as an upgrading in both capital productivity and labour productivity as in Eliasson (1983), of course offers some more possibilities to picture reality, at least in principle. Technological change may be classified not only in terms of new technologies substituting old ones, but also in terms of capital intensive technologies substituting labour intensive ones (and vice versa). How realistically these substitutions are pictured depends on how the markets for labour and capital goods are modelled (if at all).

However, many of the substitutions (or more general changes) and the quality (content) aspects of Schumpeterian dynamics cannot be pictured by representing technological change only in terms of upgraded factor (labour, capital) productivities. Embodied technological change or technical change implicit in endowments, or in management and market behaviour create problems with systems identification. As has been the case with the traditional macro production function modelling, the concept of technology then is blurred. The natural question then is how to achieve a richer and more explicit representation of technological change and if it is worth the endeavour. These questions cannot be answered here but a few aspects can be discussed.

First, regarding determinants of technological change, R&D spending can be explicitly modelled at the level of individual firms as decision making units. Reasonably good data of past R&D spending as well as studies of the R&D budgeting decisions exist for Swedish industry. (Of course, R&D spending at the level of business divisions or product areas would add to product level descriptions, but data are difficult to obtain, although not impossible for a subset of firms as with the PIMS data base.) The decomposition at firm level of official Swedish R&D statistics into research, development of new/improved products, and development of new/improved processes offer additional possibilities to use simple typologies of R&D strategies of the firms. However, R&D spending is characterized by an uncertain mix of fuzzy and overlapping purposes, and classifications ex ante by the firm must be treated with much caution.

Technological change at the level of a firm occurs not only (*a*) as a result of R&D spending within the firm but also (*b*) as a result of R&D spending elsewhere inside and outside industry, (*c*) as a result of investment in production and (*d*) as a result of non-accounted learning by using or producing. In principle, R&D spending and inter-firm transfer of disembodied technology may be modelled as a stock-flow model, but the representations would be difficult to formalize and the model would be exceedingly complex. [Note that Nelson (1983) argues that R&D should be modelled as a special form of search rather than modelled as building upon a stock of some sort of knowledge capital. However, search with a memory would come close to the latter representation.] Some category of R&D exogenous to the modelled economy is called for to represent, for example, public R&D, non-industrial R&D and foreign R&D. [This is the background R&D category in Winter (1983).] In this way R&D is both endogenous and exogenous and innovation patterns of both the Schumpeter Mark I and Mark II type may be incorporated in the model. If moreover R&D budgeting decisions at firm level are formalized as a function of cash flow, which is fairly true to reality, there is a possibility to incorporate demand-induced inventions of the Schmookler type as well. In fact, the various routes in the Schmookler model may all be incorporated in MOSES, see fig. 1. The investment in additional plant in Route 2 may then be done according to best practice or some more complex decision rule to reflect common patterns of diffusion and adoption of innovations.

Technological change as a result of learning by using or producing is important [Milutinovich and Dempsey (1978), Sahal (1981)] but difficult to model explicitly, other than to let cumulated production contribute to the upgrading of labour productivity. In many cases some data about learning curves are available at least at a sector level.

Investment in R&D at firm level normally is coupled to investments in production and marketing as well. (Pure licensing out and some forms of joint ventures are exceptions.) Variations among firms regarding their innovativeness and competitive performance are largely attributable to differences in skills to handle the entire spectrum of R&D, production and marketing activities in the whole process of technology-based business development. Investments in this set of activities include acquisitions by a firm of technologies and/or other firms externally as a means of entry, complementary to or substituting for internal development [see for example Hines (1957), Yip (1982)]. Even data about marketing investments may

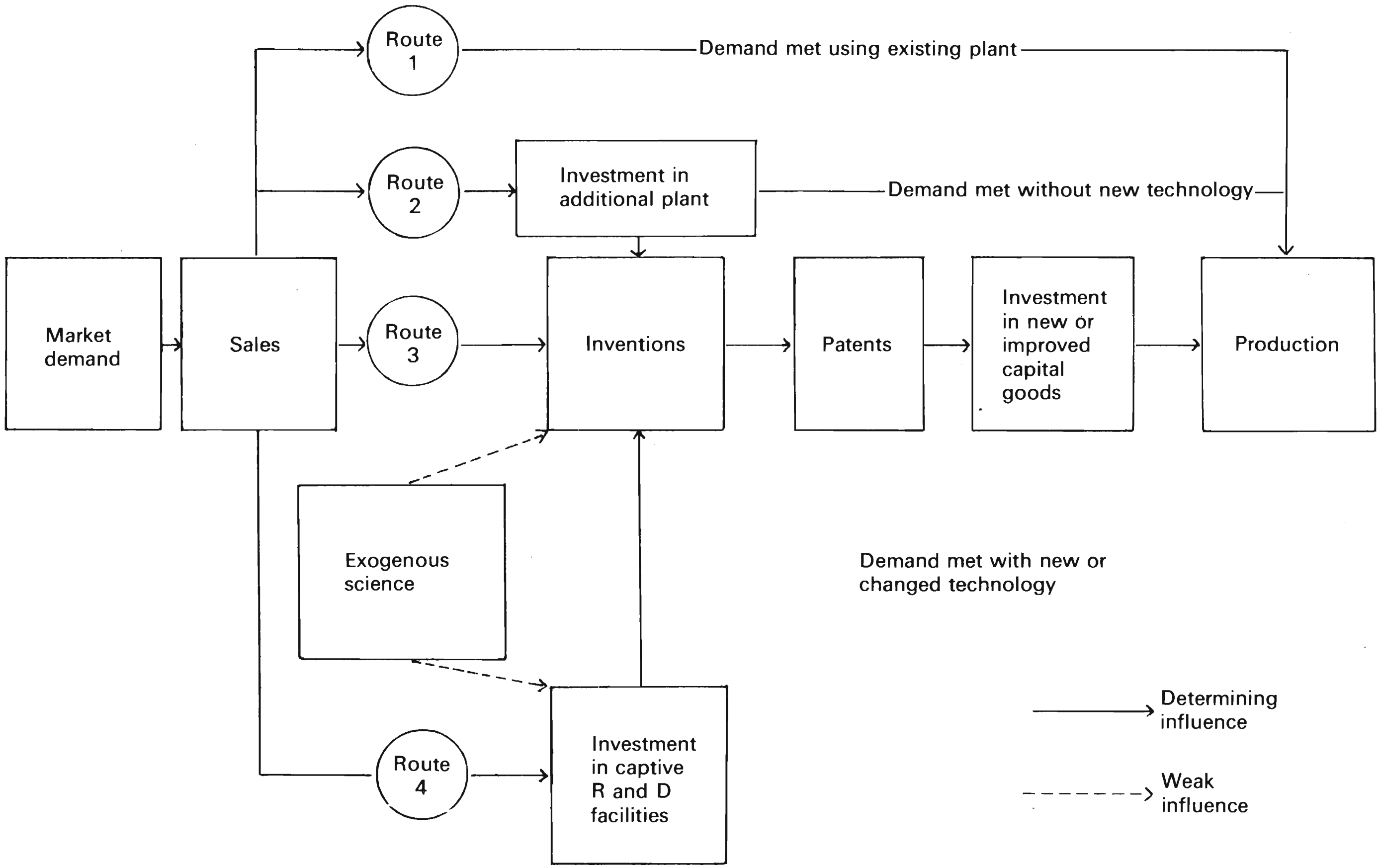

Fig. 1. Schmookler's model of demand-led invention [Source: Freeman et al. (1982, p. 37)].

become available on the MOSES sample of firms from an ongoing IUI survey, although the actual modelling of this aspect of innovative behaviour must be left to the future.

As for representing the micro outcome of R&D spending, one would ideally want to specify firm, technology and market specific rates of new or improved products and processes. This is so not only because they would provide an explicit link between R&D spending and economic performance measures such as factor productivities, but these rates are of interest in their own right. Needless to say, modelling is getting more complex this way. It is near at hand to rule out deterministic modelling in this case. On the other hand, despite inherent technical and commercial uncertainties in R&D, there is a fairly close correspondence between R&D spending and rate of innovations, at least on sector level as seen in the preceding sections for the case of major innovations in post-war Swedish industry. Clearly, this is too little of empirical evidence for assuming a direct drive from R&D input to rate of innovative output. (Note that R&D is often budgeted as a fraction of sales so that the direction of causality over long periods of time is blurred.) After all it is difficult to see how the limits of deterministic modelling and available data could be surmounted by something else than some form of stochastic modelling that locates innovations to firms and points in time in a probabilistic way. With a certain probability then, a firm's R&D could also throw off an innovation in another sector and pose the decision to enter that sector to the firm.

5.2. Representing entrepreneurship

A second main question is how to model new entrants. In a multi-sector model, new entry through new firms and diversifying old firms ought to be distinguished. [More sources or forms of new entry may be considered, see Garvin (1983).] Entry may be based on innovations and imitations. The distinction between innovation and imitation is questionable in many respects, see, e.g. Rosenberg (1982). Carbon copy imitations seldom exist. When a new technology, which is new to the market and the world, diffuses among buyers/users it will normally be changed and improved parallel to the diffusion through imitation of the technology among sellers/producers. Thus imitation is a matter of degree and it is a reasonable possibility to link imitative R&D to R&D for minor improvements for products and processes. In a given sector then, innovations have three main sources — old firms within the sector renewing their product/process technology, old firms outside the given sector diversifying into it and new firms.

An important issue is what determines the mix of these sources and the mix of entrepreneurship (corporate, autonomous) behind new entry. Winter (in this volume) constructs two 'Schumpeterian regimes' corresponding to an innovation and entrepreneurship pattern dominated by autonomous and corporate entrepreneurs respectively. These regimes correspond to the 'early and late Schumpeter views' on the patterns of technological innovations. In the main it may be argued that corporate entrepreneurship has become more important in Western countries during the 20th century. However, a closer look reveals that the pattern of entrepreneurship is country, period and sector specific. [See also data in Hause and Du Rietz (1984), who show substantial sector variations in the proportion of new firm entry to diversification entry, measured in terms of employment share in Swedish industry.] The large firm with its in-house R&D organization is not necessarily superior.

A model of new entry must accommodate variations in patterns of innovation and entrepreneurship of the above mentioned type. Capital market (in a broad sense) conditions are influencing these patterns. The supply of risk capital of various qualities (debt, equity), bank-industry relations, government industry policies, etc., are important determinants. Factors such as these account for country and period variations. (See also Rybczynski in this volume.) The locking-in effect on capital through double taxation of dividends and the lack (until recently) of small firm equity markets in Sweden have in principle favoured corporate entrepreneurship. Also public technology procurement has been mainly directed to old established firms. (Compare the effect on new firm formation in the U.S. electronics industry during the 1960s through pro-entry, pro-competitive defense procurement policies.)

Entrepreneurial performance is difficult to model explicitly. It is thus tempting to ignore this function in modelling firm behaviour. It certainly would be non-Schumpeterian to neglect innovative and entrepreneurial behavior in modelling business behavior. It is possible to decompose the labor market into various skill and capability categories. A simple decomposition is into manual workers, engineers and managers. (Mobility between and overlapping of categories may be disregarded.) Another alternative is to work with the concept of a pool of entrepreneurs, but in this case the pool cannot be made totally exogenous. In this way, the spin-off of new firms from old ones may also be modelled. The studies cited in the preceding sections point at the importance of large firms in Sweden, both as a breeding and a feeding ground for new firms through training of entrepreneurs, R&D collaboration and customer credits. A corporate employee may shift to an autonomous entrepreneur if his perceived profit opportunity exceeds his career and wage prospects in the existing firms. Thus an increasing gap between profitability of new firms and salaries for engineers and managers in old firms increases the propensity for autonomous entrepreneurship, everything else equal.

Barriers to entry is the third set of factors influencing the pattern of entrepreneurship. Some barriers strike differently to new firms and old diversifying firms. If rate of entry is modelled on the set of variables found to be significant in empirical studies [e.g., Ahmad et al. (1974), Duetsch (1975), Du Rietz (1980), Gorecki (1975), Harris (1976), Khemani and Shapiro (1983), Mansfield (1962), McGuckin (1972), Orr (1974)], barriers to entry may be modelled as threshold levels of these variables, for example as a barrier rate of return [see Caves and Porter (1977)]. Unfortunately, there are few studies which compare new and old firms as sources of new entry under different sets of barriers to entry.

Fig. 2 summarizes the main relations we have discussed for modelling new entrants. Given that new entrants appear in a simulation model, there is the question how to start them in the model. Utterback and Reitberger (1982) give data about start-up conditions for new firms, which have survived a certain period of time. Initializing new entrants in MOSES with these start-up conditions (either by sampling from a distribution for each one or by using average conditions for all) would underrepresent start-up losses leading to quick exit. On the other hand, these losses are mostly small relative to the whole economy and may be neglected (at least when the exit rate is small). The case is different with large, diversifying firms with higher exit barriers. Data about start-up conditions for this type of new entrant are largely missing in Sweden, and it is an open question how to initialize these entrants. The performance of new versus old firms in new entry is an important issue in its own right, for which no readily available comparative results exist. (Some U.S. studies report on the low performance of corporate entrepreneurship in diversification in general.)

A final question is if there are differences regarding growth rates and other performance characteristics between new and old firms as new entrants. Surviving new entrants in general should display superior performance in order to bring in an element of substitution of firms on the product market of an economy. But substitution of firms would require superior performance of new firms vis-à-vis old firms. This kind of substitution has been rare in Swedish industry. It might also be noted that the sales growth rates of major innovations in the study by McQueen and Wallmark (1983) were strikingly similar for new firms and old firms. A special feature of corporate entrepreneurship, which work in similar directions is the increasing rate by which large firms acquire new, innovation based firms. To model this would require the modelling of some sort of market for firms, unless a simple rate by which this structural event occurs, is built into the model.

A model, outlined along the lines above, may finally be specified in the form of equations. Let us therefore introduce the following notation:

i = firm index,
j = sector index,

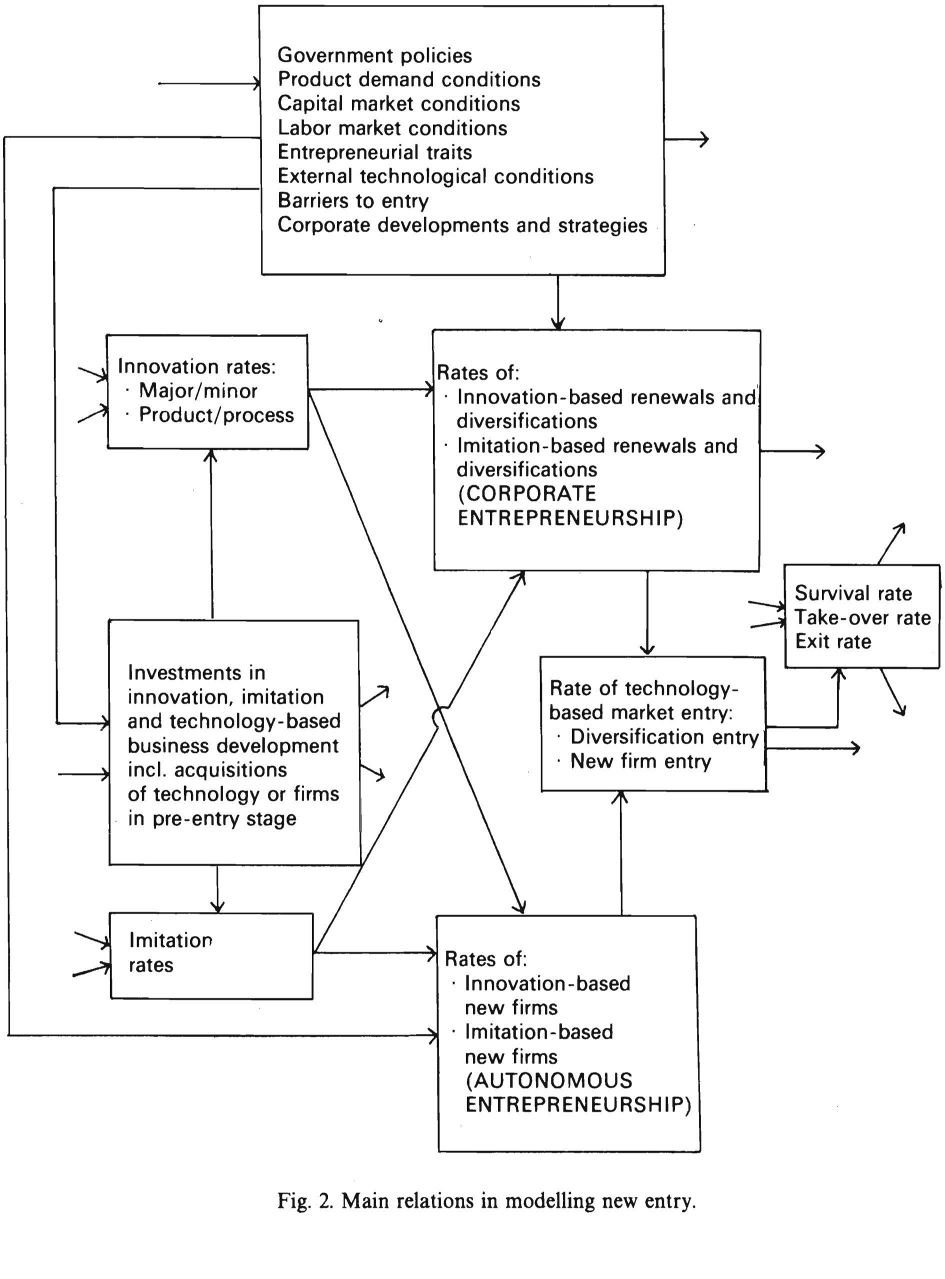

Fig. 2. Main relations in modelling new entry.

t = time index,
RIN_{ijt} = R&D spending by the ith firm in the jth sector in the tth period on *new* products and processes (available from national statistics),
RIM_{ijt} = as above but for *improved* products and processes,
R_{Bt} = background (non-industrial) R&D,
$PROFM$ = profit margin,
S = sales,
ROI = return on investment,
LIQ = liquidity,
$NENT$ = rate of technology based new entry,
$CENT$ = rate of corporate diversification entry,
$AENT$ = rate of new firm entry,
$INCENT$ = rate of innovation-based diversifications,
$IMCENT$ = rate of imitation-based diversifications,
$INAENT$ = rate of innovation-based new firms,
$IMAENT$ = rate of imitation-based new firms,
IN = rate of innovations,
IM = rate of imitations,
L = arbitrary linear function.

Then we may postulate the following equations, some of which follow directly from the definitions:

$$RIN_{ijt}=L\left(S_{ij,t-1},\ \sum_{k\neq i} RIN_{kj,t-1}\Big/S_{kj,t-1},\ PROFM_{ij,t-1}\right),$$

$$RIM_{ijt}=k_{ijt}RIN_{ijt},\qquad k_{ijt}=\text{strategic decision variable.}$$

As pointed out earlier, this is largely in accordance with R&D-budgeting behavior in industry.

The volume of imitation-based new entrants may be determined by sales growth and profitability in the sector entered. A more difficult problem is what determines the volume of innovation-based new entrants. Since it is difficult in this case, to observe the specific market demand we may adopt the 'technology push' standpoint. Hence the rate of innovation-based new entrants is determined mainly by the stock of R&D inside and outside the sector considered. Thus

$$INAENT_{jt}=L\left(\sum_{i}\sum_{T} RIN_{ij,t-T},\ \sum_{\substack{i,T,\\ k\neq j}} RIN_{ik,t-T},R_{\mathrm{B}}\right),$$

$$IMAENT_{jt}=f\left(S_{j,t-1},\dot{S}_{j,t-1},U(\overline{ROI^{j}_{t-1}}),\sum_{i}\sum_{T} RIM_{ij,t-T},R_{\mathrm{B}}\right),$$

where U is sinusoidally S-shaped (e.g., third order polynomial), meaning that over a threshold on average (with respect to j) ROI, both low and high ROIs attract new entrants, low ROI indicating a situation with mismanagement in existing firms. The function f is a non-linear (possibly broken linear) function in such a way that market structure and barriers to entry in the form of capital requirements etc. may be taken into account.

$$AENT_{jt} = INAENT_{jt} + IMAENT_{jt}.$$

Factors, which determine diversification behaviour in Swedish industry are largely unresearched. Until further understanding is gained in this regard, we hypothesize that

$$INCENT_{ijt} = L(=INAENT;(RIN_{ij})_{t-T},(\dot{S}_{ij})_{t-T},(LIQ_{ij})_{t-T},\ldots),$$

$$IMCENT_{ijt} = L(=IMAENT;(RIM_{ij})_{t-T},(\dot{S}_{ij})_{t-T},\ldots).$$

Note that these variables on the firm level refer to the corresponding sector as a source of diversifications. Some of these diversifications may then have other sectors as targets. The total rate of diversification within a sector is then the sum of diversifications originating in the same sector plus a share of the diversifications originating in other sectors. With broad sector definitions one may assume that the number of cross-sectorial diversifications are negligible. This is reasonably true for Swedish industry on the 2-digit ISIC-level for the post WW2 period. As a first approximation we may then postulate

$$CENT_{jt} = \sum_i INCENT_{ijt} + \sum_i IMCENT_{ijt}.$$

Thus finally,

$$NENT_{jt} = AENT_{jt} + CENT_{jt},$$

$$IN_{jt} = INAENT_{jt} + \sum_i INCENT_{ijt},$$

$$IM_{jt} = IMAENT_{jt} + \sum_i IMCENT_{ijt}.$$

An implementation into the general MOSES model of an entry model specified in this way is presently undertaken at IUI.

References

Ahmad, I.U., G.K. Constable and H.W. Lanford, 1974, The investigation of innovations and their effect on the number of firms entering and leaving an industry, Industrial Marketing Management 3, 243–256.

Caves, R.E. and M.E. Porter, 1977, From entry barriers to mobility barriers: Conjectural decisions and contrived deterrence to new competition, Quarterly Journal of Economics 91, no. 2, 241–261.

Dahmén, E., 1970, Entrepreneurial activity and the development of Swedish industry 1919–1939 (Irwin, Homewood, IL).

Duetsch, Larry L., 1975, Structure, performance, and the net rate of entry into manufacturing industries, Southern Economic Journal 41, 450–465.

Du Rietz, G., 1980, Företagsetablering i Sverige under efterkrigstiden (IUI, Stockholm).

Eliasson, G., 1978, A micro-to-macro model of the Swedish economy, IUI conference reports 1978:1 (IUI, Stockholm).

Eliasson, G., 1983, On the optimal rate of structural adjustment, in: Eliasson, Scharefski and Ysander, eds., Policy making in a disorderly world economy, IUI conference reports 1983:1 (IUI, Stockholm).

Eliasson, G., 1984a, De utlandsetablerade företagen och den svenska ekonomin, Research report no. 26 (IUI, Stockholm).

Eliasson, G., 1984b, Micro heterogeneity of firms and the stability of industrial growth, this volume.

Freeman, C., J. Clark and L. Soete, 1982, Unemployment and technical innovation (Pinter, London).

Garvin, David A., 1983, Spin-offs and the new firm formation process, California Management Review 25, no. 2, 3–20.

Gorecki, Paul K., 1975, The determinants of entry by new and diversifying enterprises in the U.K. manufacturing sector 1958–1963: some tentative results, Applied Economics 7, 139–147.

Granstrand, O. and S. Jacobsson, 1983, Innovation economy and business development. A study of innovation take-overs, Report submitted to the National Swedish Board for Technical Development (STU) (Chalmers University of Technology, Göteborg).

Harris, Maury N., 1976, Entry and long-term trends in industry performance, Antitrust Bulletin 21, 295–314.

Hause, J.C. and G. Du Rietz, 1984, Entry, industry growth, and the microdynamics of industry supply, Journal of Political Economy, forthcoming.

Hines, Howard H., 1957, Effectiveness of 'entry' by already established firms, Quarterly Journal of Economics 71, 132–150.

Khemani, R.S. and D. Shapiro, 1983, Alternative specifications of entry models: Some tests and empirical results, Paper presented at the 10th EARIE annual conference, Bergen, Norway.

McGuckin, Robert, 1972, Entry, concentration change, and stability of market shares, Southern Economic Journal 38, 363–370.

McQueen, D.H. and J.T. Wallmark, 1983, 100 viktiga innovationer i Sverige 1945–1980 (100 important innovations in Sweden 1945–1980), STU-information no. 350 (STU, Stockholm).

Mansfield, Edwin, 1962, Entry, Gibrat's law, innovation, and the growth of firms, American Economic Review 52, 1023–1030.

Milutinovich, J.S. and W.A. Dempsey, 1978, The learning curve, R&D management, and marketing strategies for new products, R&D Management 8, no. 3, 177–183.

Nelson, Richard R., 1983, On technological opportunity and technological regimes, Paper presented to the IUI conference on the dynamics of decentralized (market) economies, Stockholm-Saltsjöbaden.

Orr, D., 1974, The determinants of entry: A study of the Canadian manufacturing industries, Review of Economics and Statistics 56, 58–66.

Rosenberg, Nathan, 1982, Inside the black box: Technology and economics (Cambridge University Press, Cambridge).

Rybczynski, Tad M., 1983, Industrial finance system in Europe, U.S. and Japan (this volume).

Sahal, D., 1981, Patterns of technological innovations (Addison Wesley, Reading, MA).

Utterback, J.M. and G. Reitberger, 1982, Technology and industrial innovation in Sweden. A study of new technology-based firms, Report submitted to the National Swedish Board for Technical Development (STU), Stockholm.
Winter, S.G., 1983, Schumpeterian competition in alternative technological regimes (this volume).
Yip, George S., 1982, Diversification entry: Internal development versus acquisition, Strategic Management Journal 3, 331–345.