Industriens Utredningsinstitut
THE INDUSTRIAL INSTITUTE FOR ECONOMIC AND SOCIAL RESEARCH

A list of Working Papers on the last pages

No. 397, 1993

ENDOGENOUS ECONOMIC GROWTH THROUGH SELECTION

by
Gunnar Eliasson

October 1993
Revised, August 1994

Postadress
Box 5501
114 85 Stockholm

Gatuadress
Industrihuset
Storgatan 19

Telefon
08-783 80 00
Telefax
08-661 79 69

Bankgiro
446-9995

Postgiro
19 15 92-5

10.92 10.000

ENDOGENOUS ECONOMIC GROWTH THROUGH SELECTION

by Gunnar Eliasson
KTH and IUI, Stockholm

Paper presented at the special IARIW Conference on Microsimulation and Public Policy, 6-9 December 1993, Canberra
Revised: July 1994

Abstract:

Economic growth is modeled as being propelled endogenously by (1) *entry,* (2) *reorganization,* (3) *rationalization* and (4) *exit,* the first two selection and innovation investments operating in the very long run, and the other two (rationalization and exit) in the short- and immediate-term. Exit should be seen as a disinvestment making room for expansion by forcing resources, notably labor to reallocate. The balance between these factors operating in different time perspectives determines the rate, the sustainability and the stability of the growth process. Quantity adjustment has to be coordinated and growth supported by reasonably predictable prices in dynamic markets. This coordination is dominated by the financial market, its efficiency being critically dependent on the institutions of the economy, that determine incentives to innovate and the disciplining forces of competition. The property rights institutions play a critical role behind the incentives to innovate and engage in technological competition.

The growth process as represented requires a micro organization-based macro theory to be explained. It is simulated on the Swedish micro-to-macro model MOSES, and we find that the selection mechanisms operating through the entry and exit processes, albeit slow in the beginning become a dominant moving force in the very long run. A political economy that is unable to organize itself to wait for the very long-run benefits of significant immediate efforts may never experience strong and sustained economic growth.

Economic growth as a selection process – the problem

Adam Smith is the declared father of many basic ideas in modern economics. He is, however, not as well-known for what he argued was most important of

all for the wealth of nations, namely dynamic competition – notably dynamic competition, maintained by *free innovative entry* that checked the formation of monopolies detrimental to the creation of economic wealth. Such dynamic competition is made possible by a superior capacity of some firms to compete for customers and for resources and driven by the rewards for the same superiority. This superior capacity defines the organizational competence of the temporary monopoly that we call a firm (Eliasson 1990b). Such superior organizational competence is always temporary, since it is relative to the competence of all other firms, and firms are all the time generating new competence through *organizational learning* and innovation (Eliasson 1992a).

One thesis of this paper is that without free innovative entry, rapid long-term growth of an economy cannot be supported. Innovative entry improves the technology level of the population of firms and forces competition on incumbent producers. The costs come in the form of increased exit of low performers, and transactions costs associated with the reallocation of resources.

Darwin suggested that the species adapted through selection to an exogenously changing environment. The economic question raised here is whether firms can overcome the natural filtering of winners and losers in markets through organizational learning. The Darwinian notion of an exogenously changing environment is a large step ahead of the neoclassical assumption of a given environment and given actors. The model we need to explain economic growth, however, is closer to Adam Smith's original reasoning. Economic growth is created not only by agent search into an exogenous economic environment, but by the innovative response of individual agents to the competitive actions of other agents that expand the environment, or what I will call the *investment opportunity set* (Eliasson 1987, 1991b). This paper is concerned with the growth dynamics of this game situation in what I call the *experimentally organized economy* (Eliasson 1987, 1991c). The experimental mode of behavior is fundamental for entrepreneurial activity and economic growth. Individual agents are characterized by strongly bounded rationality

and markets by free innovative entry. The latter drives the selection mechanisms in the model that also influence the economic environment, making it largely non-transparent to each agent. Only through curious experimentation will entrepreneurs be able to explore the enormous investment opportunity set of such an experimentally organized economy and discover the superior technologies that can be profitably invested in. The nature of the entrepreneurial spirit and technological competition through innovation and imitation are therefore central to this paper. They are one side of free innovative entry. The other side is regulation, i.e. the restrictions on competitive innovative entry imposed politically. Entry may therefore be insufficient for economic growth to occur for two reasons. Incentives for entrepreneurship may be lacking or entrepreneurship may be held back by regulation, typically through restrictions on free competitive entry in markets (Eliasson 1991a).

The source of entrepreneurial behavior is partly to be found in the economic environment itself that compels actors (through competition) to be entrepreneurial, or fail. This can be established by demonstrating the existence theoretically, and through simulation of the vastness of the business opportunity set. In doing that I link standard economic theory to the much richer but less rigorously formulated economics of the Austrian school. The problem of restricting free competitive entry is much wider in scope than restrictive establishment rules and, as well (!) trade protection, holding foreign competitive entry through imports down. The entire public sector of western market economies is characterized by almost complete prevention of innovative and competitive entry. In Sweden, for instance, only 20 to 30 percent of total production can be said to be subjected to open competition (Carlsson 1993b). The extreme case is of course the formerly planned economies and most of the developing world. The institutions providing for more or less open selection mechanisms in markets are therefore not as typical of western market economics as we have been made to believe (Eliasson 1993d). Paradoxically, it is difficult to imagine a true market economy without the widespread presence of such institutions. The institutions

preventing the selection mechanisms in the market from being operative very much reflect the willingness of societies to accept, and their inability to cope with change. And the only way of modeling the macroeconomic importance of those mechanisms is through a micro-based simulation model.

I will therefore demonstrate (through simulations on the Swedish micro-to-macro model, being a quantitative approximation of the experimentally organized economy), that a very long time horizon is associated with a viable growth process. A reorganization of the model economy such that competition is stimulated by more innovative entry will release immediate negative effects in the form of exit and unemployment, but the benefit in the form of positive growth effects will come in the distant future. Reformulated more relevantly for the Swedish economy, which is represented by the micro-macro model the negative effects at the macro level of less innovative entry will appear after decades, but then with a momentum that accelerates and requires enormous policy effort and patience to turn around. This means that a political economy unable to mobilize sufficient patience, or a political interest to give the very long-term benefits a fair chance against immediate negative effects, may never experience growth and/or may never be capable of turning a declining economy around.

The four investment mechanisms of growth

Free innovative entry and technological competition expand the investment opportunity set to create an environment of local unpredictability for each agent. Agents not only choose what to do but also modes of thinking about and deciding what to do. With the strong non-linearities associated with the selection mechanisms the traditional stationarity assumptions of rational expectations and efficient market theory cannot be used. Competition through new entry exercises a competitive threat to all agents that they have to counter by innovative competition on their own. This dynamic competition moves the entire economy and forces agents not capable of coping to exit. Exits in

retrospect will then appear at the macroeconomic level as a standard cost of economic growth. If this cost is not incurred, it is synonymous with the absence of both competition through innovative new establishment and of economic growth (Eliasson 1994). For viable, growth promoting competition to occur, however, sufficient diversity has to be maintained in the economy (Eliasson 1984a) through entry, or innovative behavior among incumbent firms. For growth to occur some superior, or very competent firms will have to be constantly attempting to access the investment opportunity set. Such positive competition does not necessarily increase with the number of firms. The probability of some superior firms entering the opportunity set, however, normally increases with the number of firms attempting to enter.

This growth through selection hypothesis of the experimentally organized economy (EOE) is the exact counterpoint to the static general equilibrium model. The Swedish micro-to-macro model MOSES is a model representation of the EOE. The rest of this section outlines the behavioral assumption of the EOE. The final two sections explain the representation of the EOE in MOSES and the simulation experiments respectively.

The basic axioms of the selection process of the experimentally organized economy – heterogeneity

Selection presupposes choices. If the menu of choices is sufficiently large rational choice in the "classical" sense of a fully informed decision is no longer possible. The classical model makes the menu of investment choices sufficiently small for fully informed decisions to be possible. We find such assumptions unreasonable and expand the size and complexity of the choice set sufficiently to make fully informed choices impossible. Heterogeneity of nature is enough to make this both necessary and acceptable as an assumption for theory. It has been demonstrated in Eliasson (1991c) that the varied Salter curve landscape of the Swedish micro-to-macro model offers such a varied

menu of economic choices as to make even barely informed decisions at the micro level impossible.

Under such circumstances, decisions must be characterized by *bounded rationality* (Eliasson 1990a). Bounded rationality in a complex economic environment also defines the *competence* of agents in markets to make successful business decisions. If this competence is accumulated through organizational learning in heterogeneous environments (Eliasson 1992a, Ballot & Taymaz 1993) the competence capital becomes extremely heterogeneous. The diversity of environmental and firm competence characteristics needed to establish a model version of the experimentally organized economy can be introduced through a stylized so-called Salter curve analysis.

A generalized Salter curve analysis of innovative learning and enforced competition – how competition sets the economy in motion

A market, or the entire economy can at each point in time be represented by a distribution of potential performance characteristics, like the rates of return over the interest rate ($\hat{\varepsilon}$) in Figure 1A. These types of distributions – especially if presented as productivity rankings of establishments (Figure 1B) – are often referred to as Salter (1960) curves. Each firm is represented in this curve by a ranking on the vertical axis (the columns in Figures 1), the width of the column measuring the size of the firm in percent of all other firms. Figure 1A shows that even though the firm in the model has increased its rate of return between 1983 and 1990 it has lost in ranking. Figure 1B shows the same firm's labor productivity and wage cost positions. Finally, each firm has its own productivity frontier, under which it is operating to position itself on the productivity and rate of return rankings of the industry. This is still actual ex post performance 1983 and (simulated) 1990. The dynamics of markets, on the other hand, is controlled by the potential ex ante set of distributions, that capture the planned action of all other firms, including new entry.

There is a third set of Salter curves that tell how *each firm sees itself positioned relative to other firms.* In the real world of the experimentally organized economy, as well as in its model approximation, the Swedish micro-to-macro model shows large *divergences between actual and perceived positions.*

The ex ante distributions tell the potential for the firm to outbid all other firms in wages, or in paying a higher interest rate.

Learning about one's competitive situation – in reality or in theory – occurs in different dimensions. Prices offered in the market tell something about how other firms – notably the best firms – view their competitive situation. Competition, production, hiring etc. can also be directly observed. The firm, finally, learns directly itself, when it enters the market. The critical learning experience to observe in this context occurs when firms observe that competitors can do better. Firm management then knows that this *can be done* and that it had better improve in order not to be pushed down, right along the Salter distribution, and, perhaps, out.

Similarly, when the firm finds itself at the top, or close to the top, it knows that a whole lot of "closely inferior" firms feel threatened, and are taking action to better their positions through innovation or imitative learning.

The conclusion is that if potential Salter distributions are sufficiently steep and if all firms know it, firms along the whole range of the curve will feel sufficiently threatened to actively aim for improving their positions on the Salter curve through innovation. If such innovative activity, notably through innovative entry in markets, is freely allowed, necessary conditions for maintaining sufficiently steep Salter distributions to move the entire economy through a selfperpetuated competitive process have been established (Eliasson 1985, 1991a, c). These conditions become both necessary and sufficient if the opportunity set (Eliasson 1987) is sufficiently large. This also establishes the link between dynamic competition through the Schumpeterian (1912) entrepreneur and innovative entry, argued by Smith (1776) to be the critical

mechanism behind economic growth, that perpetuates a (Wicksell 1898) type disequilibrium economic process. A sufficiently large and heterogeneous state space, boundedly rational behavior on the part of agents, and sufficiently free innovative entry are the small modifications of the classical model that create the experimentally organized economy.

The four investment growth mechanisms

The Swedish micro-to-macro model MOSES is structured on technological competition in a Salter curve environment of the above kind that constantly upgrades itself through the competitive process. The model emulates the competitive dynamics of the experimentally organized growth economy. Economic development is seen as an ongoing learning process through the immense investment opportunity set, creating new resources and new technologies. Free entry creates competition that moves the growth process, forcing reorganization, rationalization or exit on other firms. This mechanism is moderated by physical (natural) barriers, culture and policy (Eliasson 1991a, 1994). A positive sum economic game is established. It is characterized by the investment/growth mechanisms of Table 1 that are all represented in the Swedish micro-to-macro model (Eliasson 1978, pp. 52 ff., 1985, 1991c). Macroeconomic growth, hence, occurs through (1) *entry,* (2) *reorganization* and (3) *rationalization* of existing firms and (4) through *exit* of low performing firms. Together these four mechanisms can explain all investment activities behind economic growth. The bulk of medium-term production growth occurs through the *reorganizing* and *rationalizing* of existing firms (items 2 and 3). The exit of low performers is a *divestment* that makes room for the expansion of high performers, not in the least through releasing labor and competence at reasonable costs. The productivity effects of exit are immediate. Reorganization and rationalization investments affect growth fast. In fact, most of the growth inducements in Swedish industry of the 1980s came through the reorganization and rationalization of existing firms. The *entry* mechanism is, however, critical in the long run. Without entry existing industrial structures

will not be upgraded and modernized effectively (Eliasson 1991a) and especially not through the injection of new technologies not related to investments in existing industrial facilities. Innovative entry works in the very long run. It is highly experimental, the average performance of entrants being lower, rather than higher than that of the average incumbent (Eliasson 1991a, Granstrand 1986) but the spread being much wider. Hence, the exit rate among new entrants is extremely high; and the viable market economy has to learn to live with (1) the exit of incumbents forced by successful entry, (2) the high failure rate of entrants, and (3) the long waiting time needed to see the few successes mature and grow sufficiently to influence macroeconomic behavior.

The *time dimensions* of the entire investment process are critical for understanding economic growth. The welfare of the current generation has been developed in a historic perspective, not over the last few years. Table 1 has been drawn on the premise that the firm is well defined, which is never the case. The firm or the division of a large firm has been chosen as the unit of measurement for the micro-macro model and the accompanying database for being the minimum autonomous decision unit for which a statistical information system to support decisions exists. In fact, however (Eliasson 1992b), firm performance improvements typically occur through reorganizing also this unit of measurement such that its definition changes. Besides being a source of frustration for those who manage and use the internal information and control system of the firm (Eliasson 1976) it illustrates the arbitrary nature of all measurements in economcs and the all pervasiveness of selection mechanisms.[1] One particularly important dimension of long-term economic growth occurs in the intersection of the four investment categories in Table 1, partly through changing the definition of the firm as a financial unit (mergers, acquisitions, divestment), partly through the formation of what Erik

[1] It is of course desirable to break the exit and entry process down even further, into the firm, representing part or all of firm reorganization as a selection process. Even though this is what is going on in reality, speeded up by the emergence of efficient merger and take over markets we are then beyond the practical limits of statistical measurement. For a discussion see Eliasson (1992b). For an example see Jagrén (1986).

Dahmén (1950) called *development blocs*. A development bloc is based on vertical and horizontal synergies, or scale economies *between* firms, and the creation of new business opportunities for entrants within this synergy structure. The entire industrial revolution can be seen as such a development bloc created around the new machine tools that were developed some 150 years ago (Eliasson 1994). The automobile and all that came with it is another such development bloc structure, as is the electronics-based information industry. Development bloc formation is a form of infrastructure entry that works in the very long run.

While mainstream economic analysis focuses on item 3 (in Table 1, rationalization) among a given number of existing firms, the experimentally organized economy, as represented by the Swedish micro-to-macro model (see below) incorporates all four elements of change, and is fully capable of embodying development bloc formation (Carlsson, Eliasson & Taymaz 1993), creating very different long-term macro dynamics. All mechanisms operate in different time dimensions and require different competence characteristics. They have to be in a certain balance over time to generate stable, sustained growth at the macro level. Three of the four mechanisms operate through selection. The macroeconomic growth process of the real world is composed of all four mechanisms and cannot be understood in terms of one of them only.

(Table 1 in about here)

Classical and neoclassical theory assumes the market environment to be given, and populated by price taking agents. Darwinian or Schumpeterian economic analysis (Winter 1964, Schumpeter 1942) models agents that react to an exogenously (through technology) changing environment, by organizational adjustment, changing the character of firms and of industries. Micro-macro theory takes us one final step further, by making the environment endogenous and dependent on the ongoing organizational adjustment of agents. Only through this final step will the properties of the experimentally organized

economy become manifest, namely an economy about the structure of which an outsider observer – the firm – can only be partially informed through a biased information system.

The impossibility of even barely informed decisions

The Swedish micro-to-macro (M-M) model exhibits these features. Dynamic competition as described above determines entry and exit and hence the selection processes that create a path-dependent evolution of the economy, and non-stationary behavior that prevents classical statistical learning. This is so, even though the M-M model for all practical purposes is deterministic. If you have the code of the M-M model, you can predict through deterministic *simulation.* As an external observer, without access to the code, "the firm" can only observe the output from a number of simulations. On a nice linear (or linearizable) estimable structure the outside observer will eventually be able to determine the structure (coefficients) with any precision desired, barring a predetermined stochastic error. This learning problem then reduces to the problem; (1) of finding an acceptable, estimable approximation of the M-M model, and (2) of estimating the parameters of that approximate model. If, however, (3) the error terms between the M-M simulation ("reality") and the corresponding computed model values do not pass a test for randomness over any chosen simulation period, classical learning is not feasible and the particular behavioral characteristics of the firm of the EOE should exhibit themselves. The many non-linear mechanisms in the MOSES model, notably the selection mechanisms, make it unacceptable to use linear approximations, because predictions would be biased, and particularly so when unusual and important behavior now and then reaches the macro level. This happens, for instance, when the technology, or organization of learning in the economy affects economic growth as in Antonov & Trofimov (1993). The seemingly erratic behavior exhibited by the model economy, like major macro collapses that occur out of the blue (Eliasson 1983, 1984a, 1991c) all originate in the endogenous changes of the Salter distributions, characteristics that are

impossible to reproduce in a predictable way by known estimable modeling techniques. This is sufficient to rule out classical learning in the experimental setting of the M-M model. [I could also add the amusing experience we have had over the many years of modeling work. If you sit down at the computer and attempt to correct unexpected, disruptive and "socially undesirable macro behavior" by using its almost full assortment of traditional policy parameters, you tend to create more and stronger disruptive macro behavior of the same kind at some later period (Eliasson 1985, pp. 78 ff.)]. The bounded rationality of Government in the experimentally organized market economy is obvious from simulations with the Swedish micro-to-macro model (Eliasson & Taymaz 1992).

The MOSES model – a brief presentation

The MOSES model has been well documented in many publications (Eliasson 1977, 1978, 1985, 1991b, c 1992b).[2] A few observations should, however, be made here. When seen from above, the MOSES economy is composed as an eleven sector Keynesian–Leontief sector model, with endogenous investment, complete demand feedback through investment, and a non-linear Stone type expenditure system. Individual behavioral relations are typically rational and neoclassical except for the extreme informational limitations on individual firms (bounded rationality) and the presence of important tacit and incommunicable competence in firms. Together this means that markets never clear, that the state of disequilibrium (the path) influences long-term growth and that traditional exogenous equilibria do not exist as possible operating domains of the MOSES economy.

In this model the four manufacturing sectors (basic-, intermediate-, durable- and non-durable consumption goods) have been surgically removed and replaced by similarly structured real firm data, all being consolidated to

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[2] Eliasson (1978) and Albrecht et al. (1989) include a fairly complete presentation of the specification of the model and Eliasson (1991c, 1992b) a brief version, including the main behavioral equations.

exactly fit the removed sector aggregates. To achieve that a residual firm defining the difference between the consolidated real firms and the aggregate has been defined. This residual firm has then been split up into several smaller firms. Altogether the initial firm population in a MOSES simulation consists of some 250 firms (Taymaz 1992). Endogenous entry and exit change the firm population over time.

Firms make long-term investment decisions based on expected long-term rents from (returns to) investments. These investments upgrade the production system of the firm.

While the individual firm investment, entry and exit decisions are based on long-term profitability expectations related to financing costs, the short term production planning, recruitment and firing decisions are made on the basis of short-term profit improving (expected profit hill climbing) decisions. There are explicitly modeled product, labor and financial markets. Through complete feed back during, and between the quarterly planning period, quantities and prices are determined, not simultaneously, but sequentially within the same period. In this sense the MOSES model represents a general game of monopolistic competition.

The entry and exit features are critical for the experiments to be reported on in the next section. *Exit* occurs in the model when a firm has reduced its net worth to zero, but it can also be made to occur earlier and on more rational grounds, when a firm repeatedly fails to satisfy its long term profitability targets. *Entry* has been on (Eliasson 1978, pp. 52ff) and off (Eliasson 1983 pp. 269 ff) in the model. The consensus among the economics profession until the mid-1980s was that entry really did not matter (Eliasson 1991a), but it does, and very significantly so. Entry in the current version of the model is based on a stochastic process moved by profitability conditions in the four industry markets.

An entering firm behaves as an investment vintage, but instead of being integrated with the capital equipment of an existing firm it establishes itself as an autonomous competitor in the market. Entrants are assumed (on the basis of empirical evidence, see Eliasson 1991a, Granstrand 1986) to be on the average equal to, or somewhat inferior in performance to incumbents. But the spread is very much larger. This means that the failure rate among entrants is very much higher than among the incumbents. To filter out a sufficient number of success stories through competition in markets to move long-term growth, hence, resources are used up through more or less mistaken business decisions. In fact, at the macro level *a significant rate of business failure* should be viewed as a standard cost for economic development (Eliasson 1992a).

Simulation results

Experiments are designed to show the macroeconomic effects of typical entry, to illustrate the effect lags involved, to demonstrate the existence of indirect effects on competition and exit and to document the non-linear character of the market machinery set in motion by a more active entry process. All experiments are run by quarter over 50 years and are compared to a *base run*, on the parameter setting calibrated on data from the Swedish economy as described in Taymaz (1991, 1993). In this well calibrated reference run new firm entry has been shut off, albeit the exit process is on. All time series graphs show the experiment in percent of the reference base run. In the experimental run (I) *new firm entry* is turned on. In the experiment II the entry process is turned off again and the exit process has been slowed down compared to experiment (I). Manufacturing production behaves as hypothesized. Introducing entry (experiment I) makes little difference for 10 to 15 years. Then the differences starts departing exponentially from the base run to be more than 50 percent higher after 50 years. The average difference in the growth rate is on average almost one percent per year and slowly

increasing[3] as surviving new, high productivity firms grow and low performance firms contract or exit because of more intense competition (Table 2). When exit is slowed down in the base run, some improvement in output growth is seen for the first 20 years or so (Figure 2A), then development falls behind the base run. The explanation is simple. First slack is used more efficiently, even though low productivity facilities are kept going, that were forced to exit in Experiment I. After a while diminished competition, due to the absence of competitive entry, makes factor costs increase and affect overall growth negatively. This negative development, however, takes some 20 years or more to become visible. After 20 years or so the higher factor costs reduce investment incentives in expanding industries and the overall macro effect turns negative. The development of GNP is about parallel (Figure 2B).

It is interesting to stop here and think for a moment. No standard model is capable of generating these long waves of development endogenously because of institutional changes affecting new entry and exit. The dynamics of this micro-macro process is embodied in a whole complex of factors in the MOSES model regulating the time delays of a large number of market induced adjustments. These adjustment processes start on an initial disequilibrium state of the economy (the measured initial database; see Albrecht et al. 1992), that is perpetuated through the simulation. The parameters regulating adjustment processes have partly been estimated by standard econometric techniques on partial relationships, and partly been calibrated by fitting the model to a long time series of annual data (Taymaz 1991, Section 3, 1993). With these long waves being generated endogenously and constantly in the model it is for all practical purposes impossible to know what you are doing when you carry out economic policy with any ambition to achieve detailed and precise results (Eliasson 1993d, Eliasson & Taymaz 1992). Policy effects keep showing up after several decades and mix in

[3] For practical reasons experiments had to be terminated after 50 years. To judge from earlier experience with the model we would expect this difference to keep expanding since (see Eliasson 1983) the base run with no entry will eventually stagnate and show negative growth.

complicated ways with cyclical behavior being generated in the past and the effects of earlier policy. Thus, if the strong downward trend in new establishment shown in Figure 4 has been created by a policy induced deterioration of the entrepreneurial new establishment climate in Sweden over some forty years, (which we argue in *Den långa vägen,* IUI 1993) it will be as difficult to hold anybody responsible for causing a deterioration in macroeconomic performance as it will be to claim credit for observed improvements in macroeconomic performance. The only way to clarify what is good or bad policy is to use a dynamic micro simulation model of the MOSES kind, and be empirically credible about its assumptions and the underlying database measurement. Until that has been done only one clear policy conclusion can be drawn; do less.

Unemployment responds in a similarly slow fashion. The first 30 years in both experiments only show a new cycle compared to the base experiment (Figure 2C). In the entry experiment strong expansion compared to the base run significantly lowers unemployment in the third decade, while an increase eventually is seen in the low exit case because of increasing wage costs. On the whole, however, wage adjustments eventually correct the unemployment situation under the labor market regime of the MOSES model, which is reasonably flexible wages.

Rates of return follow a time pattern similar to the unemployment cycle. The long expansion wave in the entry case after some 20 years is moved by high profitability that is eventually competed away. In the low exit case rates of return follow a different cycle but begin to exhibit instabilities towards the end of the 50 year run, a signal that a bad production structure with too little diversity is emerging (see below). We know from earlier experiments (see for instance Eliasson 1983, 1991a) that if competition is held back through limiting the exit of firms, increasing the presence of old obsolete structures, Salter structures eventually begin to be dominated by firms with bad performance. This result also comes out in the Salter distributions on the 50 year horizon (Figures 4). In the entry case rather well behaved productivity

and rate of return distributions are recorded on the 50 year horizon. It is interesting to observe, that while old (initial) and new firms are fairly well distributed over the entire range, *new entrants dominate in the upper, high end of the rate of return distribution.* This should be the case (Eliasson 1991a), but apparently and very much in keeping with the hypothesis of the experimentally organized economy, high labor productivity is not necessarily the same thing as a high rate of return performance. When rate of return distributions on the 50 year horizon are compared in Figure 4C the distorted distribution in the no entry and slow exit experiments come out clearly. As observed in Eliasson (1983, 1984a) such shapes makes the industrial structure very exposed to changes in the competitive situation, or in the interest rate. A sudden jump in the interest rate can knock out the bulk of the industrial structure in the base and slow exit cases, if the increase is large. It was several times in the 1970s.[4]

[4] The shapes of the labor productivity curves are similarly distorted. We have chosen not to show this, because producer prices have changed very differently in the 50 year simulations and there is not enough space in this paper to go through the problem of how to deflate individual firm value added.

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Table 1 The four fundamental investment/growth mechanisms

(1) *entry,* new innovative establishments

(2) *reorganization* of existing firms

(3) efficient *management* of existing firms (rationalization)

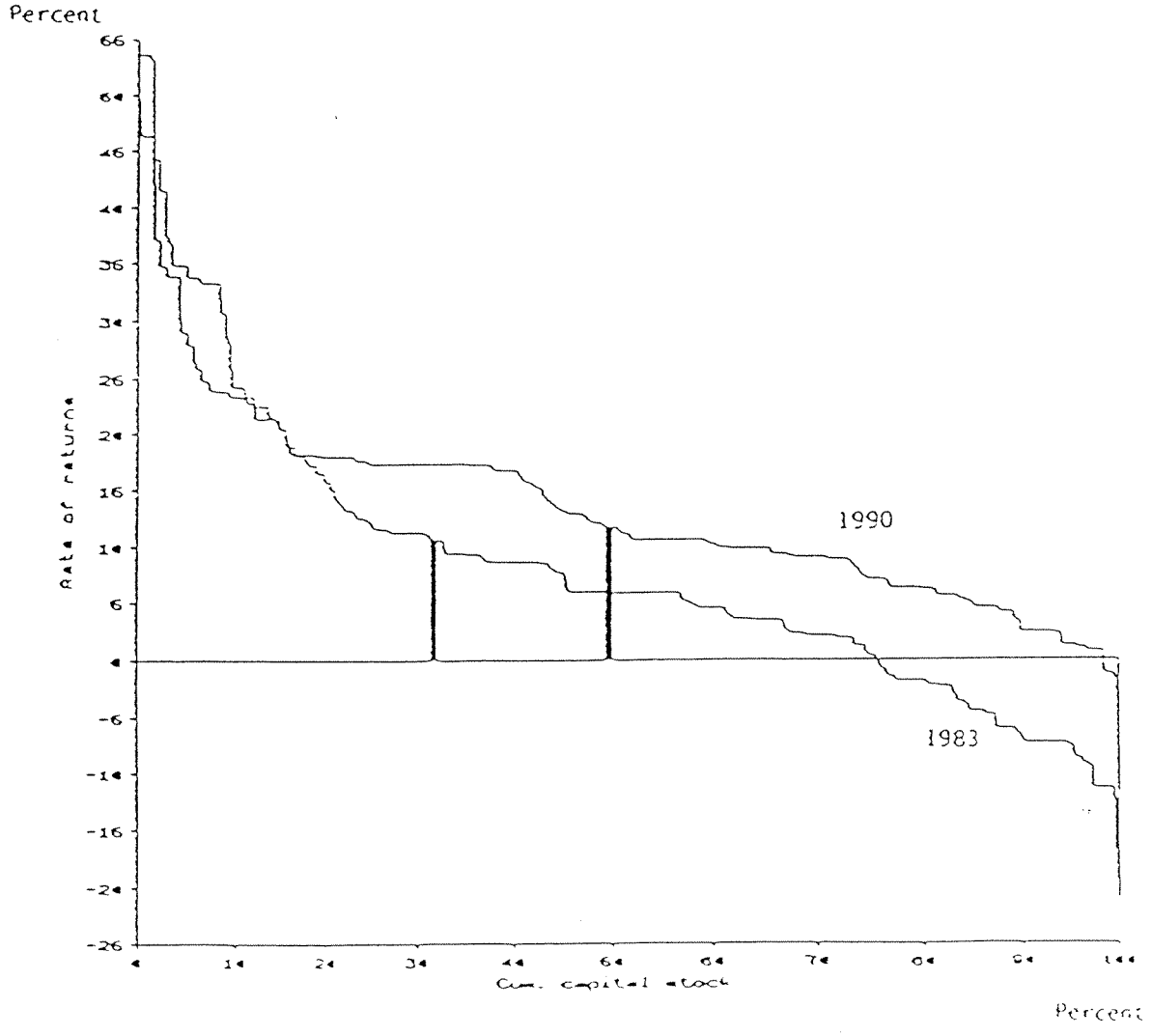
(4) bankruptcy, *exit* or creative destruction

Source: Eliasson (1993b).

Table 2 Number of firms

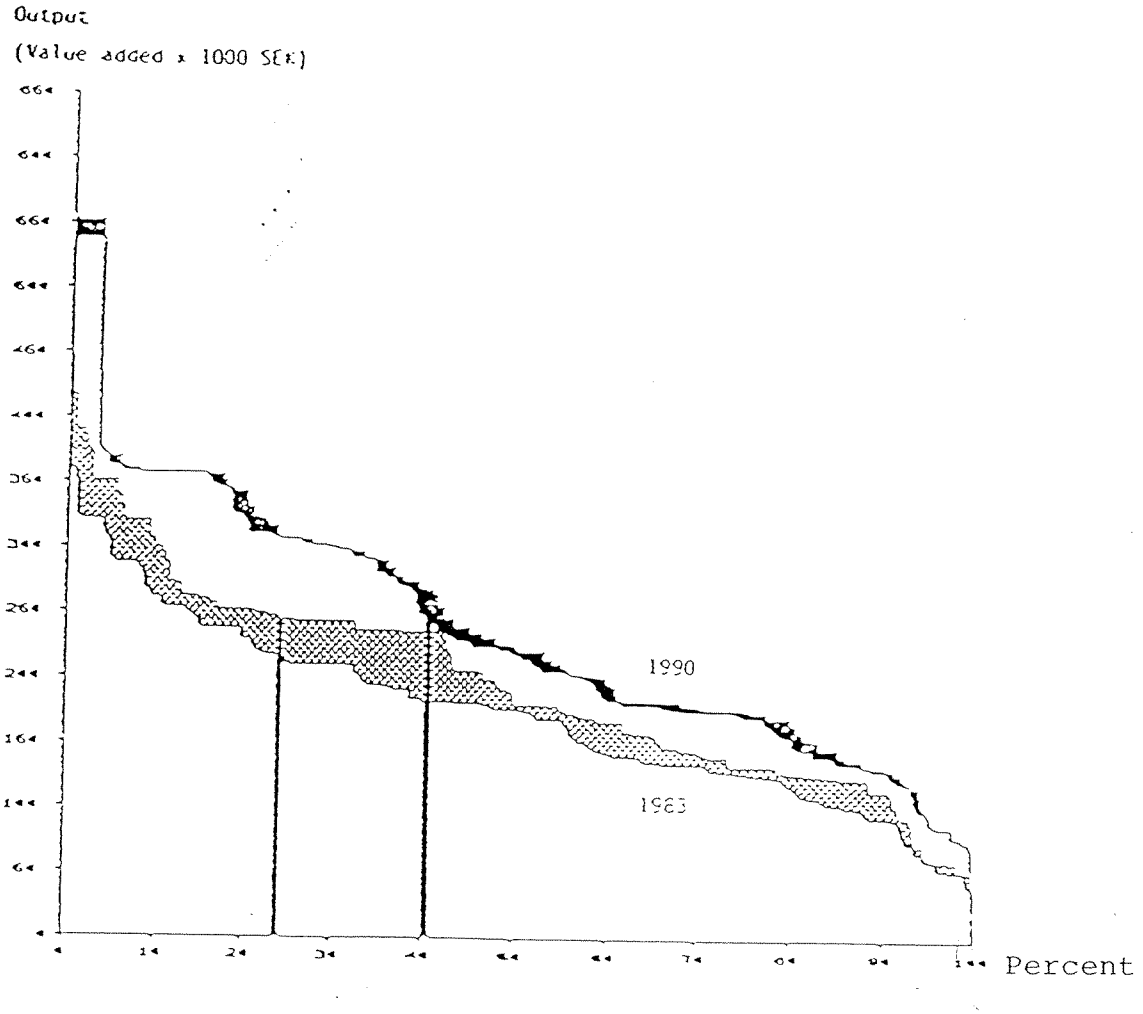
	Initial year 0	New entry during 50 year simulation	Exit during same simulation
Base experiment	250	0	119
Entry	250	257	125
Low exit	250	0	87

Figure 1A **Distributions of rates of return over the interest rate ($=\overline{\varepsilon}$), 1983 and 1990**



Source: Eliasson (1991c).

Figure 1B **Actual and potential labor productivity (Salter) distributions 1983 and 1990**



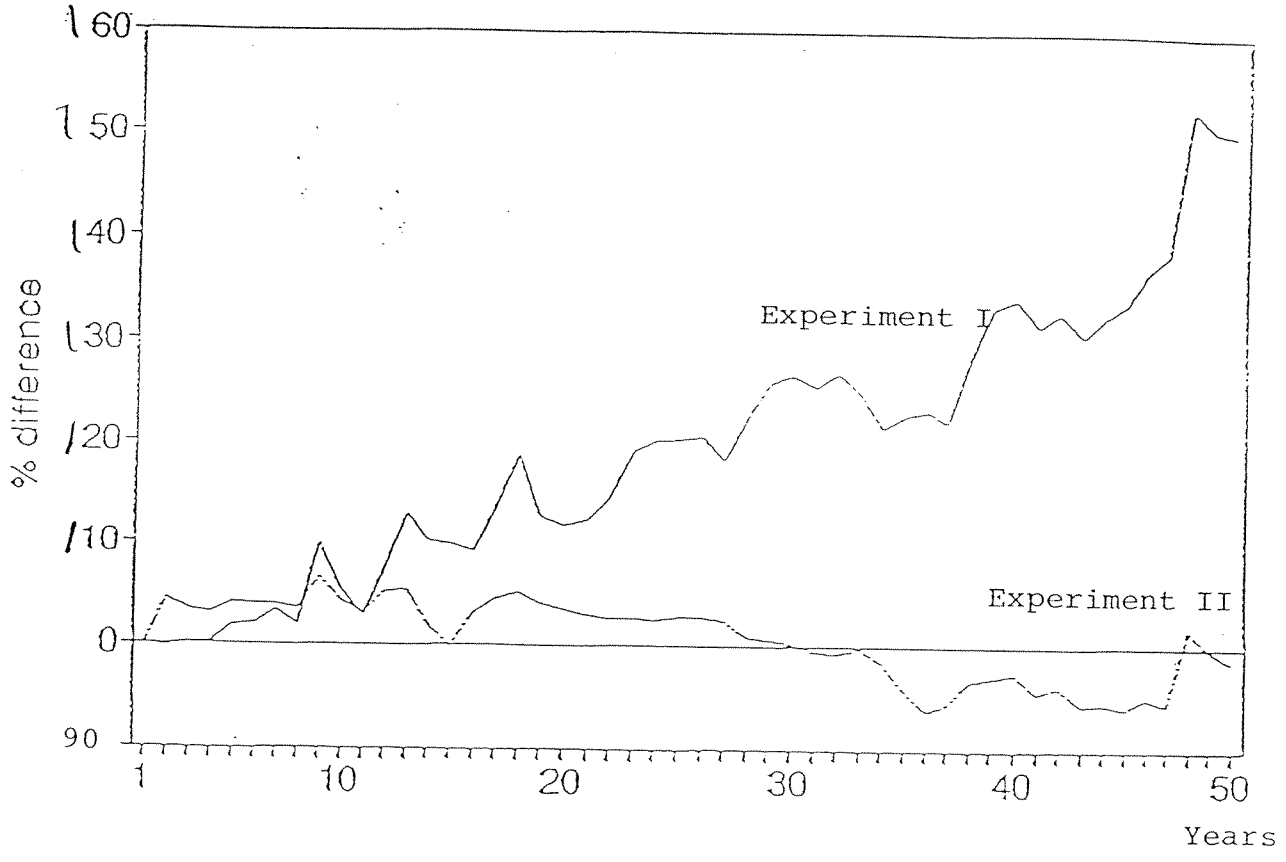
Note: Shaded areas denote unused labor capacity (labor hoarding).

Source: Eliasson (1991c).

Figure 2A **Manufacturing output**

– experiments in percent of base run

Percent

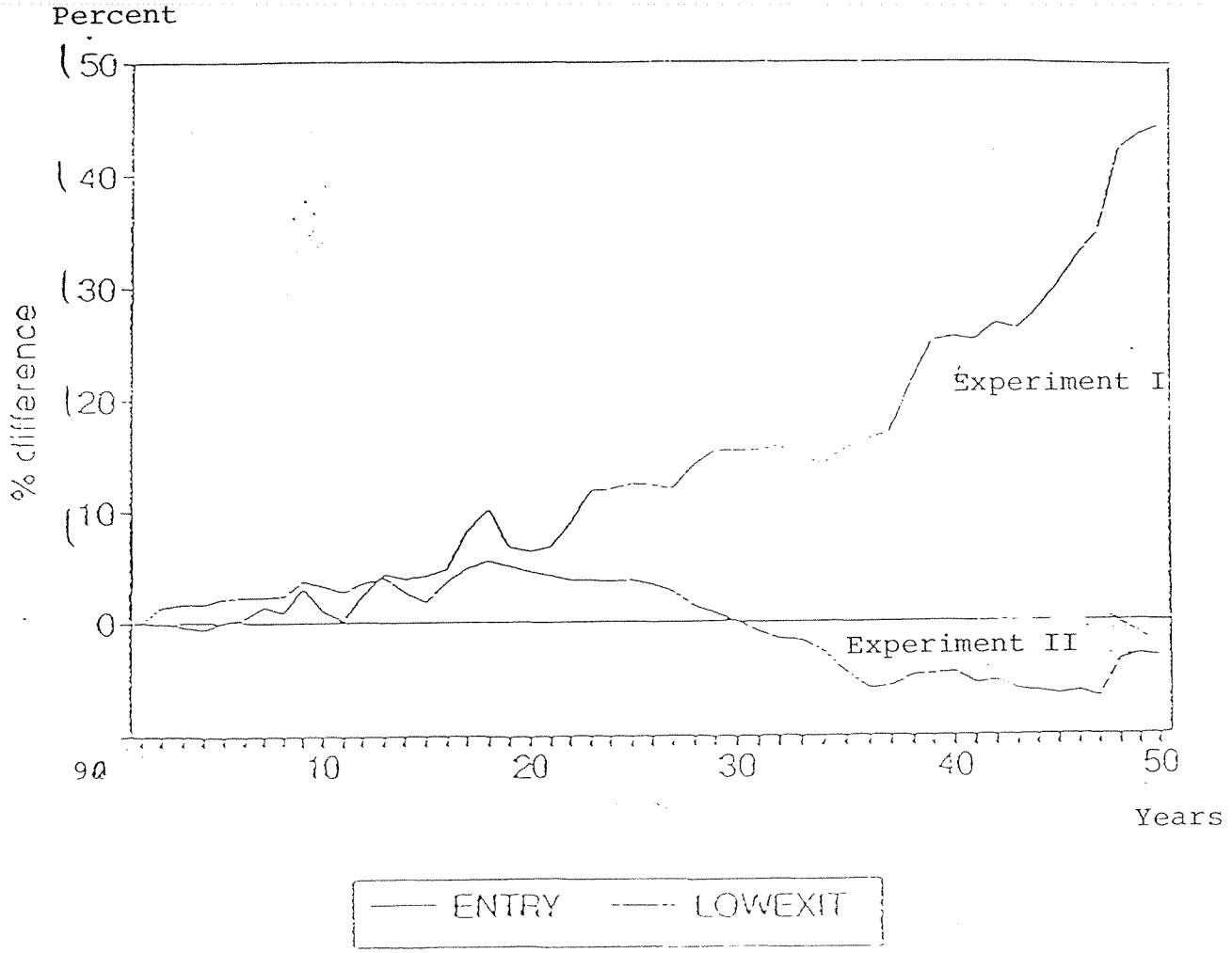


----- Experiment I, ENTRY - - - Experiment II, LOWEXIT

Note: $Definition = \frac{output(Entry) - output(Base)}{Output(Base)}$

Figure 2B GNP

– experiments in percent of base run



Note: $Definition = \frac{output(Entry) - output(Base)}{Output(Base)}$

Figure 2C **Unemployment**

– experiments in percent of base run

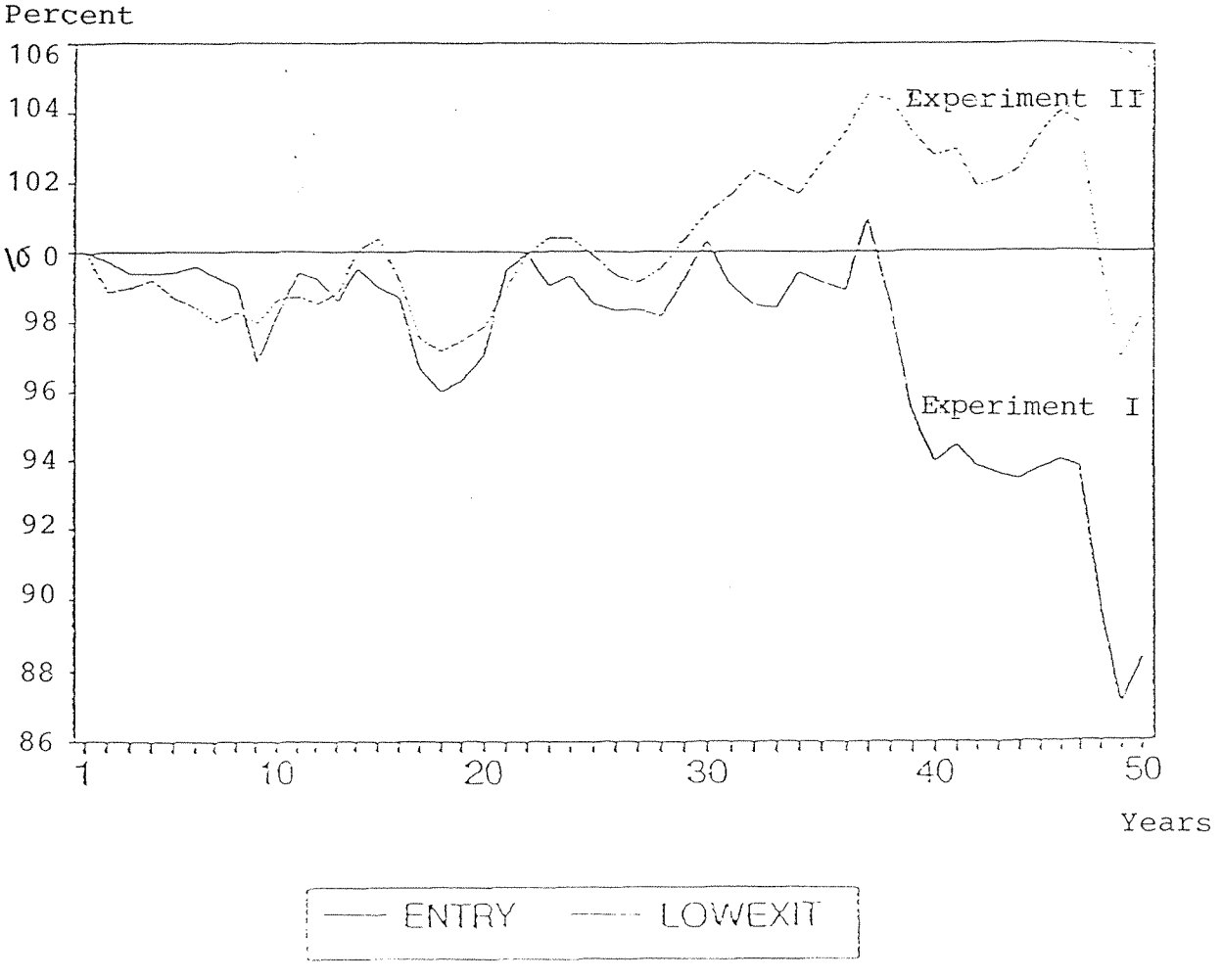


Figure 2D **Rate of Return**

– experiments in percent of base run

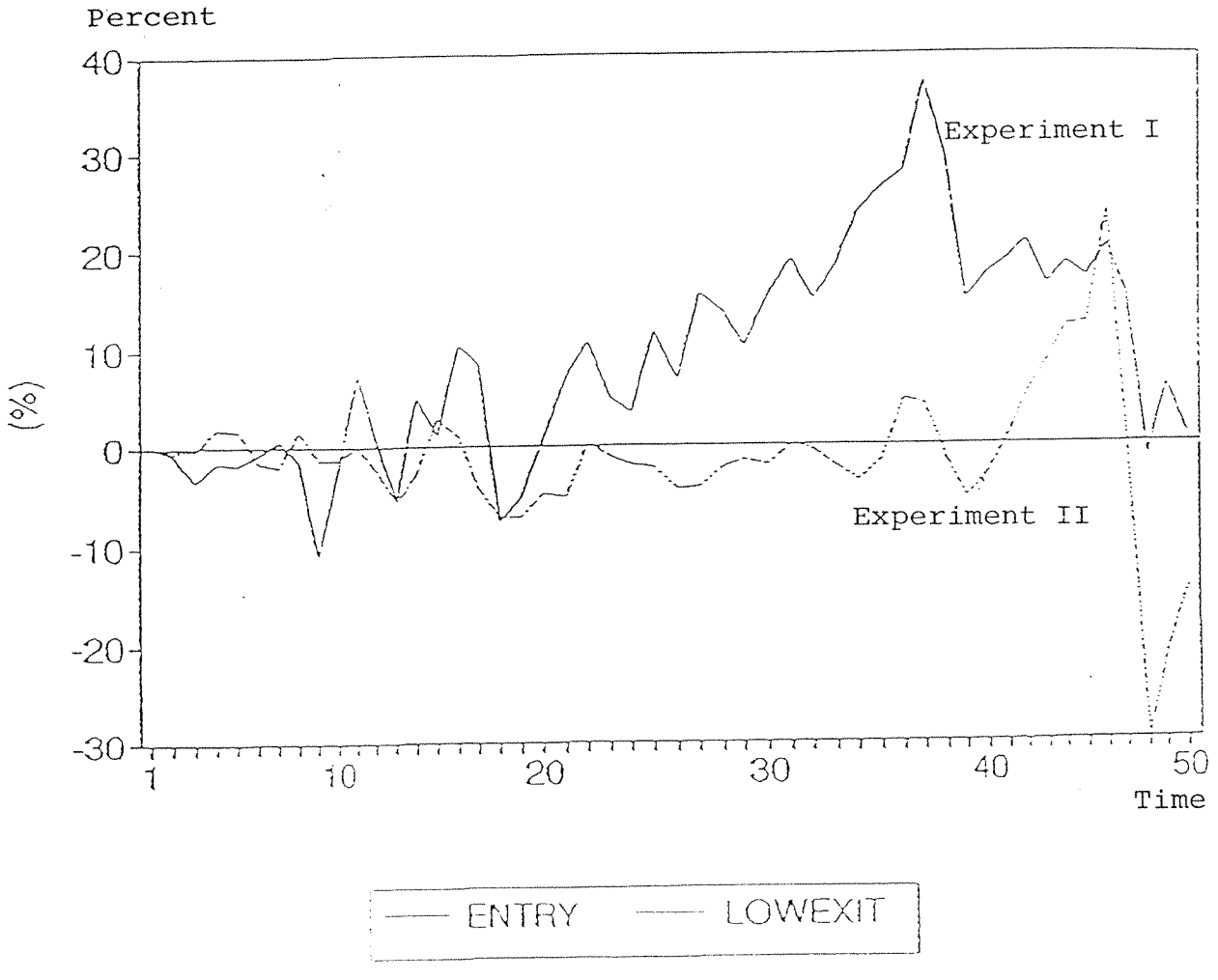
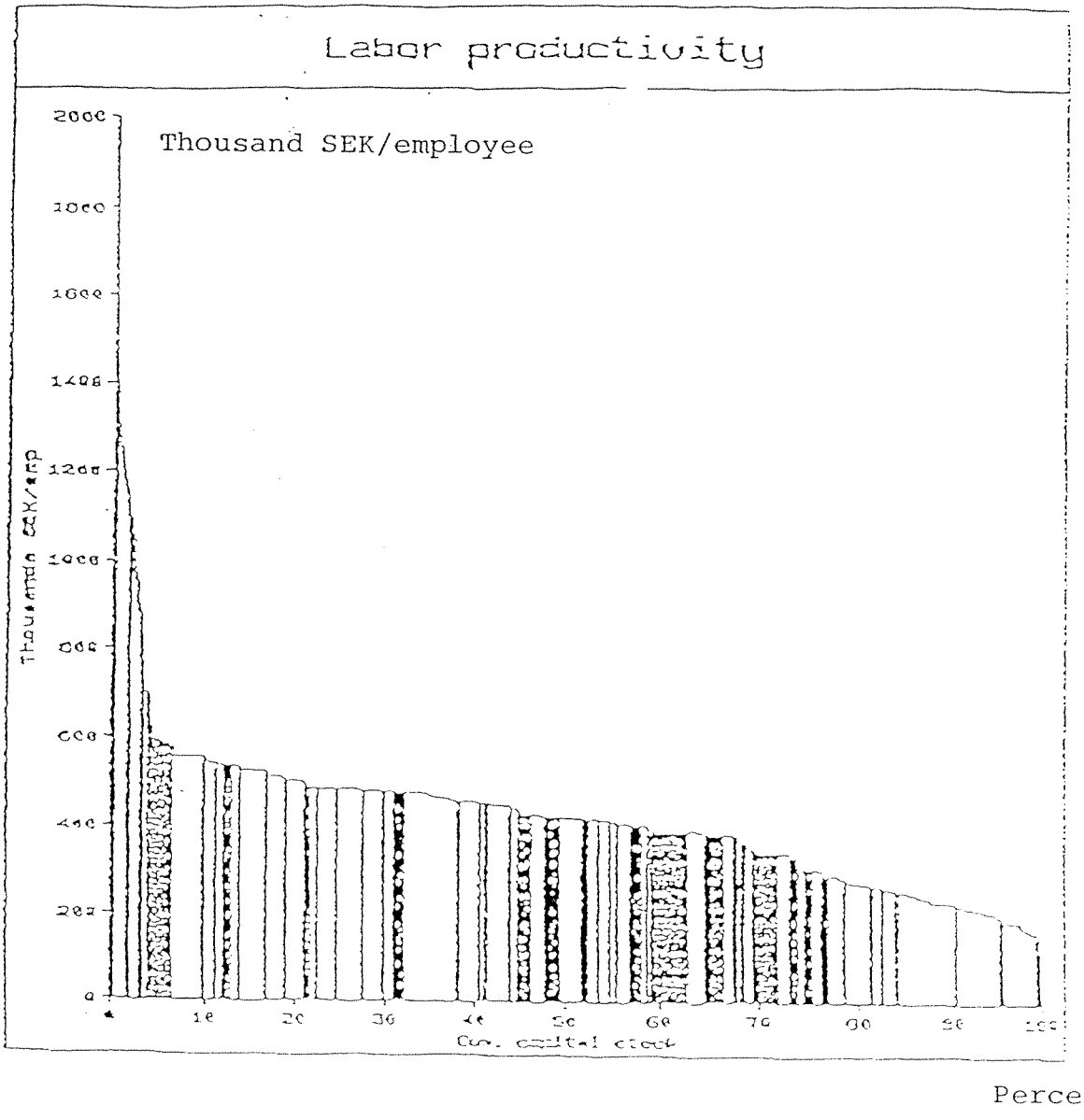


Figure 3 New establishment in Swedish manufacturing

Source. Braunerhjelm (1)., Stockholm, 1993

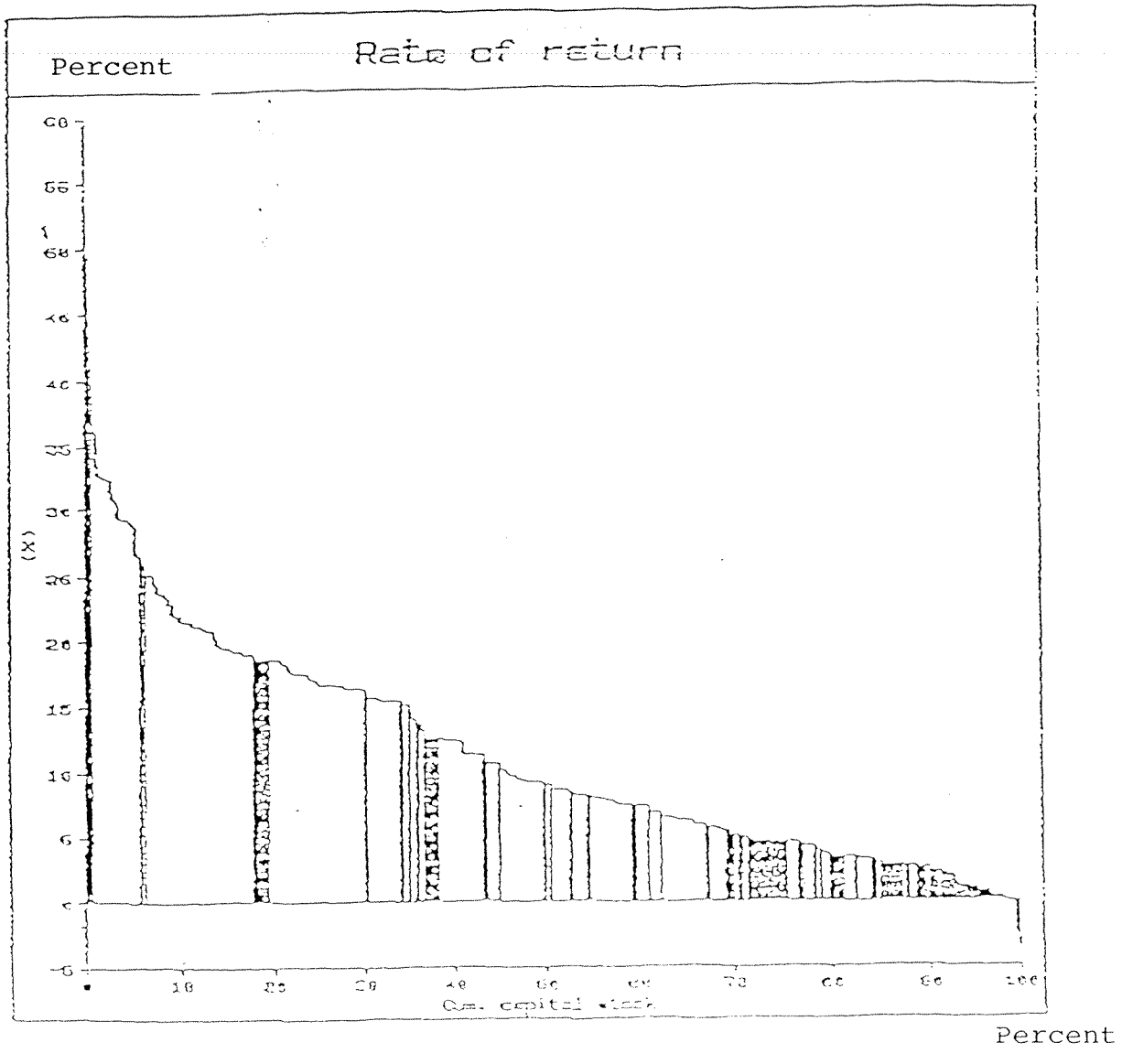
FIGURE 4 PRODUCTIVITY (SALTER) DISTRIBUTIONS ON THE 50 YEARS HORIZON

Figure 4A Labor productivity distribution in entry experiment



Note: Shaded areas represent remaining firms from initial population of firms year 0.

Figure 4B Rate of return distribution in entry experiment



Note: Shaded areas represent firms remaining year 50 from initial population of firms year 0.

Figure 4C **Rate of return distributions in entry, base and no exit experiments**