

The University in Transition, II

Currents and Whirlpools

By Herman Wold, University of Gothenburg

29

Summary The paper explores the global-wide transition of schools and universities from elitist to mass establishments. The transition is seen as evolving under the joint impact of economic, political and educational forces, and as having led to a conveyor-belt type of education that on the whole is expensive and inefficient. Part of the story is that the inherent potentials of the elitist system have been suppressed under the combined influence of centralized government power and administrative bureaucracy. This could happen because the elitist system had only vaguely identified its inherent potentials, with the result that the system showed off as fragile and impotent under the economic and political pressures. It is not fair, however, if all of the blame for the inefficiency of the school-university system is laid at the doorstep of centralization and bureaucracy; the educational -- or rather the scientific -- system is itself responsible for some serious deficiencies. For one thing, the pregnant self-centering which is a typical institutional feature of most or all scientific subject-matters explains much of the present weakness of the educational establishment.

The conclusion is that substantial gains in quality and efficiency are within reach by appropriate reforms in the educational system. A programme of university reforms is outlined, the main points of which are: (i) A rational balance between centralization and decentralization in the educational system; (ii) Abandoning the conveyor-belt design, and reorganizing the educational process with emphasis on the individual activity and responsibility of the learner, and on the guiding functions of the teacher; (iii) The self-centering of scientific subject-matters should be modulated by appropriate interdisciplinary moves.

1 Three economic, political and educational trends.

Ambitious reforms of the university system in the 1950's and 1960's, followed by unrest and other set-backs in the late 1960's and the 1970's, is a development that has unfolded itself with local variations in many Western countries. With special reference to educational politics in Sweden, the universities are seen as evolving under the impact of three interrelated economic, political and educational trends:

SPACE FOR CHART 1.1

CHART 1.1.-- The Keynesian epoch 1935-1970; an idealized picture.

- (i) The steady economic growth in the Keynesian epoch 1935-70, followed by the quagmire of stagflation (unemployment combined with inflation) from around 1970 and thereafter;
- (ii) The centralization of government power and the topheavy bureaucratization that are global-wide features of the Keynesian and post-Keynesian epoch;
- (iii) The channeling of pupils and students through the consecutive stages of a subject and through the consecutive school and university years by educational processes that remind of conveyor-belt techniques, except that the learning tests and examinations that correspond to the production controls along an industrial assembly line often are sloppy, with little or no personal-psychological contact between teacher and learner, and with little or no emphasis on an integrated test of the end product.

1.1 The Keynesian epoch 1935-1970.

All over the Western world, economic growth during the Keynesian epoch brought GNP (Gross National Product) to unprecedented heights. The economic growth had a tremendous socio-psychological impact that can best be described as a change in the zeitgeist, a change to the Keynesian zeitgeist. In the Keynesian zeitgeist, business depressions and serious unemployment are a thing of the past; steady economic growth is automatic; recessions can always be cured by public borrowing and spending.

From the 1940's through the 1960's the price of the steady economic growth was a mild inflation. Alas, since around 1970 inflation and unemployment have run out of control; the Keynesian epoch has ended, and we are in the period of stagflation. Nonetheless, the Keynesian zeitgeist is still very much in socio-psychological command.

1.2 Centralization and administrative bureaucratization.

1.2.1 The Keynesian epoch brought strong incentives for administrative centralization:

- a) The Keynesian programme made steady economic growth a first order concern of politics in the Western countries. A selective system of government regulations developed, with interest rates, public spending, price controls etc. as flexible instruments of nationwide regulations. Hence the Keynesian programme almost automatically led to a forceful centralization of economic power in the hands of the national governments.
- b) As the steady economic growth established the success of the Keynesian programme, the tendencies to economic centralization were reinforced. The taxes

SPACE FOR CHART 1.2

CHART 1.2.-- A. Employees in government agencies in Sweden, 1945-1970;
 B. Employees in the University Chancellor's office (Sweden), 1945-1970.

and thereby the public sector of gross national income increased automatically in the course of the economic growth, and not only absolutely, but also relatively to GNP. In fact, since individual tax rates increase with nominal income, inflation made the taxes flow more rapidly from the private to the public sector.

1.2.2 As economic growth continued to ever new heights during the Keynesian epoch, the rapidly increasing public income led to rapidly increasing public spending, and thereby to new and more ambitious programs of general welfare; at the same time the economic centralization became a nucleus of political centralization and administrative bureaucratization in other areas of government activity. Earlier programs of general welfare expanded, new programs were launched, and ever larger cadres of civil servants were hired to administer the programs. Old age pension schemes; rent control on private housing; helping the unemployed by economic support or new schooling; expansion of the highway system; socialization of medicine; educational reforms; these are typical cases in point, and many more could be cited. By and large, the programs were highly ambitious, and had high political potentials. Some of the programs were also highly expensive, and for some of them the costs tended to increase relative to the general economic growth. This last feature has led several programs into deep trouble during the post-Keynesian epoch of stagflation.

1.3 Learning is mental growth.

This is a main tenet of my paper. Chart 1.3 and the conveyor-belt (or assembly line) simile are set forth for critical purposes, to serve as antithetic contrast to educational systems with emphasis on mental growth.

The chart illustrates the conveyor-belt design of education. The yearly curriculum in a subject-matter, for example mathematics, is split up into consecutive modules, each module requiring a standard period of time, often one week. The teacher follows the specification of the module in his teaching, and when he finds that the large majority of his class have learnt the module he proceeds to the next module. The chart illustrates the typical case when some pupils have studied in advance and know the module already at the beginning; further it is typical in Swedish schools that when some 80 or 85% of the class know the module the teacher proceeds to the next module-section of the curriculum. -- This educational design is sometimes referred to as the "lockstep."

SPACE FOR CHART 1.3

CHART 1.3.-- The conveyor-belt design of education.

1.3.1 As everybody knows, industrial mass production entered a new epoch when Ford introduced the assembly line in his automobile factories. Along the conveyor belt the production units are assembled and completed step by step, and each worker is responsible for just one operation in the production process. By splitting up a complex production process into a sequence of simple operations, the conveyor belt has led to great triumphs in industrial mass production. To carry over this technique to education, however, is a false application of the conveyor-belt principle.

The lack of genuine analogy is twofold, namely with regard to (i) the production units on the conveyor-belt, and (ii) the workers in action along the belt. As to the learners, they are not uniform production units passively shuttled forward in a mechanical process; learners are individuals, with a wide range of variation in ability and ambitions; learning is mental activity, spurred by self-realization and other motivations. As to the teachers, while each worker along the conveyor-belt is responsible only for a limited task, the teacher has essential functions that go beyond the step by step teaching of the course-modules; speaking broadly, the teacher should develop his personal-psychological contacts with the learners, and on this basis stimulate and guide their studies. It is this twofold lack of analogy with industrial mass production that is the point of the simile of conveyor-belt education.

1.3.2 Conveyor-belt v. mental-growth oriented education. -- The distinction is reflected in most or all aspects of the educational process. To specify, we shall list some distinctive criteria.

Conveyor-belt oriented education

Mental-growth oriented education

- 1a From one year to the next, all learners pass from one class to the next, except those few who cannot follow the ordinary education and are channeled to special "aid classes."
- 2a The educational process adheres strictly to the curriculum that is fixed in detail in advance.
- 3a Frontal teaching. One-way communication teacher-learner, with questions to be answered individually.

- 1b Strict standards to be met by a learner in order to proceed from one class to the next.
- 2b The educational process follows the general curriculum, and by individual assignments it allows for differences in ability and interest.
- 3b Emphasis on two-way communication. Discussion teacher-learner to clarify difficulties in the curriculum, or carrying beyond the curriculum.

4a Little or no personal-psychological contact teacher-learner.

4b The teacher serves as individual guide for studies in his subject-matter, and each class has a teacher as educational group advisor.

5a Examination in written form, often by multiple-choice tests.

5b Examination is a confirmatory supplement, including both written and oral tests, to the knowledge that the teacher has gathered about the learner's ability in the course of the curriculum year.

6a Little emphasis on examination marks, or complete abandonment of the mark system.

6b Emphasis on examination marks as measures of mental growth.

2 Four waves of Swedish university reforms 1945-1973.

Sweden is a peaceful little country in the north of Europe. By old tradition, education and science are held in high esteem. In the 17th and 18th centuries university studies belonged to the privileges of the nobility; at the same time, and even more so from the 19th century and onwards, the universities were a well-recognized vehicle for social mobility. The secondary schools and the "gymnasium" (corresponding to the German Gymnasium and the French lycée) continued to develop on an elitist basis, and so did the universities.

2.1 The mid-1940's.-- In 1945 the Hiroshima bombs triggered a forceful wave of government reforms to strengthen the Swedish universities, first of all in technology and in the natural, medical and social sciences. The personal and financial resources were lavishly expanded both for teaching and research. The reforms were not limited to the two state universities (Uppsala and Lund); in the course of the reforms the two young municipal universities (Stockholm and Gothenburg) were transformed to state universities.

In spite of the strong push from the government, the increase in the university enrollment remained rather slow from 1945 until the late 1950's. This was however entirely in line with the elitist traditions of the Swedish schools and universities.

2.2 Equality of educational opportunity. -- On the basis of this principle, a wave of reforms in the 1950's gave rise to a rapid expansion of the Swedish educational system. The beginning was made in the early and mid-1950's with the high-grade schools, and in 1958/59 the universities were in turn. With reference to Charts 2.1 and 2.2 for illustration, the reforms induced a forceful increase in the university enrollment in the 1960's.

The educational reforms of the 1950's carried a tremendous political potential, and they were greeted with enthusiasm in wide circles. To a large

SPACE FOR CHART 2.1

CHART 2.1.-- New matriculations in Swedish universities and post-school institutes 1940-1973.

extent, the high-quality ambitions of the elitist traditions were honoured. Specific reference is made to the system of "automation" introduced by the reforms; this is a procedure of automatic appropriation of government money so as to keep the number of university teachers in constant proportion to the students; well to note, at the undergraduate level. At the same time, some of the university reforms were "schoolish," making for a transition of the undergraduate university studies in the direction of school studies. Thus the reforms brought a substantial increase in the amount of teaching (hours per week) per student. For another thing, new categories of teaching appointments were established (university adjunkt and university lector) that involved the duty to teach, but not (not necessarily) to make research; while the adjunkt has a temporary appointment, the lector has tenure. As part of the expansion program, a fifth university (Umeå) was established in the north of Sweden.

2.3 The reforms 1968/69.-- In the mid-1960's the rapid expansion of the Swedish universities began to show signs to run out of control. It suffices to mention that the costs of the universities reached new heights year by year, owing to the steep increase of the university cadres in combination with the system of automation (2.2), the free tuition (which had always been free in the state universities) and the relatively new system of all-inclusive grants (in the nature of "students' salary") to cover part of the student's costs of living. Then in 1968/69 the government brought a third wave of university reforms at the undergraduate level, known as the UKAS and PUKAS reforms. At the same time there were deepgoing reforms in the higher grades of the school system. The educational reforms of the late 1960's may be summed up under two headings:

- (i) In the universities: The transformation of the undergraduate studies in the direction of school-type education was carried several steps further;
- (ii) In the schools: More changes in the direction from mental-growth to conveyor-belt oriented education.

As to (i), the earlier scientific autonomy and diversification of the universities was weakened or pushed aside. The undergraduate courses were re-organized so as to be largely the same in the five universities (cf 2a). In faculties with free (unrestricted) enrollment, the universities by old tradition gave the students free choice in combining their selected subjects to a university degree; instead, UKAS-PUKAS imposed drastic restrictions on the admissible combinations. By old tradition in the free faculties, Swedish students learned one subject at a time, and examined for their mark in the subject by a compre-

SPACE FOR CHART 2.2

CHART 2.2.-- Developments 1945-1973 in a typical university institute in Sweden.

hensive examination at the end of one term of study (or sometimes two terms); now, UKAS-PUKAS imposed a system of three or four partial examinations per term, in general not to be concluded by an integrated final examination (cf 5a). Standards or guidelines were set up for what percentage of the students should pass at each partial examination, namely at least 70% (cf 1a).

As to (ii), further changes in the direction from 1b-6b to 1a-6a were imposed on the teaching procedures in the schools. Specific emphasis was placed on pupils with low ability so as to enable them not to lag behind. As to pupils in the upper tail of the ability distribution the philosophy was that able pupils will get along well independently, without much education.

2.3.1 Equality of educational opportunity v. equality of education.-- While the educational reforms of the 1950's had well-recognized political overtones, the reforms of the late 1960's quite distinctly were in the nature of educational politics. The change can perhaps best be described as a shift from the principle of equality of educational opportunity to the principle of equality of education. The first principle was of old standing in the Swedish educational system, even far back in the elitist epoch. The 1968/69 reforms were distinctly in the direction of the second principle, and in particular so the school reforms.

2.3.2 Thus far I have referred to reforms at the school and undergraduate university levels. Related reforms have also swept the graduate university level. A typical case in point has occurred in the reorganization of the doctoral thesis. Earlier, the doctoral thesis was subject to quality assessment by way of marks that in practice ranged over four levels (lower marks were extremely rare, since a thesis usually was withdrawn in the prospect of such results). After the reform the doctoral thesis is subject only to the marks "pass" or "fail", and again this last mark hardly ever occurs. And earlier, the quality of the doctoral thesis was documented by a written statement in the faculty protocol; after the reform, the quality documentation has been abandoned (cf 6 a-b in Section 1.3.2).

2.3.3 The 1968/69 reforms under (i)-(ii) were imposed by centralized decisions at administrative levels above the educational grass-roots. The government rules the schools via the Central School Board, and the universities via the University Chancellor's Office. It is symptomatic that in 1963 there was a clearcut shift of the university administration in the direction from decentralization to centralization. Earlier, the University Chancellor was nominated by the universities and appointed by the government; after 1963 the Chancellors have been appointed

directly by the government, without previous nomination.

2.4 A fourth university reform in preparation: U 68. -- Most of the U 68 reforms are administrative changes. A new array of bureaucratic bodies is planned by dividing Sweden into six "educational regions" (cf our system of medical regions). The transition of the undergraduate level of the universities in the direction of school organization is carried further, and so is the separation of teaching from research. Each region is planned to contain many undergraduate teaching centers, but only one research center.

3 Centralization v. decentralization in public administration.

3.1 To repeat from 1.2.1, the Keynesian programme of steady economic growth has in the Western countries given rise to a fargoing centralization of economic power in the hands of the national governments. Clearly, this centralized power is needed for the short-range regulations that serve to maintain steady economic growth. While such centralization of short-range decisions is needed in economic policy, the situation is radically different in government agencies which have their rationale in cost-benefit considerations. The main thing is here to strike a sound balance between costs and benefits in a long-range perspective. This is essentially a matter for centralized decision, whereas the short-range decisions should be decentralized to the level of the day-to-day work.

3.2 Over-centralization leads to inefficiency and waste. -- With reference to the brilliant analysis of A. Lindbeck (1972), the degree of centralization of economic policy has increased markedly in Sweden in the 1960's. Lindbeck studies centralization v. decentralization from the point of view of information flows, and argues with the support of drastic and convincing case studies that the Swedish centralization of economic policy on the whole works with a low degree of efficiency, and lots of waste.

The present paper focusses on a special sector of public service in Sweden, the university system. As a case study of administrative centralization it joins Lindbeck's analysis to provide further examples that over-centralization leads to inefficiency and waste. As is clear from 2.1-2.4, the transition from administrative decentralization to centralization in the Swedish university system is a very recent phenomenon, and the situation is as yet far from stable. We proceed to indicate some of the main weaknesses that are already showing off as manifest.

3.2.1 At the undergraduate level (the first three university years) the Swedish universities have been transformed to a school system. For one thing, teaching and research are now much more separate functions than earlier. This involves a university-wide loss of research potential. It is difficult or impossible to

evaluate this loss in units of gross national production, but it is safe to say that the loss is highly dangerous. In the modern society, competition in terms of innovations has become more keen as ever, both in national markets and in international trade, and since research is the main source of productive innovations, research is at a premium in all avenues of production. At the same time the loss of research potential involves a severe loss of diversification of the research efforts, and again this is a serious drawback in the developments of modern production.

3.2.2 As to the teaching system, the Swedish university reforms by and large have been in the direction from mental-growth oriented to computer-belt oriented education. This involves waste and inefficiency on several scores, as specified in 1.3.3, items 1 a,b - 6 a,b. And to repeat, the listing is far from complete. A case in point is the substantial increase in university lecturing brought about by the 1958/59 reforms. To some extent the increase has led to a more diluted form of lectures; in fact, before the reform a typical university lecture was an one-hour affair -- now a lecture usually is two hours.

3.2.3 A main political incentive for the university reforms was to increase the university enrollment from the strata of workers and low grade employees; the rate of enrollment from these strata had always been very low. The lack of success in this respect is a tragic failure of the recent reforms. The failure is however not difficult to explain; the effect of the reforms is rather to add to the obstacles for the students from these strata. As shown by Schultz (1963) the costs of university studies to a large extent falls upon the student himself in the form of earnings foregone; these costs are especially heavy in low income strata, where the student has less economic support from his family. Now on the whole the school-type education that after the reforms dominates the undergraduate level of the Swedish universities hampers the possibilities of self-realization of the able students. A feature with similar hampering effects is that the student-teacher ratio has dropped drastically after the establishment of university-teacher categories with duty to teach, but not to be active in research (cf 2.2). Earlier, the able student had more opportunities to earn an income (a modest income) during their studies by part-time work as teaching or research assistant.

3.3 Causes of inefficiency and waste in the educational system. -- The previous analysis of the Swedish educational system has revealed two main sources of inefficiency and waste: Administrative over-centralization, and reforms in the direction of computer-belt education. Questions arise how such failures could happen. And are they unavoidable? We proceed to discuss the situation, and in particular we wish to obtain clues for a programme of constructive improvements.

SPACE FOR CHART 3.1

CHART 3.1.-- Forecasts of the Swedish university enrollment.

3.1 Centralization v. decentralization.-- Again with reference to Lindbeck (1972), the failures of centralization are to a large extent due to two features:

- i) Alienation between the central decision makers and the grassroot levels;
- ii) Different rules of the game in the political and scientific debate.

The arguments (i)-(ii) are of a general nature, and in particular they apply to the educational administration. As is clear from the previous analysis, the recent university reforms give many obvious illustrations. And here enters a third feature, briefly mentioned in 3.1, which we venture as a general proposition:

- iii) In public agencies with a rationale in cost-benefit considerations over a long-range perspective, the centralization of short-range activities tends to generate instability in the operational programme of the agency.

The instability generated in the Swedish university system by the two comprehensive reforms in rapid succession 1958/59 and 1968/69 is a striking case in point, and the third big reform of 1968 will come up for decision in 1974. The instability in the central planning is illustrated in Chart 3.1; see the budget requests of the University Chancellor from 1970/71 to 1972/73. As a result the teaching and research activities at grassroot-institutional level has very much become a matter of day-to-day executive work with a planning horizon of one year or less. For one thing, almost all teaching appointments except those with tenure are now on a yearly or half-yearly basis. (This last feature gives further support to the argument at the end of 3.2.3.)

3.2 Conveyor-belt education.-- The simile of conveyor-belt education and the ensuing criticism of current educational trends is a main tenet of the present paper. From the point of view of mental growth we have seen that the failures of conveyor-belt education are twofold: the system is inefficient and of inferior quality both with regard to the learners and the teachers. In the transition from elitist to mass education, of course, the conveyor-belt system is nowhere set forth as an educational blueprint, let alone as an educational ideal. Rather it makes a case of mimesis in the sense of Arnold Toynbee: there is a gulf ajar between what the system is supposed to achieve and what it actually achieves.

The origin of computer-belt oriented education seems to be the United States, perhaps back in the 1920's or earlier. From 1930 and onwards the literature of the educational profession bristles with studies that in a positive vein investigate one aspect or other of computer-belt education.

3.3 Scientific self-centering.-- The disastrous trends referred to in 3.3.1-3.3.2 are largely due to two professional cadres, namely politicians and admin-

SPACE FOR CHART 3.2

CHART 3.2.-- Real World Territory (RWT) subject-matters
v. Unspecified Territory Methods (UTM) subject-matters.

istrative bureaucrats on the one hand, and educationalists on the other. The question arises how it comes that the two trends could overrun the entire university sector of the Swedish scientific community. It is often said that the university system is fragile, and is highly susceptible to outside influences. This answer is however far from satisfactory. The scientific establishment is highly institutionalized both inside and outside the universities, and the institutionalization makes for massive stability. Hence it is paradoxical how it comes that the Swedish university institutions could be swept by such calamities as the recent university reforms.

Institutionalization is a mixed blessing. The institutionalization of a scientific subject-matter has brought stability and many other advantages. But institutionalization also brings dangers, and in particular -- and this is again a main tenet of my paper -- the institutionalization generates scientific self-centering. Any scientific subject-matter (for example economics, or math, or statistics) is institutionalized, having its specific hierarchy of teachers, researchers, consulting specialists, etc., and it also has its specific literature of textbooks, monographs, learned journals, etc. To make career in such an institutionalized subject it is necessary first of all to cover the central area of the subject; on the other hand, problem areas at a distance from the center are less rewarding as topics for career-oriented studies or investigations; hence the scientific specialist tends to stick to the central area of his subject, and to leave outside questions to outside specialists.

As I see it, the tendency to scientific self-centering goes a long way to explain the paradox at issue. In consequence of the tendency to scientific self-centering, the community spirit is on the whole not much developed in the broad realm of science, nor is it much developed in universities by and large, nor even in the university faculties. Hence the establishments of the universities as scientific communities are institutionally weak relative to the establishments of the various subject-matters; hence the universities are fragile in their resistance to outside disturbances.

A related important aspect of scientific self-centering is that it hampers interdisciplinary work. It has often and rightly been said that the importance of interdisciplinary work can hardly be exaggerated, and that the quality and actual amount of interdisciplinary work is far from adequate. The tendency to scientific self-centering explains much of the difficulties to organize efficient interdisciplinary work, and especially so in the universities.

For later reference, Chart 3.2 illustrates a fundamental dichotomy in the scientific realm. Distinction is made between RWT (real world territory) subjects, such as physics, chemistry, economics, history, and UTM (unspecified territory methods) subjects, such as mathematics, statistics, philosophy of science. The RWT subjects are represented as lines that penetrate the circle -- which may be thought of as representing the real world -- while the UTM subjects are represented as concentric circles around R. The chart emphasizes the unity of science. At the same time the chart illustrates on the one hand that self-centering can arise anywhere in the scientific realm, on the other hand that there is unlimited need for interdisciplinary scientific work -- between RWT and UTM subjects, between RWT subjects, and between UTM subjects.

Toward a rational university organization.

Our conclusions from the previous analysis will be stated in the form of a programme of university reforms bearing upon the three broad areas (i)-(iii) referred to in the Summary. For considerations of space the conclusions will be stated very briefly. The conclusions refer primarily to the Swedish university system, just as with the previous analysis, but the underlying arguments are of general scope.

4.1 A rational balance between centralization and decentralization.-- In the educational system as in other areas of public service some functions should be performed by the central administration, others by decentralized work at grass-root level. To specify:

4.1.1 Centralized functions:

- (i) Obtaining money for the yearly budget from the Department of Finance;
- (ii) Establishing preferences between broad scientific sectors by a partitioning of the budget in corresponding broad classes;
- (iii) Setting long-range goals for the universities in terms of costs and benefits -- goals in terms of teaching and research;
- (iv) Establishing and applying rational criteria for measuring the degree to which the long-range goals are achieved, measures both for the costs and the benefits.

4.1.2 Decentralized functions:

- (i) Breaking down the long-range goals into an array of short-range goals of teaching and research; carrying out a corresponding partitioning of the broad budget posts;
- (ii) Planning and carrying out the teaching and research toward the short-range and long-range goals;
- (iii) Assisting to establish and apply the criteria under 4.1.1 (iv);

- (iv) Subjecting the long-range goals to scrutiny with regard to the ever changing world around us, with a view to assess whether the long-range goals remain appropriate or whether new goals should be proposed.

4.2 Mental-growth oriented education.-- The modern large-scale universities are psychological desert milieus, with little or no psychological contact between teachers and undergraduate students. This sterile milieu is to a large extent generated by the conveyor-belt oriented education with its alienation between teacher and student. As is clear from Section 1.3.2, items 1 a,b to 6 a,b, a re-organization in the direction of mental-growth education requires a manyfaceted revision of the educational process. In the light of Swedish experience the following features are of key importance:

4.2.1 Reorganizing the learning: activity in small groups.-- Frontal teaching to large audiences tends to make the learners passive. Hence most of the frontal teaching should be reorganized into sessions of small-groups activity. Good results have been obtained by the following design.

The sessions include 25 students seated at five tables in groups of five. The sessions run four hours each morning, five days a week. The first hour the students in each group discuss questions in connection with the current phase of the curriculum, and in particular the previous afternoon's homework. The teacher arrives, and in the second and third hour he goes from table to table to discuss current questions, and to give individual assignments for homework to the next day. Part of the time he devotes to frontal teaching to the entire group of 25, giving overviews and explaining difficult points in the current curriculum. -- The groups of five students are formed according to the students' ability, with due consideration to individual preferences of collaboration.

Experience shows that the small-groups activity is no more cost- or time-consuming than the ordinary frontal teaching of the Swedish universities. The small-groups activity further has given evidence of a marked improvement in the achievements of the students, and in particular so at the lower part of the ability distribution.

4.2.2 Reorganizing the teachers' functions. -- The teacher's activities in mental-oriented education have partly been described under 4.2.1. In the course of the small-groups activity the teacher develops psychological contact with the learners, and he stimulates and guides their studies. One of the teachers who collaborate in one and the same 25-group is assigned as "principal teacher" to the group. The learner is welcome to contact his principal teacher, individually or in group, to discuss educational questions and obtain guidance and advice.

3 More research.-- The coordination of teaching and research has been a basic principle in the Swedish universities over the centuries. This tradition has been broken by the recent university reforms 1958/59 and 1968/69, which have given research a stepchild treatment. Above all, the more and more pronounced separation of teaching from research which the reforms have imposed has brought a drastic reduction of the research potential, both with regard to volume and diversification. It is now high time to stop the deterioration, to restore the symbiosis of teaching and research, and to build up the research potential. This is not the place to enter at length upon this manyfaceted and difficult task, which for one thing requires that the recently established university appointments of adjunkt and lektor (cf 2.2) must be reorganized so as to involve the duty not only to teach but also to be active in research. I shall here take up just one organization problem of key importance, namely the need to promote interdisciplinary research.

3.1 In interdisciplinary research, say involving two subject-matters A and B, the organizational problem is to span a bridge between A and B, a bridge for the two-way communication that is essential for the interdisciplinary work. Two approaches are in current use to solve this problem.

i) One approach is to create a hybrid science, say AB, and to establish separate scientific institutes for the new science AB. In rather short time, however, the new science tends to become self-centered (cf 3.3.3), and thereby to lose the direct contact with the sciences A and B. The result is that the new science AB will not make a bridge between A and B, but rather a barrier between the two sciences.

ii) The second approach is that those parts of subject B which are of immediate relevance for subject A are incorporated as an integrated part of subject A. Let A(B) denote the subject A thus enlarged. The enlarged subject A(B) should then cover the interdisciplinary work. This second solution is likewise unsatisfactory. What happens after a time is that the expanded subject A(B) tends to become self-centered relative to B, with the result that innovations in B that are of relevance to A do not come across to A. Again, A(B) will make a barrier, not a bridge between A and B.

3.2 In spanning a bridge between two subjects A and B the problem is to counteract the ubiquitous tendency to self-centering. My proposition for solving this problem is as follows: Hybrid professorships and other teaching and research appointments should be established and shared between the subjects A and B, with duty to work half the day or half the week at institute A and half the day or half the week at institute B. Let (AB) denote the institutional set-up of these interdisciplinary specialists. This solution to the problem counteracts

the tendency to self-centering, and makes it possible for the interdisciplinary specialists in subject (AB) to maintain contact with the innovations in both subjects A and B .

In view of the ubiquitous tendencies to self-centering in the scientific realm, I anticipate no such enthusiasm for the approach (AB) . I have no doubt, however, that comparative studies and experiments will confirm the shortcomings of approaches AB and A(B) , and show that (AB) is indeed a better approach to the organization problem of interdisciplinary work.

5. Acknowledgements.

This paper belongs under the research programme "The organization of teaching and research (T & R) at institutional level, in particular statistical T & R ," sponsored by the Tercentenary Fund of the National Bank of Sweden. Like the first part of the paper it links up with earlier work under the programme, and in particular with the report of G.Andersson (1972) on his project under the same programme, and with an earlier paper of mine (1970). What is new in the present paper should lie in the arrangement of the material; in the simile of conveyor-belt education and the ensuing critical discussion; and in the discourse on scientific self-centering.

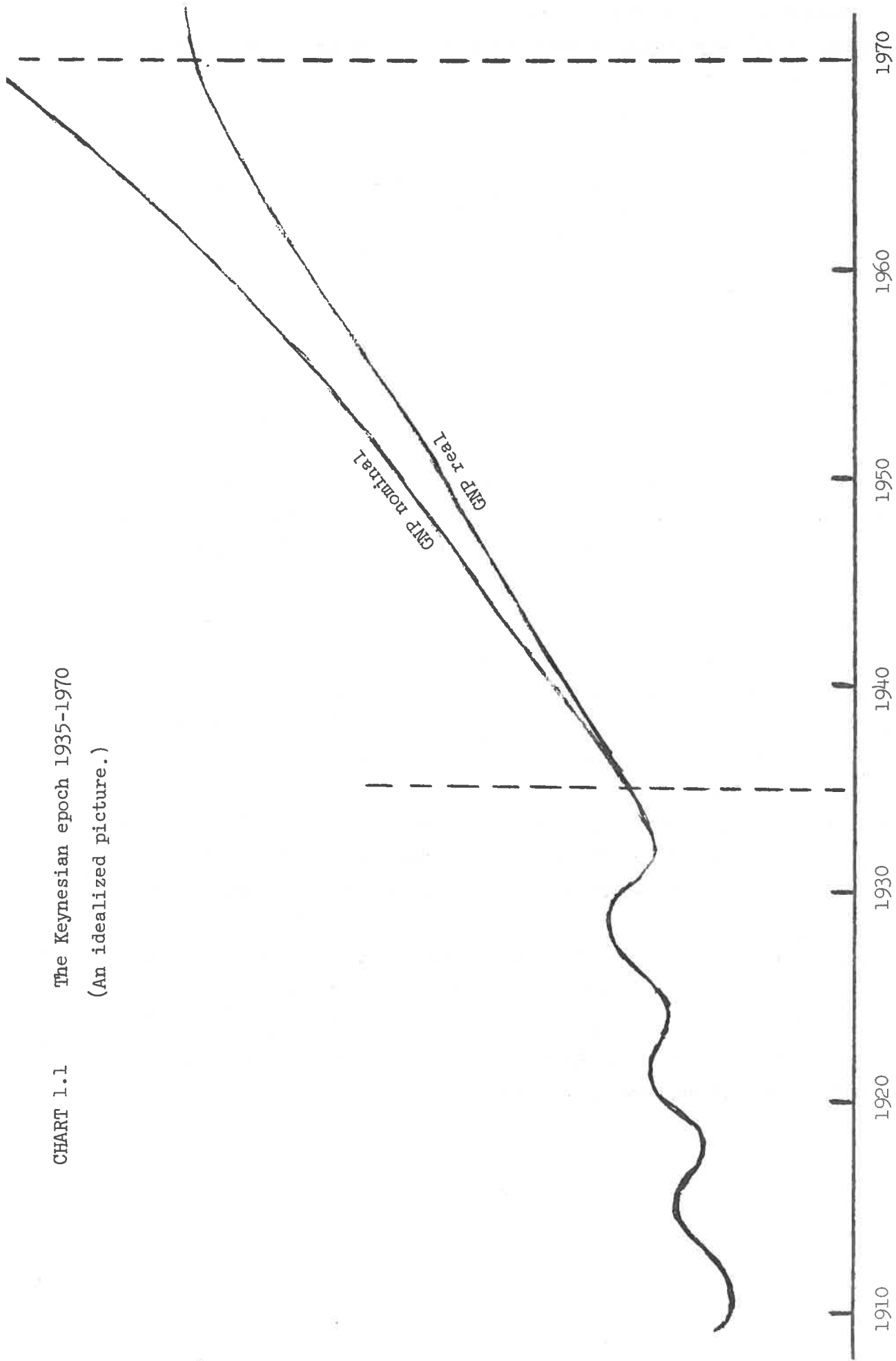
REFERENCES

- Andersson, G. (1973): Small scale teaching in large scale universities. Séminaire Inter-disciplinaire, Collège de France, Paris, 4 Nov. 1972. (Available at request from the author; Statistics Dept., University of Uppsala, Uppsala, Sweden.
- Haskell, E., ed. (1974): Moral Orientation of the Sciences. Proceedings of the First International Conference on Unified Science, New York 23-26 Nov. 1972. (In preparation.)
- Lindbeck, A. (1971): The efficiency of competition and planning. Pages 83-107 in Planning and Market Relations, eds. M.Kaser and R.Porter, Macmillan, London.
- Schultz, T.W. (1963): The Economic Value of Education. Columbia University Press, New York.
- Wold, H. (1970): Challenge and response. Some aspects of the organization of teaching and research. Pages 23-52 in Theory and Methods in the Behavioural Sciences, ed. P. Lindblom, Scandinavian University Books, Stockholm.
- Wold, H. (1972): The university in transition, I. First International Conference on Unified Science, New York 23-26 Nov. 1972. Also in Haskell, ed. (1974).

CHART 1.1

The Keynesian epoch 1935-1970

(An idealized picture.)



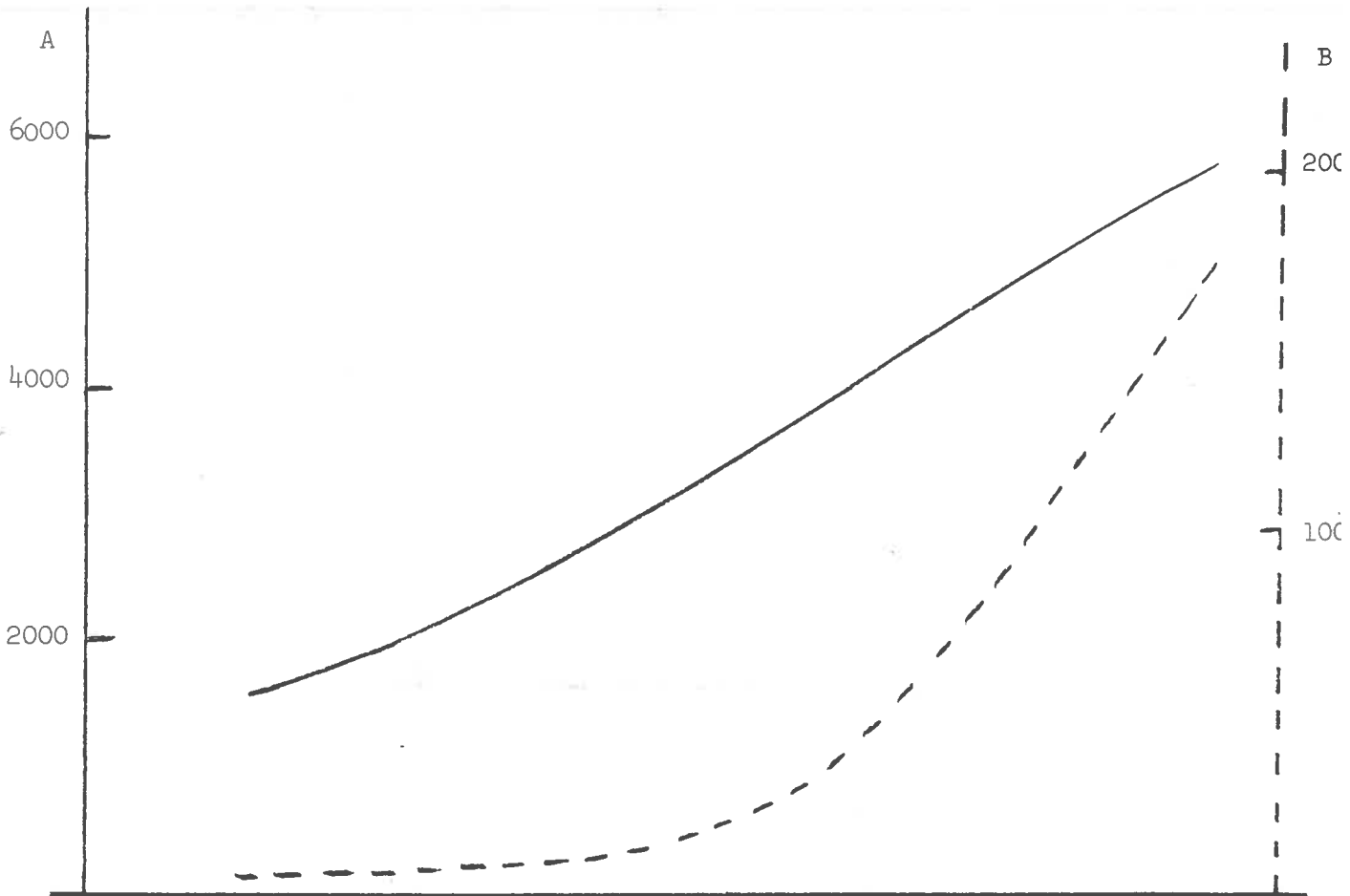


CHART 1.2. -- A. Employees in government agencies in Sweden, 1945-1970
B. Employees in the University Chancellor's office (Sweden), 1945-1970

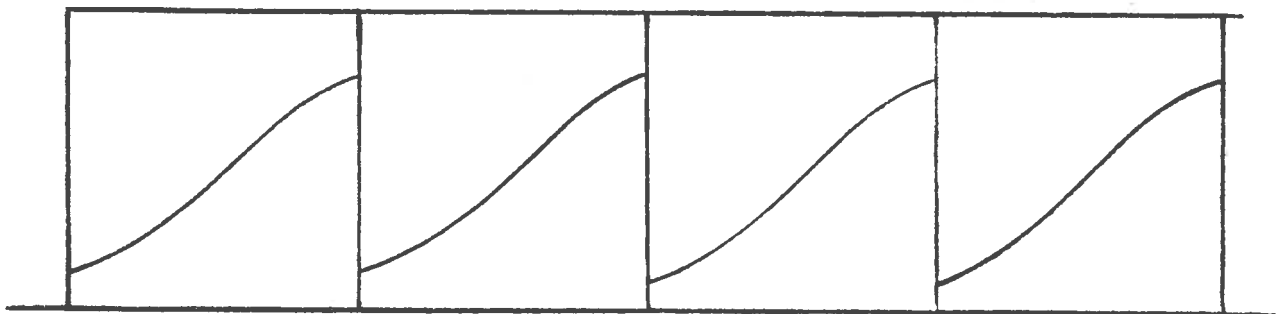


CHART 1.3. -- The conveyor-belt design of education

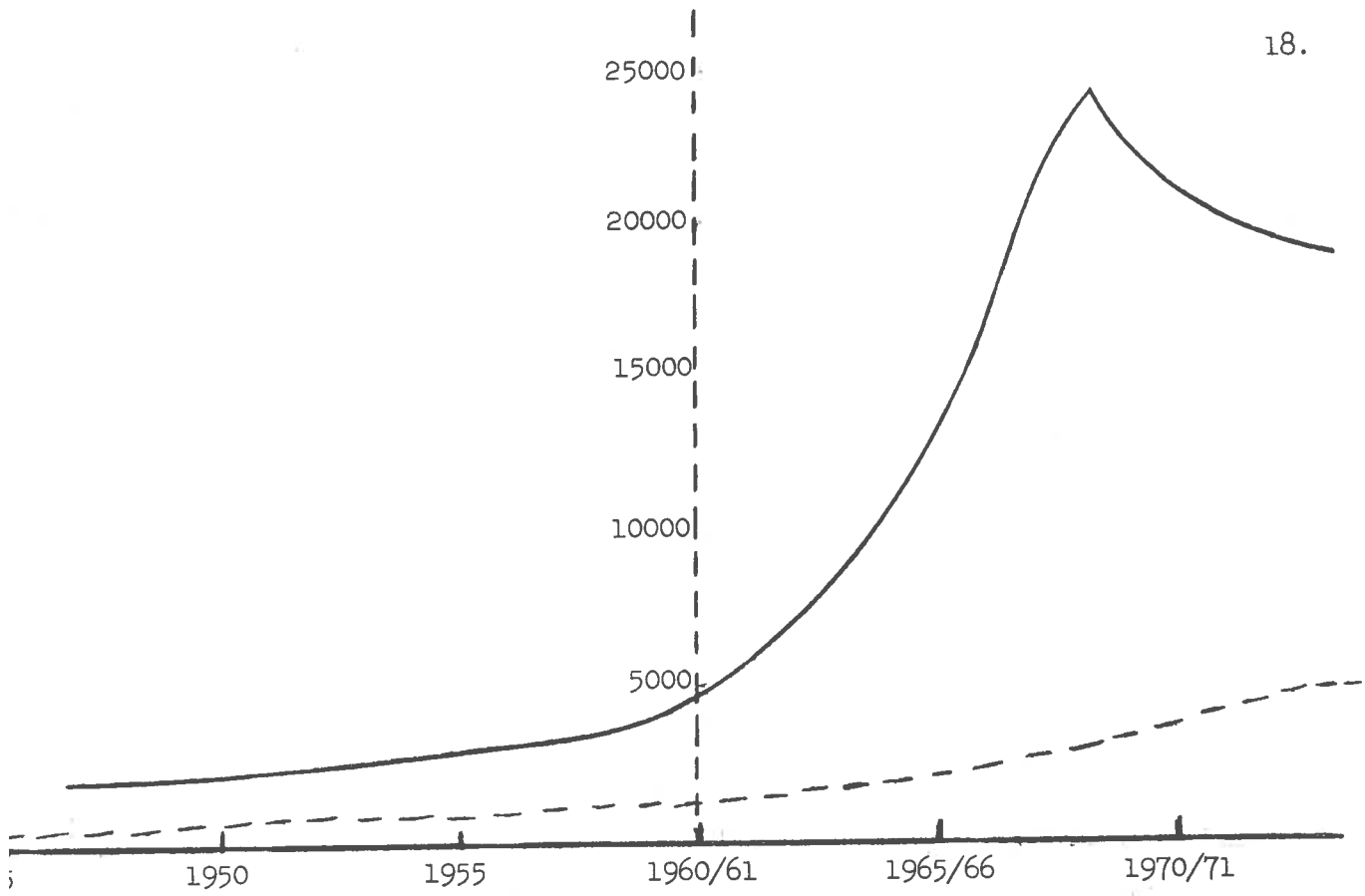


CHART 2.1. -- New matriculations in Swedish universities and post-school institutes 1940-1973

	1950	1968	1972
New-beginners, yearly	60	1300	700
Teachers, undergraduate	6	50	30
graduate level	2	3	4

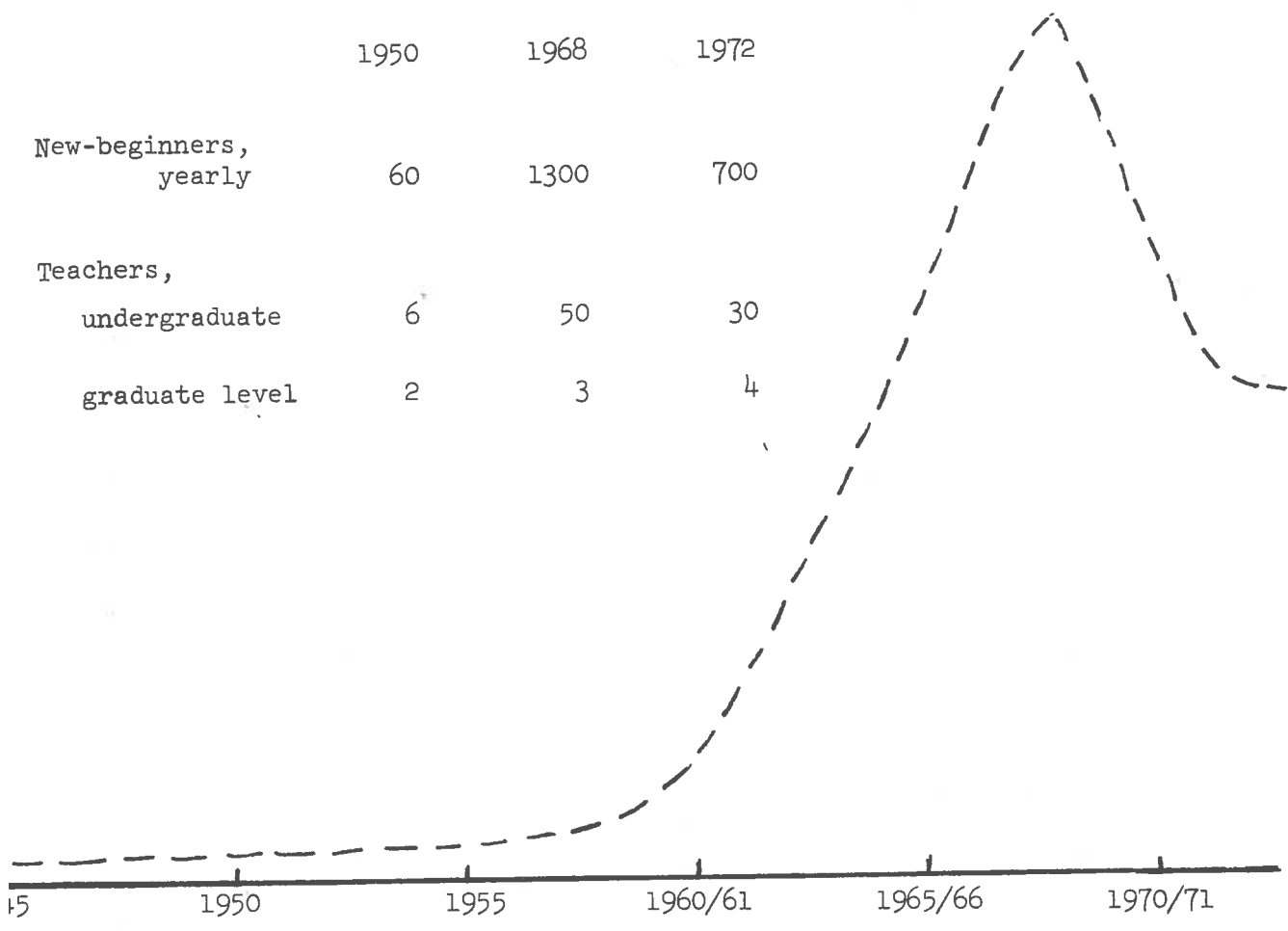


CHART 2.2. -- Developments 1945-73 in a typical university institute in Sweden.

CHART 3.1. -- Forecasts of the Swedish university enrollment.

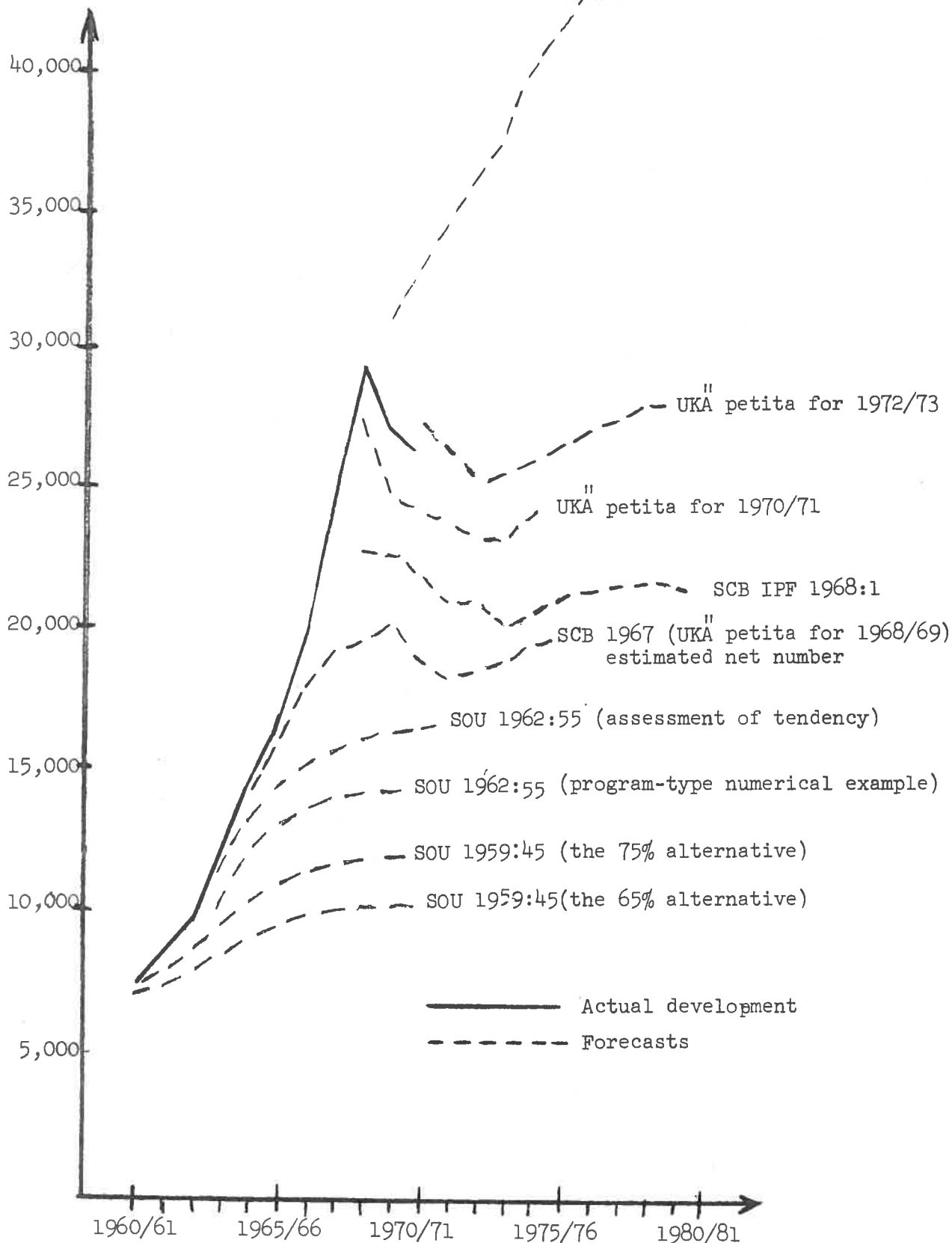
Forecasts and actual numbers 1960-1972

Source: Central Bureau of Statistics

(petita = planned budget

UKÄ = University Chancellor's Office)

SCB IPF 1970:1 (UKÄ petita for 1971/72)



29

*needs two
concentric circles.*

UNCLASSIFIED
DATE 01/20/01 BY 60322 UCBAW

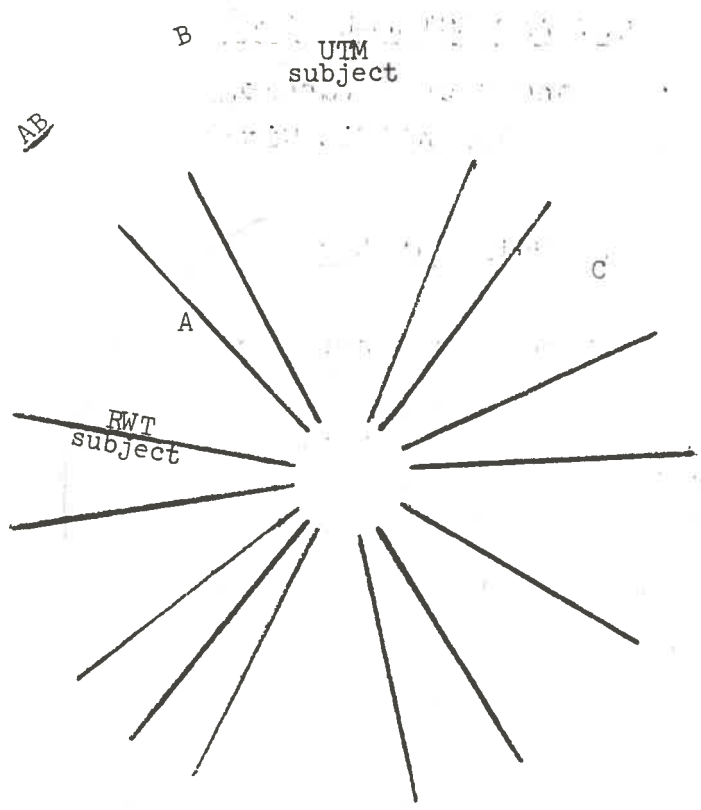


CHART 3.2. -- Real World Territory (RWT) subject-matters
 v. Unspecified Territory Methods (UTM) subject-matters

UNCLASSIFIED
DATE 01/20/01 BY 60322 UCBAW