The Internal Rate of Profit as a Measure of Profitability. A Metascientific Comment on a Recent Study in Business Economics.

By GERARD RADNITZKY*†

First a theory of explication (the reformation of concepts) in empirical science is sketched. Then this theory of concept formation is utilized to examine, from the viewpoint of the logic science, a recent study, viz. Sándor Asztély's monograph on the internal rate of profit as a means for appraising the stewardship of risk-assuming capital. Special attention is given to the following question. What are the specific features of Asztély's concept? In what respects may it be claimed to be superior to certain other concepts of profitability? How can the adequacy criteria employed in such an assessment in turn be legitimized? Eventually, against the background of the discussion of adequacy, the role is examined which the said concept may play in connection with investment evaluation and with decision-making.

When a scientist makes a critical assessment of a theory, an explanation etc. he is working as metascientist of his own. To do this well (and to develop a "methodological awareness" if we may so express it) he needs conceptual tools. These he suitably gets by adopting, from the metascientific literature, some theory which appears promising and trying it out by applying it. Ideally, special scientist and metascientist should cooperate closely; for this the scientist would need some training in metascience and the philosopher of physics, of economics etc. a background in physics, economics etc.

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† The example was discussed in Docent Sándor Asztély's postgraduate Seminar at the Gothenburg School of Economics and Business Administration. I wish to thank him and the participants of the Seminar. He also obliged me with a scrutiny of a MS of which this paper is an extract and made many valuable suggestions. I take this opportunity to express my very deep gratitude to Professor Håkan Törnebohm and to Mr. Carl Lesche from both of whom I have learned much.

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This paper aims at providing, in rough outline, a specimen of how one might approach a study in economics from a metascientific viewpoint. We have chosen the above-mentioned monograph [2] as our material of study for the following reasons. It clearly is an example of concept formation; it can be discussed (at a certain level) with a minimum of metascientific appartus; as the concept of internal rate of profit is not yet integrated with others into a system, it can be studied by itself; and it is a central concept of business economics. What we hope to show is that, while the scientist usually makes this evaluation of reformed or improved concepts in a more or less implicit fashion, it would be much preferable to do it explicitly and to articulate the metascientifc concepts used, so that both evaluation and the metascientific tools used may in turn be critically examined.

When confronted with a scientific text one of the first taks is mapping out its "discourse functions".[1] The monograph chosen has essentially one main function: to reform a concept, to provide an explication as one says. A "theory" of explication belongs to general metascience. Ideally it should be presented (as any theory of explanation, confirmation etc.) *within* an outline of the whole metascientific approach of which it is a part. This obviously cannot be done here. But as a theory of concept formation belongs to the elementary parts (in both senses of 'elementary') of a metascientifc framework, it is feasible to present it in a relatively selfcontained fashion.[2].

1. A Concept of Explication Designed for the Study of Texts of Empirical Science.

The results of science are twofold: new knowledge in the form of descriptions and explanations[3] is accumulated and "theories", i. e. descriptive and explanatory systems, are constructed and reformed. They are in turn instruments for producing new descriptive and explanatory discourses. Hence theory formation is ubiquituous in science. When constructing or reforming a theory we reform (explicate) a set of concepts, "systemwise" so to speak. In a field where we find concepts which are

[1] Cf. [15] § 24.

[2] Concerning the metascientific framework underlying our whole approach we beg to refer to [18] [19] [20]; for an aperçu see [13]. As regards explication see [5] ch. 1, [11] and [12]. Since we cannot here present the framework, sometimes instead of a reasoned defence of an assertion made only a reference to the literature can be given; so we apologize if this sometimes looks dogmatic.

[3] Cf. n. 26.

relatively "isolated", explication is the central thing. Hence explication too is ubiquituous in science, either as an aspect of the construction of well-developed systems or as the reformation of relatively isolated concepts which are the nuclei of systems in *status nascendi*. To study the explication of a still relatively isolated concept is thus a suitable preliminary to the study of theory formation. (And this was one of our recommendations for the choice of the example.)

11. *Overview and clarification of the explicandum.* As we have already hinted at *explication* is, roughly, the replacing of a concept (the *explicandum*) by another one (the *explicatum*) which is supposed to be superior to it. In the development of a science we typically find series of explications. To mention just one stock-in-trade example: the sequence formed by the thermal concepts "warm", "cold" etc., the operationally defined concepts of temperature, the concepts of temperature in thermodynamics and eventually in statistical mechanics.

Now, obviously the main function of § 1 is itself explication, viz. the reformation of the just-mentioned rough idea of explication. To draw attention to this fact will allow us to save space because now we have at least some "meta-concepts and -terms", which in spite of their crudeness will facilitate thinking and exposition. *Our explicandum* is the metascientific notion of the replacement, in certain contexts, of a (less technical concept used in *emperical* inquiry by another (more technical) concept which is supposed to be a superior tool in that inquiry. *Our explicatum* is the metascientific concept to be specified in § 12.

12. *Specification of our own concept of explication.* We specify our explicatum (of the metascientific notion of the discourse function "explication in science") by specifying its subfunctions as follows.[4] 121. *Clarifying the explicandum.* This is part of the formulation of the problem since we must know what concept we are trying to explicate. (NB that the explicanda we now are speaking of are concepts of *empirical* inquiry.) The methods are informal explanation and exemplification, possibly supplemented by a sample of paradigm sentences showing what uses of the explicandum term one has in mind, and sometimes by meaning analysis. 122. *Proposing to replace the explicandum by the explicatum,* i. e. proposing a term to designate the explicatum, and specify-

[4] The sequence corresponds to the context of reconstruction. In the "context of discovery" clarification of the explicandum and outline of adequacy criteria supposed to fit the purpose in view will precede proposal and testing of candidates for an explicatum.

ing its meaning. (We beg to remind that § 12 is itself an example of a textsection whose main function is the introduction of an explicatum.)

123. *Recommending the proposal or justifying the decision to adopt the explicatum.* 1231. Three questions are central. In what respects is the explicatum supposed to be superior to the explicandum (i. e. what does 'adequate explicatum' mean)? Does the explicatum actually meet these claims? Considering the purpose for which the explication is made, are the said respects really those that matter? Obviously 'correct' or 'true' do not apply to an explication; an explication is successful to the degree in which the explicatum is adequate, and the meaning of 'adequate' is specified by specifying the adequacy criteria employed.

A justification argument may suitably be reconstructed as an argument with both cognitive and evaluative premisses from which the discourse by means of which the resolution is performed is deduced.[5] The sort of criticism of an explication which amounts to attacking the cognitive premisses, i. e. roughly to saying "Your explicatum does not meet the criteria you have set up", may be called 'an *internal criticism* of an explication'. If an explication meets this criticism then the only criticism left is an "*external*" one, viz. questioning the fittingness of the special adequacy criteria set up. In practice these criteria are, as a rule, left implicit by the scientist. Hence the first task of the metascientist is to unearth them and to formulate them. The specific adequacy criteria depend upon the nature of the explicandum and the end-in-view; hence what can be stated in a general way are only schematic adequacy criteria. 1232. *The schematic adequacy criteria of an explicatum.* Since *an explicatum* is a tool of empirical inquiry, its degree of adequacy depends upon the extent in which its employment contributes to the adequacy of descriptions and explanations and/or of descriptive and explanatory systems (or increases this adequacy as compared with using some alternative conceptual tool). The formulation of the criteria will depend upon the metascientific groundplan,[6] and hence we will again have to limit ourselves to a few hints. A1: "usefulness" as a conceptual tool. A11: "utility", i. e. usefulnes in connection with descriptions by means of relatively isolated concepts and with explanations where no explanatory system is used. A12: "fruitfulness", i. e. usefulness in connection with descriptions and explanations where a relatively well-developed descriptive or explanatory system is used. This sort of use-

[5] Cf. n. 24.
[6] Cf. n. 2.

fulness has to be specified in terms of the adequacy of the system[7] to which the explicatum belongs. A2: "exactness". A21: Syntactic determinacy, i. e. the form must be made clear of the contexts in which the explicatum term is to be used. A22: Nonambiguity of the explicatum term in the contexts where it is to be used. A23: Precision, i. e. reduction of the explicatum term's vagueness to an optimal degree. (A term which fulfills the two last-mentioned criteria to a high degree will also show a high degree of "pragmatic determinacy", i. e. it can be decided with great certainty whether it does or does not apply to a certain entity and of "observational reliability", i. e. consistency and uniformity of usage, personal and interpersonal.) There are also optional criteria. A31: "similarity" between explicandum and explicatum. A32: "simplicity" – a typical *ceteris paribus* criterion. But now it is high time to turn to our example.

2. Application of the Metascientific Concept of Explication to Asztély's Monograph

21. *The explicandum of his study and the purpose for which his explication is made.* His explicandum is the notion of "profitability"[8] as applied to joint-stock companies or investments in their shares. The explicatum should enable one to describe business firms with respect to their "profitability" from the view-point of the owners of the risk-assuming capital and indirectly investments in their shares, and perhaps, under certain conditions, to make comparisons between such items. Precisely as in the above-mentioned example of the explication of "warm" by "temperature", the explicatum should enable us to decide conflicting descriptions at the explicandum level.[9] These descriptions may then be used in connection with the evaluation of investment decisions.

22. *Introduction of the explicatum.* 221. *Informal introduction of the explicatum.* The sort of profitability under consideration is measured by ascertaining that constant[10] rate of interest at which the total (present) value of all inputs made by the owners of the risk-assuming capital into the firm equals that of all outputs from the firm to the

[7] For an overview of such criteria see, e. g., [13] pp. 36–42 and [19] ch. 6.

[8] Both nontechnical notions and earlier explicata; for an inventory of such see [3].

[9] E. g. when there is disagreement about the profitability of a firm the parties to the dispute may literally say '*calculemus*' and apply the explicatum.

[10] Cf. n. 28.

owners. Hence the essential conceptual elements are: input, output, their temporal distribution, and rate of interest.

Let us derive the formula which is the core of the definition of this concept of profitability (let us call it 'J') by means of a simplified example.[11] At t_0 we establish a company by investing the amount E. At the end of the first year, t_1, the pattern of inputs and outputs may be as follows. t_1: $E_0\,(1+\frac{p}{100})-d_1$, where '$p$' designates that rate of interest with which the capital has increased or decreased, 'd_1' a dividend which the company paid to us at the end of the first year. Let us assume that we make an additional investment at t_2, that the company pays a dividend every year and makes a refund of capital at t_3 (designated by 'U_3'), and that eventually is wound up at t_4 rendering the amount L as the final proceeds. This will, for t_4, give the following pattern of inputs and outputs.

$$E_0\,(1+\frac{p}{100})^4-d_1\,(1+\frac{p}{100})^3-d_2\,(1+\frac{p}{100})^2+E_2\,(1+\frac{p}{100})^2-U_3\,(1+\frac{p}{100})=L_4\ \ldots\ ($$

Now we may summate all purchase of shares, dividends and refunds, and by generalizing we arrive at the following fomula for t_n.

$$\Sigma E_m\,(1+\frac{p}{100})^{t-m}-\Sigma d_k\,(1+\frac{p}{100})^{t-k}-\Sigma U_r\,(1+\frac{p}{100})^{t-r}-L=0\ \ldots\ (2)$$

By solving (2) for p we find the internal rate of profit of our enterprise.

222. *A more formal introduction of the explicatum.* The form of the sentences in which the explicatum term occurs (cf. above A21) may be symbolized, e. g., by '$J\ (a_{t_0,t_n})=p$', which may be interpreted, e. g., as "The profitability J for the argument (company etc.) during the time interval (t_0,t_n) equals p". (Compare "The length-in-meters of this rod has the value 2") J is a quanticized concept and p its value for the argument in question.[12]

[11] Assuming that the value of the monetary unit is constant or has been converted to that of the same date and that transactions occur at the end of each year.

[12] We propose here to explicate J (supply, demand etc.) approximately as "fluents" in Karl Menger's sense [13]; see also [8] [9]. To justify this we would have to present a theory of fluents. Just to give a hint – at least in extensional contexts one attempts to specify a fluent as a function (many-one relation) whose range is the set af (real) numbers and whose domain and range are disjoint. This seems to work well as far as models and "theoretically defined" concepts are concerned. So-called operationally defined fluents seem to be more complicated; e. g. in '$\text{Length}_m\ (a)$ has the value v', 'v' cannot strictly be replaced by a definite description of a number. To make such a sentence descriptive in a stricter sense one would

To introduce the explicatum we need much the same elements as when we formulate a law (description of regularities among phenomena). a) First we need the *formula* (2) or some formula logically equivalent with it. However (2) as it stands is a numerical equation containing the numerical variables, 'E_m', 'd_k' ('E_0', 'd_1' etc.) etc., 'p', and numerals, where 'p' is a constant for a set of value assignments to the said variables.[13] In its context the equation is a "Zahlenwertgleichung", but as a numerical equation it says something about relations between numbers and it says nothing about empirical phenomena. Hence (2) must be given an *economic* interpretation. But before we can do so it must be written more correctly.[14] To save space we illustrate this expanding with respect to the simpler formula (1). It ought to be given, e. g., the following form.

$$\text{If } [(M_{\$}(a_{t_0}) = E_0) \,\&\, (M_{\$}(b_{t_1}) = d_1) \,\&\, (M_{\$}(c_{t_2}) = d_2 \,\&\, (M_{\$}(d_{t_2}) = E_2) \,\&\, (M_{\$}(e_{t_3}) = U_3 \,\&\, (M_{\$}(f_{t_4}) = L) \,\&\, (J_{\text{years}^{-1}}(g_{t_0,t_4}) = p)] \text{ then } (1) \ldots (3)$$

b) Now we can *interpret* (3) or the corresponding expansion of (2) respectively. b1) We give interpretation rules for each of the nonlogical constants of the antecedent, e. g. '$M_{\$}$' refers to monetary value in dollars, 'a_{t_0}' to the acquisition of shares of a certain company at the beginning of the first year and so on. From this it follows that 'E_0' refers to the number associated (e. g. by means of a counting operation) to the monetary value of the first investment. b2) We stipulate that all argument expressions, 'a', 'b' etc., refer to one and the same enterprise, and that moreover the realm of application of the law-like formula (3) is limited in certain ways, e. g. to joint-stock companies. Now we may[15]

have to write rather 'Length-in-meters $(a) = v \,\&\, v_1 \leqslant v \leqslant v_2$'. This takes one into the theory of measurement. For a fine nontechnical aperçu see [4]; see also [14] [7].

[13] Value assignment to a numerical variable is conceived as a function between it and a number. In econometric texts 'variable', 'function' and similar terms are mostly used in a rather unprecise way. Clarifications and explications may be found in [8] [9] [14].

[14] On the formulation of quantitative descriptions and laws see [13] p. 18 f.

[15] Strictly speaking (in a still more formal treatment) we ought also to indicate that each conjunct in the antecedent of (3) is a descriptive sentence. This could be done, e. g., by Törnebohm's corner notation, which would allow us to conveniently use (1) and (2), placed within corners, as descriptive sentences; cf. [18] p. 195. Moreover the conditional (3) is to be understood as a closed sentence, i. e. the numerical variables, the variables functioning as argument expressions, and the time indicators are to be conceived as bound by quantifiers. But here we are not concerned with transcribing sentences of ordinary speech and "intuitive" mathematics into logical symbolism.

read (3) as saying: if the first investment in the company's shares was equal to E_0 and . . . and the value of the internal rate of profit was equal to p, then the numerical equation (1) hold. But even when so interpreted, (3) is, strictly speaking, still schematic; we ought to add instructions how to measure the fluents (e. g. time) involved and how to count the various items. [16] Such instructions are here presupposed. Presupposed are of course also the instructions how to solve the numerical equation for 'p'.

c) We must add instructions how to select the "economically significant" root of the numerical equation (cf. below § 241 *sub fine*).

23. *The adequacy of the explicatum.*

231. *Some special features of the explicatum which are relevant for its adequacy.* (A) Only those transactions are taken into account which are transacted between the firm and the owners of the risk-assuming capital (a class with variable membership). (B) Inputs and outputs are converted to the same monetary value (e. g. by means of a wholesale-price index) and converted to the same time of reference. (C) If t_n coincides with the company's dissolution, the final proceeds of that operation constitute the last output. If the company at t_n is a going concern, the total market value of its shares is inserted as an "approximation". (D) the time is considered to vary discontinuously and it is assumed that inputs/outputs occur at the beginning of the time intervals concerned.[17]

How are these features relevant for the adequacy of the explicatum? The basic adequacy criterion of the explicatum is obviously "*utility in connection with describing business firms*". To meet this criterion the explicatum must be sufficiently general and the above features insure this generality. Without the proviso of (A) the date of aquisition and sale of shares would desicively influence p, and we would characterize the *individual* investor's choice rather than the company. (B) enables us to abstract from fluctuations in the value of the monetary unit em-

[16] Here we would be mainly concerned with looking up the results of previous countings in records. Mere counting is not yet measuring but often an ingredient of it, cf. [4] p. 29.

[17] The dimension of J is either t^{-1} or 0. The problem of dimensionality is important because unless solved one cannot clearly formulate any descriptive system. It is almost wholly neglected in the economic literature; an exception is [10] § 11 "Dimension of economic quantities". For an overview of the sort of problem involved see [13] pp. 18–20.

ployed and from the temporal distribution of transactions.[18] (C) makes the explicatum applicable also to going concerns, and by enabling us to compute p for any subinterval of the life span of the firm described, it makes possible longitudinal descriptions ("profitability analyses over time"). The way of quanticizing time (D) is convenient since it is in accordance with accounting practice.[19] In what general ways does the explicatum increase the adequacy of descriptive discourses? To begin with it will increase their density of information, and also the ease of decidability and observational reliability of the explicatum term (cf. above § 1232). All this is a consequence of the fact that the explication involves introduction of a quantitative concept. However since the descriptive discourses are in turn to be used in connection with investment evaluations, their adequacy has to be judged in this *wider* context.

"*Exactness*" – Syntactic determinacy we have already dealt with (§ 222). "*Precision*" – what degree of accuracy is optimal is itself a decision involving considerations of how much we value an increase in accuracy of information and of the "costs" of increasing it.

The degree of vagueness will depend upon the approximations involved, e. g. the conversion operation (B) depends upon the "index" used (its accuracy and validity). The insertion of market value (C) is based upon the rationale that the market value reflects the expectations of outputs including final proceeds at a later date, and that this is the best guess for the moment; it is somewhat euphemistically called 'an approximation' since, e. g., the "horizon" is undefined. But it seems to be the only way; and in connection with the explicatum under consideration we can at least test the sensitivity of p to changes in the last output by hypothetically inserting different values of L. "Nonambiguity" – The equation (2) has n roots and it has been said in the literature that in connection with the type of series of transactions here involved only one of them is "economically significant".[20] So far as our above equation (2) is concerned one can construct examples where the roots form an arbitrary sequence. In the sentence corresponding to (3) there are already some restrictions since as regards real business firms the coefficients of (2), upon which the roots depend, will have to meet certain conditions.

[18] Without a common unit in terms of which to describe inputs and outputs we could not significantly perform the mathematical operations with the numbers corresponding to their values.

[19] p may of course be computed for a continuous time variable or for a moment; cf. hereto the concept of *Verzinsungsintensität* in [16].

[20] For references see [2] p. 25.

But mathematics tells us nothing about how to choose even between two roots. If one proposes some such rule as "Select the smallest positive (real) root of (2) as the value of p!" such a rule must be justified by *economic* theory. While it may be that this circumstance never creates any practical difficulties for economists,[21] the issue has theoretical importance; for if one has to select the "economically significant" root intuitively then in certain contexts the explicatum may be highly precise but ambiguous. Hence the justificatory argument in terms of economic theory must be spelled out.[21a]

[21] That the choice between (say) 5 % and 500 % is easy to make and that the choice between (say) 5 % and 5,3 % does not matter.

[21a] A very general metascientific comment is highly relevant here: *Quantitative description* always involves schematization and model-making; to describe quantitatively we need a quantitative descriptive system, and the kernel of such a system is a set of schematization- or representation rules and a set of theoretically defined concepts. (On the notion of schematization and theoretical definition see [18] [19] [20].) Let us illustrate this thesis by some remarks on a maximally simple example. In physics Galileo's epoch-making idea was to replace the taxonomic (Aristotelean) description of moving bodies by a quantitative description. (A quantitative description is implicit already when one makes a diagram.) To describe real objects with respect to motion, we first schematize them into points. For this we need a descriptive system with rules regulating the representation of a real object by a point and of a real physical system by a point-model of such a system. This descriptive system (physical kinematics) may be said to contain in turn a point kinematics, a special sort of "descriptive" system enabling us to "describe" moving *points*. It is essentially a set of theoretically defined concepts, viz. the concept of the position of a point, that of the velocity of a point etc. including a schematic frame of reference. (Cf. e. g., [19] p. 27 ff.) Notice that the concepts of position etc. are defined in such a way as to apply to points and not to real objects. Now we can talk about the points by means of formulae, which makes it possible to apply mathematical calculi. In the context of calculatory transformation we disregard the fact that there are other sections providing an interpretation of the formulae. The new formulae obtained as the result of transformations and deductions are then "interpreted". To do this we make again use of the representation rules of the descriptive system (*physical* kinematics), which contains also rules regulating the transition from points to real objects and from the velocity etc. of a point to the operationally defined velocity of a real object (or more strictly speaking, rules regulating "translation" of sentences about points into sentences about real objects). The so-called operational definitions, the rules how to measure quantitative characters of real objects, thus belong to the representation rules of the descriptive system and are guided by the theoretical definitions (cf. [18][19]). (To *justify* the special representation rules in this particular exampel we need more advanced physical theory, a concept of center of gravity etc.) A "law of nature" is stated typically by a descriptive sentence or discourse involving more than one quantitative concept. (Cf. above § 222, where it was said that the text section introducing the concept of profitability has much the same structure as that of a law.) An essential

232. *The question of the legitimization of various versions of the adequacy criterion of "usefulness as a tool".* 2321. *"Fruitfulness".* Asztély has not implied this sort of adequacy. And indeed it could not be legitimized at present. For, although it is plausible that the explicatum or some similar concept will form part of a system for describing business firms (together perhaps with explicata of such notions as propriety ratio, liquidity ratio, relation of funds to turnover etc.), *at present* the said criterion would lack effectiveness since we have no means for deciding it but would have to gues how the discipline in question will develop. 2322. *The role of the explicatum in connection with evaluation of past investments and with decision-making.* In the literature we find suggestions that some version of the "internal rate of profit" may be used as criterion for estimating investment proposals as well as criticisms of such suggestions.[22] Asztély emphasizes, very cautiously, that his concept is intended for investigations of "*ex post*" character in connection with *satisficing* (in Herbert Simon's sense) rather than with maximizing[23] We propose to reconstruct this debate in the economic literature as a metascientific debate concerned with the legitimization of the adequacy criterion of "usefulness in connection with evaluating/decision-

characteristic of such a quantitative description of observed regularities among phenomena is that we describe the behavior of a real system by means of talking about a model. Much as we describe a territory by means of talking about a map.

The parallel between the example from physics and *our economic example* is obvious. When formula (2) above was called 'a *Zahlenwertgleichung*' (or placed, e. g. within Törnebohm's corner quotes, cf. p. 201) one thereby indicates that, for the moment being, he is concerned with a context of description and hence that text sections interpreting the formula are provided or presupposed. In the context of mathematical transformation we disregard these features. Notice that we can apply mathematics to formulae, or perhaps to numbers, say, to 100, 10 etc., but *not* to descriptive sentences or to (say) $100, 10 tons of wheat etc. In a more detailed reconstruction, formula (2) would be set up as the nucleus of a *theoretical* definition of a concept of profitability referring to a praxiological model of a very general type, a black-box model with generalized inputs and outputs (cf. below ft. 32). Only thereafter an *economic* interpretation would be given, and eventually measuring rules would be supplied for the various magnitudes involved. (This is in perfect parallel to what is done in physics when we introduce a concept of velocity: first a theoretically defined concept is introduced applying to a model and *without* mentioning any units.) Hence, when it was said above that the concept of profitability is operationally defined this was rather crude. For expository reasons we did not wish to base our reconstruction of Asztély's text upon the principal view of quantitative description just hinted at. However we still wanted to mention this feature since, from the metascientific viewpoint, it is of outstanding importance.

[22] For references see [2] p. 20.

[23] Cf. [2] p. 69.

making". We said in § 231 that the descriptions made by means of the explicatum are to be used in connection with investment evaluation. To disentangle problems we would need *a*) a "theory" of justification, b) a "theory" about the relation of descriptions to certain arguments. Let us at least give some hints. *a*) The schema of "justification" has to cover both evaluation of past resolutions and "deduction" of decisions for future action (planning). To have a generic term also for the sort of conclusion relevant here, we propose to call it 'a (technological) prescription' (since, although it is not ordinary usage to speak of prescription i connection with past actions, the time of the action is irrelevant to the logical structure of the argument). Any prescription has to be justified both versus descriptive discourses and versus evaluative discourses, which together form the premisses of the justificatory argument.[24] *b*) Description is almost never the final end. Out of an infinity of phenomena – why select just these and why describe them in just this way? In general the adequacy of a description consists in both its correctnes and its utility or relevance to certain problems.[25] The choice of descriptive system and hence how we describe and in a sense also what we describe (since nonoverlapping descriptive systems cannot be used to describe strictly the "same" phenomena) is typically guided by considerations of the possibility of explaining the descriptions and hence by the explanatory systems available. In this sense it may be said that explanation is the "primary" function of scientific discourse.[26] – However, often what and how we describe is guided by consideration not of explanation but of "justification". (The conclusion of the justificatory argument may of course belong to a "theoretical" contexts as well as to a "practical" one; it may be, e. g., a decision to invest in certain stocks as well as a decision to adopt an explicatum, to select one among intervalent scientific theories, to apply a certain method of testing hypotheses etc.) Many descriptions in business economics as well as many descrip-

[24] Cf. § 1231. For an outline of the said schema see [13] § IV and [15] § 4. The explication of the *concept* of justification is the task of "metaethics". The topic of justification has been rather neglected; only a small sector (game theory), a *part* of justifying a prescription versus descriptive discourse, has been studied intensively.

[25] Cf., e. g., [15] p. 32 f. Think of a set of maps describing the same territory "equally correct", topographical, economic, geological etc. maps with various projections, scales etc. We select one of them by arguing that by means of it we can answer certain questions and that it provided this information in a suitable form.

[26] 'Explanation' is here of course used in the sense which includes also predictions, which in turn include retrodictions and forecasts, i. e. roughly – an argument where the conclusion is a description derived by means of other descriptions and/or explanatory systems.

tions of scientific results made in metascientific contexts are clear examples of this. In this sense justification may be said to be the "primary" function of the aforesaid types of discourses. As regards our special problem one could epitomize the just-mentioned special thesis by saying "managerial accounting (a sort of describing) is guided by considerations of justificatory arguments, which belong to organization theory".[27]

We have said that Asztély wishes to use his explicatum mainly in connection with questions of *satisficing*. Descriptive discourses produced by means of the explicatum should, e. g., provide us with information relevant to evaluating (*ex post*) the profitability of investments in common stock vs. conventional ways of savings, such as saving accounts, bonds or life insurance. One way of deciding whether an investment was satisficing is to compare it with bank savings, whose p constitutes one sort of *Kalkulationszinsfuss* (open to everybody and relatively risk-free).

What about *ranking* a sample of companies/investments according to p (still *ex post*)? If we can at all correctly describe firms with respect to J, we must be permitted to rank them according to p.[28] If we have had a fixed sum to invest (so that after the investment we have not to make any decisions about the manner of its use) for a fixed period (so that there is no problem of defining the horizon of planning) and all the projects which are considered run during the whole of this period (so that opportunity costs can be ascertained) and this period has expired (so that there is no problem of uncertainty), then it appears that this ranking together with the valuation that we wish to maximize return on investment would allow us to construct an adequate justification argument from which it follows that the investment with the highest p was indeed the "best" choice for the realm of possibilities considered. However, if all these provisos are *not* met, the ranking by p's can constitute only *part* of the descriptive discourses with respect to which a past decision has to be justified.[29] In the justificatory argument we

[27] Cf. hereto [6] esp. p. 64 and p. 66.

[28] We beg to remind that in ascertaining p for a firm, we ascertain that p which, if the firm *had* given a constant return on investment during the whole period in question, would have given the same final result. J cannot be a statistical index of a central tendency because it is exact in the sense of not being concerned with expected values which p approximates with a certain probability, and because it is not a sort of arithmetic mean since (2) is an exponential equation and not a linear one. So no measure of variability is involved.

[29] E. g. if the project A with the highest p expires after only a part of the period under consideration, opportunity costs must be taken into account since, e. g., the market situation might be such that by investing in A we have lost the opportunity of investing later in B, which although it has a slightly lower p runs throughout the whole period, and so on.

would need also descriptive discourses which provide the relevant information about – to use C. W. Churchman's felicituous phrase – "the well-known and well-neglected opportunity costs". But the descriptive discourses (*P*- and *L*-statement etc.) which we can produce by means of the present accounting system (essentially a descriptive system) do not provide this information, hence they are not fully adequate for use in connection with managerial decisions (even *ex post*). If we could ascertain p for all possible combinations within the set of (past) investments under consideration, it appears to us that a ranking in terms of p would be significant for evaluation even if maximizing is the value premiss adopted.

What about the justification of decisions for *future* investments? It is obvious that *any* explicatum of the concept of profitability can at best provide only a minor part of the descriptive discourses required in that sort of argument. To begin with let us look at the role the explicatum may play in connection with forecasts. In ascertaining p for some company we simply use available accounting records. If these procedures are included in the specification of J, then J is not defined for periods where t_n is a future date. If they are not included and if we did posses explanatory systems by means of which we could deduce (predict) estimates of the future values of the various parameters in the definiens of J, it may seem that we could use the explicatum in connection with forecasting. However, even the addition of explanatory systems would not suffice since many of the problems involved in forecasting p are themselves not problems of empirical science(problems of describing and explaining) but rather decision-problems.[30] E. g. defining the period or "horizon" of planning will involve our whole value system, discounting for time and uncertainty again will involve our "way of living", psychological factors such as our patience, how we experience "utility of success" versus "disutility of failure" etc.[31]

Here we have been concerned with studying Asztély's explicatum whose realm of application is clearly stated. Yet it is tempting to end with a passing remark on its "flexibility". Can some concept "based upon" it be used to describe investments, e. g., in inventory, embarking on a vocational training etc., in such a way as to be relevant to business-planning or to planning one's own future? One essential difference is that

[30] This is the precious discovery of C. W. Churchman. Cf. [6] esp. his inquiry into the nature of managerial decision in ch. 3.

[31] For a study of the concept of decision in a wide context see the impressive work of G. L. Shackle in [17].

now the "investor" (whether manager, union leader, private individual etc.) has to make continuously subsequent decisions how to use the investment made, such as proper timing of acquisition etc., actions produced in competitors (which leads into game theory) etc. C. W. Churchman ([6] ch. 3) has shown the difficulties of applying a monetary standard even to business decisions. However, would it not, at least in many contexts still be reasonable first to study the monetary aspects by means of some version of Asztély's explicatum (already because it affords a common unit while hedonistic and other value measures do not), and then to try to wiev the question anew in the wider context of a "full" justificatory argument? If we go far enough we will of course have to take into account not only our set of value systems but our whole "way of life" (as we can learn from the literature in ethics); but this seems seldom practicable, and where to draw the line is again a decision to be justified.[32]

[32] Let us pause to consider the question of the *flexibility* of the concept of profitability under consideration. In ft. 21a above we mentioned that the concept of profitability should properly be introduced by a theoretical definition. If so, it is designed to play an essential role in a praxiological theory, a system of maxims of efficient action by means of which we produce rational behavior models applicable to concrete decision situations [12b] [12c]. It appears reasonable to look at the relation between general praxiologic theory and economic theory from two sides. a) An economic decision model may be extended or generalized to become applicable to the sphere of action outside economics in the narrow sense. In our example one would attempt to extend an economic concept of profitability to decision-making in the field of social etc. action or to efficient action in general. b) First a general praxiological theory is developed; then it is tested in that special field which is most highly developed, viz. economic decision-making. (Much as it is profitable to test a general theory of the testing of hypotheses in that special field which is best developed, viz. the testing of statistical hypotheses). In our example, a theoretically defined concept of profitability would be tested by applying it to economic situations.

Such considerations lead us to look more closely at the rational behavior model based upon praxiological theory. One general rationality postulate (adapted from [17]) might be the following. It is rational to maximize "ascendency", i. e., roughly, to choose on the basis of ordering hypothetical outcomes according to their degree of satisfaction (or distastefulness) and within each of such a number of hypotheses ordering them according to the greater or lesser degree of potential surprise assigned to them. Hence events with a very high potential surprise are not interesting, not even if their degree of satisfaction (or distastefulness) is very high. A further postulate might be: The more distant in time the less important is an event to us. This seems to fit well human attitudes in general. To justify it in connection with our example, one would mention that the more distant an event the higher the discounting factor and the greater the uncertainty, including the uncertainty in

However, for us the vital problem of § 2 has been whether it can be made plausible that the explicatum of the concept of explication proposed in § 1 can profitably be employed, e. g., in the study of the concept of profitability.

estimating the capital costs (subjective *Kalkulationszinsfuss*). Opportunity costs will, in general, depend upon the horizon of planning. And the choice of horizon will, in the economic, the military and similar fields, be influenced by one's specific guesses concerning the steps within the general trend of technological development. In our example, e. g., the horizon of investments in replacing machinery will be influenced in this way. It might well be that one first constructs several models with different horizons, and then compares them with a view to getting clues for the final choice of horizon. In long-term planning one usually fixes certain controls on the way, at which new decisions will have to be made as to whether to continue on the task, and, if so, whether or not to change approach etc. These "control stations" should take care of or at least mitigate the complications arising from the fact that our preference schedule may change before the (once) desired result have been brought about.

Another question pertinent here is: How *realistic* is the rational behavior model of which our concept of profitability is to form a part? The simplest model, the maximizing model, is based upon a "maximum profitability" maxim – "if means are scarce relative to an end maximize output-input ratio, i. e. minimize the inevitable costs and losses!". It is fairly realistic only when the realization of the task at hand is considered an ultimate goal, an end to be pursued –*ruat coelum* – without regard for anything else. When one takes into account not only the costs of means and the opportunity costs of the alternatives one has to forsake for the sake of the one chosen but also the opportunity costs associated with the other uses to which *time and energy invested in the maximizing effort* might otherwise be put, the maximizing maxim is *automatically* replaced by a satisficing maxim. Hence, when Asztély points out that his concept is designed primarily for use in connection with satisficing, this scarcely reduces its usefulness. To make the satisficing model still more realistic, one would have to take into account also extra-economic values such as, e. g., hedonistic and social values (self-esteem, feeling of achievement, security, status etc.) [12a]. So in the end any justification procedure of an economic decision, if continued, will eventually lead us back to the "ultimate preferences" or "ultimate decisions", to answers to the question "What do I want out of life, anyhow?" – from the viewpoint of the acting individual. From the viewpoint of institutions and their "functional rationality" the discussion of the end will lead us from positive economics to political economy and eventually back to such basic questions as "What kind of society do we (I) want to realize?". General value theory, praxiology and economics thus overlap and are intertwined; they constitute together a tremendously complicated field, yet the most important one for human beings faced with decisions to make; and the various special concepts based upon the generic concept of profitability will play important roles in it.

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