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On the origin and meta-principles of causal inference. The case of T. Haavelmo

Abstract. Recent advancements in methodology of social sciences focus on elaboration of formal tools representing causal dependencies (Kawalec 2006) collectively referred to hereafter as “causal calculus” (Pearl 2014 pp. 161–162). In his recent paper Judea Pearl elaborates on the historical role of Trygve Haavelmo in initiating the development of causal calculus as the scholar who was “the first to recognize the capacity of economic models to guide policies” (Pearl 2014 p. 152). The present paper attempts to extend Pearl’s observation by discussing a historical hypothesis concerning likely inspirations of Haavelmo’s original idea. It opens with a *prima facie* plausible observation that because of apparent similarities between the relevant features of Haavelmo’s and George Katona’s inferential procedures, both contemporaneous members of the Cowles Commission, the historical development of causal calculus was largely influenced by Katona’s research design intended to capture effects of interventions. The reasons are discussed in the paper to the effect that the hypothesis on direct influence may be found wanting and more plausible seems a modified hypothesis to the effect that several of the critical features of Haavelmo’s innovative approach are indirectly (via Kurt Wicksell) inherited from Eugen Böhm von Bawerk (Böhm-Bawerk hereafter). The similarities between Katona and Haavelmo, however, are – after all – not accidental as they stem from the mediating role of Christian von Ehrenfels, one of the founders of Gestalt psychology, and his mutual inspirations with Böhm-Bawerk. Nevertheless, while, on a closer inspection the improved version of the hypothesis is rejected, a more likely historical origin of the idea of autonomy and the structural aspect is pinned down in Ragnar Frisch’s paper.

Key words: causal calculus, Haavelmo, Katona, Frisch

O źródłach i meta-zasadach wnioskowań przyczynowych. Analiza przypadku T. Haavelmo

Abstrakt. Najnowsze osiągnięcia w metodologii nauk społecznych koncentrują się na opracowaniu formalnych metod reprezentacji zależności przyczynowych (Kawalec 2006), określanych tu zbiorczo jako „rachunek przyczynowy” (Pearl 2014, 161–162). W swojej niedawno opublikowanej pracy Judea Pearl odnosi się do historycznej roli, jaką odegrał Trygve Haavelmo w zainicjowaniu rozwoju rachunku przyczynowego, uznając go za badacza, który „jako pierwszy dostrzegł potencjał modeli ekonomicznych w kierowaniu politykami” (Pearl, 2014, 152). Niniejszy artykuł zmierza do rozwinięcia obserwacji Pearla, odnosząc się do hipotezy historycznej, poświęconej prawdopodobnej inspiracji, którą kierował się Haavelmo w swoich dokonaniach. Rozpoczyna od sformułowania *prima facie* prawdopodobnej obserwacji, że – z uwagi na zauważalne podobieństwa między istotnymi własnościami procedur inferencyjnych, jakie stosował Haavelmo i George Katona, będących jednocześnie członkami Komisji Cowlesa – historyczny rozwój rachunku przyczynowego w dużej mierze dokonał się pod wpływem planu badań, jaki zainicjował Katona w badaniach efektów interwencji publicznych. Dalej, sformułowane zostają racje, dla których hipoteza o bezpośrednim oddziaływaniu prac Katona może być uznana

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za wątpliwą i że bardziej wiarygodna może wydawać się zmodyfikowana postać hipotezy, zgodnie z którą szereg istotnych własności innowacyjnego podejścia Haavelmo jest pośrednio (via Kurt Wicksell) pochodną odziedziczoną od Eugena Böhma von Bawerka. Te podobieństwa między pracami Katona a Haavelmo być może nie są przypadkowe, gdyż pośredniczącą rolę mógł tu odegrać Christian von Ehrenfels, jeden z fundatorów psychologii postaci, oraz jego wzajemne oddziaływanie z myślą Böhm-Bawerka. Jednak zmodyfikowana hipoteza zostaje zakwestionowana wobec faktu przywołania istotnych faktów, dotyczących bezpośredniego wpływu na Haavelmo ideę autonomii i strukturalnej niezmienniczości, jaką są prace Ragnara Frischa.

Słowa kluczowe: rachunek przyczynowy, psychologia postaci, causal calculus, Haavelmo, Katona, Frisch

1. Haavelmo and Causal Calculus

Recent advancements in methodology of economics focus on elaboration of formal tools representing causal dependencies (Kawalec 2006) collectively referred to hereafter as “causal calculus” (Pearl 2014, 161–162). In his recent paper Judea Pearl elaborates on the historical role of Trygve Haavelmo in initiating the development of causal calculus as the scholar who was “the first to recognize the capacity of economic models to guide policies” (Pearl 2014, 152).

Haavelmo’s paper “The statistical implications of a system of simultaneous equations” (Haavelmo 1943)¹ – and in a more elaborate form his “The Probability Approach in Econometrics” (Haavelmo 1944),² according to Pearl, “introduced three revolutionary insights” (Pearl 2014, 152): the conception of structural equations as representing “hypothetical experiments” rather than statistical relations, which entails that the economic models can yield answers to questions concerning results of policy interventions in the economic system (Christiansen and Rodseth 2000, p. 187) and, finally, the mathematical procedure, which enables the derivations of the answers.

On Pearl’s account, the meaning of the parameters in the exemplary structural equations, like (1) and (2)

$$y = ax + \varepsilon_1 \quad (1)$$

$$x = by + \varepsilon_2 \quad (2)$$

are causally defined as:

$$a = \partial/\partial x E(Y | do(x)). \quad (3)$$

¹ Haavelmo conceived of the idea first in the spring of 1942 (Bjerkholt 2015).

² The detailed story accompanying the publication of Haavelmo’s 1944 paper is presented in (Bjerkholt 2015, 33).

The definition (3) represents an experiment, where an agent (e.g. government) is controlling the variable x and observes the effect of the intervention on y .³

As Pearl (2014, 156) underlines, the following passage from Haavelmo's paper (1943, 12) is critical for the determination of the mathematical procedure of deriving the effects of interventions:

Assume that the Government decides, through public spending, taxation, etc., to keep income, r_i , at a given level, and that consumption u_i and private investment v_i continue to be given by (2.5) and (2.6) [corresponding to (1) and (2) in the present paper – P.K.], the only change in the system being that, instead of (2.7), we now have $r_i = u_i + v_i + g_i$ (2.7')

where g_i is Government expenditure, so adjusted as to keep r constant, whatever be u and v ...

Of the more recent elaborations of Haavelmo's idea, the key element was the precise definition of causal counterfactuals,⁴ in words (Pearl, 2014, 157): “the counterfactual $Y_x(u)$ in model M is defined by the solution for Y in the modified submodel M_x , with the exogenous variables held at $U = u$.” To illustrate it with the above equations (1)–(2), the counterfactual $Y_x(u)$ is equal to $ax + \varepsilon_1(u)$, where $\varepsilon_1(u)$ represents the omitted factors characterizing unit $U = u$.⁵

Pearl (2014, 158) sums up succinctly the novelty of Haavelmo's approach to causality as follows:

I do consider it revolutionary in that it defines the effect of interventions not in terms of the model's parameters but in terms of a procedure (or “surgery”) that hypothetically modifies the structure of the model so as to simulate the actual intervention. It thus liberates economic analysis from its dependence on parametric representations and permits a totally nonparametric calculus of causes and counterfactuals that makes the connection between assumptions and conclusions explicit and transparent.

The subsequent accomplishments in advancing mathematical representation of causal calculus are represented by Structural Causal Model (SCM) depicted on Figure 1.

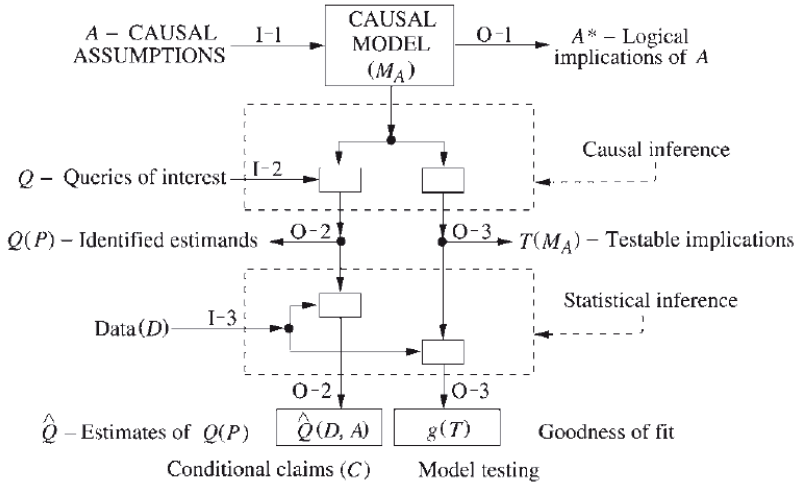
SCM allows for nonparametric inference in accordance with Jacob Marschak's (1953) observation that for policy decision “a combination of parameters is all that is necessary and, moreover, it is often possible to identify the desired combination without identifying the individual components” (Pearl 2014, 167).

³ It is important to note (Pearl 2014, 153) that a is understood here in such a way that it is not related to the regression coefficient defined as $\partial/\partial x E(Y | X = x)$, which is observed in the population prior to the intervention represented in the structural equation.

⁴ For a precise formulation see Definition 1 in (Pearl 2014, 156).

⁵ The definition of the counterfactual captures the intuition behind the potential outcomes propounded by Sława-Neyman (Sława-Neyman 1990) and Rubin (Rubin 1974). See also (Christiansen and Rodseth 2000, 187).

Figure 1. Structural Causal Model

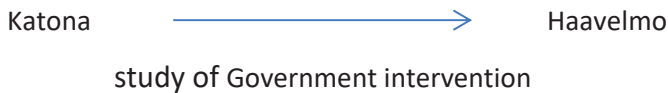


Source: (Pearl 2014, 160).

2. The Initial Historical Hypothesis

Pearl (2014, 159) mentions in the passing that Haavelmo's inspirational ideas were aligned with the overall program of the Cowles Commission (Christiansen and Rodseth 2000, 187–188). Given this fact and granted the characterization of his contribution to causal calculus presented in Section 1. of this paper, it seems *prima facie* plausible that George Katona – who was another member of the Cowles Commission – with his innovative approach to methods of economic research could have provided an important inspiration for Haavelmo's idea (see Figure 2).

Figure 2. The initial historical hypothesis on the origin of causal calculus



In his initial paper (1943) Haavelmo uses an example of consumption function and discusses “Government experiment”, i.e. intervention in the economic system, which would affect the consumption level. Since the beginning of 1942 Theodore Yntema, supported by Leonid Hurwicz,⁶ started to work for the Cowles

⁶ He became acquainted with Haavelmo in New York around 1941 and commented one of his earlier papers (Bjerkholt 2015, 31). Thus, independently of Katona, Haavelmo could become aware of the research project investigating the effects of the large-scale government intervention.

Commission on a project researching the effects of price control interventions of the US government, intended to prevent wartime inflation, among producers and distributors of consumer goods in the Chicago area (Bjerkholt 2015, 30). They both, however, abandoned the project soon after arrival of Marschak, who acquired Katona in order to complete it. The latter joined the Commission in January 1943 (Leavens 1942, 'Report for Period 1942, University of Chicago' 2014). He carried out the research project till 1944 and published the results in the monograph series of the Cowles Commission (Katona 1945). After the project completion Katona moved to Washington (Hosseini 2011, p. 979).

In the book (1945 p. 2) he succinctly characterizes the project thus:

Our approach to the investigation of the impact of price control had three distinguishing features. First, our subject matter was the actions of American businessmen as affected by price regulations and other wartime conditions. Underlying our studies was the assumption, amply confirmed by our findings, that government action alone could not prevent inflationary price increases. Whether or not, and to what extent and in what form, price increases took place depended upon the behavior of businessmen and consumers. ... and only occasionally did the regulations alone determine the actions taken. ...

Secondly, the method of our investigation was to conduct detailed interviews with a small sample of businessmen. ... in the expectation that by that procedure we should be able to shed light on the direction in which various forces operate, gain insight into the actual working of price control, and clarify the reasons for its success or failure. ...

Thirdly, ... [w]herever possible we have drawn upon information collected by other agencies to fill ... gaps in our material [i.e. extensive and reliable quantitative data on sales, costs, and profits – P.K.]

Katona's innovative research design⁷ was preceded by his earlier studies on understanding and mental representation. Max Wertheimer in his *Foreword* to Katona's earlier monograph *Organizing and Memorizing* (Wertheimer 1940) emphasizes the focus on structural features of the organization of elements and interventions which they enable – two features, which are akin to the relevant characteristics of Haavelmo's causal calculus. The main motivation behind his innovative research methods in economics, was the unfolding of the real effects of price control government interventions in economic systems (Katona 1942, 1945), intended to prevent wartime inflation.⁸

Katona, being critical of aprioristic Keynesian analyses of aggregate consumer behavior, introduced survey methods as an indispensable part of economic research design oriented towards realistic understanding of the "intervening" causes of the overt behavior (Katona 1947, pp. 455–456):

⁷ The final paragraph, in fact, represents what is now recognized as "mixed methods" research design; see (Kawalec 2014).

⁸ Innovative research design in economic research is the rationale for Katona's recognition as the founder of behavioral economics (Hosseini 2011).

By far the most important method of economic psychology is the sample interview survey. ... These methods have been used in the economic field to achieve three objectives: to collect information concerning attitudes, motives, plans, intentions and expectations; to collect micro-economic data on the distribution of income, savings, and liquid asset holdings; and to determine the relation of attitudinal and financial data.

Katona (1947, 454) explained his focus on survey methods as an innovative research tool in economics as follows:

They originated in the belief that if individuals know the factors that determine their future spending or saving performance and are willing to give information on these matters, then it would be possible to obtain reliable data about a few individuals. If, furthermore, a representative cross-section of people could be sampled, then perhaps we would not have to rely solely on the law of large numbers to assess forthcoming developments of the entire economy. (reference omitted – P.K.)

Katona believed that survey methods allow researcher to control “intervening variables”, which were crucial for prediction of non-routine behaviors of economic agents, behaviors which were manifested in situations of intervention, in particular, the government intervention under scrutiny (Katona 1946, pp. 46–47): “The same stimulus may elicit different responses if it is perceived or understood as the part of the one or other whole”.⁹

The significance of the framework yielded by understanding becomes especially relevant under interventions, which require a modification of “habitual” behavior (Katona 1946, 49):

The first refers to habitual behavior and maintains that principles, well understood in their original context, tend to be carried over from one situation to another. This is the most important explanation of routine or conventional action, in contrast to purely repetitive action, never fully understood or understandable, such as tapping the typewriter here for “s” and there for “t.”

The second refers to new decisions and actions and maintains that the emergence of a new situation and the realization that certain stimuli belong to a new context, different from a previous one, leads to the acquisition of new meanings through understanding. Instead of proceeding with psychology and quoting experimental evidence for the two propositions or discussing differences between schools of psychology, we shall now turn to a few illustrations from the field of economics. We shall discuss specific instances of substantial changes in business policies, and of the absence of such changes, and shall try to show how the preceding psychological analysis applies to them.

Like Haavelmo, Katona was interested in interventions of public authorities in economic systems (Katona 1946, 62):

What then are the conclusions drawn from the analysis of expectations for public policy? Government action should be directed to counteract the development of cumulative expectations – the expectation of a cumulative decrease or increase of prices, profits, and incomes – but should not

⁹ Katona refers here to Gestalt psychology (Kurt Koffka 1935) and (Wertheimer 1938) as well as his own book on psychology of learning (1940).

attempt to hinder the emergence of all kinds of definite expectations. The analysis of this requirement, the study of the question whether such action is practicable, transcends the limits of this paper. It is, however, fitting to close with the remark that here is to be found one of the most important and most fruitful fields of “economic psychology.” The government should take such action that is not only desirable in itself but is also likely to arouse those expectations that are called for at the given time (for example, expectations of price stability when inflation threatens, expectations of income increases when deflation is imminent). Since expectations are not innate and are not a function of the frequency of the individual’s past experience but are dependent upon his understanding of events (including government actions and government announcements), it does not seem impossible to achieve this objective. But in order to achieve it, policy makers must explore the probable effects of their contemplated actions on business and consumer expectations and must consider the presence or absence of a need for, and the means of, reorienting public thinking.

There is, however, no direct evidence which can support the hypothetical influence of Katona’s interactive approach upon Haavelmo’s inspirational idea. Haavelmo’s major papers of 1940’s as well as the relevant subsequent publications do not mention Katona’s influence nor his survey studies or methodology. Hence, there is no hint that it was Katona’s research that motivated the example of price control intervention and moreover, apparently, he is not referred to in later works of Haavelmo, in particular in his (Haavelmo 1960). The information about the early (1943 and 1944) seminars at the Cowles Commission do not hint towards a possible personal influence.¹⁰ The more recent biographical studies on Haavelmo and also methodological reviews of his contributions are likewise silent on the hypothesized influence by Katona.

There is, however, indirect evidence that yields some probability to the hypothesized influence. The first one is related to the analogous ‘interactive’ approach of Katona and Haavelmo in undertaking economic problems. Katona expresses it succinctly thus: “[My study’s] aim will be to determine the probable types of behaviour under different conditions. For that purpose it will analyse the distributions of economic position and the behaviour of individual consumers and firms (Katona 1951).

3. A Modified Hypothesis

As mentioned in the preceding Section, there is no evidence supporting the initial hypothesis of Katona’s direct influence upon Haavelmo. As (Christiansen and Rodseth, 2000, 181) emphasize, the latter “liked to follow his own paths rather than elaborating on the work of others”, and indicate Ragner Frisch and Knut Wicksell as “the strongest impulses” for his thought.

Moreover, there is some evidence, which puts such an influence into question. Katona was engaged with the Cowles Commission to replace Yntema and Hurwicz

¹⁰ In particular, Kenneth Arrow’s memoir quoted in (Haavelmo 2007, p. 838) does not include Katona among the participants of Haavelmo’s lecture. Similarly, see (Anderson 2014, Qin 2013, 2015).

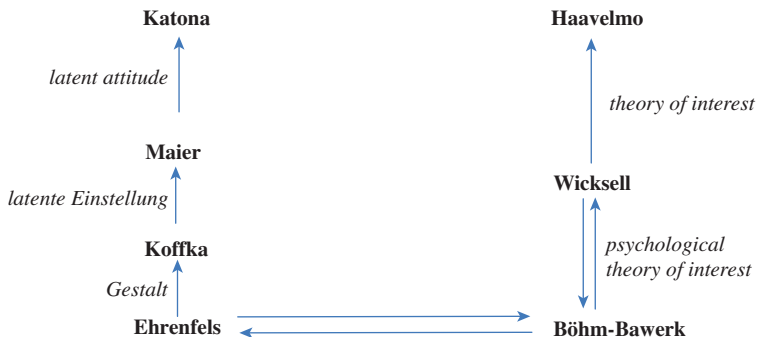
and his engagement ended in 1945. By that time, however, Haavelmo was only formally involved with the Commission and arrived at Chicago only in 1946, with prior post for Norwegian government in New York and Washington (Christiansen and Rodseth 2000, 185, Anderson 2014, 276). There is no evidence that they had an opportunity for a personal contact prior to 1944, when the most important contributions, identified in (Pearl 2014), originated.

Moreover, Haavelmo does not include Katona's works, in particular in (1943; 1944) among his sparse references. Phillip Mirowski (Mirowski 1989, p. 78, quoted from Edwards 2009, p. 190) explains:

Further, the Cowlesmen had little respect for survey techniques or participant observation of social actors. This was illustrated in the cool reception given to the survey on war time price controls conducted by George Katona under the temporary auspices of Cowles.

It entails the conclusion that either the similarities between the research methodologies of Katona and Haavelmo are apparent, or there is a common source for both of them. In the remainder of this paper I attempt to modify the initial hypothesis around the latter alternative. It seems that the apparent similarities can be derived from a psychologically informed approach to economic problems, which interactively inspired major conceptual advances in Gestalt psychology. Schematically, the modified hypothesis concerning the historical influence is presented on Figure 3.

Figure 3. Historical inspirations of Haavelmo's causal calculus



Böhmer-Bawerk developed his psychologically informed theory of interest rates in monumental monographs (Böhmer-Bawerk 1884) (Böhmer-Bawerk 1884) and in particular in *Positive Theorie des Kapitals* (Böhmer-Bawerk 1889), which was soon translated into English (Böhmer-Bawerk 1891)¹¹. His theory possesses the important

¹¹ And it was the English translation that Haavelmo (1960) referred to.

characteristics, emphasized by Pearl with regard to Haavelmo's contribution. It includes causal and counterfactual reasoning, and identification of the effects of interventions.

The relevant characterization is succinctly expressed by Luigi Dappiano (Dappiano 1996, p. 398):

The essential aim of his model is to conduct analysis of capital independently of analysis of distribution: an independence which is necessary for the causal-genetic method, more than being a device to avoid circularity of reasoning. If, in fact, distribution implies a fixed system of values (in terms of retribution and exchange-value), the indirect process of production, which helps to determine this system, is logically antecedent to it, and therefore involves only acts of direct valuation of goods and of compared valuation between goods at hand and future ones.

Böhm-Bawerk thus, in his theory of interest, already investigated the "independence", which in Haavelmo's account became the key property of structural equations, namely their "autonomy" (Haavelmo 1943, 1944).

Also the intervention element is present already in Böhm-Bawerk's theory, as Dappiano (1996, 399) makes clear:

But as a factor of production capital can only represent a technical relationship which is impossible to postulate as known, because if it were really known, it would be measurable, and if it were measurable it would require the intervention of a measure of value, i.e. a single rate of production for all capital goods. But if such intervention actually took place, then capital, as a factor of production, could not be taken as given according to the system of values and retributions that it should actually help to determine.

Böhm-Bawerk's theory of interest involved not yet existing future goods, which were valued against the presently available goods. Hence, his theory involved also counterfactual reasoning:

Broadly speaking, the problem is whether we desire something because we value it (Meinong) or whether we value something because we desire it (Ehrenfels). The answer provided by Böhm-Bawerk's theory of capital comes closer to Ehrenfels' than to Meinong's position, and emphasises Böhm-Bawerk's psychological theory founded on the centrality of a particular mental act which consists in the cognitive anticipation of the characteristics and intensity of future emotions. This mental act is an essential part of the individual's decision to invest capital and thereby to accept future remuneration in place of present remuneration. (Dappiano 1996, 396)

Böhm-Bawerk's theory of interest rate, which apparently had the main features characterizing Haavelmo's novel approach to causal calculus, was assimilated by Kurt Wicksell. He gave it the mathematical formulation. In neither (1943) nor (1944) Haavelmo refers explicitly to Wicksell's publications. However, from his later book (Haavelmo 1960), where both Böhm-Bawerk's and Wicksell's contributions are discussed at length, it might be concluded that Haavelmo was using Wicksell's

Lectures, especially (Wicksell 1977a, 1977b), which appeared in English in 1934, rather than the latter's original publication in German (Wicksell 1893), which appeared in its English translation only later in 1954 (Wicksell 1970). Analogously, Haavelmo becomes explicit as regards the influence of Böhm-Bawerk on his work only in (1960), and again he refers to the English translation (Böhm-Bawerk 1891).

Böhm-Bawerk theory of interest rates turned out to be inspirational also for Gestalt psychologists, in particular its involvement of marginal utility, which was expected to yield a measure of value for a general theory of value as intended by Ehrenfels. He (Ehrenfels 1890) is claimed to be the first to publish systematic account of Gestalt theory of representation. It was further elaborated by Kurt Koffka. In (Koffka 1911) he elaborated the notion of 'latente Einstellung' (latent attitude) to discern frameworks of representation, which were projected from the original context to a new one, where they persevered even being inadequate with regard to the underlying phenomena. Koffka's work was assimilated by Katona (1940) via Maier's series of papers on reasoning in humans (Maier 1930, 1931, 1945). The government intervention, studied by Katona in his research project for the Cowles Commission, was conceived of as re-framing "latent attitudes"¹² (Koffka 1911, Maier 1930) of producers and consumers and thus changing their underlying understanding of the basic economic relationships (Pietrykowski 2009, p. 61).

Taking into account the mutual inspirations between Böhm-Bawerk and Ehrenfels the modified hypothesis partly explains, as is claimed in this paper, the apparent similarities between Katona's and Haavelmo's research methodologies in economics. Its further and more complete elaboration, however, would require an extensive archival study of the manuscripts of Böhm-Bawerk and Ehrenfels to definitely establish the extent of the dominant direction in the mutual inspiration.

To conclude this section, given the historical record of influences upon Haavelmo's critical papers (1943; 1944), which initiated causal calculus in economics, it seems that its major characteristics can be traced back to Böhm-Bawerk's work on the origins of interest rates (Böhm-Bawerk 1889), which was first cast in mathematical form by Wicksell and then fully elaborated by Haavelmo. The apparent similarities between Haavelmo and Katona may be partially explained by the latter's inspirations in Koffka's and Ehrenfels's Gestalt psychology, but it would require an extensive archival inquiry to confirm the extent of the possible direct influence of Katona upon Haavelmo as well as the relevant mutual influences of Ehrenfels and Böhm-Bawerk.

¹² Perhaps the following passage from (Böhm-Bawerk 1891, 255) can be taken as a pre-conception of Koffka's "latente-Einstellung": "I should not be surprised, however, if the psychologists were to explain this case also as only a variation of the former: it may be that the weaker feeling of the moment prevails over the stronger feeling of the future only because the latter, while present in consciousness in a general way, is not lively enough and strong enough to take possession of the mind. For our purpose, however, it is a matter of no consequence."

4. Ragnar Frisch and origins of autonomy and the structural aspect

The improved hypothesis makes it very likely that there might be a common ancestry to both Haavelmo's idea of causal calculus and Katona's causally-oriented research design in behavioral economics. However, there is no sufficient evidence – both published and archival – that could sustain the claim of a *direct* influence. Instead, what seems more likely the projected *indirect* link might exist between Ragnar Frisch's writings and Katona, while the former was presumably the source of direct inspiration for Haavelmo. Below, I present the argument in more detail. Let me note, however, that if that is the case, than a direct personal influence between Katona and Frisch becomes very unlikely.

The term "autonomy" was first used in print by Haavelmo (Bjerkholt 2008 n. 27, p. 23). However, as is well known, his work culminating in the 1944 paper was directly inspired by the famous Memorandum *Statistical Versus Theoretical Relations in Economic Macrodynamics* by Frisch, which appeared in 1938 (reprinted in Frisch et al. 1948). It was Frisch's response to Tinbergen's *The Statistical Testing of Business Cycle Theories*, but the core ideas stem from earlier work. Apparently, thus the origin of the majority of ideas studied later by Frisch, including autonomy, is his earlier paper (Frisch 1929). The recurrent topic, which appears in his later writings, concerns the problem of empirical grounding of structural equations. The relevant data measured – as observed by Frisch – will be grouped for all the satisfied relations and therefore it will not be possible to empirically determine the individual equations. Characteristically, he called for a solution, where theory and empirical measurement are both entangled (Bjerkholt 2008, p. 25) in a way very similar to empirical grounding (Boumans 2013, 2014, Kawalec 2017). As claimed in (Frisch 1929, p. 93) statistical analysis alone is not potent to conclusively discriminate between "accidental" associations of variables, "disturbances" (a result of ignoring an important variable) and "systematic variations" (manifesting a genuine regularity). On the basis of this paper (Aldrich 1989) Frisch elaborated the notion of "the structural relation" in a joint paper (Frisch and Waugh 1933, p. 390). The structural relation is "postulated" by theory, while the remaining relations might be regressed using the classical statistical relations, postulating that it is relevant in trend forecasting. This definition explicitly draws upon Frisch's 1929 paper. It led to a series of further developments in his direct polemics with Tinbergen. In a sense Haavelmo integrated the two approaches, but also modified them significantly: "Confluence analysis had been data analysis – first find relations in the data and then make sense of them. Here the sequence was reversed: define the relations that made economic sense and estimate them" (Aldrich 1989, p. 27).

5. Conclusion

While Katona's influence upon economics and the identification of causal structures is recurrent, the initial hypothesis concerning his direct influence on Haavelmo has to be rejected. Instead, there is plausible evidence that his idea of autonomy was derived – but also ultimately transformed – from Frisch's 1929 paper. However, the upshot of the initial hypothesis may still inspire a more intense search for a common ancestral ground for the contemporary various stands of interest in causal structures as apparently emergent from the initial Gestalt psychology and its influence upon late 19th century economists.

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