Errors in Time as Causes of Economic Fluctuations: An Introduction

Meacci, Ferdinando and Caldari, Katia

University of Padova

22 August 2007

Errors in Time as Causes of Economic Fluctuations: An Introduction[*]

by

Katia Caldari and Ferdinando Meacci

Dipartimento di Scienze Economiche

Università di Padova

1. Preliminary remarks

Marco Fanno's major contributions to the theory of fluctuations are considered to be his article "Cicli di produzione, cicli del credito e fluttuazioni industriali" in *Giornale degli Economisti e Rivista di Statistica* (1931) (henceforth: the Italian article) and his book *La teoria delle fluttuazioni economiche* (1947 [1956]). Recently, the 1931 article has been translated into English and has been published with an introduction by Augusto Graziani under the title "Production Cycles, Credit Cycles and Industrial Fluctuations" in *Structural Change and Economic Dynamics* (1993). Even more recently, this translation has been re-published in H. Hagemann[(2002) pp.227-61].

Left rather in the shadow, and relatively little known, is another article published by Fanno on the same topic and in German in 1933. This article was written following an invitation by Rosenstein-Rodan and Oscar Morgenstern and was published with the title "Irrtümer in der Zeit als Ursachen wirtschaftlicher Schwankungen" in the Austrian journal *Zeitschrift für Nationalökonomie* (1933) (henceforth: the Austrian article)[1].

---

[*] Earlier drafts of this paper were presented at the 3rd STOREP Conference, 1-3 June 2006, Lecce and at the 9th AISPE Conference, 15-17 June, 2006, Padova. We would like to thank all the participants to these meetings, and in particular Cristina Marcuzzo and Antonio Magliulo, for their helpful comments. Further revisions of this paper have benefited from some valuable suggestions and comments by Daniele Besomi, Harald Hagemann, Fabio Masini and an anonymous referee. Any remaining errors of presentation or interpretation are, of course, our own responsibility.

[1] We have found a reference to Rosenstein-Rodan and Morgenstern's invitation in a brief letter written by Fanno to Morgenstern on July 17, 1931 (Marco Fanno Archives, Dipartimento di Scienze Economiche, University of Padova, C1.56). The letter runs as follows:

"Padova, li 17 luglio 1931. Preg.mo Sig. Dott. Oskar Mongenstern, Vienna. Il dott. Rosenstein, quando fu a salutarmi a Padova, mi pregò ripetutamente di scrivere un articolo per la loro rivista, e gli promise di prepararne uno, trattando una parte dell'argomento recentemente svolto sul Giornale degli Economisti, e precisamente la parte che si riferisce agli errori di tempo come causa delle fluttuazioni economiche. Adempio ora alla mia promessa ed invio a Lei, non conoscendo l'attuale indirizzo del dott. Rosenstein, il manoscritto dell'articolo. Con i più distinti saluti mi affermo suo dev.mo Marco Fanno".

It results from this letter that the original text of the Austrian article was written in Italian by Fanno himself, was sent by him to the Zeitschrift für Nationalökonomie and was there translated into German by Hans Fried. In this connection we have contacted Professor Giacomo Corneo, the current editor of the Journal of Economics (once Zeitschrift für Nationalökonomie) in order to get hold of the original Italian manuscript. We have learned from

The purpose of this paper is to bring out the peculiar features of the Austrian article and to examine this article in relation to the Italian article from which it was derived. We shall try to prove that the Austrian article, however shortened relative to the Italian article, is something more than a German translation of the latter. This is not so much a matter of details, such as the different numerical examples on which the two articles are based but rather, and in spite of the sections dropped, the more explicit treatment of the nature of "Irrtümer in der Zeit" (errors in time), an expression which is not used by chance in the very title of the new article. The importance of this notion and of the theory built upon it is proved, on the one hand, by its interaction with the Austrian notion of the time structure of production and, on the other hand, by the role that the disappointment of expectations, a different but equivalent expression, plays in the theory of fluctuations. In our view, Fanno's treatment of errors in time in the Austrian article contributes, more clearly than the title and content of the Italian article, to placing Fanno's contribution in the forefront not only of the theory of expectations that was developed in the 1930s but also of that part of this theory which unfortunately failed to develop in the second half of the Twentieth century. This is the part by which expectations are studied in terms not so much of their origin and least of all of their rationality or time consistency but of their disappointment and related impact on macroeconomic equilibrium and fluctuations. The relations between the Fanno articles and the macroeconomic theory of expectations first in the 1930s and later in the second half of the Twentieth century will be examined in a different paper.

The present paper consists of 4 sections and of two Appendixes. While sections 1 and 3 are devoted to the preliminary and concluding remarks and while section 4 provides some notes on the English translation of the Austrian article which is published at the end of this paper, the core of this work is displayed in section 2. This section is divided in two subsections. While subsection 2.1 is focused on the essential similarities, the longer subsection 2.2 highlights some important differences between the Italian and the Austrian articles. As for the Appendixes, Appendix 1 exhibits our reconstruction of Fanno's example of a stationary economy as illustrated in the Austrian article while Appendix 2 provides a similar reconstruction of the

Professor Corneo that the Fanno manuscript is missing from the Journal Archives possibly because it was destroyed in the world war bombing of Vienna.

2

impact on the volumes and structure of production of a sudden (unexpected) drop in consumption[2].

2. The Austrian article (1933) vs. the Italian article (1931): A comparison

It is likely that Rosenstein-Rodan's request to shorten the Italian article for publication in the *Zeitshrift für Nationalökonomie* must have led Fanno to reproduce a more essential version of that article. This must have been dictated not only by Fanno's realization of some shortcomings in the Italian article but also by the remarkable improvements macroeconomic theory had undergone in the meantime. The relations between Fanno's theory, as found in these articles and from his following book on fluctuations (1947 [1956]), and other similar theories developed in the 1930s or in subsequent times will be discussed in another article (some of these relations, as looked at by Fanno himself, are merely mentioned in subsection 2.2.4 below).

2.1. Similarities

Both the Italian and the Austrian article aim to analyze the impact on the volumes and structure of production resulting from all possible shocks. The shock mainly focused upon by Fanno is in both cases a sudden (unexpected) fall in aggregate consumption (a rise in aggregate savings). Both articles start with an essentially two-sector economy (consumption goods and capital goods) considered in a stationary state (with total output and bank credit constant). The two sectors are looked at both side-by-side, as required by an input-output snapshot of the economy, and in sequence, as required by the notion of time-consuming methods of production. In conformity with the Austrian theory of production, goods are thought of as being produced through a "production cycle" with a longer or shorter duration depending on whether this "cycle" starts from the production of plant and equipment ("long production cycle") or, given the plant and equipment, from the production of the raw materials that go into the production of final goods ("short production cycle").

The complete production cycle is supposed to be run by a certain number of "Groups" while the long production cycle is supposed to have a certain duration (200 days in the 1931 article, 375 days in the 1933 article)[3]. Each production cycle is made up of different stages, each stage being managed by one of the Groups involved in the production cycle. Production is carried on

---

2 On the terms "sudden" and "unexpected", see below §4 sub 2.

3 A compact presentation of the 1931 and 1933 numerical examples is provided below in §2.2.2. For a more detailed account of the 1933 example, see below Appendix n.1 and Appendix n.2.

continuously and is financed through the intermediation of banks which lend to the Groups the savings of the public: every day a step forward is made in the long journey by which raw materials are turned first into machines and eventually into consumption goods by different Groups. Concerning the volume of credit, "only sales to consumers enable producers and traders, considered as a whole, to pay back all debts incurred by them to finance a given production cycle. And this enables banks to reduce their credit volume by the same amount" (1931 [1993, p.405], 1933 [2007, pp.4-5]. It is however understood that, given the stationary conditions, for any credit that is paid back to banks another credit is made by banks so that the total amount of credit is constant.

It is at this point that Fanno's dynamic analysis sets in. Out of a number of possible disturbances (shocks), he focuses upon a sudden (unexpected) drop in aggregate consumption (a rise of aggregate savings) and deals with its repercussions on the time structure of production. In so far as the increase in savings is turned into an increase in investment, the two-sector economy adjusts to a new stationary state in which the capital-goods sector becomes bigger at the expense of the consumption-goods sector. Fanno's main interest, however, is devoted to the transitional period in which the two sectors –and the corresponding Groups– adjust to each other while a number of troublesome and serious effects occur (1931 [1993, pp.407-10]; 1933 [2007, pp.4-7]).

What happens in the transitional period is the core of Fanno's analysis. When the drop in consumption takes place, its effects spread backwards to all the stages of the production cycle and affect all the Groups in charge of these stages. Thus a small drop in consumption (5% in the Austrian article, 12.5% in the Italian article) results in a greater reduction of aggregate production (18%) (1933 [2007, p.6]), the reduction being the greater the more distant from the final stage is the stage under consideration (the reduction in capital goods production, for instance, is reckoned to be 45% in the Austrian article). Thus a slight drop in consumption is shown to result in a more noticeable reduction in total output, the fall in production being much greater in the capital-goods sector than in the consumer-goods sector (1931 [1993, p.409]; 1933 [2007, p.7]). But this is not the end of the story. For, when production falls as a result of the drop in consumption, unemployment increases and wages decrease thus entailing a further decrease in the aggregate consumption of the following periods. More generally, given the repercussions in production across the different stages of the production cycle and given the resulting repercussions in the income and consumption of the following periods, the downward

spiral of production-income-consumption-production continues in principle until total output grounds to zero[4]. Thus Fanno's conclusion in both articles is that "saving, if it merely consists of goods not being bought, that is of hoarding or of the mere opening up of bank deposits, is harmful to both the individual and the society: harmful to the individual because unemployment will gradually increase and wages will fall, and harmful to the society because while the real savings do not increase, real incomes gradually fall." (1931 [1993, p.411]; 1933 [2007, p.11]).

Fanno is aware that the downward spiral of production triggered by a sudden (unexpected) drop in consumption never reaches its ultimate round of a zero level of output. But this is because a number of obstacles or remedies interfere in the process. Amongst these is a compensating increase in the production of capital goods (the "best solution of all"; see 1931 [1993, pp.412-4]; 1933 [2007, pp.9-10]), except that in the two-sector and time-consuming economy this "best solution" cannot be accomplished *instantaneously*. For the increase in the production of capital goods to match exactly the fall in the production of consumer goods, a simultaneous change in the composition of output is required. But this is exactly what is made impossible by the time structure of production, on the one hand, and by the "errors in time" committed by the various Groups, on the other. The possibility of these errors stems from the fact that Groups, and particularly the Group of producers of capital goods, cannot perfectly foresee the amount and the moment of the drop in consumption. If they could, they would be able to adjust their production in time, i.e. exactly when their productive cycle begins. But this would be the case only under the special circumstances of the production cycle of capital goods being as long as that of consumer goods (in which case there would be no lags whatsoever in the transformation, if ever, of new savings into the production of additional capital goods) (1931 [1993, p.413]; 1933 [2007, p.10]). Thus, if a sudden (unexpected) drop in consumption takes place at time t_0, its compounded effects will be transferred cumulatively backwards in times $t_1, t_2, t_3 \ldots t_n$ to the higher stages in the time structure of production regardless of whether the Groups have or, which is the worst and most frequent case, have not anticipated the drop (see below, Appendix 2).

The framework in which business cycles are studied by Fanno hinges, therefore, on two foundations. These are:

1) the time structure of production;

---

4 There is a strong similarity between the multiplying (downward) mechanism envisaged by Fanno in these articles and the multiplying (upward) mechanism envisaged by Kahn (1931). This aspect, and its relation with the more general theory of fluctuations, will be examined in our subsequent paper.

2)   the impossibility to predict shocks and, if prediction is possible, the impossibility at the time of prediction to adjust properly the time structure of production.

This framework results in the identification of errors in time or, as they will be called later on, in the disappointment of expectations as the fundamental cause of fluctuations. Other phenomena, such as normal or abnormal credit expansions or contractions, price increases or decreases, the structure of financial markets, and so on, can only accentuate the wave-like form of fluctuations

2.2. Differences

In addition to the similarities highlighted above, the Italian and the Austrian article exhibit some important differences. These range from the role assigned to credit and banking in amplifying fluctuations to the role assigned to economic policy in preventing or smoothing these fluctuations out. Some of these differences are negligible and others are important while some of them are quite evident and others are not.

2.2.1. Credit and banking

The most evident difference between the Italian and the Austrian articles is the different attention devoted to credit and credit cycles as an amplifying cause of fluctuations (1931 [1993, §4]). While a number of sections of the Italian article are focused upon this issue (to the extent that the expression "credit cycles" is part of its title)[5], in the Austrian article Fanno's central attention is rather focused upon the (different) duration of production cycles and, on top of this, upon "errors in time" (to the extent that it is this expression that is part of the new title) as the fundamental causes of fluctuations. Thus it can be maintained along with Graziani (1993, p.396) that "the German version is very close to the Hayekian approach to the analysis of the time structure of production as a fundamental element in economic equilibrium, while in the Italian version greater attention is devoted to Wicksell's monetary theory and to the Cambridge macroeconomic analysis of the early thirties".

---

5 The Wicksellian elements of the Italian article are emphasized by Graziani (1993, p.396) who quotes in this connection the following passage by Wicksell: "Among the many similes which have been employed to illustrate the nature and functions of money that which describes it as the oil in machinery is, from many points of view, the most appropriate. Oil is not a component part of a machine; it is neither a motive force nor a finishing tool; and in an absolutely perfect machine a minimum of lubrification would be required. Naturally, however, our simplification is only provisional. Economists frequently go too far when they assume that the economic laws which they have deduced on barter assumptions may be applied without qualification to actual conditions, in which money actually effects practically all exchanges and investments or transfers of capital" (Wicksell, 1906 [1935, pp.5-6]).

Of the parts of the Italian article on credit and banking that are partly maintained and partly dropped in the Austrian article, two passages are worth noticing. One deals with the savings which are turned into bank deposits but which, in so far as they are not turned into credits, are rather viewed as hoarding (1931 [1993, pp.406-7; p.411]: more on this below, see 2.2.5). Another deals with the "abnormal credit expansion" which is required when the production of capital goods is triggered by new inventions but the public is unwilling to provide the necessary savings (1931 [1993, pp.422-3]). A proper discussion of this "abnormal credit expansion" (which, according to the passage just quoted, is likely to become an "unbounded" expansion destined to revert into a harmful contraction "for the system's own salvation") is missing from the Austrian article. Such a discussion, however, is needed for a proper treatment of the upper turning point of the business cycle curve (which is a crucial topic in the Austrian as well as in the Italian article) and for the difference (which is implied, though not highlighted, by Fanno) between increases in endogenous *money* (bank credit) and increases in *savings*[6].

2.2.2. The production cycle and the number of Groups

As argued above, Fanno's two-sector and time-consuming economy is run by different Groups (of producers -of consumer goods or capital goods- and of traders -wholesalers or retailers) each of which is concerned with a different stage of the production cycle, whether long or short. But the number and specification of these Groups is different in the two articles. Also the time structure of production is assumed to be different. For the duration of a complete process, from the production of raw materials to the production of final goods, is assumed to be

---

6 The difference between the role of money and the role of savings (and therefore between the creation of money and the creation of savings) is made more explicit in the Italian article than in the Austrian article if only because, as noted above, the latter is more heavily focused on time-consuming production and on production cycles rather than on bank credit and credit cycles. See, for instance, the different emphasis devoted in the two articles to the crucial phenomenon of "forced saving". This phenomenon is mentioned both in the Austrian and in the Italian article (to the extent that the note on the history of the doctrine of forced saving is reproduced in both articles (1931 [1993, n.26, p.428]; 1933 [2007, n.21, p.]) although it is only in the Italian article that this is linked up with the "abnormal credit expansion" to such an extent that forced saving is here said to set the ultimate ceiling to that expansion (as well as to the production of instrumental goods beyond the lower ceiling established by voluntary savings) (1931 [1993, §16]). For a coordination between the new and the old (Say's and Mill's) views of saving, see also footnote 29 in Fanno (1931 [1993, 430]) and footnotes 13 and 21 in Fanno (1933 [2007, p. and p.]). The coordination between the role of credit and the role of saving in determining fluctuations can be looked at from the standpoint of the demand side of the credit market where, as Graziani argues, Fanno's final conclusion is that the "demand for credit" must be distinguished from the "demand for money balances" so that "banks can only create money in order to satisfy the liquidity requirements of the market" while "investment can only be financed by an equivalent amount of saving" (1993, p.401). For a more detailed account of Fanno's theory of money and credit and of its relations with other theories of fluctuations, see Realfonzo and Graziani (1992). See also Arena (1998). We will deal with these issues in another paper.

200 days in the Italian article and 375 days in the Austrian article. Fanno does not state the reasons for the new numerical example (whether, for instance, this is just a matter of convenience or rather reflects a more capitalistic -and therefore more prone to fluctuations- time structure of production). Whatever the case, we prefer to think of Fanno's new example as something designed to bring out the more complex setting of a capitalistic economy endowed with a larger number of Groups. For it should be noted that one thing is the "technical" duration of the production cycle (how much time and how many stages are needed, given the technology adopted, to move raw materials to the last stage of production); another thing is its "institutional" duration, i.e. how many Groups (of decision-makers) are involved in it between the beginning and the end of the cycle.

In the Italian article the time structure of production is assumed to be run by 5 Groups:

1) Group A: producers of instrumental goods;

2) Group B: traders who purchase instrumental goods from A and sell them to C;

3) Group C: producers who transform raw materials and raw food stuff into consumer goods;

4) Group D: wholesalers and retailers who purchase consumer goods from C to resell them to Group E;

5) Group E: consumers (it includes all the members of the other Groups).

By contrast, in the Austrian article, the time structure of production is assumed to be run by 7 Groups:

1) Group A: producers of instrumental goods (or "goods of a higher order", as we shall see);

2) Group B: wholesalers who purchase instrumental goods from A and sell machines to C and other goods to E;

3) Group C: producers who transform machines bought from B and raw materials and raw food stuff into semi-finished goods;

4) Group D: wholesalers who purchase semi-finished goods from C and resell them to E;

5) Group E: producers who transform into final goods, by the machines bought from B, the semi-finished products bought from D;

6) Group F: wholesalers and dealers who buy consumer goods from E and sell them to G;

7) Group G: consumers (it includes all the members of the other Groups).

The larger number of Groups in the Austrian article indicates that the number of typical transactions assumed along the time structure of production is larger than the number envisaged in the Italian article. With a given "technical" duration of the production cycle, this change in

the institutional setting of the economy reflects a greater decentralization of the decision-making process. This is not a trifling change for, as can be argued from footnote 7 added to the Austrian article, a longer list of transactions widens the room for the number of decisions to be taken under the uncertainty surrounding the structural changes resulting from shocks. Hence the higher likelihood of errors in time, the special topic of the Austrian article, and the greater exposure to fluctuations of an economy based on a decentralized, rather than centralized, decision-making system.

2.2.3. Assumptions dropped and assumptions adopted

Other differences between the Italian and the Austrian articles bear on the different kinds of shocks and on the different cases examined in the two articles[7]. In the Italian article, for instance, three cases are considered.

Case 1: producers of consumption and capital goods "do not forecast the reduction in consumption of the former goods in time and only start to modify their production levels from the moment in which consumption effectively begins to drop".

Case 2: case 1 plus a different duration of the production cycles of different goods.

Case 3: cases 1 and 2 plus the further assumption that investment is not carried out by savers (for instance by underwriting new share issues) but by different sets of agents and particularly by banks (1931 [1993, pp.414-19]).

In case 1, "if a fall in consumption occurs, the presence of long-run production cycles is, on its own, enough to bring about a wave-like appearance in the business cycle curve during a period of transition where the directional changes of various production volumes do not occur with the necessary foresight in terms of time of production cycle" (1931 [1993, p.415]). In case 2, given the unexpected rise in savings, "the different durations of production cycles are, on their own, enough to determine more or less accentuated business cycle curves" (1931 [1993, p.417]). Finally, in case 3, given the "complicated mechanism of banks, intermediaries and business enterprises which, at least in part, preside over the investment of savings today in the real world", it occurs that the likeliness of errors is "infinitely greater" than in the other hypothetical cases. So that, in general, "the fact that investments may be carried out, at least in

---

7 Shocks other than a sudden (unexpected) drop in consumption are mentioned in both articles but are discussed almost exclusively in the Italian article. These are: 1) an increase of consumption; 2) waves of optimism or pessimism; 3) partial overproduction; 4) invention or application of new productive processes; 5) change in trade policy; 6) changeover from a period of war to one of peace or vice versa; 8) increase or decrease in harvest yields (shocks n.2 and n.4 are not discussed at all in the Austrian article).

part by persons other than savers, which increases the likelihood of errors relating to time factors or to the measurement of investments themselves, tends, overall, to accentuate the extent of disturbances" (1931 [1993, p.420]).

These three cases do not appear in the 1933 article. Here the single case studied is based on *three* assumptions *dropped* and on *two* assumptions *adopted*. The assumptions *dropped* are: a) that the moment in which the drop in consumption occurs is exactly forecast by the producers of consumer goods; b) that these producers are consequently able to cut their production with the necessary anticipation; c) that the producers of capital goods are in turn able to forecast the drop in consumption and to adjust their production in the opposite direction and with the necessary anticipation. The assumptions *adopted* are: d) that the duration of the production cycle of capital goods is equal to the duration of the production cycle of consumer goods; e) that savers are able to invest their savings directly and exactly in the capital goods that are produced with the necessary anticipation. The dropping of the three assumptions above is forced by the existence of time-consuming production while the two assumptions adopted are designed to make this most realistic case more manageable for analysis. The outcome of this combination of assumptions dropped and assumptions adopted results in the single case whereby "the various Groups have made the same error. This is nothing other than an error in time" (1933 [2007, p.10]). The errors committed in this sense are generated by the producers' *inability to forecast* the future as well as by the *diverging delays* with which the time structure of production is adjusted to the new conditions (1933 [2007, pp.10-11]). Fanno's crucial idea is that these errors are the most common, important and unavoidable root causes of fluctuations.

Errors as the root causes of fluctuations are analyzed also in Fanno's later book on fluctuations (1947 [1956, Chap. XII]). Here different kinds of errors are classified as errors of *measure* (i.e. errors concerning the quantities produced relative to the quantities to be demanded)[8], errors of *quality* (i.e. errors concerning the kinds of goods produced relatively to the kinds of goods to be demanded), and errors of *cost* (i.e. errors concerning the determination of the production cost of goods to be produced). Errors of measure are the most crucial errors. To this group belong, in general, the "errors of proportion between saving and investment". These errors can affect either the proportion between the part of income which is saved and the

---

8 These errors are typical of the upward phases of the business cycle when investment may well exceed savings by means of credit expansion (but is eventually brought to equality with it by the increases in savings resulting from the increases in income) and may indeed lead the economy into a crisis if this expansion is excessive (1947 [1956: 312]). For savings and investment to catch up to each other, however, takes time.

part which is consumed as well as the proportion between the part of output that is in available and the part that is in non available form (to use Keynes's terminology) or the proportion between fixed-capital goods and working-capital goods or even the proportion, on the financial side of the economy, between the amounts of short-term securities and long-term securities in which savings are annually invested (1947 [1956, pp.312-8]). Whatever the group of errors, all of them are connected with the time structure of production inherited from the past as well as with the overall impossibility of knowing –and perfectly forecasting- the future (1947 [1956, pp.36-8; pp.311-332]). All of them can therefore be considered as errors due to the real dimension of *historical* time (errors *in* time)[9].

2.2.4. Fanno's theory vs. other theories of fluctuations

Another difference between the two articles lies in the different way in which Fanno himself compares his theory of fluctuations with the other theories available in his times.

In the Italian article, for instance, Fanno concludes that his theory is compatible with most theories of fluctuations to the extent that it could be regarded as a kind of link between them (1931 [1993, p.437]). Among the cited economists we find: MOORE (1914), SCHUMPTER (1926), VON MISES (1928), HAYEK (1929), KEYNES (1930) and TUGAN-BARANOWSKY (1913). By contrast, in the Austrian article, Fanno appears more critical of the existing theories on the account of their excessive neglect of, or little attention given to, the role of errors in time as causes of fluctuations when the structure of production is time-consuming (1933 [2007, p.20]). We will deal with these observations in a different paper. For now we will limit ourselves to noting that Fanno's 1931 observation on the compatibility between his and other theories is based on the idea that these theories are to his own as the leaves or branches of a tree are to its roots. For it is not the variation of crops as such (Moore, Pigou), or new inventions as such (Schumpeter), or the time required to build plants as such (Tugan-Baranowsky, Spiethoff), or – to go back and up to more general theories– over-production or under-consumption as such, or the gap between savings and investment as such (Mises, Hayek, Keynes), or the waves of optimism and pessimism as such (Pareto, Pigou) that are at the roots of fluctuations: what is at their roots is, rather, the single fundamental cause in which all these superficial disturbances

---

9 On the distinction between historical and logical time, see J. Robinson (1978). See also Hicks (1976) on economics in time vs. economics of time. This point will be developed in our subsequent paper.

result, i.e. the errors in time committed by entrepreneurs embedded in a given time structure of production[10].

2.2.5. Saving and (unexpected) changes in saving

The most important difference between the Italian and the Austrian articles is nearly imperceptible. This difference relates to how clearly the notion of *saving* is distinguished in the two articles from the notions of *changes in saving*, on the one hand, and of *hoarding*, on the other, it being understood that these phenomena are dealt with in both articles as *unexpected* events.

To begin with, even the "unexpected" aspect of these phenomena is brought to light more clearly in the Austrian rather than in the Italian article. While, for instance, the 1931 article begins by stating that it "aims to examine certain aspects of distortions arising from changes within production and consumption flows", the 1933 article makes it clear from the very beginning that these are "unforeseen" ("unvorhergesehne") changes, this adjective being often re-utilized –mostly in conjunction with the not exactly equivalent term "plötzlich" ("sudden")– in the Austrian text (where it is reiterated that an "unforeseen/unvorhergesehne" event is an event that is also "unforeseeable/unvorhersehbar": more on this in §4 below). Thus the Austrian text reinforces the idea that fluctuations stem from unexpected shocks through the unavoidable adjustments (fluctuations) that would *not* take place if the structure of production were *not* time-consuming (in the Austrian sense).

But the place where the two articles fall particularly apart in this connection is where the Austrian article makes it clear that it is not *saving as such* that is a cause of recessions (or of depressions, a term inaccurately used in both articles as equivalent to the other). This is stressed by the 1933 elimination of a 1931 passage on the role of saving in the stationary state (which is assumed to hold before the shock occurs) as well as by the 1933 insertion of a passage on the non-harmful effects of saving. The passage expunged from the Austrian version is about the presumed incompatibility between savings and the stationary state (1931, p.334, where it was

---

10 Compare, in this connection, Fanno's criticism of Schumpeter as set out in the Italian article (1931 [1993, p.435, n.38]) with his criticism of Keynes as set out in the Austrian article (1933 [2007, p.15, n.15]. While in the former case Fanno defends his theory by arguing that it provides "the general features of any type of disturbance and, therefore, the principles of a true and real economic theory of crises", in the latter case he argues that the fundamental cause of fluctuations is not that savings and investment are decided by different sets of people but, rather, that the people who are in charge of deciding how much to invest cannot start to do it in time once the other set of people have decided how much to save.

stated that the assumption of stationary state must be abandoned when saving is admitted) while the passage inserted is about the possibility that, "when saving goes hand in hand with the production of capital goods, its increases can continue without limits without generating, at least in the long run, the harmful effects discussed above" (1933 [2007, p.12])[11]. If taken together, these two differences indicate that *saving* is one thing (the existence of which is as necessary in a stationary as it is in a growing economy) and that a *change* in saving (more precisely, in the propensity to save)[12] is another, it being understood that it is an *unexpected* change that is at issue in both cases. They also indicate that the shock focused upon at the beginning of both articles is a mere (unexpected) *drop in consumption* (as made out in some section titles of the English translation of the Italian article where these titles are missing) if the event is considered in the short run (i.e. with a given time structure of production) whereas it is *a rise in saving as distinct from hoarding* if the event is considered in the long run (i.e. with the resulting changes in the time structure of production). Thus the statement that saving is "harmful to both the individual and the society" (above, §2.1) should be taken to mean, first, that this "saving" rather amounts to an unexpected change in the propensity to save and, secondly, that it rather presents itself at the beginning as nothing but *hoarding*. When the point of view is that of society, the damage done by saving *considered in this sense* is that in these circumstances "real savings [*die reale Gesamtersparnis*] do not increase" while "real incomes [*das reale Gesamteinkommen*] fall"[13].

---

11 Fanno's qualms about how saving had been dealt with in the 1931 article are further proved by his later pointing out that in a stationary economy it is the flow of new savings that is equal to zero and by adding that, even in this case, the savings equal to zero are large-scale savings (1947 [1956, p.21]).

12 This specification of Fanno's rather inaccurate language is not missed by Graziani who takes Fanno's starting assumption (i.e. that "from a given moment, consumers decide to save" (1931 [1993, p.406]) as just "an increase in the propensity to save" (1993, p.398). This is confirmed by the language used in other parts of the Italian article and particularly in its section 12 (devoted to a summing up of the argument on the drop in consumption and entirely missing from the Austrian version) where expressions such as "increased tendency to save" and "accentuation of the tendency to save" can be found.

13 This reveals an ambiguity both in the Italian and in the Austrian article. For saving is intended in both circumstances first as a drop in consumption (when the recession begins) and later (when recovery starts again) as an extra demand for capital goods But it should be noted that even in this second case the meaning attached to the notion of saving does not correspond to the "real savings" mentioned in the passage above. For the point of view of society requires that these "real savings" be viewed either as purchasing power over the labour to be employed in the production of capital goods or as these very capital goods once they have been produced by the labour thus employed (1931 [1993, pp.414-18]; 1933 [2007, pp. 10-11]), rather than, as Fanno does, as purchasing power over these very capital goods. This ambiguity is partly cleared up and partly maintained by Graziani when, in his introduction to the Italian article, he makes out that in this article "the savers' final intention is not to hoard but to invest" (Graziani, 1993, p.398). A more general truth is that the scope of both articles is not to deal with the static principles of saving and capital but, as argued below in §2.2.7, with the dynamic adjustments resulting from the

2.2.6. Fanno's Austrian approach

There is a point of view from which the two articles share both a similarity and a difference. The similarity is in the Austrian view of production, the common foundation of both articles. This foundation was laid out first by Menger through his notion of goods of a higher order and, more particularly and extensively, by Böhm-Bawerk through his notion of time-consuming (roundabout) methods of production. The similarity between the two articles is strengthened by the common and new view of *time* on which they are based: whereas Menger's and Böhm-Bawerk's theories were based on *logical* time (in J. Robinson's sense), Fanno's approach (as well as the approach of the Austrians of his own generation such as Mises and Hayek) was based on *historical* or *real* time; on the idea, that is, that the time that is consumed by methods of production in *real* economies is not without *events* or *surprises*. Fanno's aim in both articles is focused upon the consequences of these events or surprises in economies where production is time-consuming.

But even in this connection there is some further, albeit minor, differences between the Italian and the Austrian articles. Take their titles first. The title of the Italian article is misleading because the expression "production cycles" ("cicli di produzione") is somewhat unfit for an article which highlights the causes of "business cycles" ("cicli economici"), it being understood that an analytically more appropriate expression for such a title should have been something like "time-consuming production" or "time structure of production". The title of the Austrian article is in this context more appropriate. For, on the one hand, it is not time-consuming production as such that is focused upon even in this article (this is after all what had already been accomplished by Böhm-Bawerk). Rather, it is the consequences that, in such a theoretical framework, descend from historical time and the disappointment of expectations (errors in time) on the ups and downs of actual production. On the other hand, the framework of time-consuming production is best highlighted in the Austrian article if only because the analysis of credit cycles is here mostly neglected while the Austrian expression "goods of a higher order" ("Produktionsgüter höherer Ordnung") is here repeatedly used in lieu of, or in addition to, the less sophisticated expression "beni strumentali" ("instrumental goods") used in the Italian article.

---

intertemporal miscoordination of plans between the various groups of people operating in a given time structure of production.

2.2.7. Forecasts, expectations and plans

From a number of passages both in the Italian and in the Austrian articles it might result that the fundamental cause of fluctuations is our inability to forecast the future correctly. Yet Fanno maintains, in the same or in different passages, that this cause is rather the inability of producers to adjust instantaneously the time structure of production as soon as an unexpected shock occurs. It should indeed be noted that the inability to forecast the future is a general feature of the human condition and affects, as such, even that "early and rude state of society" where no capital is employed and no fluctuations, except those generated by natural events, occur. It should accordingly be pointed out that it is only when this inability to forecast the future correctly is coupled with the inability of producers to adjust instantaneously the time structure of production that the fluctuations of modern industrial economies arise. This implies that the distinguishing feature of these economies, and the real object of the modern theory of fluctuations, is not the former inability –which always exists– but the latter –which exists only when methods of production are time-consuming and, indeed, when more or less time is embodied in the production of different consumer goods.

This makes it possible to argue that the real object of the Fanno articles, and more particularly of the Austrian article, is the study not of forecasts as such but, rather, of *expectations*. For the time structure of production that exists today is the result of the expectations that producers, and particularly the producers who come first in the chain of time-consuming transformations, had formed when they decided to give a certain shape to such a chain. The time structure that these producers are now unable to adjust instantaneously to the new conditions created by a present shock is the structure that they have inherited from the irreversible decisions that they themselves made in the past. "Now" means the moment in which the future that they expected while shaping this structure fails to materialize owing to the unexpected shock of today. Their "error in time" is nothing but the disappointment of their expectations and implies a falsification of their past *decisions* rather than of their past *forecasts*.

However subtle, the distinction between expectations and forecasts is crucial in the theory of fluctuations for the former notion implies the idea of *planning* whereas the latter does not. And it is the coordination of plans (i.e. of the *current* decisions by consumers and the *previous* decisions of producers) that is required for macroeconomic equilibrium to hold; or, in other words, it is their *miscoordination in time* or, as we may call it, the *intertemporal miscoordination of plans* that is needed for fluctuations, i.e. a break in macroeconomic

equilibrium, to occur. Fanno's central idea seems to be that this intertemporal miscoordination is *unavoidable* once our general inability to predict the future is coupled with our specific inability to adjust instantaneously the time structure of production as it stands.

2.2.8. The role of economic policy

A final difference between the two articles can be identified in their diverging views on the role of policy-makers in managing fluctuations. The section devoted to this issue in the 1931 article (§7) deals with the counteractive measures by which the increasing contraction of output resulting from an initial shock can be partially or totally averted. These measures are 1) unemployment benefits, 2) public works programmes, 3) maintaining the production of consumer goods in spite of the reduction in their demand, 4) promoting an equivalent production of capital goods. Of these four measures only the fourth, i.e. the replacing of the production of consumer goods by the production of capital goods, which had already been regarded in the Italian article as "the best solution of all", is discussed in the Austrian article as the only one that is a "really effective measure with long-lasting results" (1933 [2007, p.11]). But there is this further difference between the Italian and the Austrian articles: while both articles admit that even in this case fluctuations occur, at least in the transitional period, unless the production of consumer goods falls at the same *instant* and by the same *amount* as the production of capital goods – in the different quantities and qualities desired by savers – increases; and while both articles admit that these assumptions are made impossible by the given time structure of production, the Austrian article is focused only on the actual case in which the producers of consumer goods and of capital goods, being unable to predict the drop in consumption with the necessary anticipation, do react to this drop with a considerably different delay. This confirms that the stress of the Austrian article is about the impact of *errors in time* on the time structure of production rather than about any other subsidiary or concomitant cause of fluctuations. And therefore is instrumental to the final argument (which is missing in the Italian article) that, if *errors in time are unavoidable*, fluctuations are unavoidable in their turn[14]. Thus the ultimate problem tackled in the Austrian article is the problem of the effectiveness of economic policy once errors have been committed and fluctuations begin or are

---

14 This does not mean that economic policies are totally useless and should be avoided. In his later book on fluctuations, for instance, Fanno (1947 [1956, Ch. 15]) recognizes the role of policy-makers in combating recessions but emphasizes the idea that their policies should not be inspired by a single recipe or theory, a suggestion that paves the way for the "art of central banking", an idea that in turn conforms to the unpredictability and complexity of fluctuations.

about to begin[15]. In Fanno's view, economic policy can mitigate but cannot eliminate the effects of errors (1933 [2007, p.26]). After briefly discussing this view at the end of the Austrian article, Fanno develops it more firmly in his later book on fluctuations (1947 [1956, pp.428-51]).

3. Concluding remarks

We have argued above that the Austrian article brings to light more clearly than the Italian article the role of errors in time as fundamental and unavoidable causes of fluctuations. We have also noted that the opposite occurs with regard to the role of money and credit in amplifying these fluctuations. At the crossroads of these diverging emphases and at the core of both articles is the role of *saving*. This role is sometimes obfuscated and sometimes clarified in some passages of the Italian as well as of the Austrian article. From the arguments above it follows that this slightly unclear approach can be clarified as follows: i) saving (propensity to save) is one thing while a change (and, more particularly, an unexpected change) in saving (in the propensity to save) is another; ii) the impact of such an event on the macroeconomic equilibrium is, in the short run i.e. once the time structure of production is given, the same as if the act of saving were an act of hoarding whereas, in the long run i.e. when the time structure of production can be changed, this impact results in a wave-like transition towards a more time-consuming structure of production; iii) this twofold and deferred impact is due not so much to the producers' inability to forecast the future but, more particularly, to the *intertemporal miscoordination* of the *previous* decisions (plans) of producers with the *present* decisions (plans) of consumers (or of different Groups of producers) once the time structure of production inherited from the past is given; iv) as specifically indicated in section 20 of the Italian article as well as in footnotes 13, 21 and 22 of the Austrian article (the first of which is missing in the Italian article), Fanno's theory of fluctuations is compatible not only with other similar theories of his times but also with the classical theories of capital, however different their objects, their methods and their conclusions.

4. Notes on the English translation

The English translation of the Austrian article has been done by us under the supervision of Dr. Ralph Church, a lecturer of English at the University of Padova, and is added as a further

---

15 Here Fanno's references are to Mises (1928), Wicksell (1897) and Keynes (1930).

appendix to this introduction. The Italian translation of the same article has equally been done by us under the supervision of Dr. Dagmar Winkler, a lecturer of German at the University of Padova, and Dr. Marina Grusevaja, a lecturer of Economics at the University of Potsdam. This translation is available from the internet site of this Journal. While completing the Italian translation we had in mind the original text of the Italian article which, however shortened and altered for publication in the *Zeitschrift für Nationalökonomie*, must have been largely preserved in the now lost manuscript. We warmly thank our three colleagues for their work and particularly for their very helpful suggestions in finding the solution to a number of problems posed by setting Fanno's articles in three different languages. Some of these problems are listed below.

1) We have frequently opted for the term "shocks" rather than for the term "disturbances", though this is a more literal translation of the Italian "perturbamenti" and of the German "Störungen", in view both of the widespread use of the term "shock" in modern macroeconomics and of some ambiguity in Fanno's text where the same terms are used to mean sometimes the originating events (shocks) of fluctuations and sometimes the economic repercussions of these events.

2) We emphasized above the role of "unexpected" events in the Austrian article. In our translation we have taken care in distinguishing terms such as the English "sudden" or the German "plötzlich" from the apparently equivalent English terms "unexpected", "unforeseen" or "unpredictable" and the corresponding German terms "unvorhergesehne" and "unforhersehbar". The reason is that an event may be "sudden" without being "unexpected" and it may be "unexpected" without being "unpredictable" (the runners' starting jolt in the 100-meter competition, however "sudden", is neither "unpredictable" nor "unexpected"). What is crucial in Fanno's reasoning, and particularly in the reasoning of the Austrian article, is the unexpected, not the sudden or unpredictable, event.

3) "Errors in time" is an immediate translation of "Irrtümer in der Zeit" as highlighted in the title of the Austrian article. However, there are passages in Fanno's works where a more appropriate translation or interpretation of the text might be "errors *of* time". We believe that there are analytical reasons for preferring the former, more general, expression to the latter. These reasons are embodied in our view, developed above, that the gist of Fanno's reasoning is the *intertemporal miscoordination of plans* as something necessitated in the time structure of production by the flow of historical time and by the unavoidable surprises entailed by it. The

expression "errors *of* time" rather refers to the avoidable, and relatively superficial, mistakes committed for instance by an actor or a player when entering a scene or concert at the wrong moment.4) We have translated the German expression "Gesamterzeugung" (which mostly stands for Fanno's 1931 "produzione globale") with "aggregate production". We have equally translated the German expression "unmittelbare Verbrauchsgüter" (which mostly stands for Fanno's 1931 "beni diretti") with "consumer goods" or "final goods" or "goods ready for immediate consumption" as perfectly equivalent expressions.

5) We have taken care in using the terms "phases" (such as, for instance, the "phases of the business cycle") and "stages" (such as the "stages of the production cycle") as referring to two different concepts. These in turn reflect the different role of time as an "ingredient" and of time as a "container" in economic analysis (MEACCI, 1994).

6) Footnote 7 of the English translation is one of the passages added to the Austrian article. This footnote supports the idea, mentioned above, that the larger the number of Groups involved in the production cycle the more prone the economy is to errors in time. It also strengthens the meaning of the sentence on the "accumulation of repercussions of the drop in consumption as these repercussions ascend the stream of the production process" which, however present in the Italian article (1931, p.337 [see 1993, p.409 for an inaccurate translation]), was dropped from the Austrian article.

References

ARENA R. 1998, "Marco Fanno", in F. MEACCI, *Italian Economists of the 20th Century*, Cheltenham, Edward Elgar, pp.114-133.

FANNO M. (1931), "Cicli di produzione, cicli del credito e fluttuazioni industriali", *Giornale degli Economisti*, XLVI, pp.329-69.

FANNO M. (1933), "Irrtümer in der Zeit als Ursachen wirtschaftlicher Schwankungen", *Zeitschrift für Nationalökonomie,* IV, pp.25-51.

FANNO M. 1947, *La teoria delle fluttuazioni economiche*, Torino, UTET; second edition 1956.

FANNO M. 1992, *Teoria del credito e della circolazione,* edited by R. REALFONZO and A. GRAZIANI 1992, Napoli, Edizioni Scientifiche Italiane.

FANNO M. 1993, "Production Cycles, Credit Cycles and Industrial Fluctuations", *Structural Change and Economic Dynamics*, 4, pp.403-37.

FANNO M. 2007 (Engl. transl.), "Errors in Time as Causes of Economic Fluctuations", *Il Pensiero Economico Italiano*, XV, pp.147-163.

GRAZIANI A. 1993, "M. Fanno's 'Production Cycles, Credit Cycles and Industrial Fluctuations': An Introduction", *Structural Change and Economic Dynamics*, 4, pp.393-402.

HAGEMANN H. (ed.) 2002, *Business Cycle Theory, Selected Texts 1860-1939* ,Vol. II, London, Pickering & Chatto.

HAYEK F.A. 1929, *Geldtheorie und Konjunkturtheorie*, Wien, Holder-Pichler-Tempsky.

HICKS J. R. 1976, "Some Questions of Time in Economics", in A. M. TANG, F. M. WESTFIELD and J. S. WORLEY (eds), *Evolution, Welfare, and Time in Economics. Essays in Honor of Nicholas Georgescu-Roegen*, Toronto, Lexington Books, pp.135-151.

KAHN R. F. 1931, "The Relation of Home Investment to Unemployment", *Economic Journal*, 41, pp.173-98.

KEYNES J. M. 1930, *A Treatise on Money,* London, Macmillan.

MEACCI F. 1994, "Hayek and the Deepening of Capital", in M. COLONNA, H. HAGEMANN, and O. HAMOUDA (eds), *Capitalism, Socialism and Knowledge*, Aldershot, Edward Elgar, , Vol.II, pp. 26-44.

MEACCI F. 1998, *Italian Economists of the 20th Century*, Cheltenham, Edward Elgar.

MISES L. V. 1928, *Geldwertstabilisierung und Konjunkturpolitik*, Jena, Fischer.

MOORE H. L. 1914, *Economic Cycles: their Law and Cause*, New York, Macmillan.

REALFONZO R. and GRAZIANI A. 1992, "La *Teoria del credito e della circolazione* di Marco Fanno", in M. FANNO, *Teoria del credito e della circolazione*, Napoli, Edizioni Scientifiche Italiane, pp.XV-LXXIII.

ROBINSON J. 1978, "History versus Equilibrium", *Thames Papers in Political Economy*, London, Thames Polytechnic.

SCHUMPETER J. A. 1926, *Die Theorie der wirtschaftlichen Entwicklung*, Munchen and Leipzig, Duncker & Humblot.

TUGAN-BARANOWSKY M. I. 1913, *Les crises industrielles en Angleterre*, Paris, Giard et Brière.

WICKSELL K. 1897, "Der Bankzins als Regulator der Warenpreise", *Jahrbücher der Nationalökonomi*e, 68, pp.228-43

WICKSELL K. 1906*, Föreläsningar I Nationalekonomi,* translated from the Swedish by E. CASSEL, *Lectures on Political Economy,* edited with an introduction by LIONEL ROBBINS, NewYork, Macmillan, 1935

THE PRODUCTION CYCLE IN FANNO'S STEADY STATE ECONOMY

(A) *100 days*+ (B) 25 days + (C) *100* days + (D) 25 days + (E) *100* days + (F) 25 days = 375 days

---

Group A *(Producers of instrumental goods of higher order - machines, industrial raw materials, raw food-stuffs – who sell to* B)

In 100 days they produce and sell goods worth 1.100 millions: 1.000 millions (the amount of costs) are borrowed from banks; 10% is earned as profit.

↓

↓ instrumental goods of a higher order

    -machines

    -industrial raw materials

    -agricultural raw materials

    -other goods of a higher order

↓

Group B (*Wholesalers who purchase instrumental goods of higher order from A and sell instrumental goods of every type to C and only machines to E)*

They purchase 1.100 millions worth of instrumental goods of higher order from A.

Daily outlay: 11 millions (1.100/100); minimum stock: 275 millions (=11 millions x 25 days).

They borrow 275 millions from banks.

They sell machines for 1.210 millions (1billion to C + 210 millions to E)

Total sales are 1.100 millions + 10% profit (=1.21 Billion)

↓

↓ machines   ↘

                                       E

↓ other instrumental goods of a higher order

↓

Group C *(Producers who transform instrumental goods into semi-finished goods and sell to D)*

They purchase 1 billion worth of machines from B. Total costs are 3 billions (2 billions for interests, wages, rent and so on)

In 100 days they produce and sell semi-finished goods worth 3.300 millions (= 3 billions costs + 10% profit)

↓

↓ semi-finished goods

↓

Group D *(Wholesalers who purchase semi-finished goods from C and sell to E)*

They purchase semi finished goods worth 3,3 billions.

Daily outlay: 33 millions (= 3.300/100).

Minimum stock: 825 millions (=33 millions x 25 days).

They borrow 825 millions from banks.

They sell semi-finished goods for a value of 3,63 billions (3,3 billions + 10% profit)

↓

↓ semi-finished goods (produced by C)

↓   **B**

↓   ↙

Group E *(Producers who transform semi-finished into finished goods and sell to F)*

They purchase 3,63 billions worth of goods from D and 210 millions worth of goods from B.

Total cost of production (included interests wags and rent): 5 billions.

They sell finished goods for a total value of 5,5 billions (5 billions + 10% profit)

↓

↓ finished goods

↓

Group F (*Wholesalers and retailers who purchase finished goods from E and sell to G)*

They purchase finished goods from E for a value of 5,5 billions.

Daily outlay: 55 millions (= 5.500/100).

Minimum stocks: 1.375 millions (=55 millions x 25 days).

They borrow 1.375 millions from banks.

They sell finished goods for a value of 6.050 millions (5.5 billions + 10% profit)

Total credit outstanding in the economy: 1.000 (A) + 275 (B) + 3.000 (C) + 825 (D) + 5.000 (E) + 1.375 (F) = 11.475

APPENDIX 2

A SUDDEN (UNEXPECTED) DROP IN CONSUMPTION IN FANNO'S STEADY STATE ECONOMY

***Group* G** (*Final consumers*)

They buy goods from F.

A *5%* sudden drop in consumption (increase of saving) is assumed. Final purchases fall by 5% → 6.050 millions (previous consumption) – 5% (302,5 millions) = 5.747,5 millions (rounded off at 5.75 billions)

↓

↓

Group F (*Wholesalers and retailers who purchase finished goods from E and sell to G)*

They sell finished goods to G.

Their purchases from E fall by 5% → 5.500 millions (previous purchases) – 5% (= 275 millions) = 5.225 millions (rounded off at 5,23 billions)

F must hold stocks equivalent to 25 times their daily purchases. Since purchases ↓, stocks ↓ as well.

BEFORE DROP: 5.500/100 = 55 millions (daily purchases) x 25 days = 1.375 (stocks)

AFTER DROP: 5.230/100 = 52,3 millions (daily purchases) x 25 days = 1.307,5 (stocks)

5% of 55 millions in daily purchases = 2,75 millions: that is the total diminution in daily purchases → 2,75 millions x 25 days = 68,5 millions (the total diminution in minimum stocks)

Purchases must be stopped for 1,25 days→ 68,5/52,3 = 1,25

The total diminution in purchases → 275 millions (diminution in total purchases) – 68,5 (diminution in stocks) = 343,5 millions that is 6,25% of previous purchases

---

↓

↓

Group E *(Producers who transform semi-finished in finished goods and sell to F)*

They sell to F.

BEFORE. Costs: 5 billions; sales: 5.5 billions-worth.

Since purchases ↓ by 6,25%, sales to F ↓ of 6,25% every day.

E cuts current production by 6,25%, and new production by 12,5 %.

In average in 100 days production is likely to fall by 9,37% [(6,25 + 12,5)/2]

Costs ↓: 5.000 – 9,37% (468,5) = 4.532 billions

Purchases ↓ by 12,5%[16]

↓

---

16 According to Fanno's reasoning, E's purchases should diminish by 9,37% and not by 12,5%. In fact, when Fanno deals with group C (producers as well as E) his reasoning and conclusions are different. See below.

↓

Group D *(Wholesalers who purchase semi-finished goods from C and sell to E)*

They sell to E.

Purchases fall by 12,5% → 3.300 (previous purchases) – 12,5% (412,5) = 2.887,5 millions

Stocks fall by 12,5% → 825 (previous stocks) – 12,5% (103.125) =721.875 millions

Daily stocks fall → 33 (previous daily stocks) – 12,5% (4.125) = 28.875 amount necessary to cover the fall in total stocks (103.125)

Purchases must be stopped for 3,57 days → 103.125/28.875 = 3,57

Purchases fall → 3.300 – 412,5 – 103.125 = 2.784,37, where 412,5+103.125 is about 16% out of 3.300

↓

↓

Group C *(Producers who transform instrumental goods into semi-finished goods and sell to D)*

BEFORE: costs 3.000; sales 3.300.

Sales to D fall by 16%

C cuts current production by 16% and *ex novo* production by 32%

In average in 100 days production is likely to diminish by 24% [(16 + 32)/2]

costs ↓: 3.000 – 24% (720) = 2.280

Purchases ↓ of the 24%[17]

↓

↓

Group B (*Wholesalers who purchase instrumental goods of higher order from A and sell instrumental goods of every type to C and only machines to E)*

They sell to C (instrumental goods of every type) and to E (only machines).

Purchases fall by 24% → 1.000 – 24% (240) = 760 millions

Stocks fall by 24% → 275 (previous stocks) – 24% (66) = 209

Daily stocks fall → 11 (previous daily stocks) – 24% (2,64) = 8.36

Purchases must be stopped for 7,89 days→ 66/8,36 = 7,89

Purchases fall: 1.000 (previous purchases) – 240 (diminution in purchases) – 66 (diminution in stocks) = 694 where 240 + 66 = 306 is about 30% out of 1.000.

↓

↓

17 According to Fanno's reasoning applied to group E, purchases should diminish not by 24% but by 32%. See frame of group E.

Group A (Producers of instrumental goods of higher order - machines, industrial raw materials, raw food-stuffs – who sell to B)

BEFORE: costs = 1 billion; sales = 1.1 billion

Purchases fall by 30%

A cuts current production by 30% and ex novo production by 60%

In average in 100 days production is likely to fall by 45% [(30 + 60)/2]

Purchases fall by 45%[18] → 1.000 – 45% (450) = 550

---

18 See and compare frames of groups C and E.

Errors in Time as Causes of Economic Fluctuations*
by
Marco Fanno, Padua

1. The present article aims to examine some particular aspects of economic disturbances due to unexpected changes in the rhythm of production and consumption. It is therefore a contribution to the study of the problem of economic fluctuations. Before entering this problem, it is worth clarifying some fundamental concepts.

Whatever the intermediate stages maybe, economic activity terminates with the production of consumer goods. It is therefore made up of numerous and complex technical and economic operations. Through these operations raw materials are transformed and, by going through successive stages, they mature into the consumer good. The series of all operations necessary *in a given moment* to produce and sell a given good –starting from those which, at a given moment, represent the initial start-up to those creating the final link with the consumer– shall be called the *production cycle of a good* or, more simply, the *production cycle*. We shall call the time necessary to complete this process *production cycle duration*. According to this definition, the production cycle of a determined group of consumer goods starts with the production of plant and equipment if, in order to start the production of these goods, it is necessary, at this stage, to provide for the creation of new plant and equipment; or it starts from the production of raw and secondary materials if, at that moment, existing plant and equipment are sufficient to carry out this role. We shall call the former the long production cycle and the latter the *short production cycle*. From what has been said above, it follows that the duration of any production cycle, long or short, depends on: 1) the duration of successive production operations which are part of it; 2) the rhythm with which the goods are sold in the successive production stages. The length of a production cycle may therefore increase either because of an increase in time in some, or all, the technical operations of production, as a result of changes in production methods, or the rate of sales in some or all of its stages is delayed for any other reason. But the length may also increase, other things being equal, if any expansion of the production of the good in question requires, at a given moment, the creation of new plant and equipment. In this case, this is due to the fact that, when starting at the said moment, the short production cycle is transformed into a long cycle.

We shall call the volume of all credit subsequently created to finance a determined cycle, or a given part of a given production cycle, the *credit cycle*. And we shall call *credit cycle duration* the time necessary for the bank credit thus created to be completely extinguished.

2. Let us move on to look at the production and credit cycles in a country. For simplicity's sake we shall assume that a) traders and producers work exclusively with bank credit; b) business categories include the following six groups: 1) **Group A** (entrepreneurs/producers of industrial and agricultural raw materials and machinery, hence instrumental goods of a higher order); 2) **Group B** (wholesalers who purchase machinery and other instrumental goods from A and sell machinery to C and E and other instrumental goods only to C); 3) **Group C** (industrialists who, by using their existing machinery and those bought from B, transform industrial and agricultural raw materials into semi-finished goods, i.e. instrumental goods of a lower order); 4) **Group D** (wholesalers who purchase semi-finished goods from C and sell to E); 5) **Group E** (industrialists who, by using their existing machines and those bought from B, transform the semi-finished goods bought from D into consumer ready goods); 6) **Group F** (wholesalers and retailers who purchase consumer goods from E and sell to G). Group G is very wide and includes all parties who directly or indirectly contribute to the production or sale of the various goods. Therefore it

includes first of all groups A, B, C, D, E, F; but also all blue- and white-collar workers, landlords, factory owners, capitalists, banks and bankers. It is these groups that, by lending their personal services to groups A, B, C, D, E, F or having made material goods available to them, are rewarded by the six groups for their contribution to production. They therefore have money resources at their disposal that are necessary for the purchase of the various goods[19]. Machinery built by A, bought by B and thereafter sold partly to C, partly to D and partly to E, preserves and increases the *capital equipment* of these groups. Raw and auxiliary materials, produced by A and transformed into semi-finished goods by C and into finished goods by F, represent, in the various production stages in which they go and in which they find themselves at any particular moment, the enterprises' *real working capital*[20].

Finally, let us assume that: a) groups A, C and E require on average 100 days to produce, i.e. to transform, their products; b) groups B, D and F keep them for 25 days on average, i.e. they keep on average *stocks* 25 times greater than a day's total purchases; c) the country considered) is in stationary economic conditions; d) as a result: α) the flow of new savings is zero; β) the plant used by A, C and F is sufficient for current production of the respective goods; γ) the production of machinery by group A is limited solely to the amount needed to replace any worn-out machinery either in group A or in groups C and F. The complete production cycle, from production start-up as raw materials to their sale as final consumers, lasts 375 days (100 + 25 + 100 + 25 + 100 + 25).

In 100 days group A produces machines and other instrumental goods of a higher order equivalent to 1.1 billion Schillings and borrow about 1 billion schillings from the banks, the 10% difference being their profits. Group A uses this amount mainly to pay wages, interest, rents and so on. During the 100-day period group B buys machinery and other instrumental goods of a higher order worth about 1.1 billion from A. However, since only stocks equivalent to 25 times the quantity of the daily purchases are held, group B needs bank loans equal to a quarter of the turnover figure for the 100-day period, i.e. an amount equivalent to 275 million Schillings. Group B will then produce sales equal to about 1.21 billion, with 1 billion coming from the semi-finished goods sold to C and 210 millions from the machines sold to E, plus 10% profit. In 100 days group C produces semi-finished goods worth 3.3 billion at a cost of 3 billion which is made up of 1 billion-worth of machinery and raw materials and 2 billions-worth of wages, interest, rents and so on[21]. Group D buys 3.3 billions of semi-finished goods from C but, like group B, needs bank loans equal to a quarter of the turnover figure for the 100-day period, i.e. an amount equivalent to 825 million Schillings. They sell to E for a total of 3.63 billions. Group E, in turn, buys 210 millions-worth of machines from B and 3.63 billions-worth of semi-finished goods from D in order to produce consumer goods, with a total cost of 5 billion that include wages, interest, rents, and so on. Group E sell consumer goods to F for 5.5 billion. Group F sells all goods to consumers of group G for 6.05 billions. The total loans required by groups A, B, C, D, E, F and provided by banks are thus equal to a total of 11.475 billion Schillings. This amount is supposed to be the banking system's normal credit volume of the country under consideration.

---

* Engl. Transl. of "Irrtümer in der Zeit als Ursachen wirtschaftlicher Schwankungen", in *Zeitschrift für Nationalökonomie*, Vol. IV, Heft 1, 1933, pp.25-51.

19 Abbati, *The final buyer*, London, 1928, pp.45 ff.

20 Hawtrey, *Trade and Credit*, London, 1928, cap.VII, pp.119-141; Robertson, *Banking Policy and the Price Level*, p.42; Keynes, *A Treatise on Money*, London, 1930, vol. II, ch. 28, pp.102-129; Hayek, *Prices and Production*, London, 1931, p.37.

21 Hawtrey, *Currency and Credit*, p.45.

The production by groups A, C and E is a continuous flow as is the buying and selling by B, D and F. Every day, therefore, group A produces machinery plus industrial and agricultural raw materials which are then bought by group B. Group A is thus able to pay off part of its bank debts. However, this reduction in debts is equalled by a corresponding increase in the debts carried by group B[22]. B in turn sells machinery to E and industrial and agricultural raw materials to C and is thus able to pay off part of its bank debts. However, as these are paid off, group C needs to take out new and larger loans. The same holds for groups D and E. Finally, group F buys consumer goods from E and asks for loans in its turn, but sells these goods daily to G, i.e. essentially to A, B, C, D, E, F and to all those who, having received remuneration for their direct or indirect contribution to production, have the monetary means necessary for such purchases. Therefore group F, by selling to group G, reduces its debts without the need for others to raise theirs. We may conclude therefore that *only sales to consumers enable producers and traders, considered as a whole, to pay back all debts incurred by them to finance a given production cycle. And this enables banks to reduce their credit volume by the same amount*[23].

Effectively, however, this does not occur in reality, at least during the course of normal production and credit cycles in a stationary economy like the one under consideration. In fact, in a stationary economy production maintains a constant level of volume. Group A is therefore able to repay an average of 1/100 of its debt on a daily basis. However, by having to start up a new production cycle every day – the same as the previous day's in every respect – they must take out a new loan equivalent to this amount also on a daily basis. Groups B, C, D, E, F do the same. New debts equal to the old ones are thus created and the credit volume remains unchanged.

3. Given all the above premises, let us assume that some *shocks* come into play. The possible shocks are infinite. But for the moment we shall consider only one. To be precise we shall assume that, *at a given moment, consumers begin to save*. First we shall consider or, rather, look closely at this shock because it is this which, better than any other, lends itself to highlighting the main effects of a sudden disturbance in the equilibrium between production and consumption. Furthermore, it will help us on to determine later the repercussions brought about by other types of disturbances.

Let us assume that consumers, at a given moment, decide to save 7.50% of their monetary income. It would appear that such a situation should be restricted to a corresponding reduction in the production of consumer goods. In the end, this may well prove to be the case. However, during the transitional period, repercussions of a varying nature or an exceptional gravity cannot fail to materialize. These are the repercussions we aim to analyse.

From the moment the drop in consumption occurs the flow of sales by F falls with a consequent reduction in the prices of consumer goods. Let us assume that the fall in prices is such that the effective consumption falls only by 5% and let us assume furthermore – in order to consider for the moment the most favourable hypothesis which we shall see does not correspond to the real world – that the drop in consumption remains unchanged at the initial level of 5% for the entire duration of the production cycle. What will be the fall of aggregate production and what will be the fall of production in each of the groups involved in the production cycle? This will depend on moves taken by producers and traders. The drop in consumption reduces the sales of traders and producers and increases their stocks to the same extent. It is, therefore, to producers' and traders' advantage to cut their own production and purchases as soon as possible. Let us assume that this takes place according to the above assumptions and let us see what and how

---

22 To be precise, this increase is 10% greater than the reduction in A's debts.

23 "This debt is only finally paid off when the goods are sold, not to be dealt in, but to be consumed…." (Hawtrey, *ibid.*, p.8).

many repercussions in the first 100 days after the shock will occur 1) in each group's production and purchases; and 2) in aggregate production.

With a 5% drop in consumption by group G, the sales per day of group F fall by the same amount -more precisely from 6.05 billions to 5.75 billions- while purchases fall from 5.5 billions to 5.23 billions[24]. If we assume that the stocks kept by those groups are also equal to 25 times their daily purchases, these stocks will diminish by 5% and more precisely by 68.5 millions. As a consequence, the groups considered would stop their purchases for 1.25 days and would reduce them by 343.5 millions, i.e. by 6.25%.

The situation of group E will be as follows: during the 100-day period prior to this moment, group E has been preparing, with a total cost of 5 billions, goods ready for immediate consumption to be sold for 5.5 billions. When consumption begins to diminish, those commodities are at different stages in their production process so that they require different periods before coming to completion, one day for some, two days for others, three days for still others and so on up to a maximum of 99 days. With daily sales reduced by 6.25% in the first 100 days, group E *will have to reduce by 6.25% first the work on products already in the pipeline of production but at the same time it will have to cut by twice as much, i.e. by 12.5%, new production while 6.25% of the production of the previous 100-day period is still available at different stages of transformation.* It is therefore possible to calculate, on a very rough basis, that in the first 100 days after the shock the production of group E falls by 9.37%, i.e. from 5 billions to 4.532 billions, while its purchases from group D fall by 12.5%.

As for group D, this group will cut its purchases by 12.5% but will have also to diminish its stocks by the same amount and to interrupt its purchases for 3.57 days and to resume them for 96.43 days, with a total reduction of 12.5%. All things considered, the purchases of this group fall from 3.3 billions to 2.77 billions, that is by 16%. If we now apply to groups C and A the calculations made for group E and to group B the same calculations made for groups F and D, we obtain the following results:

Producers and traders Groups	Production or purchases in 100 days prior to fall in consumption	Production or purchases 100 days following start the fall in consumption	Percentage fall = [(b-c)/b] 100
	Millions of Schillings		
(a)	(b)	(c)	(d)
A (producers)	1,000	550	−45%
B (traders)	1,100	768	−30%
C (producers)	3,000	2,280	−24%
D (traders)	3,300	2,770	−16%
E (producers)	5,000	4,532	−9,37%
F (traders)	5,500	5,230	−6,25%

24 Concerning the numerical data provided in the text, the following qualifications need to be made. These data reflect the monetary values of the production, purchases and sales of the various groups of producers and traders under the assumption that the prices of goods and services remain unchanged. In calculating the monetary values of these magnitudes, we have assumed constant price levels, even though they may have changed in the meantime, in order to be able to derive from the changes in these monetary values the variations in the volumes of production and purchases; which are the data of prime interest to us. It is understood, therefore, that the data used in the text must be considered to be nothing but representative indices of variations in the production levels and buying volumes of the various groups of producers and traders.

From this table it results that *a 5% drop in consumption* brings about the following consequences in the following 100-day period: a *fall* of 18.2% *in aggregate production* (the production of groups A, C, E falls from 9 to 7.362 billions); a 6.25% reduction in the purchases of group F; a 9.37% reduction in the production of group E; a 16% reduction in the purchases of group D; a 24% reduction in the production of group C; a 30% reduction in the purchases of group B and a 45% reduction in the production of group A.

We have reached these results starting from two crucial assumptions; i.e. 1) that traders continuously keep stocks equal to 25 times their daily purchases and accordingly reduce them exactly in the same percentage of their sales; 2) each group of producers cuts its production immediately, i.e. as soon as its sales diminish.

These two assumptions do not always and completely correspond to reality. We have therefore to take into consideration what happens when reality does not match these assumptions. As for the traders, experience shows that, when consumption increases and prices rise, they tend to increase their stocks to their maximum whereas, when consumption diminishes and prices fall, they tend to reduce them to their minimum. One may accordingly assume that a drop in purchases and production, if it results from a drop in traders' stocks, will turn out in reality to be bigger than that found in our numerical examples. As for producers, it may happen that some groups of producers regard the drop in sales as a passing phenomenon and keep their production momentarily stable or reduce it by less than necessary. Furthermore, it may happen that the drop in production of the various groups does not occur simultaneously, as assumed above, but in subsequent phases. In the former case, the initial reduction, whatever its size, necessarily gives rise to a greater reduction sooner or later for the accumulated stocks must eventually be used. On the other hand, we will in the latter case observe a lengthening of the adjustment process that follows the shock.

Whatever the size and the repercussions of the process of adjustment, the results of our numerical example do not change substantially. From the data obtained so far, we can derive the following general statements of fundamental importance:

I. Even a slight drop in consumption produces, at least immediately, *a far more noticeable reduction in aggregate production*. II. The drop in production is by far *greater for instrumental goods* as a whole than for consumer goods; and indeed, given the diversity of instrumental goods, it is the greater the more distant their position in the production process is from final consumption [25]; or, better, it is greater the higher the "order of goods" in *Menger*'s sense[26]. The reason for the greater variability in the production of all categories of instrumental goods relative to that of consumer goods, regardless of the intermittency of the creation of new plant, thus becomes clear[27]. Furthermore,

---

25 We could forego considering the different reductions in the output of various groups when nearly all stages of the production process are run by a vertical syndicate. This kind of syndicate, by controlling production in all its stages, can avoid not only the negative amplifications of shocks due to the panic or to the unusual behaviour of traders, but also the multiplication and degeneration of these repercussions from one stage to another in the process of production. The existence of a vertical syndicate may make the reduction in production be of equal size in all the stages of the process with the result that the reduction in aggregate production will be less intense in the downswing and vice versa in the upswing. This stabilizing effect of vertical syndicates on production deserves to be highlighted.

26 Menger, *Grundsätze der Volkswirtschaftslehre*, Wien, 1923, cap.II., p.20.

27 The dependency of the greater variability of the production and prices of instrumental goods on the discontinuity in the creation of new plants or, in a dynamic context, on the variations in the rate of increase in the consumption of final goods was extremely well highlighted by M. Clark, Studies in the Economics of Overhead Costs, Ch. XI, pp.386 ff. See also Frisch, "The interrelation between capital production and consumer-taking", *Journal of Political Economy*, October 1931.

the reason for the greater variability of prices also becomes clear in that prices are generally subject to even greater variations, all other conditions being equal, as the demand for goods varies, the greater variability in instrumental goods being, in this specific case, just an indication of the greater variability in demand.

4. In reality the repercussions of a drop in consumption are even more far-reaching than has been shown so far. As one may recall, the fall in *production* of various types of goods shown in the previous table was calculated under the condition of an initial 5% drop in consumption and no further drops during the production cycle. If this is the case, aggregate production should not only stop falling but also undergo a general recovery. Indeed, once stocks built up from the moment of the fall in consumption are exhausted, the only source of the supply of consumer goods would once again be the daily production output. This flow should match the daily flow of the demand for consumer goods which, according to our example, has been cut only by 5%. For this to occur after the first 100 days, aggregate production ought to experience a general recovery given the great extent of the previous contraction in output. But this does not happen since, as we have just pointed out, the assumption of constant consumption is out of touch with reality. Indeed, the reduction in the production of various groups over the 100 days following the shock can only lead to a rise in unemployment and a general fall in wages. This decrease in wages, which represents the means by which entrepreneurs can redress the balance between costs and prices, which was altered against them by the reduction of the latter, tends, along with the rise in unemployment, to reduce the monetary income of producers and consumers. Since, however, this income represents the only purchasing power available for buying consumer goods, ignoring any savings consumers may eventually put to this use, a decrease in this income would determine a further drop in the demand for such goods. From this, the following consequences result: not all the consumer goods available during these 100 days can be bought at current prices by the producers and consumers. A part of them will remain unsold and, being offered for sale, will force a further drop in prices and a further reduction in the production of different types of goods. Hence, the overall reduction will be greater than that illustrated in our numerical example.

But if after the first 100 days consumers continue to save, what will the effect be? By continuing to save consumers will spend less of their monetary income on consumer goods. Now the monetary income of the public – i.e. of producers and consumers – is in every production cycle equal to the cost of the goods produced in it, for this cost is nothing but the aggregate of the individual compensations paid by entrepreneurs to the various producers and consumers. It is therefore obvious that, so long as the public continues to spend less of their monetary income, a part of the consumer goods produced in every production cycle will remain unsold; which in turn implies that in the successive cycle aggregate production will undergo a further reduction with all the possible negative effects on the various productive groups discussed above. For reasons previously mentioned, the production of instrumental goods naturally decreases to a greater extent than that of consumer goods during this period of declining production. Even a slight reduction in the consumption of consumer goods may – if this continues for some time – have very significant effects on the production of instrumental goods. As theoreticians know very well, this factor explains why, in periods of economic depression, the activity of industries engaged in the production of this type of goods sometimes falls to insignificant levels.

The conclusion to be drawn is that saving, if it merely consists of goods not being bought, that is of hoarding or of the mere opening up of bank deposits, is harmful to both the individual and the society: it is harmful to the individual because unemployment will gradually increase and wages will fall, and it is harmful to the society because, while the real savings do not increase, real

incomes gradually fall. This fact was first highlighted by *Robertson*[28] and vigorously reiterated by *Keynes*[29].

5. What measures should be taken in order to avoid these negative repercussions? Many measures can be envisaged but the most important are: 1) unemployment benefits; 2) public works programmes; 3) maintaining production of consumer goods in spite of the reduction in demand; 4) production of new instrumental goods. Of these four measures the first three have a very limited impact for they can only mitigate or postpone the shock's harmful effects but are unable to eliminate them. The only really effective measure with long-lasting results is the fourth. It is on this measure alone that we will dwell upon.

The *production of instrumental goods* (industrial plant, machinery and equipment, working capital goods) *in lieu* of the consumer goods that savers stop consuming is undoubtedly the best solution of all. For this prevents (*at least in the long run*) the reduction in aggregate production and replaces the production of goods ready for immediate consumption but no longer demanded by the production of goods with deferred utility; of goods, that is, in which savings can be fruitfully embodied for some time at least30. When, therefore, saving goes hand in hand with the production of instrumental goods, its increases can continue without limits without generating, at least in the long run, the harmful effects discussed above. If, for instance, we adopt the assumption above that consumers, at a given moment, keep saving 7.50% of their monetary income, then aggregate production – which originally consisted of a flow of consumer goods equal in value to the monetary incomes of producers and consumers for each production cycle – will have partially to change direction in such a way as to accommodate, sooner or later and in every production cycle, a flow of consumer goods and a flow of instrumental goods equal in value to 92.5% and 7.5% of the monetary incomes of producers and consumers respectively. In this case, the aggregate volume of production will not decrease. And indeed from a certain moment onwards it will start to rise thanks to the contribution made by the new instrumental goods to further production[31].

However correct from the standpoint of the long run, these considerations are not exact if referred to the period of transition; that is to the period in which production, once consumers have increased their savings, is being adjusted to the new conditions. Here we want to focus on the *disturbances that take place during the period of transition* for this is what constitutes the core of our work.

In order for the adjustment of production, in the aforementioned sense, to take place imperceptibly and without jolts, i.e. without any change in the value of aggregate production and in the number of workers employed, it is necessary that at the very moment in which the public begins to save: 1) the production flow of consumer goods fall immediately by the same amount; 2) the production flow of instrumental goods increase at the same moment and by the same degree; 3) the new instrumental goods be produced in the exact quantity and quality required by the consumers willing to invest their savings. But, for these conditions to occur, it is necessary in turn: a) that changes in consumption levels on the part of consumers be forecast by producers both in

---

28 Robertson, *Banking Policy and the Price Level*, London, 1926, p.46.

29 Keynes, *A Treatise on Money*, London, 1930, vol. 1, p.174 ff.

30 Pantaleoni, *Principii di Economia Pura*, Firenze, 1894, p.296.

31 This is a fundamental truth that was adopted by our science a long time ago (see, for instance, J.S. Mill, *Principles of Political Economy*, London, 1821, Vol. I, Ch. V. §5, pp.71-73); yet recently it has been usefully re-examined and brilliantly strengthened by Hayek ("Gibt es Widersinn des Sparens?", in *Zeitschrift für Nationalökonomie*, Bd. 1, Heft 3; and "The Paradox of Saving", *Economica*, May 1931, p.140) who refutes the theories that want to deny this truth.

the extent of change and as to when it will occur; b) that consequently producers of consumer goods reduce their production levels by the required amounts since the very moment the new production cycle (which will be completed exactly when consumption begins to fall) commences, that is, with an anticipation equal to the complete production cycle of consumer goods; c) that with an equal anticipation producers of instrumental goods increase their production by the required amounts and quality levels; d) that the production cycle of instrumental goods have the same duration as that of consumer goods both from a technical standpoint and from the standpoint of employment levels; e) that the savers be prepared to invest their savings directly and into the instrumental goods produced with the correct anticipation by their respective producers. It is obvious that it is extremely unlikely that these conditions will occur simultaneously. It can even be said that none of them ever materialize perfectly. It remains to be seen, therefore, what will happen if any of these do not materialize or materialize imperfectly. There are several cases worth studying. But in order not to go beyond the limits of the current analysis, we will focus only on one case, and specifically on that in which conditions a), b) and c) are absent, so that the various groups have made the same error. This is nothing other than an *error in time*.

6. Let us assume that producers of consumer and instrumental goods do not foresee in time the reduction in consumption and only start to modify their production levels from the moment in which consumption actually begins to drop, that is, with a delay equal to a complete production cycle. From the moment the 7.50% drop in consumption begins, the production level of these goods at their various production stages drops overall, as seen above, by a far greater amount. However, since this should ultimately end up being exactly 7.50% lower than the previous level of production, after this first dip it should then pick up. Hence, the production curve of consumer goods is forced to take on a concave form. On closer inspection, the aggregate production curve is also forced to take on this form. Indeed, in the case we are examining, we have assumed that the beginning of the increase in instrumental goods production occurs at the same time as the fall in consumer goods production. Therefore, when the production of the latter starts to change, production of the former begins. The start of this trend helps improve the situation, but only slightly. For the production of instrumental goods not to prove excessive, it must be contained from the outset within limits such as to cause in turn a flow of instrumental goods equal in value to 7.50% of aggregate monetary income. Now in the case where the production process and cycle of instrumental goods are in all respects (duration, technical organization, fixed and circulating capital ratios, the ratios between these and the workforce) identical to that of the final goods whose production falls, the production value of instrumental goods and the employment level will represent respectively 7.50% of aggregate income and of the working population. This 7.50% will occur only at the end of the first production cycle, that is, only after instrumental goods production, at all production stages, reaches the point of full development and these goods start to appear on the market. But at the beginning, while the production of consumer goods falls by more than 7.50%, instrumental goods production, having to start from the initial stages and being restricted to these alone, must be slight and therefore less than 7.50%. Hence the beginning of instrumental goods production, even if it occurs at the same time as the fall in consumption and production of other goods, does not prevent aggregate production from falling or unemployment from spreading. Of course, as instrumental goods production gradually moves into its successive stages, their production volume and value increase, the number of workers re-employed also rises and the improvement in the situation becomes more noticeable. On the other hand, the re-employment of workers in the production of instrumental goods, by increasing the purchasing power over consumer goods, makes it possible to increase the production also of these goods and to reabsorb some of the unemployed workers in this sector. Thus, through the contribution of both industrial sectors, aggregate production gradually rises after dipping during the initial phases.

For this reason, in this case of a general fall in consumption, the mere fact that producers of both types of goods do not alter their respective production volumes with the required anticipation of one whole production cycle is enough to make a general perturbation inevitable during the transitional period. This occurs in two distinct phases: in the first phase aggregate production, due mainly to the fall of consumer goods production, undergoes a big drop, unemployment rises and wages and prices fall. During the second phase, aggregate production gradually picks up because of the commencement of instrumental goods production and the successive rise in consumer goods production. As a result, unemployment falls and wages start to increase again[32]. The intensity of these perturbations, all other conditions being equal, is greater the longer the delay with which the adjustments of production start to be carried out; that is, the longer the forecasting error committed by producers is. But, as can be seen, all these factors come about as a result of the long duration of production cycles. *Therefore, if a fall in consumption occurs, the presence of long run production cycles is itself enough to cause a wave-like appearance in the business cycle curve during a period of transition when the directional changes of various production volumes do not occur with the required foresight in respect to the time of a production cycle[33].*

But what is the path and duration of this period of transition? As a result of the shock under consideration, aggregate production at the new point of equilibrium shall consist 92.50% of consumer goods and 7.50% of instrumental goods in monetary terms, as already stated. To answer the questions raised we shall therefore have to see whether, given the assumed conditions and once the recession period has been weathered, the new point of equilibrium is reached directly in the following period of recovery or only indirectly after further oscillations. It would appear that this point could be reached directly if the production flow of instrumental goods were identical (in money terms) to the flow of new savings. But, on closer inspection, this is not the case. It must be borne in mind that, in the case under consideration, that the production of instrumental goods is supposed to begin only when savers begin to save, hence with an error in time. Given this assumption, it is evident that when savers begin to save they cannot immediately invest their savings but must wait for the new instrumental goods to be ready – i.e. until the first production cycle comes to an end. Therefore, during this cycle, they keep saving without being able to invest. For the equilibrium to be reached it will be necessary for the production of the instrumental goods to start and to be continued in the proportions required for the supply of a daily flow of products of equal value to the daily flow of savings. However, if the production of such goods is contained within the aforesaid limits, it is evident that, as soon as the new instrumental goods come onto market, they will not be sufficient to satisfy the demand of all savers. For, while the daily flow of such goods corresponds in value to the daily flow of new savings, their aggregate demand will be equal in that moment to the latter's flow plus the amount of total savings that has been accumulated during the production cycle of instrumental goods and that are still waiting to be

---

32 What happens as a result of an unexpected increase in the propensity to save on the part of the public also happens, as we will see below, as a result of any other kind of shock. This helps to clear up the reasons why the diagrams of business cycles are usually asymmetrical; i.e. why they exhibit a sharp inclination in the business cycle curve during the downswing and a less accentuated inclination during the upswing.

33 Therefore Keynes' claim is inaccurate: "If the decisions as to the proportions of the flow of future output to be in available and in non available form respectively at a given date were to be made by the same people who decide how much is to be saved at that date, no trouble would arise" (*ibid.*, vol. I, p.175). From what was argued above, it is shown that for the business cycle curve not to undergo any distortions it is not enough that the flow of production of instrumental goods determined at a given moment be exactly equal to the amount of savings that is in turn determined at that very moment. It is also necessary – and this is the fundamental point of our argument – that the former decision be taken with the required anticipation relative to the start of the change in savings for the production flow of instrumental goods to be able to be equal to the flow of savings. If this does not happen, a crisis occurs although the two flows shall ultimately be equal.

invested. For all savings to be invested, it is necessary therefore that the production of instrumental goods initially be greater than the normal flow of savings and the longer their production cycle, the greater they need be. Such large scale production is most likely stimulated by the high price of instrumental goods which cannot be avoided due to their demand exceeding their supply. But if production of these goods commences in quantities greater than those corresponding to the future and normal flow of sales, then it is destined to decrease as soon as the surplus supply of as yet uninvested savings has been satisfied. Furthermore, this decrease cannot fail to have an effect on the trend curve. For this reason, *the initial error of not having commenced production of instrumental goods with the required anticipation of a complete production cycle with regard to the moment that savings begin, while making a change to this curve inevitable in the initial phase, makes a rise above the new equilibrium level in the second phase and a further change to the curve in successive phases inevitable.* For this reason, the new equilibrium point is reached indirectly after at least a second alteration in the curve rather than being reached directly during the recovery period.

7. The shock we have looked at so far is not the only one possible. It produces the effects described by a sudden disruption, hence without any gradual and preventive adaptation, of the equilibrium between production and consumption. But, on a closer look, an unforeseen disruption of this equilibrium may be brought about by other factors such as: 1) a disturbance opposite in nature to the one studied so far, that is an increase in consumption on the part of consumers at the expense of savings; 2) partial over-production; 3) a general change in trade policy; 4) the outbreak of war; 5) transition from a period of war to one of peace; 6) extreme increases or decreases in harvest yields, etc. To round off our study, we shall therefore have to look at the consequences of all these perturbations.

An *increase in consumption* on the part of consumers at the expense of savings tends to encourage an increase in the production of consumer goods. However, these goods would only become available after the completion of an entire production cycle be it long or short. In the meantime, new production will gradually increase and expand in successive stages. The overall consequences, however, will vary according to the production of instrumental goods. If, at the moment when the production of consumer goods begins, the production of instrumental goods in which consumers' savings have been invested is suspended throughout the entire production process, then aggregate production will fall. Initially the business cycle curve will dip only to pick up again later. In other words, it follows the same course as does the opposite type of case looked at previously. If, however, the production of instrumental goods is mistakenly followed up to the extent mentioned above, aggregate production will rise at first and the business cycle curve will initially register a tendency to increase. But since, in the absence of new savings, the instrumental goods being produced cannot be bought by savers and, if bought by other people, can be bought only through an expansion of credit that cannot continue forever, the production of instrumental goods will, sooner or later, have to shrink or stop altogether. When this happens, aggregate production will fall rapidly and the business cycle curve will, in this case, take on a convex form.

Similar to the case just discussed are perturbations deriving from *partial over-production* due to an error of forecasting or calculation. Undoubtedly, a country whose economy sets off down the wrong path may, with the assistance of credit, persist in the error for a certain time; but, at a given moment, it will have to change direction by squeezing the production of excess goods and replacing it with that of other types of goods. For this to happen successfully, production of the former will have to contract initially to an extent greater than what will be its final reduction. This is either for the reasons already described in the previous cases or, in this particular case, in order to sell off excess products. When production starts to correct itself, the production of excess products is destined to contract greatly without being initially compensated by new production of other types of goods. This new production – even if it starts immediately when the necessary

plant, to consider the most favourable of hypotheses, is already available – can only be limited, at the beginning, to the initial phases of the process and therefore is, on the whole, rather slight. Furthermore, its growth rate is constrained by economic and technical limitations. To start up and develop, this production process needs working capital. But, *given the already abnormal expansion of credit*, this can only be supplied either by the disinvestment from the former industries' excess working capital or by the *spontaneous* creation of new savings or by the inflow of foreign capitals. But the disinvestment of the excess working capital has to be gradual as the products of the respective industries, aligned as they are at different stages of manufacturing along the production process, reach final consumers. Also the creation of new savings has to be gradual. As for the inflow of foreign capitals, this is indeed akin to the inflow of fresh new blood, but it is not always available in the quantity necessary; and, by the way, must be excluded from consideration when the problem in question concerns not one or a few countries but the whole world as today. For all these reasons, the industries whose production is to increase cannot but develop gradually, and only after a period of time will they reach the stage of full development. How long will this period be? Without taking into consideration the spontaneous creation of new savings and the inflow of foreign capitals, this period represents the time required to *completely* dismantle the excess working capital of the industries affected with over-production; and this, for the reasons explained beforehand, requires a time period greater than that of the short production cycle of these industries. Secondly, the working capital of the industries affected by under-production, which comes from the dismantling of the working capital of the former, must be fully set up; and this requires at least a period equal to a short production cycle of the latter. In short, therefore, and without taking into consideration the formation of new savings and the inflow of foreign capitals, the new industries need *a period of time generally greater than that of the two production cycles of the two sets of industries under consideration* before reaching their full development. Furthermore, this period is greater the larger the volume of the excess goods to be liquidated, that is, in the final analysis, the greater the delay which postpones the adjustments required in the structure of production. All this is based on the assumption that the plant necessary for the development of the new industries is already available, it being understood that, should this not be the case and had this plant to be produced ex novo, the time needed to reach a normal situation would be even greater. This means that, before reaching this situation, aggregate production remains lower than the initial level. Therefore, *the adjustment of the productive structure of a country or of the whole world, which is made necessary at a certain moment by persistent partial over-production, leads initially to a sharp fall of the business cycle curve and is followed thereafter by a slow but gradual recovery; i.e. it occurs, as with the other perturbations we have looked at, through a wave-like pattern of the business cycle curve.* The case just considered has great importance because, no matter what causes these disturbances, the upward phase of economic fluctuations nearly always culminates in partial over-production. Thus the resulting after-effects we have examined show characteristics common to all business cycles.

A change towards protectionism in customs policy on the part of a country of great economic importance (such as for instance the USA) brings the exports and production of exporting countries to a sudden stop, forcing them to replace the production of traditional goods with that of other types. However, given the long duration of production cycles, this cannot come about immediately. Therefore, as a consequence of the fall in the production of export goods, a contraction of aggregate production occurs while a general recovery takes place only later**,** that is when the production of new goods commences and, as their production cycles develop, spreads to all the stages of manufacturing. A similar situation arises when there is a sudden change in customs policy but in the sense of trade liberalization.

The *outbreak of war*, by imposing on nations at war as well as on neutral powers an unforeseen change in production from peacetime to wartime goods, acts basically in the same way as does an unexpected drop in consumption. For, in the first phase, this causes, along with a sharp fall in the

production of peacetime goods, a fall in aggregate production; while, in a second phase, this is followed up by a general recovery as the production of war goods, which started at the outbreak of war, spreads widely and thus pulls up the volume of aggregate production[34]. The situation is no different when an economy moves from wartime to a period of peace because this change, by making a production changeover necessary, initially causes a general depression which is gradually reversed as the production of wartime goods is replaced by that of peacetime goods[35].

Also *considerable variations in world harvests* may have serious economic consequences. The nature and direction of these consequences depend, both in the case of a scarce and in that of an overabundant harvest, on the elasticity of demand for the agricultural products whose supply has changed. A considerable reduction in the world's harvest of the main agricultural products whose elasticity of demand, in *Marshall*'s sense, is greater than 1[36], lowers the farmers' purchasing power over manufacturing products. And since farmers are the biggest group of customers for manufactures, the production of these goods falls along with aggregate production. But since the fall in aggregate production is, initially, inevitably greater than the real fall in effective demand, aggregate production must later increase again, once excess goods have been liquidated, as explained above, along the various stages of the overall production process according to new demand conditions. Even in this case the business cycle curve will take up a concave form.

In the opposite case of exceptionally abundant world harvests, with a demand elasticity again greater than one, the farmers' purchasing power over manufactures increases and tends sooner or later to boost industrial activity. However, since the increased demand for manufactures cannot be actually satisfied, owing to the long duration of production cycles, but after a long time, it continues to exercise its stimulating effects on production throughout these production cycles. This has the probable result of pushing production expansion past the required limits and the inevitable outcome of creating a successive reaction. If, on the contrary, the demand elasticity for agricultural products is less than one, the effects, of course, will be the opposite. A considerable drop in world harvests may, sometimes, boost industrial activity whereas an extraordinary increase of these harvests may result in an industrial slump. Thus it is possible to observe, under certain circumstances, the paradox by which a country may experience, at the same time, a situation both of abundance and of general depression. The present economic crisis is a clear example of this paradox[37].

---

34 Proof that those indicated above are the phases of the perturbation caused by the outbreak of a war is clearly seen from recent world economic events. Here is how Thorp describes economic conditions in the USA in the years 1914, 1915 and 1916. Year 1914: "Depression. Conditions grow steadily worse to war; severe depression with little activity and extensive unemployment; …weak stock market collapses with war". Year 1915: "Revival, prosperity. Increased activity beginning in industries manufacturing war materials; unemployment gradually disappears….". Year 1916: "Prosperity. Great activity and expanding trade; …rapidly rising commodity prices" (*Business Annals*, New York, 1926, pp.142-43).

35 Even in this case recent experience is enlightening. Indeed, here are the features of England in the years 1918 and 1919 as highlighted by Thorp.Year 1918: "War activity; recession. Friction and confusion with armistice; November: prices rise slowly to peak October, and then fall; exports very small and imports enormous". Year 1919: "Revival; prosperity. Dullness gives way to boom; rapid industrial expansion; full employment; commodity prices decline gives way to rapid rise" (*ibid.*, pp.177-78).

36 Marshall, *Principles of Economics*, London, 1907, III edition, *Mathematical Appendix*, pp.839 ff.

37 That the effects of variations in harvests depend on the elasticity of demand for agricultural products is still an open question since excellent statisticians and economic theorists do not agree. On the one hand, we find famous experts that on the basis of statistical data maintain that rich harvests are the source of wealth (Jevons, Investigations in currency and finance, pp.114-21; Moore, Economic Cycles, New York, 1914; Pigou, Industrial Fluctuations, pp.36-41; and more recently Graue, "The relationship of business activity to agriculture, *The Journal of Political Economy*, August 1930, p.472 ff.). On the other hand, we find experts

The disturbances we have considered, like many others we have neglected for the sake of brevity, tend to alter, as we have seen, the business cycle curve in the transitional period and give it either a concave or a convex form according to the case in question. On looking closely, it can be seen that all this happens, as in the case of the drop in consumption, because shocks, being unexpected, are also unpredictable. And also because, if that's how things are, shocks make a delay inevitable, that is *an error concerning the time* to start the adjustment of the various branches of production. The right moment would be when, given the long duration of production cycles, the adjustment should start so that it could be carried out without any disturbance. Modifications of the business cycle curve such as those discussed in our previous analysis are therefore brought about, owing to the long duration of production cycles, not only by a sudden change in the propensity to save on the part of the public, but also by a large number of other kinds of shocks.

8. In summarizing what has been argued above, we want now to understand whether and to what extent the results reached can be considered part of a general theory of economic fluctuations. For this reason we are now going to draw the reader's attention to the following fundamental points:

I. When a country is stuck by a harmful shock which changes the direction of production and the proportions of its various branches, the resulting changes take place according to an automatic adjustment process. Such an adjustment, if it does not begin with the necessary anticipation of an entire production cycle, that is if it is due to an *error in time*, it inevitably results in a temporary fall in aggregate production. Therefore, *errors in time* are sufficient in themselves, without any other kind of error, for the business cycle curve to assume a wave-like form.

II. If, due to errors in time or to other types of errors, one of the perturbations above results in a fall of production in some branches, the consequent fall in aggregate production will be greater than that which would be necessary due to the intensity of the initial shock while the fall in each individual branch will be the greater the higher the order of goods produced in this branch.

III. Since an initial reduction in production also brings about a reduction in the income of producers and consumers, and consequently a general diminution in consumption and, in a second phase, a further diminution in production, it results that small harmful shocks on consumption may cause, during the adjustment process, significant changes in aggregate production and especially in the production of goods of higher order.

These three results, which are important in themselves, are fundamental for the remarks that follow. The two latter points are particularly important for they highlight what normally happens in countries in the course of adverse fluctuations. During fluctuations of this kind, production initially falls in certain industries; this fall spreads afterwards (as argued above) to all the others. However, the fall in the production of goods of a higher order is much greater than that of consumer goods or of goods of a lower order. This fundamental point in the analysis of economic fluctuations is clarified therefore by our findings[38].

From this last point we can draw another conclusion. A fluctuation affecting only some industries originates from an alteration in the equilibrium between production and consumption and manifests itself, as we have seen, in partial over-production. If, due to this partial over-production, the production in many other industries falls, a general excess in stocks of raw materials, instrumental goods and final goods will occur. Faced by this excess, the illusion appears that the economy is suffering from *general* over-production or general under-consumption. From this illusion spring the well known theories that trace the crisis either to the former or to the latter.

---

that with analogous data prove the contrary (Tougan-Baranowski, *Les crises industrielles en Angleterre*, Paris, 1913, p.273; see also Keynes, *ibid.*, vol. II, p.124, note 1).

38 Cfr. Marschak, "Substanzverluste", in *Archiv für Sozialwissenschaft und Sozialpolitik*, April 1932; p.136.

But, as argued above, what we are dealing with is neither over-production nor under-consumption. What we are dealing with is, rather, a temporary overabundance of goods that forms as overall production, which is undergoing a process of dynamic adjustment following partial over-production, gradually falls in all industrial branches[39]. Therefore, the paradox arises of exceptional stocks that go hand in hand with a fall in aggregate production; a paradox which the current tragic situation of the world economy is an extremely clear example: on the one hand, huge quantities of stocks of many goods with no buyers or consumers; on the other hand, skilful workers without employment have to live on the dole and other kinds of assistance. These two last remarks highlight the more striking aspects of economic fluctuations.

The first of these remarks leads us to important conclusions. Think of what is going on in the modern world economy. The economies of many countries and the world economy itself are subject to a continuous process of development and change. Throughout this process, production and consumption tend to balance each other, even though they are continuously changing. But their equilibrium, difficult itself to reach, is continuously threatened by shocks of various kinds, the most important of which have been considered above. If production cycles of the goods had zero-time durations or if, though having the long duration they effectively have, it were possible to predict shocks and to modify the structure of production with the necessary anticipation, the equilibrium between production and consumption would re-establish itself instantaneously in the first case while it would virtually remain undisturbed in the second. Then the business cycle curve would undergo only a few imperceptible vibrations. But, as we have seen: 1) most production cycles are of long duration; 2) the shocks that strike the economies of countries and the world economy itself are mostly unexpected and therefore are not predictable with precision. From these remarks follow both the impossibility of foreseeing shocks and the unavoidable delays with which the production changeovers begin along with the unavoidable fluctuations and distortions in the business cycle curve.

When therefore we focus on the extreme consequences of our first remark, we are faced with the following fundamental question: should we regard *errors in time* as the causes of economic fluctuations? We think that the answer to this question must be yes. This does not mean that errors in time are the only cause of fluctuations. They must be considered along with other errors and factors that also have an important role in generating economic fluctuations. And neither does it mean, when it comes to errors in time, that these are in themselves able to shape the actual path of fluctuations. It is well known, for instance, that the intensity and amplification of recessions, whatever their initial cause, are accentuated by the fall of prices. And since the fall of prices tends to cut production, this fall makes this movement self-feeding and then pushes it beyond the limits determined by the intensity of initial causes. On the contrary, in phases of expansion, whatever their initial cause, each increase in prices, by increasing producers' profits, will encourage production increases which in turn will bring about further increases in prices. These production increases, as we have seen, are then sustained and fed beyond the limits set by the voluntary savings of the public first through an abnormal credit expansion and later through the creation of *forced savings*[40]. Although these causes might seem independent from the initial causes of

---

39 This dynamic aspect of the adjustment process, through which a general over abundance of goods occurs, reconciles the facts of real life, such as the enormous stocks of every kind of goods in the depressive phases of economic fluctuations, with the static theory of outlets by Say and Mill who deny the possibility of general over-production (J. St. Mill, *Principles of Political Economy*, Vol.III, cap.XIV, 3, p.558).

40 The idea that savings may be created not only voluntarily but also by compulsion through means of credit has been explicitly argued by various authors in the first half of the 19th century such as Malthus (see Hayek, Prices and Production, London, 1931, p.18) but also by Ferrara (see Del Vecchio, "Ritorni alla teoria ferrariana del credito", in *Saggi in onore di Camillo Supino*, vol. I, p.242) and by J.S. Mill *(Principles of Political Economy*, vol. I, chap.V, § 4, p.69 and vol. III, chap.XI, § 2, p.512, Longman edition, 1921). It is

fluctuations and therefore from errors in time, as a matter of fact they are *subordinate* to those initial causes and errors. For, just as in the case of a downswing the reduction of prices may accentuate the shape of the business cycle curve once production begins to fall; likewise it is necessary, in the case of an upswing, that the expansion of production be already under way prior to the reinforcing effect of the price increases. Even a credit expansion, while sustaining and fostering the upswing, presupposes that the upward movement of production has already started and is clearly manifest. For a considerable credit expansion, it is not enough, as many excellent theoreticians[41] maintain, that there be a difference between the rate of discount and the rate of profit when banks make the mistake of setting the former below the latter (*Wicksell*'s natural rate of interest). On the contrary, there must be significant differences, which can happen only when the rate of profit is particularly high, that is after the goods prices have risen. Indeed, for the movement to start, the impulse of other forces is necessary. The reinforcing effect of price movements and credit expansions, though playing such a relevant role in fluctuations, do not exclude therefore the action of other causes which are the root of everything. Hence our first thesis, tracing the origin of fluctuations to *errors in time*, has brought to light a concept rarely used to date in the analysis of the causes and effects of fluctuations and has shown how the reinforcing forces mentioned above are intermingled with our fundamental causes of fluctuations in determining their characteristic course. Thus economic fluctuations have been analyzed, at least in part, from a new viewpoint. The arguments developed in this essay touch, and are indeed centred upon, a fundamental part of the general theory of fluctuations, although they may focus only on particular points of the business cycle.

These arguments, however, are also important from the standpoint of the effectiveness of *business cycle policies*. For, if we acknowledge that fluctuations are partly due to unavoidable errors in time, it follows that economic fluctuations are, at least in part, unavoidable as well. This raises the question of the effectiveness of all the business cycle policies that have been advocated by authoritative scholars with the aim of eliminating fluctuations either through intervention on the discount rate[42], or through price stabilization policies[43] or through the maintenance of the

---

only in recent times and mostly by German writers that this idea has been developed and integrated into the theory of credit. The first to use it was Mises in his *Teorie des Geldes und der Umlaufsmittel*, 1912, pp.227 e 411. Virtually at the same time it was used by Schumpeter in the first edition of his *Theorie der wirtschaftlichen Entwicklung* (1912, reprinted in 1926; see pp.140 and 150). See also Hahn, *Volkswirtschaftliche Theorie des Kredits*, 1920, and the article "Kredit", in Handwörterbuch der Staatiswissenschaften, IV edition, vol. V, p.951; Schumpeter, "The explanation of the business cycles", *Economica*, December 1927, p.305; and "The instability of capitalism", *Economic Journal*, September 1928, pp.381-82; von Mises, *Geldstabilisierung und Konjunkturpolitik*, Jena 1928, p.45; Kuznets, "Monetary business cycles theories in Germany", *Journal of Political Economy*, April 1930, p.148. This idea was recently taken up again without knowledge of these earlier works by Robertson (*Banking Policy and the Price Level*, London, 1926) and used by Pigou (*Industrial Fluctuations*, London 1927 p.130 ff.) and more recently by Keynes (*A Treatise on Money*, London 1930). Concerning the application of this idea to the particolar cases of inflation, see Bresciani, "La crisi di stabilizzazione monetaria", *Giornale degli Economisti*, January 1926, p.24 ff., and my work "Il consolidamento dei buoni del tesoro e le sue ripercussioni", in *Saggi in onore di Camillo Supino*, vol. II.

41 Wicksell, "Der Bankzins als Regulator der Warenpreise", *Jahrbüchern der Nationalökonomie*, 1897, pp.238 ff.; *Geldzins und Güterpreise*, Jena, 1898; "Influence of the rate of interest on prices", *Economic Journal*, 1907, pp.213-20; von Mises, *Geldstabilisierung und Konjunkturpolitik*, Jena, 1928, pp.57 ff.

42 von Mises, *ibid.*, p.63 ff.

43 Fisher, "Stabilizing the dollar", in Edie, *The Stabilization of Business*, New York, 1923, pp.54 ff.; Cassel, *The world's monetary problems*, pp.138-9; "The restoration of the gold standard", *Economica*, November 1923, p.178 ff; and *The Theory of social economy*, vol. II, p.184; Bellerby, "The controlling factor in trade cycles", *Economic Journal*, September 1923, p.324 ff.

equilibrium between investments and savings[44]. On this whole question we want to make only quick reference without pretending to express a superficial judgement on policies which are advocated by experts and can bear wide-ranging consequences. These policies deserve a more ample and detailed analysis. Here we are satisfied to have shown the existence of some causes of fluctuations that have neglected to date and with having analysed some of their important consequences. We will have accomplished our goal if our analysis will manage to draw the attention of theorists to these causes and to stir new reflections on some obscure points and questions concerning the problem of economic fluctuations.

---

44 Keynes, *ibid*., vol. II, p.339 ff.