

## **Hayek's business cycle theory during the 1930's : A critical account of its development**

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### **Abstract**

Hayek's business cycle theory in the 1930's was pioneering both in developing the general equilibrium framework, and in integrating capital with monetary theory. From published and unpublished work and correspondence a more complete picture of the evolution of Hayek's thought emerges. This paper traces how Hayek's effort to produce a consistent business cycle theory led him to redevelop important parts of capital theory, and the theory of expectations. The inherent difficulties of dealing with capital durability in an Austrian framework, and his evolving views on knowledge and expectations led him to abandon his project of developing a definitive version of Austrian business cycle theory.

### **1. Introduction**

Hayek's first rise to academic prominence was through his work as a business cycle theorist. His efforts to complete a business cycle theory that integrated monetary with capital theory became an important part of his research program from the late 20's to the early 40's. In fact, a stream of publications starting with "Intertemporal Price Equilibrium and Movement in the Price of Money" ([1928] 1984) and ending with *The Pure Theory of Capital* (1941), and "The Ricardo Effect" (1942), became the basis of a distinct theory of the business cycle that gained much attention at the time. This is not to suggest that Hayek did not occasionally change his mind and alter parts of his explanation of the business cycle throughout that decade. He did so in a number of ways, but still these contributions can be seen as efforts to elucidate a distinct conception of how and why economic cycles occur.

This paper traces the evolution of Hayek's theoretical output in the 30's as it relates to his business cycle theory. However, it should be clear that this did not happen in isolation from other changes in Hayek's thought at the time. More particularly, Hayek's changing conception of 'equilibrium', as well as his work in capital theory had a dramatic effect on his theory of the business cycle. This was inevitable as Hayek considered business cycle theory as the dynamic extension of equilibrium theory, so that any change in the tenets of equilibrium theory affected the 'bedrock' of his business cycle theory.

Therefore it makes sense to start any analysis of Hayek's business cycle theory by first laying out the specific conditions in which he originally defined equilibrium, and also by examining his early 30's theory of the process of production. From there we can

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not only proceed to his analysis of what happens outside the state of equilibrium, but also chart how his effort to improve his analysis of the business cycle led him to rethink his concept of equilibrium and his representation of the economy's capital structure both in equilibrium and out of it.

The structure of the paper is as follows : Sections II outlines Hayek's contributions in developing the neoclassical intertemporal equilibrium system. Section III gives a brief overview of Hayek's capital theory as it was utilized in his business cycle theory. Section IV discusses the traverse, and the problems Hayek faced in both forming a viable theory of price expectations outside equilibrium, and with extending his capital theory in order to include fixed capital. Section V considers the link between the traverse and equilibrium, and how this changed between *Prices and Production* ([1931] 1935) and *Profits, Interest and Investment* (1939). Section VI concludes.

## 2. Intertemporal Equilibrium

Hayek had strong views on how a theoretical investigation of the phases of the business cycle should be conducted. In his *Prices and Production* (PP) he clarified that he disagreed in principle with theories that 'explained' cycles simply by bringing in production redundant resources already in existence (see Hayek, [1931] 1935, 32-34) In fact, Hayek was convinced that "if we are to proceed systematically, therefore, we must start with a situation which is already sufficiently explained by the general body of economic theory. And the only situation which satisfies this criterion is the situation in which all available resources are employed. The existence of unused resources must be one of the main objects of our explanation." (Hayek, [1931] 1935, 35)

This gave his theory a distinct theoretical advantage over other contemporary theories. That is, a point of origin which could be described far better than any 'general' point of disequilibrium, and at the same time provide a unifying link with the rest of the neoclassical economic theory. In describing the point of equilibrium Hayek used a central tool of modern macroeconomic theory, inter-temporal price theory in a general equilibrium framework.

The first exposition of the basis of Hayek's theory can be traced to his two most important contributions in economic theory from the late 20's, his article "Intertemporal Price Equilibrium and Movement in the Price of Money" ([1928] 1984), and the book *Monetary Theory and the Trade Cycle* ([1929] 1933).

In these contributions Hayek, following the pioneering work of von Mises, explores the Austrian conception that the same physical good at different points in time and space is really a different economic good (see Hayek, [1928] 1984, 80).<sup>2</sup> The importance of this distinction is central to the Hayekian foundations of capital and monetary theory. Since we are speaking of different products, there must be a price for which a product today will exchange itself against a future one. Hayek writes that "...it may therefore be concluded that what follows from the difference in conditions that must always exist at different points in time... must be the formation of definite exchange

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<sup>2</sup> The distinction that the same goods at different places as really different economic goods had been analyzed by Mises (see Mises, [1912] 1981, 97). In fact, Hayek's insistence in his early work that he is extending the analysis of equilibrium prices across 'time' as Mises did for goods across locations is an important link between Mises, Hayek, and the Walrasian equilibrium concept.

ratios for inter-temporal exchange between goods of all kinds available at separate points in time, in the same way as exchange ratios are formed between goods which are simultaneously available." (Hayek, [1928] 1984, 81)

The analogy between prices of the same 'good' (in a technical sense) when they are located in different geographical markets, with the same 'good' at the same market at different points in time is important for another reason as well. Differences in space are the realm of what Hayek termed as 'static' theory; that is, theory that abstracts from the concept of time<sup>3</sup>. One could describe equilibrium of products in one location or between locations while abstracting completely from the time dimension. Creating an inter-temporal framework for these markets dealt directly with extending the analysis in the time domain. Therefore the point of origin of business cycle theory is exactly that of extending the 'static' analysis over time.

Furthermore, the allocation at equilibrium is clearly one that cannot be improved upon. The economy was utilizing its resources at the optimum given the wants of its consumers and the resources available<sup>4</sup>. The existence of a unique and stable optimum, is a clear link of Hayek's business cycle theory with the central tenets of general equilibrium theory, and also with the bedrock of modern theories of the business cycle.

What must be understood is that this is not an empirically relevant state of affairs. It is as abstract a state as the 'static' equilibrium is. However, it is the only point - according to Hayek- from which our investigation can start. While it may never materialize, it is the point that the system in time will gravitate towards, or at least the point from which we may consider 'change'.

The lack of 'change' means that market participants have all their future expectations fulfilled. Producers make their plans while knowing the existing structure of production, and conjecture -successfully- on its future replication or evolution. Furthermore, they can successfully predict future wants, and plan ahead. In the state of equilibrium nothing ever materializes that has not been foreseen by the market participants. The signaling mechanism that coordinates all these activities is relative prices between goods across space and time. The relevant prices of goods are the only signals market participants need to observe in order to plan their activities. Prices are "the guide and regulator of all economic activity in the exchange economy."<sup>5</sup> (Hayek, [1928] 1984, 71)

This is not only true when we consider the theoretical case of a barter economy, but also when we introduce a monetary standard into the system. Hayek makes clear that at equilibrium the introduction of money should not have an effect on the relative prices. In equilibrium money should be 'neutral' in the sense that it does not in any way

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<sup>3</sup> This has also been argued by Milgate (1979).

<sup>4</sup> Hayek's link of his theory with Walrasian equilibrium theory, especially when dealing within the framework of a barter economy, is quite explicit in his late 20's and early 30's writings. This is noted by Desai (see Desai, 1994, 29) and by Laidler (see Laidler, 1999, 36-37).

This is very evident in Hayek's own writings not only in the often cited quote of the Lausanne School (see Hayek, [1929] 1933, 32 (fn.)) but mostly because he stresses repeatedly that there is only one best outcome for resources to be distributed in an economy, and this is the equilibrium allocation. (see e.g. Hayek, [1928] 1984, 75-77)

<sup>5</sup> Hayek in his early writings uses 'exchange economy' for an economy that operates in barter. This is important as Hayek makes an important theoretical distinction between economies that operate in 'barter', and economies that employ a monetary medium.

influence or distort the informational role of relative prices in the economy [see Hayek, 1941, 30-31 fn.1] <sup>6</sup>. This means that while "...money is indeed present to facilitate indirect exchange, it can be neglected as a factor influencing the relative price levels"<sup>7</sup> (Hayek, 1933b, 159). The introduction of money into the system does not only complete the characterization of the system in equilibrium, but also prepares the ground for discussing the traverse, that is, the conditions under which the system is outside equilibrium. Nevertheless, before we consider the traverse it is important to outline in some detail the capital structure Hayek integrated in his business cycle model.

### 3. Building on Austrian Capital Theory

It would not be an exaggeration to argue that Hayek's capital theory is mainly developed in two books, in PP and his magnum opus on capital, *The Pure Theory of Capital* (1941) (PT). Hayek admitted that with PT he had more or less completed his foray into capital theory (see Hayek, 1994, 96). In fact, during the 30's he had published a number of articles on capital theory (see e.g. Hayek ([1934] 1935, [1935] 1939, 1936)) but these can be seen either as elucidations of the basic framework developed in PP or as topical studies later integrated into the grand framework of PT.<sup>8</sup>

The main distinction between the two books is that the first was written primarily as a treatise on business cycles, and the second mostly as a book on capital theory. Nevertheless, PP cannot be simply dismissed as irrelevant when discussing capital because it develops within its short span a highly elaborate, even if stylized, capital scheme through which the business cycle is analyzed. Hayek's conception of capital was based on Böhm-Bawerk's *Positive Theory of Capital* (1888), and utilized the distinction between goods of 'higher' and 'lower' order that were the purview of Austrian economists since the work of Menger (1871).

The first elaborate introduction of the capital process in PP occurs in lecture II. There Hayek identifies three different products, two factors of production, the original means of production, and the intermediate products, and one final product, the consumption good. What becomes immediately apparent is that the capital process is conceived as a long integrated process in which, given the original means of production, with the application of labor and time we finally create the output of consumer goods.

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<sup>6</sup>It should be noted that 'neutral money' does not necessarily mean constant prices across time. Hayek gives an example of an economy where fruit is the only consumer good produced (see Hayek, [1928] 1984, p. 88-90). There he shows that there can be seasonal fluctuations of the price level of the fruit.

<sup>7</sup> It is also opportune to clarify another confusion at this point concerning the concept of 'neutral money'. Hayek in PP chapter IV (esp. 124-6) had discussed the possibility of operating a monetary policy so that the relative prices of the economy are not distorted. This naturally leads to a discussion whether it is the objective of monetary policy to make 'money neutral'. Without going into a discussion on what is the appropriate monetary policy, it is important to clarify that the concept of 'neutral money' was created as a theoretical concept applying to the abstract conception of a general equilibrium economy with money, not as a policy objective (see Hayek, [1933b] 1984, 159). For a discussion on Hayek's changing views on monetary policy see White (1999).

<sup>8</sup> For example the article : "On the relationship between Investment and Output" (1934a) was integrated in chapters XV and XVI of PT (see Hayek, 1941, 193-215).

It is important to note that during the decade Hayek engaged in a capital theory debate mainly with Knight and briefly with Kaldor, and some of his articles (e.g. see Hayek (1936)) were specifically written for this debate. For an overview of the debate see White, 2006, XXVIII-XXX.

The creation of intermediate products is simply a middle step for the creation of final output, since in themselves these goods have no other economic purpose. This creates a clear 'hierarchy' of demands, with consumer demand driving the whole process of production by an interlocking mechanism of markets for intermediate products. In PP we also see an abstraction from the composition of the consumption good. It is assumed that we have one consumption good, whose price and quantity is in equilibrium decided by the prevalent technical conditions, and by the saving and consumption behavior of the economic agents present.

Concurrently with the development of this model of production Hayek is claiming that the main problem with other theories of the cycle is their highly aggregated nature, and their reliance on a general price level. This would at first sound paradoxical. Hayek does not only have one consumption good, but also, at least in equilibrium, only one chain of unique intermediate products that lead to this consumption good. The answer to this paradox is the kind of desegregation Hayek was concerned about. He was not concerned with a divergent composition of consumption goods and their relative changing demand, or how relative price changes between consumption goods would affect their particular 'chain' of production, if we are to accept the simple teleological way demands are ordered,<sup>9</sup> but how changes of the cycle would effect the demand for intermediate products 'closer' or 'further away' from the final consumption good. This seems to deconstruct completely the analysis developed in the last section of an equilibrium in Walrasian lines, as this framework would require aggregation of products at the different 'stages of their completion', something that is in contradiction to the decentralized structure of a Walrasian market. This particular construct of the Austrian school, and its relative merits as a useful abstraction, was first noted by Hicks whom I cannot but quote at length :

"There is a useful analogy with the static 'Walrasian' theory. We are accustomed to think of a product being made by the combination of a number of factors, or inputs. A 'technique' [what I called a chain of production] is defined by a set of input coefficients, the quantities of the factors that are needed to make a unit of some particular output. The Austrians being more interested in time-structure than in qualitative differences between factors, thought of final output as being made by a combination of previous inputs, inputs of which the interesting characteristic was the date at which they were applied. A 'technique' for them was thus an elementary process, in which a series of dated input-quantities combined to produce the unit of output." (Hicks, 1973, 7)

In this sense then the Austrian process is disaggregated. It can account exactly for the time a given input is applied and is expected to produce output. In PP Hayek starts his analysis of capital from a process in which investment is continually applied from the

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<sup>9</sup> This was again an issue that was deeply rooted in the Austrian tradition, and particular to that tradition. The idea that each capital good is serving a particular purpose at its designated stage in production, is linked with the Mengerian classification of 'lower' goods and 'higher' goods meaning goods closer and further away from the final consumption good. The fact that capital goods cannot be meaningfully defined in this way has been argued from the time Menger first suggested this by competing economic theorists. Possibly Marshall's famous example of the train transporting people, machinery, and food at the same time is the best illustration of the discussion that ensued. (see Marshall, 1961 [1890], 64-65, fn. 3)

time the process has started to a moment before it yields output (see Hayek, [1931] 1935, 37-41 and fig. 1). Only later and as a simplification of his analysis does he create discrete stages in which investment is applied, in order to make his analysis tractable (see Hayek, [1931] 1935, 43-47, and Hayek, 1941, 113-125)<sup>10</sup>.

To understand the position of an economy in equilibrium which maintains its capital structure we have to turn to the decisions of the consumers and the producers. As the interest rate guides the allocation of consumption intertemporally, the consumers decide the level of saving they wish to commit given an interest rate level. For that given interest rate the producers decide the structure output will take in the future, i.e. their pattern of investment over this and the following periods.

The decision of the producers is indeed a complex one. Hayek reiterated in PT the well known Austrian conception that processes which take longer to deliver output will be more productive, even if the marginal gain of waiting over time is decreasing with time (see Hayek, 1941, 60). This consideration is distinct from any changes in our technological knowledge. This means that, given a level of technological knowledge in the economy, there are a number of ways to produce a final consumption good.<sup>11</sup> These ways are mainly distinguished by how much time they take to deliver this consumption good. The more time they take to deliver it, the more consumption good there is. The producer then has to decide which process is best given : A) the level of the interest rate at which he is to borrow the means by which he will finance this capital process, B) the level of the wage rate, on which he will pay his workers in order to build up the process and C) the final remuneration he is to receive once this process is set up and delivers the consumption good. An interesting and important point in understanding the workings of this model is that an increase in the consumption good can only happen by 'lengthening' the process of production. More consumption good inevitably means a bigger waiting period, and cannot mean an increase in capital committed in the current process of production -at least in equilibrium. This is an important distinguishing feature. Hayek states that "additional capital is assumed to be needed for making changes possible in the technique of production (i.e. in the way individual resources are being used), and to lead to longitudinal changes in the structure of production" (Hayek, 1941, 48). This is fundamentally different from a 'lateral' expansion which means "a mere duplication of equipment of the kind already in existence" (ibid.)

The reason for his particular aspect of the theory rests on its assumption of the labor market.<sup>12</sup> Hayek starts his analysis from a full employment position (apart from Hayek 1939a), so that any changes in output can only come about by altering the process of production used. In fact, he had repeatedly argued that his analysis both in PT and PP does not depend on changes in individual effort, or on bringing in unemployed resources in order to explain changes in production (see Hayek, [1931] 1935, 32-35 and 1941, 48-

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<sup>10</sup> It is interesting that this remains a common link between PP and PT, even after a decade of research and change in Hayek's project. The analysis in PT is much more refined but in this aspect of the representation of the production process through time it can be read as simply an elucidation of the crude structure presented in PP. For practical purposes again Hayek makes discrete the process in intervals (or 'slices' as he calls them see Hayek, 1941, 142) in which the production process can be represented.

<sup>11</sup> Hayek considers this of particular importance in distinguishing Austrian theory from the "Anglo-American" point of view (in 1941 at least). (see Hayek, 1941, 48)

<sup>12</sup> As Colonna (1994) has suggested, Hayek in PP as well as in PII assumed a stationary economy, so that both technological and population changes were neutralized (see Colonna, 1994, 37-39).

9). Instead his analysis rests on the distinction between being able to devote the labor for one more period of time in building up the existing capital, instead of turning over the capital to produce the consumption good.

What defines then the equilibrium length of the production process in an economy? In equilibrium length is decided by the saving behavior of individuals. Individuals receive income in the form of wages<sup>13</sup>, and they decide how much to consume and save from these wages. This decides the depth of the production process in an economy. If it is deeper than what the consumers indicate by their saving behavior, the price of the consumption good will rise and cause reorganizations of the distribution of labor across time.

Introducing money into the system should not disturb the equilibrium relationship between saving and investment. This is again a new way to define 'money neutrality', compared to the definition given last section. In fact the different definitions of equilibrium are held together by the natural rate of interest. As Backhouse (2006) notes there are three ways in which to define the natural rate of interest in intertemporal equilibrium, 1) as the rate at which investment and saving equal, 2) as the rate at which price expectations are fulfilled<sup>14</sup> 3) as the rate of interest that corresponds to the productivity of real (physical) capital goods (see Backhouse, 2006, 37). By having completely described the conditions in which the system is in equilibrium, we can now discuss the behavior of this system when it is not in equilibrium.

#### **4. The traverse and its problems.**

The establishment of the conditions that constitute equilibrium was an important preparation for our understanding of what happens at the traverse.<sup>15</sup> In fact our analysis of the traverse and the problems Hayek had to face will be separated into two topics, one will be a discussion on what happens to market information and expectations of prices during the business cycle, and the other a discussion of how the 'real' economy, and particularly the structure of production changes. We therefore first turn on the role expectations play in the formation of the cycle.

##### **4.1 Prices, Information and Expectations**

In the proceeding analysis we did not considered the element of 'change' either from real factors due to technical changes or due to a change in the saving and consumption decisions of the individuals, or finally due to a change in the value of the monetary medium of the economy. Hayek had argued consistently at least as early as 1929 (Hayek, [1929] 1933), that the business cycle is a monetary phenomenon.<sup>16</sup> It is

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<sup>13</sup> Which is the marginal product of labor. In Hayek's system we are always in a perfectly competitive equilibrium.

<sup>14</sup> Backhouse writes 'as the rate of interest in which prices are constant' (Backhouse, 2006, 37). I have changed this to consistent expectations in agreement with my analysis in the previous section.

<sup>15</sup> In fact, Hayek's business cycle theory can be seen as a direct extension of his work on equilibrium. As Garrison points out, "Hayek's theory of the business cycle- of intertemporal discoordination- is no more than a corollary to his theory of intertemporal coordination" (Garrison, 1985, 313).

<sup>16</sup> He had noted this in passing even before (see Hayek, [1925] 1984, 21) but it was in his 1929 book that he gave the first complete account of why this is so.

fluctuations in the value of money that create the perceived recurrent cycles of economic activity. Before we proceed to analyze the effects that changes in the value of money have on the economy it is important to clarify two questions : 1) Can we, in theory, have cycles in a barter economy? and 2) In a model with money, are all business cycles the result of changes in the supply of currency in the economy? The distinction between these two questions is a vital one if we are to understand what Hayek was arguing.

Hayek's *Monetary Theory and the Trade Cycle* is in part a polemic against theories that have 'real' as opposed to monetary factors as the causes of business cycles.<sup>17</sup> He emphasized that in a theoretical model without money we are essentially in the realm of equilibrium analysis. In equilibrium prices could not be wrong, and therefore production could not be distorted. The wishes of the savers to increase or decrease their level of saving did not only lead to a new stationary state, but could also be explained within the developed theory of equilibrium analysis. This does not mean that we could not observe increases in the deepening of capital, and changes in relative prices, that produce alterations in production capacity and the organization of labor, but these alterations could be more easily interpreted as long-period changes of fundamentals, which are relevant factors in growth theory, rather than business cycle theory.<sup>18</sup> It is interesting to note that a substantial part of PT is very much devoted not only to explaining the structure of production, its representation, and how different capital products fit into it but also to changes in the structure, and a comparison of the stationary equilibria before and after the change (see e.g. Hayek, 1941, Ch. XII). All this happens before Hayek introduces money into the theoretical model he was discussing. As Colonna (1990) points out, in barter economies, Hayek assumed that the expectations of prices were always correct (see Colonna, 1990, 53). Therefore, the intertemporal mechanism always worked and producers were aware of the changes that are to come and planned accordingly. This methodological stance of Hayek distinguished his theory from contemporary non-monetary theories of the business cycle. As Caldwell (2002) notes, "Non-monetary theories of the cycle usually posited the same proximate cause of the cycle, namely, a disproportionality that arises between the production of capital goods and consumer goods during the boom phase. But a question naturally follows : If one accepts the results of equilibrium theory, if one assumes that prices automatically equilibrate markets, or that full equilibrium obtains, how could such a disruption take place? Hayek's answer was clear. No such disruption could take place, *unless* one was willing temporarily to abandon equilibrium theory to generate a cause of a cycle." (stress in original, Caldwell, 2002, 63)

In order to abandon equilibrium theory we have to introduce a common unit of account, i.e. money. Hayek's insistence on introducing money in theoretical models of the cycle is related to another central theme of Hayek's research program, the overall organization of the market. In Hayek ([1928] 1984), he had argued that prices were signals of overall economic organization. In a decentralized money based market

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<sup>17</sup> It should be noted that at the time the monetary explanation of the cycle was in no way undisputed, and important theorists (Spiethoff, Tugan-Baranovsky and later Cassel among others) had emphasized the 'real' aspect of the business cycle. For a survey see Haberler (1946, 29-85), and for the theories leading up to the 30's see Hutchinson, (1953, 344-409).

<sup>18</sup> This is in a sense a crude theoretical dichotomy. Hayek had an arguably more complex understanding of 'trend' and 'cycle' than simply that the one was separate and distinct from the other. ( see Hayek, 1925, 21)

economy each individual would have to observe only his immediately relevant prices, and that would be enough to guide his planning of consumption, investment and production. Hayek gave money denominated prices this particular role over their 'barter economy' equivalents, that they are perceived by market participants to be the correct signals on what is happening in the market. For this reason prices now are important in the organization of the market. However, now that prices have a role to play in production, they could in principle abuse it.<sup>19</sup>

The fact that prices could be misaligned in a monetary economy means that we can step outside equilibrium theory in order to explain market behavior. This means that prices behaved differently in barter to that of money economies. In barter economies changes in the real factors altered prices and directed production as well as consumption and saving towards the new rest state. In the money economy, a number of things could happen. First, changes in the supply of money could affect the relative prices of the economy and start a movement towards an equilibrium that was not warranted by the 'real' factors of the market. Second, changes in the real factors have also to use the mechanism of monetary prices to disseminate the information of the new economic conditions to the market. If prices could be misaligned in the first case, surely they could be also in the second. It would not make sense for them to be efficient in communicating the information when the changes were real and not when they were monetary, although Hayek at times wanted to have it both ways.<sup>20</sup> Furthermore, the difference between the orderly long-period price changes in a barter economy, and the at times, violent cycles created by price changes of a monetary economy, shows how much the price mechanism can be misaligned.<sup>21</sup>

To understand the movements of money prices in the economy is basically to explain the mechanism driving the business cycle. Hayek wrote that "trade cycle theory itself is only expected to explain how certain prices are determined, and to state their influence on production and consumption...." (Hayek, [1929] 1933, 29). In fact, the whole argument in the relevant chapters of PP discussing the mechanics of the business

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<sup>19</sup> It may appear as a contradiction to suggest that in a general equilibrium setting, relative prices cannot hold this informational role but money prices can. This, however, is very much implicitly assumed by Hayek in PT. In Hayek's example of the simple economy (Part II of PT) he says that this is an economy organized by a communist dictator. This would mean market forces are neutralized, as the benevolent dictator plans production for the future, and decides how to distribute, in the best interest of his people, consumption intertemporally (see PT, chapter XII). As soon as we move to Part III of the book we find that we enter an analysis of a competitive community, and we need money in order for the market to become organized, even in stationary equilibrium. Based on the vital role of transmitter of information Hayek notes "It is self-contradictory to discuss a process which admittedly could not take place without money, and at the same time to assume that money is absent or has no effect." (Hayek, 1941, 31)

<sup>20</sup> Hayek's ambivalent view on this point has been investigated by Colonna (1994). Colonna persuasively argues that as early as (Hayek, [1929] 1933), Hayek was ambivalent about his stance that monetary factors are a necessary and sufficient condition of the cycle (see Colonna, 1994, 32-39). Zappia (2001) and De Vecchi (2001) debate how much Hayek changed his mind on the importance of monetary shocks between PP and PT. As De Vecchi (2001) argues, it seems that generally Hayek's view on the relevance of monetary shocks, as the primary and empirically most important shocks did not change much over this period.

<sup>21</sup> This is why the Austrian school generally considers "intertemporal discoordination" as "the central problem in macroeconomics" (Bellante and Garrison, 1988, 214). In fact, it is exactly the fact that prices can feed wrong information to the various market participants in a decentralized money economy that triggers alterations in the real sector of the economy causing business cycles (see also Garrison (1984, 1985) and O'Driscoll (1977)).

cycle (ch. II and III) shows time and again how changes in the prices of consumer goods, intermediate goods and the interest rate, influence the decision of the producers in undertaking lengthy investment projects, and effectively change the capital composition of the economy. It is interesting that the reaction of the producers is always mechanical in nature; they react almost immediately to the latest prices the market mechanism delivers. This has to do with the belief that producers almost always consider the changes in relative prices as permanent. This is an interesting step, for while Hayek knows that we have left equilibrium analysis and the infallibility of the price mechanism, he will not permit his agents to act on this knowledge. In this his agents are not only myopic, but more fundamentally lack any apparatus for making decisions outside the equilibrium state. Another way to put it is that they deal as if this is a world of certain outcomes, and did not have the tools to deal with uncertainty.

This drawback of Hayek's theory was first noted by Myrdal, who wrote that in Hayek's theory there is no room to be played by expectations (see Myrdal, 1933, 385). This elicited from Hayek his article on "Price Expectations, Disturbances and Malinvestments" ([1933] 1939) which was explicitly an attempt to discuss what happens to the expectations of the entrepreneurs during the cycle. Hayek, much better than anyone else, outlines the central problem of his theory with the use of the price mechanism outside equilibrium. I quote in length :

"Very large and unforeseen fluctuations of saving would therefore be sufficient to cause extensive losses on investments made during the period preceding them and therefore to create the characteristic situation of economic crisis. The cause of such crisis would be that entrepreneurs had mistakenly regarded a temporary increase in the supply of capital as permanent and acted in this expectation. The only reason why we cannot regard this as sufficient explanation of economic crises as we know them is that experience provides no ground for assuming that such violent fluctuations in the rate of saving will occur otherwise than in consequence of crises. If it were not for the crises, which we therefore shall have to explain another way, the assumption of the entrepreneurs that the supply of saving will continue at about the present level for some time would probably prove to be justified." (Hayek, 1933, p. 143)

In the above paragraph we see the whole apparatus of Hayek's cycle turned on its head. The argument runs as follows. If economic fluctuations are the only reason for seeing large price changes, since real economic growth happens over long periods and cannot account for these violent fluctuations, and the entrepreneurs know that, then whenever they see violent price changes, they know it cannot last, for they know that these prices are not equilibrium ones. Thus, instead of having the naïve and irrational expectation that these prices will go on for ever and change their investment behavior on the basis of this belief, the producers would have done better to ignore the price change, and simply go on as before. In this case the cycles would not happen, as the real economy would not have been affected by the wrong signals in the money prices. The disequilibrium prices would not fool anyone. Hayek had stumbled on a logical fallacy of the first order, which needed drastic revision to the basic tenets of the theory.

In the reprint of the above discussed article, (Hayek, [1933] 1939) published in his collection of articles in 1939 dealing with the business cycle, (Hayek, 1939) Hayek added a footnote noting that the discussion of what market participants know was now more comprehensively dealt with in a new article on 'Economics and Knowledge' (Hayek, 1937). The importance of this article for Hayek's research program, especially after the 30's, has been extensively discussed.<sup>22</sup> In it Hayek admits that it was originally his concern with expectations that led him to consider more closely the role of information in the market (see Hayek, 1937, 35). However, this led him to question how a decentralized market, where every participant holds only limited knowledge, attains equilibrium, and how to define this state of equilibrium. As these general and fundamental questions gained prominence, the specific question of what happens to price expectations in his business cycle theory started to become of secondary importance. He notes that "price expectations and even the knowledge of current prices are only a very small section of the problem of knowledge as I see it." (Hayek, 1937, 50) And the problem is deeper than a simple discussion of the traverse, as "the situation seems here to be that before we can explain why people commit mistakes, we must first explain why they should ever be right." (Hayek, 1937, 34) This led him to question the basic neoclassical premises of intertemporal equilibrium that Hayek had helped to build so far.

Where did this leave his business cycle theory? When in 1939 he published 'Profits, Interest and Investment' (PII) (1939a) he included a section on expectations which in part either reiterated the problem as stated in the (Hayek, [1933] 1939) article or betrayed a skepticism about what will really happen to expectations outside equilibrium (see Hayek, 1939a, 17). When he notes that "... a change in current prices may conceivably affect prices in more than one way and it therefore becomes necessary to consider more explicitly the role played by expectations of the entrepreneurs" (Hayek, 1939a, 17) he is in part admitting that the expectations of the entrepreneurs when not in equilibrium are not anchored anywhere, and that he had yet no complete theory of how entrepreneurs reviewed and changed their expectations. Entrepreneurs may expect prices to rise, or to fall, and their expectation will affect the future movement of prices. It would seem that the simple reaffirmation of equilibrium tendencies when we are at the traverse, so prominent in PP, appears now much more elusive. The deep rift opened by "Economics and Knowledge" has obviously not been overcome by 1939.

Surviving correspondence between Hayek and Keynes, exchanged between September 20, and Oct. 20, 1939, and discussing primarily Hayek's PII gives some insight into Hayek's thought at the time.<sup>23</sup> Keynes starts the correspondence by asking Hayek to clarify his assumptions about the expectations the market participants hold. Specifically he asks :

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<sup>22</sup> Caldwell (1988) has suggested that the article poses a major philosophical and methodological shift in Hayek's thought. As a methodological break it was also noted by Hutchinson (see Hutchinson, 1981, 215). In fact the debate on continuity and change in Hayek's thought still rages, see Birner (1999a, 1999b) and Caldwell, 2004, 409-422.

<sup>23</sup> This correspondence and the correspondence between Hayek and J.V. Robinson remains unpublished in its entirety. It can be found in the Kings College modern archive section, University of Cambridge. It has been recently reviewed in two articles [Ingrao and Ranchetti (2005) and Ingrao (2005)] printed in Marcuzzo and Rosselli (2005).

"Is the price you contemplate instantaneous and once-for-all, or is it at a rate over a period? (p. 18 does not much help me about this)... Is it foreseen? If so, how long beforehand? (p. 17 does not lead me to a clear conclusion about this.[]). .... Having once occurred, is the price expected to be permanent, or is it expected to contain within it seeds of reaction?" (Keynes letter, September 20, 1939)

All three questions relate to the permanence of the shock, and the expectations that the market participants have about future price movements. Hayek's answer is revealing. He writes: "Outside section 5 where I consider other cases, the assumption is that a single rise of prices of consumers' goods has occurred unexpectedly and that prices are now expected to remain at the new level." (Hayek's letter, September 24, 1939) Therefore, in PII outside the separate section (section 5) which discusses different expectation schemes, his assumptions on expectations that relate to the rest of his analysis have not changed from what they were before 1937, and bear a close resemblance to what was argued in PP.<sup>24</sup>

Meanwhile Hayek was rethinking his concept of equilibrium. In PT we see an important change in his analysis. Hayek finally decides to introduce uncertainty even when discussing equilibrium. Thus, we have moved from the original conception in which agents know the relevant unique equilibrium prices (Hayek, [1928] 1984), and even left behind the decentralized equilibrium in which the subjective expectations of all the market participants are fulfilled<sup>25</sup> (Hayek, 1937), for a concept in which the expectations of each individual may be verified or not by future events, but aggregate equilibrium has to do with the general state of the economy.<sup>26</sup> Aggregate equilibrium is achieved when the prices of the goods approximate their 'cost of production'. However, this does not mean that for every market participant this is the case. Now individuals know that in the system there is inbuilt uncertainty.<sup>27</sup> They act upon their knowledge of

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<sup>24</sup> This was also noted by Shackle who writes that "In *Prices and Production* there is no mention of expectation. Even in *Profits, Interest and Investment* this lack is only formally recognised." (Shackle, 1981, 241)

<sup>25</sup> Desai (1994) notes Hayek defines equilibrium not only as "compatibility of individual plans *ex ante*", but "also congruence (correspondence of subjective expectations with objective data)." (Desai, 1994, 42)

<sup>26</sup> An important link in the evolution of Hayek's line of argument is his article, 'The Maintenance of Capital' published in 1935. The article is important because it discusses how the entrepreneurs/capitalists behave when foreseen and unforeseen changes occur to upset their plans. However, what is more important for our immediate analysis, and could be seen as a first step towards the position Hayek took in PT, is the idea that the entrepreneurs/capitalists do not know why their expectations are not fulfilled when they are not, and why they are when they are. This problem arises directly from the fact that we are not in a perfect foresight world. With uncertainty we really never expect our plans to be fulfilled exactly as planned. We need therefore a new criterion for defining equilibrium. This criterion should "enable us to distinguish between losses-or rather missed opportunities of faster improvement- which are unavoidable in view of the unpredictability of the change, and capital losses due to what appear to be avoidable mistakes." (Hayek, [1935] 1939, 116) However, this new criterion proves to be a very elusive concept.

<sup>27</sup> Hayek makes two important claims in PT. First, that there is no need for future certainty for us to consider the concept of 'equilibrium'. Second, that individuals in a market economy hold money as a precaution against uncertainty, and this special function of money permits us to speak of equilibrium under conditions of future uncertainty. Therefore, "the assumption of certainty about the more distant future, although we have so far based our argument on it, is not really essential for our concept of equilibrium. The plans of the various individuals may be compatible with the extent to which they are definite, and yet the individuals may at the same time be uncertain about what will happen after a certain date and may wish to

the economy, and the information they can gather, and act half expecting to have their future plans one way or other changed by events to come. In this setting, each individual does not know if it was his expectations that were wrongly constructed that led his plans so far astray, or a general change emanating from the real conditions or the monetary factors of the economy. In this system of perpetual change<sup>28</sup>, there is for the individual no clear divide of being in or out of equilibrium. The decentralized way information is held means that each individual does not know how far the plans of the others market participants were fulfilled, and has no way to find out. Thus, the only mechanism he has to rely on is the price system, for want of a better alternative. He is always on his guard when he sees variations between his expectation and the realization of prices, but as he cannot be sure what the reason for this is, he may well imagine that it is his expectation which was at fault, not the price, and redraw his plans with the new price seen as providing new and reliable information.<sup>29</sup>

It becomes clear that by PT Hayek's analysis of equilibrium has been so much removed from what he started with in PP that the whole discussion of the business cycle has to be redrawn from a new perspective. This Hayek did not do, primarily because his analysis of expectations had led him on a new intellectual path which considered broader issues than the business cycle. He admits this in a letter to Joan Robinson when they debate, in correspondence, specific aspects of his business cycle theory. He writes:

"My present pre-occupation with what may seem altogether different problems [than technical issues of the business cycle] may suggest to you that I am running away from the difficulties which my position creates. The fact is that I have increasingly come to the conclusion that all our differences -- or I should probably say my differences with almost all "modern" economists not only in the specific field of monetary theory but quite generally, including in particular the approach to the theory of competition, the use of concepts representing averages or aggregates, and the whole problem of socialism, all trace back to a more fundamental difference which I am gradually trying to clear up. The only published results of these efforts gradually to work out a consistent system of "subjectivism" is the article on "Economics and Knowledge" in *Economica* 1937 which you may have seen. But I feel that to elaborate these fundamental problems is more important than to go on with the work on particular problems where one comes up all the time against the same difficulties..." (Hayek's letter, 10 March 1941)

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keep some general reserve against whatever may happen in the more uncertain future. In this way our system can be made to include the desire of the individuals to hold money as a general reserve of command over resources." (Hayek, 1941, 357)

<sup>28</sup> By perpetual change we do not mean necessarily that the 'real' conditions of the market change. As Hayek (1937) suggested, changing the knowledge individuals hold and how they use it, changes the subjective system of expectations of the economy.

<sup>29</sup> This explanation is, however, not entirely satisfactory. The individual now knows that the price system is at times wrong, and would clearly also consider other factors when making his decision. Thus it can be argued that the fundamental "conflict between his vision of the faultlessly working mechanism of the price system and the problem of cyclical fluctuations ... is never reconciled by him." (Desai, 1994, 47)

Nevertheless, his evolving view of equilibrium was not the only insurmountable hurdle Hayek faced in creating a consistent theory of the cycle. He was also facing problems with the 'real' side of his analysis, and to this discussion we now turn.

## **4.2 Investment and the structure of production**

The way the capital structure of the economy changes in the business cycle was not only a central theme of Hayek's business cycle theory, but also one that was particularly novel. The basic mechanism of the cycle, as propounded in PP, is that changes in credit either coming from an extension of the monetary base by the central bank, or from the lending behavior of the commercial banks, leads to a reduction of the interest rate affecting production in industries that depend on the interest rate 'more', to a larger extent. This point is particularly important. From the way production is organized in the Austrian model it follows that the only goods which are not resold are the ones consumed. Taking that as the starting point we find that this industry buys intermediate products which are one stage from completion, applies labor to them, and sells them. To finance this operation it borrows from the bank at the going interest rate. It pays out wages and for the acquisition of the intermediate products, and gets remunerated by selling the final product. A reduction in the interest rate means that now it can extend its operations. It can, given the current level of wages and prices of intermediate products, buy more of both, and produce more of the consumption good, even if this marginally decreases its price. The company producing this intermediate good finds not only an increased demand for its product, but also the reduction of the interest rate beneficial for its profits. The double signal of its selling price and the interest rate make it profitable to increase production. This drives the prices up even more for the intermediate product this company uses as first input. In this way the credit expansion reaches through the whole production chain back to the original factors of production, that is, the first application of labor and the production of the most removed from consumption, intermediate good.<sup>30</sup>

Since we have no unemployment, the only way to increase production is by organizing a 'longer' chain of production. That means that labor is reorganized so that it is bid away from the industries which produce closer to the final consumption good, and finds employment in the new intermediate stages of production that develop. This makes sense as the increased demand for intermediate goods would naturally lead to more labor being applied to them. At this point one central question is what happens to the wage rate during this period of transition. One line of thought, discussed in Hicks (1967), has emphasized that a lag in wage increase is necessary for the creation of the cycle. Hicks noted that if wages are fully flexible, then the increased demand for labor would increase its wage. The increase in wages would mean that the wage-earners can increase their consumption, without changing the proportion of their income they save and consume. This will increase the price of the final consumption good, making the industries directly producing the consumption good able to pay the higher wages without reducing their

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<sup>30</sup> For simplicity I assume that we have only labor as an original factor of production and not land. This is in keeping with Böhm-Bawark's simple model, and with Hayek's exposition in PP (see Kurz, 2000, 268).

production. In all, the price vector across goods would rise symmetrically, and therefore no reason would arise for changing the structure of production.<sup>31</sup>

Hayek's central theme was that the wage-earners would not be able to increase their consumption, and for some time they would be 'forced to save'. How this could happen without an assumption of wages being fixed in the short run remains an interesting if unresolved question.<sup>32</sup> Nevertheless, assuming that wages are rigid in the short run, Hayek asserts that at some point in the future labor will receive its increased wage, and, since its disposition towards saving has not changed,<sup>33</sup> it is bound to drive consumption prices up. This causes a crisis, as the capital structure has either changed, or is changing, and it demands a bigger proportion of income to be devoted to saving than was the case before, for the new structure of production to remain in this form, (or to be completed, if yet not operational).

The question of whether it makes a difference in the impending crisis if the new structure of production is in place, or remains to be completed, was a point of debate between Hayek and some of his contemporary critics. Neisser (1934), having in mind the distinction between the stock of capital needed to set up a new production process, and the flow necessary to keep it in place, criticized the theory on the ground that if the rise in consumption happens when the new process is already operating, then there is no reason to insist that a change of the relative vector of prices would induce a change in the old production process.<sup>34</sup> Therefore, credit expansion could have a real long-period effect exactly because it can have a very delayed effect on consumer prices. The consistency of Hayek's theoretical argument then rests on the exact mechanism that delays consumer prices rising immediately when credit expands, and then, on how long the roundabout process takes to be build.

In fact, the core of Neisser's argument is unrelated to whether the alteration of the optimum technique comes about due to a change in the decision of the individuals to save, or due to 'forced saving'. This is because in general, when resources are being redirected from the shorter process to the longer one, several periods of adjustment ensue in which the supply of consumer goods is reduced. The scarcity has to do with the old process being abandoned, and the new one not yet being completed. During this period the prices

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<sup>31</sup> This was also pointed out by Neisser who notes that 'fixed term contracts' and especially 'wage rigidities' account for the sacrifice imposed upon consumers by 'forced saving' (see Neisser, 1934, 435).

<sup>32</sup> Hayek was acutely aware of the fact that his theory of 'forced saving' depended on this consumption lag, and was quite undecided on how to set it in his theory. When Hayek is answering Sraffa he is probably discussing a fixed wage (see Hayek, 1932, 242), and when he is answering Hansen and Tout he is making a much more complex argument in which wage-earners receive their increase but are reluctant to spend it immediately (see Hayek, [1934] 1935, 146). This second line of thought is much more interesting as it keeps intact his argument that the exposition of his theory in PP has no fixed prices, and it could possibly link with the work Hayek was doing on expectations. Nevertheless, Hayek did not fully articulate this or any other idea, and as in PII he explicitly assumed fixed wages in the short run, we may presume that he did consider this assumption empirically relevant.

<sup>33</sup> It is important to stress that business cycle do not occur due to a change in preferences. Hayek repeats this point in his correspondence with Keynes. Keynes asks whether a change in demand for two products, ('bread' and 'houses') emanates from a change of the relative preferences of consumers or there is another cause (Keynes' letter, Oct. 16, 1939). Hayek answers that "I assume no change in consumer preferences. The effect of a rise in profits on the amounts of "bread" and "houses" produced is analogous to a change in relative costs." ( Hayek's letter, Oct. 20, 1939)

<sup>34</sup> The case that the transition period needs more saving than the period after the new productions processes are in place is sited in a number of studies esp. Haberler (1946), Cottrell (1994), Lawlor and Horn (1992).

of consumption goods are even above what they would be if there was no change in the process of production. However, as soon as the new process is in place, an increased amount of consumer good can be delivered, in which case their prices are reduced. Given the current level of saving, (either forced or voluntary) at this time more consumer goods are produced than before. Thus, if the savings are forced, how can we be certain that this new equilibrium would not be stable, and the individuals would wish to consume even more than this chain can produce? The optimal outcome depends on the structure of intertemporal preferences of the individuals, the productivity of the longer process, and the rate of depreciation of capital.

The question of the depreciation rate of capital is important because it has a bearing on how temporary the new structure of capital is without any new saving. To take an extreme case, if the capital produced due to 'forced saving' is indestructible and it never become obsolete, then, even without any new saving, the capital structure of this economy has permanently changed, and so has its ability to produce a stream of consumption goods. This realization brings out a central simplification in Hayek's capital structure in PP. This is that capital depreciates completely once it becomes productive, or to put it another way, all capital is 'circulating capital' and there is no discussion of 'fixed capital'.<sup>35</sup> However, this is a highly unrealistic assumption and Hayek knew it. In a letter to Keynes on 7 Jan. 1932 he writes that "I am conscious that I have treated the durability factor lightly too in *Prices and Production*, but I did so because I hoped to make it less difficult and because I assumed a greater familiarity with Böhm-Bawerk's concept of the average length of production than I ought obviously have done." (Keynes, 1987, CW XIII, 262) In the same letter he distinguished between two different ways to represent the capital process, one is on the 'duration of the process of production', which is what PP was based on, and on the 'durability of many instruments of production' which his analysis so far ignored. He concludes that "the problem becomes, of course, a little more complicated if one combines, as one has to do to come nearer to reality, the two factors determining the existence of capital." (Keynes, 1987, CW XIII, 261-2)

How really are we to combine capital durability with his representation of the capital structure? Hayek does not give us many direct discussions of this. It is not dealt at length with in any of his important contributions to the business cycle literature in the 30's and is only noted in passing in PII (see Hayek, 1939a, 20-24). It is only in PT that we have an extensive discussion of durable goods. The problem that arises with durable capital is that it cannot easily be integrated in the standard representation of the capital process with a definite period of production. If existing capital can provide a repeated stream of products, then, the simple representation of the production process with a 'point-output' consumable good is not valid. In fact, we would have to deal not only with production chains that have 'flow-input' 'point-output' representations, but also with ones that have 'point-input', 'flow-output' forms (see Hayek, 1941, 66-7). If durable goods produce directly consumption goods, then we can speak of a 'flow-output' representation (see Hayek, 1941, 68). Furthermore, if the production of the durable good was a time consuming process, like building a road, then we are dealing with flow-inputs, flow-outputs, in which there will be "a stream of input stretching over a period of time and a stream of output stretching over another period of time." (Hayek, 1941, 151-2)

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<sup>35</sup> This is admitted by Hayek, see Hayek, 1939a, 22 : fn.1.

The problems do not end there. Durable goods are usually used in the production of other intermediate goods, in which case the representation of the process of production becomes even more complex. We do not any more have simply 'circulating capital' being transformed into consumer products with the help of labor, but labor jointly with durable goods produce and sustain the flow of 'circulating capital'. This realization leads to insurmountable difficulties in representing this new system in the framework Hayek was working in. Lutz finds that the input and output curves Hayek constructs to demonstrate the structure of production, cannot be constructed when durable goods are involved (see Lutz, 1943, 303-4). Finally, as Steedman notes "Hayek himself makes it quite clear that 'Austrian' theory must be able to take in its stride the continuous input-continuous output case and yet he provides no convincing demonstration that his input functions or output functions can adequately represent this case" (Steedman, 1994, 14)

Hayek is very aware of these shortcomings, and defends himself by arguing quite early in PT that non-permanence of capital goods is one of the defining characteristic of the Austrian view of capital. In the famous list (Hayek, 1941, 47-9) where he distinguishes the 'Austrian' from the 'Anglo-American' point of view of capital he writes that whereas the 'Anglo-American' view of capital stresses the role of fixed capital, as if capital consists only of very durable goods and that there "the term capital goods is reserved to durable goods which are treated as needing replacement only discontinuously or periodically" (Hayek, 1941, 47), the 'Austrian' view stresses the role of circulating capital which arises out of the duration of the process of production, and also considers non-permanence as the characteristic attribute of all capital goods. (Hayek, 1941, 47)

Where does this leave Hayek's business cycle theory? Whereas one of Hayek's most insightful critiques of contemporary business cycle theories was that they regarded capital as an absolute 'datum' which is given for short period analysis, and therefore capital theory was separated from business cycle theory, he finds his theory occupying the opposite extreme, one in which capital is a flow, and has nothing to say about the changing uses of fixed capital. However, the changing use, and future use, of durable goods in the business cycle is a central pre-occupation of the capitalist, and cannot be simply ignored in the theory of the cycle. As Shackle writes "Hayek's argument, viewing 'capital goods' as materials which only retain their physical identity through a process of fabrication into consumable form, overlooks the grip that durability has in constraining the business man's choice of productive methods." (Shackle, 1981, 240)

Hayek's abstraction from durability and the existence of 'fixed capital' leads him to an interesting analytical distinction. The use of existing capital, and the planning of future investment are two entirely separate activities for the producer/entrepreneur. For Hayek the producer is never bound by his previous investment choices, when he decides how to invest in the future. Thus, any investment the producer has undertaken in the past with a given expectation of the future, may be rendered useless if the external conditions have changed. The investment already applied has no value to the producer now, and it is capital lost.

In his reply to a critical review of PP by Sraffa, Hayek explains that "here it must suffice to point out that if the entrepreneurs in one stage of production find it impossible or unprofitable to replace e.g. their machines, then this will cause the capital instruments which are devoted to the production of these machines to lose their value. That the physical quantity of these capital goods will, for some time, continue to exist unchanged

does not mean that their owners have not lost the greater part, or all, of their capital."(Hayek, 1932, 243) He further goes on to ask "Is Mr. Sraffa really unfamiliar with the fact that capital sometimes falls in value because the running costs of the plant have risen;...And would he really deny that, by a sudden relative increase in the demand for consumers' goods, capital may be destroyed against the will of its owners?"(Hayek, 1932, 244). This underlines a central difference in the conception of capital between Hayek and some of his critics. Hayek considers capital a fragile, perishable good, constructed for a particular purpose whose value diminishes close to zero once its very specific usefulness is surpassed. Minor changes in the interest rate or changes in demand may lay waste machines built over time and dearly paid for. How different a conception then from a view that regards capital as a relatively fixed indestructible good, which evolves over long periods of time, and is rendered obsolete only with sweeping changes of technology, not by minor alterations of demand. Thus, external changes in demand mean that existing capital has to be altered in order to bring supply into conformity with demand, but this does not entail substantial capital loss. In the other extreme, Hayek underplays the malleability of existing capital, and its ability to be transformed into something profitable if the economic conditions of the cycle so demand. His insistence that investment must start again almost from scratch is an extreme position, but again it underlines what other contemporary theories of the 30's underplay, the real loss of capital in the cycle due to unforeseen demand changes.

## **5. Equilibrium vs. the traverse**

Sraffa's review of PP had a considerable impact on how Hayek's business cycle theory was understood and perceived at the time. It continues to generate interest, and a large secondary literature has developed analyzing several aspects of the debate.<sup>36</sup>

One of the important criticisms made by Sraffa of Hayek's cycle analysis concerned the distinction between forced and voluntary savings which was at the heart of Hayek's system. Already from Neisser's criticism it is evident that Hayek's distinction was unclear. However, there remained a theoretical difference between voluntary and forced savings, i.e. that forced savings may not always have a long-period effect on the capital structure of the economy. It is for Sraffa improbable, indeed impossible that once an expansion of credit is introduced into an economic system, there is the slightest possibility of it returning to the exact position occupied prior to the increase. On account of this objection we find one of Sraffa's more lucid and passionate passages in his critique. It reads:

"That the position reached as the result of 'voluntary saving' will be one of equilibrium ... is clear enough; ... But equally stable would be the position if brought about by inflation: and Dr. Hayek fails to prove the contrary." (Sraffa, 1932a, 47)

And adds, after he quotes Hayek's passage that forced savings are bound to have only temporary effects :

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<sup>36</sup> A summary of the secondary literature reviewing the debate can be found in Lawlor and Horn (1992). Important contributions have also been made by Cottrell (1994), Kurtz (2000) and Zappia (2001).

"As a moments reflection will show, 'there can be no doubt' that nothing of the sort will happen. One class has, for a time, robbed another class of part of their incomes; and has saved the plunder. When the robbery comes to an end, it is clear that the victims cannot possibly consume the capital which is now well out of their reach. If they are wage-earners, who have all the time consumed every penny of their income, they have no wherewithal to expand consumption. And if they are capitalists who have not shared in the plunder, they may indeed be induced to consume now a part of their capital by the fall in the rate of interest; but not more so than if the rate had been lowered by the 'voluntary savings' of other people." (Sraffa, 1932a, p. 48)

The argument is that before there is any change in saving, or indeed any in credit, the economy is in a position of equilibrium. In equilibrium the markets are perfectly competitive and the workers are paid their marginal product, capital is given its interest return, and the remaining profit for the firm is zero. This neoclassical distribution system is stable and static. When there is a change in the supply of credit the distribution of resources between entrepreneurs, capitalists and workers gets distorted. Gains may be accrued by capitalists, workers, entrepreneurs, anyone who is lucky or successful during the transition. Hayek may have a distribution mechanism for the static case of equilibrium, but, when this is disturbed his system can say nothing about what will happen. That is because the individuals, or class that benefits by getting first the increased revenue of money can save or consume those goods that they favor, increasing the prices of those goods, and triggering further changes in production.<sup>37</sup>

Hayek in his reply to Sraffa agreed that there was a possibility that some permanent redistribution could occur. He writes that while after the increase in wages, savings will be reduced to their previous level, he qualifies the statement by adding "this is modified only to the extent that entrepreneurs may not consume part of the extra profit made during the period, but may invest it. In such a case the shift of incomes from a class less inclined to save to a class more so inclined will ultimately have produced some real saving"<sup>38</sup> (Hayek, 1932, 242)

Therefore, Hayek distinguished between what happens in the traverse and the new equilibrium position. At the new equilibrium position every factor receives again its marginal product. For that we need competitive solutions for all the markets. So, even though during the period of re-adjustment wealth has changed hands, the re-establishment of equilibrium in part reverses this effect, by reducing profits and increasing wages. Thus, the income streams of the various factors of production are re-established.

This re-establishment of equilibrium was something Hayek discussed extensively. In his reply to Sraffa he thought it necessary to add that from Sraffa's article "one gains the impression that his attitude is a curious mixture of, on the one hand, an extreme theoretical nihilism which denies that existing theories of equilibrium provide any useful

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<sup>37</sup> For Hayek the 'forced savings' can be said to disappear from the system. Sraffa's criticism is that if a sector of the population received a real reduction in their income, this must mean that another sector received a real increase. (see Kurz, 2000, 286)

<sup>38</sup> In fact, this partly permanent effect of changes in savings due to the income redistribution is also noted in PT. (see Hayek, 1941, 35 n.2)

description of the non-monetary forces at work; and, on the other hand of an ultra-conservatism which resents any attempt to show that the differences between a monetary and a non-monetary economy are not only and not even mainly, "those characteristics which are set forth at the beginning of every textbook on money." (Hayek, 1932, 238) While one would have expected that Hayek would have been on the defensive over his analysis of the effects on money in the economy, it is more surprising that he finds it necessary to defend the very concept of equilibrium.<sup>39</sup> This has led a number of modern commentators on the controversy to argue that Hayek and Sraffa were debating from a different theoretical 'bedrock', and given Sraffa's later theoretical contributions, this argument has some intelligibility, although a careful reading of the review would not give it much credibility<sup>40</sup>. It may also be argued that Hayek was starting to be unsure how relevant the state of long-run equilibrium was for the analysis of business cycles. This led him eight years later to drastically alter his position.

In PII Hayek takes one important step in severing the remaining links between the equilibrium state as defined in 'pure theory' to the relevant starting point of his business cycle theory. He defines a short-run equilibrium position, as the point where there are no further rises in the prices of consumption goods (see Hayek, 1939a, 57-60). At this point there is unemployment in the economy. This is because he regards labor to be immobile between stages, and its distribution between stages a "legacy of former booms, the result of the capital goods industries operating in periodical spurts" (Hayek, 1939a, 59). This labor immobility is a very persistent characteristic, and it takes very long to change and readjust; longer than it takes to renegotiate wages, which are also assumed fixed in the short run. Therefore, as existing capital is the 'legacy of former booms' it fits awkwardly with the existing distribution of labor between stages. There are stages with too much capital and too little labor, and others with too little capital and much labor, creating 'pockets' of unemployment. Implicit is the assumption that former booms were driven from demands made on specific sectors of the economy, sectors which may or may not have had unemployed resources. This suggests a very weak link between the short-run equilibrium position, and equilibrium as defined in 'pure theory'. Hayek discards the empirical relevance of the latter.<sup>41</sup> In fact he provides very little insight on how the two equilibria are related in theory.<sup>42</sup> From this short-period equilibrium position, which is clearly not a full equilibrium position, Hayek starts his discussion of the traverse.

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<sup>39</sup> He further writes that "I do not quite understand whether Mr. Sraffa thinks that, in order to show this [an inherent tendency towards equilibrium], it would have been necessary first to re-state the whole of equilibrium economics" (Hayek, 1932, 238)

<sup>40</sup> McCloughry(1982) and Lachmann (1986) had first suggested that Hayek and Sraffa were arguing across each other as they "are in fact not thinking within the same framework." (McCloughry, 1982, p. 172) Caldwell also agreed with this (see Caldwell, 1995, p. 38). However, as Kurz persuasively argues, if Sraffa was against the very concept of equilibrium as employed by Hayek, he would not have gone on to argue on the natural vs. equilibrium rates of return, (see Sraffa, 1932a, 49-51) and their divergence on the traverse, nor the re-establishment of equilibrium when the forward and the spot price coincide with the price of production (see Kurz, 2000, 287 ft.31).

<sup>41</sup> He emphatically asserts that in PII we have "...an account of how such cyclical fluctuations, once started, tend to become self-generating, so that the economic system may never reach a position which can be described as equilibrium." (Hayek, 1939a, 6)

<sup>42</sup> This is an important missing link in the analysis of PII. Hayek writes that once we are in the short-run equilibrium, increasing employment beyond this point is possible only "as savings gradually accumulate and a redistribution of labor between industries proceeds" (Hayek, 1939a, 62). This suggests a 'gravitation'

This is not the only change between PP and PII. In PP the analysis focuses on the interest rate and the change of relative prices, with the profits of the firms not receiving any independent analysis. With the publication of PII the focus drastically changes. There the rate of profit was considered separately to the general effects of the rate of interest, and it became the central moving force of the business cycle.<sup>43</sup>

In PII Hayek can analyze the rate of profit because he has made much more explicit his assumptions about what happens to the various prices during the period of transition. By keeping constant the interest rate and the nominal wage rate, the firms maximize profits given changes in the demand of their final product, and the prices of the intermediate products their production directly depends on. This drastically changes the way we are to understand the cycle. In PP the capital structure was represented by an integrated process from the industries producing the most roundabout capital by use of labor alone, to the industries providing the final consumption good, at the other end of the production process. The two things that defined this process are the proximity of the product of each industry to the final consumption good, and the process's relation to the rate of interest that defined the 'depth' of the process. Within these confines Hayek tried to build a business cycle theory. In PII the rate of interest is completely ignored, and is kept a constant. Instead we have the rate of profit affecting changes in the relative distribution of labor between industries, while keeping the ordering of industries as before, i.e. the proximity of the industry to the final 'composite' consumption good. This does not mean that the 'rate of profit' determines in a new way the depth of the production process in equilibrium that is still determined as before from the rate of interest, and equilibrium savings<sup>44</sup>. The rate of profit becomes a useful concept only outside 'long-period' or 'pure theory' equilibrium, that is in our discussion of the business cycle. This is why in PT Hayek introduces the rate of profit very late, in Part IV of the book, where he

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towards the long-period equilibrium position but how, and when this is relevant remains unclear. Hayek does not explicitly, apart for the indirect indications like the one quoted above, explain how and when -if at all- we get there. In fact, with one very brief and unclear exception (Hayek, 1939a, 44 pointed out by Colonna, 1994, 43) we have no indication of how the traverse between short-run equilibrium positions, which is the main theme of PII, relates to the 'traverse' covering the distance between short-run and long-run equilibrium. Furthermore, it is also not discussed in PT.

<sup>43</sup>This was first noted by Shackle, see Shackle, 1981, 242.

<sup>44</sup>This inevitably opens up the question under what conditions does an existing structure of production redistribute resources internally. In fact, we have to consider what determines the original distribution of resources in the first place. In PP what was assumed was that there is one unique way to optimally organize labor production for each existing process. As all labor was fully mobile between sectors this would make sense. It was, however, never explicitly stated, and even more, in any way proved.

In PII it is still suggested that it is the real economy, and the saving decision of individuals that decide the overall structure of production, i.e. the 'depth' of the process, and therefore the optimal distribution of labor between the different stages. There is still one distribution of labor between the different stages that is compatible with long-run equilibrium. It is assumed that the existence of fixed capital from investment decisions of the past frustrate this equilibrium creating a misalignment between the optimal distribution of labor between stages, given by the choice of optimal technique, and its existing distribution brought about by the historical development of capital. Therefore, given the complexity of the current position we would expect Hayek to have elaborated on the optimal distribution of labor in a process of production with a given depth, and what happens when we depart from this optimal distribution. Why some 'mis-distributions' are better than others, as some are short-term equilibrium ones and others are not. Thus, we have left the simpler case of PP where we compare alternative processes whose difference is only in the depth of the capital structure, for the extremely complex case in PII where we have to consider explicitly not only the depth of the process, but also the distribution of labor in the different stages of the process.

very briefly deals with business cycles in a money economy, and in all other sections discusses solely the rate of interest. This also gives us the long-period equilibrium position between the two rates, the rate of interest and the rate of profit are the same thing there (see Hayek, 1941, 396).

What is then the mechanism of the transition in PII? Hayek starts his analysis assuming there is a raise in the demand for consumer goods. At the same time he is assuming that for the period of the rise nominal wages are fixed, so that workers cannot consume what they did before the increase in the price of consumer goods. The rise in consumer good prices is the analogous trigger for the business cycle to the reduction in the interest rate that triggered the cycle in PP. The paradox, in comparison with what happens in PP, is that here consumer goods prices rise before there is any rise in the disposable income of the wage earners. Hayek then introduces The Ricardo Effect. The Ricardo effect is simply "that the rise in wages will encourage capitalists to substitute machinery for labor and vice versa" (Hayek, 1939a, 8). If we now assume that there is unemployment in the industries producing consumption goods, the producers producing consumption goods will be able to benefit directly from the price increase. This will mean that there will be increased demand for intermediate products and labor directly supplying these producers. Whereas in PP, the combined effect of increased demand for intermediate products, and the decrease in the interest rate increased the profit margins of the producers further away from the consumption good, the effect here is exactly the opposite. The increased demand for intermediate goods and workers, in connection with fixed wages, means that the producers of consumption goods will try to substitute away from buying expensive intermediate products, and try to increase production by hiring more workers. In PP changes in the distribution of workers across the process of production meant a change in the 'depth' of production, and triggered a change of technique. This is not so in PII (see Hayek, 1939a, 8 fn.2) where the labor employed by the industries producing consumption goods is not only specific to that sector, but also redundant enough to supply a sizable increase in employment and consequently of output. Under these conditions very little of the increased demand for consumption goods actually leads to increased prices of intermediate goods, and the profit margins of the producers further down the process of production have increased substantially less than those who were producing directly consumption goods. In this way we can also claim that the process of production has become 'shallower', as proportionately more labor is applied closer to the finishing stages of the process of production than before, without as such reorganizing the distribution of labor already employed across the whole structure of production.<sup>45</sup>

The question arises of what happens to the profits accrued by the producers. One suggestion is that they are saved, and as the interest rate is kept at a constant level by assumption, they cannot influence the investment market. However, the low level of interest assumed thus far is not only a deterrent for further saving, but also keeps low the

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<sup>45</sup> The difference between PP and PII at this point is quite important. In PP, the change in the rate of interest did not mean an alteration of labor input between the existing stages of production, but an abandonment of the whole structure and a setting up of a new one. In PII we do not find a change in the structure of production, and an abandonment of the current structure, but rather an application of excess labor in the stages closest to the production of the consumption good. This is done without changing the number of stages, but simply by drawing in unused resources.

return savers receive from their investment effectively reducing their overall income. Another more interesting suggestion was given by Colonna (1994) who argued that the decreased level of interest made the producers consume most their increased income.<sup>46</sup> This would mean that even a small initial increase in the price of consumption goods would have within it the propagation mechanism of continually increasing demand for those goods, at least as long as unemployment in this sector existed.

Furthermore, at this new position, the economy at large is not experiencing 'forced saving' as it did in PP, but if anything, 'forced consumption' as an increased amount of income goes now for consumption.<sup>47</sup> However, we still have not provided any reason why capital in this economy has not as such remained close to intact. The demand for intermediate goods has not decreased, and neither have resources been drawn from them as labor is compartmentalized and cannot be influenced by what is happening in the other sectors of the economy. It is true that producers producing consumption good directly are making much larger profits than their competitors at the other stages of production. Should this mean that the other producers should change their production and produce directly consumption goods? This is highly doubtful, as they clearly would not have the appropriate capital equipment to do so. At this point Hayek introduces a raise in the 'cost of raw materials' (see Hayek, 1939a, p. 29-31) by arguing that the increased demand for production in the consumption producing industries, raises their price affecting adversely the industries that produce capital. These industries face now not only a large increase in costs, but also a limited demand for their products, they are therefore bound to curtail production, and affect a sizable reduction of capital in the economy.

If the last few lines make little sense it is because I have willfully ignored a central issue of the structure of production in my representation of it in the last three paragraphs. That is, how do the raw materials fit in this production process? or to put it differently are the capital goods under discussion durable machines, or 'circulating capital' that gets transformed into consumption good as in PP? The problem is that Hayek is trying in PII to have a bit of both worlds, a production chain making goods of various durability, from which flows a constant stream of 'circulating capital' now under the name of raw materials. The construction proposed by Hayek is at best confusing if not self-contradictory, as Hayek tries to link proximity to the final consumption good with durability of machines.<sup>48</sup> If we try to ignore the durability aspect, and revert to suggesting

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<sup>46</sup> Colonna (1994) suggests that in Hayek (1942) we find "the identification of the class of rentiers as 'the consumers' whose unchanged propensity to save prevents the workers from reaching the appropriate level of real wages". (Colonna, 1994, 46).

<sup>47</sup> This was also argued by Kaldor see Kaldor, [1942] 1960, 151-3.

<sup>48</sup> Hayek while admitting that most capital is of a durable kind, (see Hayek, 1939a, 20-21) goes on to present an augmented 'Austrian' production scheme (Hayek, 1939a, 22-24) where the most durable goods are further away from the final consumer section. The scheme, contrary to the simple linear 'Austrian' scheme, assumes that the consumer goods industries (stage I industries) receive capital inputs not only from the previous stage (stage II), but in part from all stages from the most removed from the final to the one closest to it (stages III, IV, etc.). This happens also for the industries in the stage one removed from the final (stage II), who receive inputs from all stages preceding theirs (stage III, IV, etc.). In this representation it is assumed that the industries providing capital goods 'further away' from the consumption good provide the most durable equipment. The closest we come to the consumption sector industries, more of the capital produced is of the 'circulating capital' form. Presumably, consumption goods are of a very ephemeral character, although his example of railroads (Hayek, 1939a, 23), if he is speaking of consumption goods there, makes this far from clear. This becomes more complicated by assuming that the further down we go

that we are simply concerned with circulating capital, then the Ricardo Effect strikes us at best as an oddity, as it is arguing that increasing labor input at some stage of the production can 'compensate' for increased unfinished products, i.e. raw materials, that will 'become' the consumption product<sup>49</sup>. Furthermore, the whole argument of short-run equilibrium rested on the existence of 'fixed capital' from the past. If we cannot explain the existence of fixed capital in the economy, then the conception that there are economic sectors that combine regularly with machinery, and, due to 'investment decisions of the past', some sectors are left with a residue of plentiful capital, while others have too little, is hard to explain. The existence of 'structural' unemployment appears to be an oddity for a model with only circulating capital.

Thus, we are left with three interesting insights from PII. First, Hayek's claim that the full equilibrium position is not a theoretically or empirically relevant position, and as such we sever almost entirely the link between long-run equilibrium analysis and the discussion of the traverse. Second, the implicit claim that the overall structure of production ruled by the interest rate can be assumed to be a constant in business cycle analysis, and what changes is the relative curtailment of production at the various stages due to the rate of profit, that determines investment in the traverse between short-run equilibria. Third, that the resolution of the question of the durability of capital becomes a central issue of the business cycle, not only of equilibrium theory. Thus, the introduction of the profit rate in PII did not do much to clarify the mechanism of the traverse, or provide a tighter link between long-run equilibrium analysis and the traverse. Therefore, it can be suggested that a model which abstracts from the detailed representation of the Austrian 'linear process of production', which is now irrelevant in the short run, but could capture the interdependence of fixed with circulating capital in the supply of consumption goods, would be a much better point from which to start business cycle analysis.<sup>50</sup> Thus, we have moved far from the original conception of PP where the restructuring of the process of production is an integral part of the transition, and where the Austrian representation of capital is as crucial in transition as it is in equilibrium.

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in the stages (III-IV-V, etc.) we observe more automatic machinery being produced. He considers that stage II production would provide consumers' goods industries with "raw materials and their simplest tools" (Hayek, 1939a, 22). While it may be clear that 'raw materials' and 'simple tools' may be of limited durability, and therefore fall nicely in the scheme provided, it is rather difficult to see how they can depend on complex machinery for their production, and complex machinery does not depend on them for supplies! This becomes even more difficult to believe if we consider that increases in the prices of raw materials directly affect all stages in the structure of production, and this is a cornerstone of Hayek's analysis in PII.

<sup>49</sup> To put it differently that there can be substitutability between 'working capital' and labor input. Hayek recognized that this is highly unlikely (see Hayek, 1939a, p. 29).

<sup>50</sup> Hayek was effectively working towards this conclusion. His exposition of the capital structure of the economy in PII hardly takes up two sections (see Hayek, 1939a, 20-29) and is in a very cursory form. He is also very reluctant noting that the scheme "does some violence to reality" (Hayek, 1939a, 22). He notes that many relationships in the capital structure are of a 'circular' character and cannot be depicted linearly. (Hayek, 1939a, 22) Furthermore, he acknowledges the work of Burchardt and his critique of 'Austrian' capital theory (Hayek, 1939a, 23). On the critique of Bohm-Bawerk's production scheme by Lowe and Burchardt see Hagemann (1994). In fact, as Hagemann points out a theory of capital with durable goods shifts the focus of the analysis on the traverse from the monetary causes to the real structure of capital changing entirely the focus of business cycle analysis (see Hagemann, 1994, 115-71).

## 6. Conclusion

Hayek's late 20's and early 30's contributions in extending the neoclassical concept of equilibrium, and in elaborating Austrian capital theory, placed him in a unique position from which to start his analysis of the business cycle. In his first extended attempt in PP Hayek emphasized that changes in the supply of credit that reduced the level of interest in the economy signaled an alteration in the equilibrium 'depth' of capital. This meant that changes in the monetary variables created important distortions in the real economy that affected the process of production, and the flow of consumption goods over time. From early contemporary criticism it became evident that a more complex framework of expectations had to be devised in order to explain the behavior of the entrepreneurs when out of equilibrium. This led Hayek to realize that the concept of equilibrium he was working with needed further elaboration and improvement, which made him consider broader issues than those directly related to business cycle theory. Concurrently Hayek was working on a generalization of his process of production as applied in PP. As early as 1932 he had realized that he had given very little attention to 'fixed capital'. He admitted that in PP he had only considered 'circulating capital'. In PT he tried to integrate 'fixed capital' within the Austrian conception of the process of production, but the effort was not successful. Also, in PII he took much more seriously the effects of 'fixed capital' in the workings of the business cycle, as now in contradistinction to PP, past investment decisions leave a trail of 'fixed capital' in the economy that determines the short-run equilibrium position of employment. However, without a capital theory framework of how 'fixed' and 'circulating capital' combine the analysis in PII is at best incomplete. What was an external critique of PP became an internal one in PII. Nevertheless, one advantage of PP is that by emphasizing almost entirely the perishable nature of capital Hayek was able to provide a novel view of capital destruction due to cyclical alterations in demand. His explanation of the changes in the flow of 'circulating capital' during the business cycle remains relevant to modern theory.

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