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On the monetary nature of savings: a critical analysis of the Loanable Funds Theory

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Abstract

To hypothesize the existence of a relationship between money and savings means questioning a fundamental pillar of the mainstream economic theory: the concept of neutrality of money. According to the traditional theory economic phenomena such as savings can be defined independently from money. The objective of this work is to show that savings cannot be defined independently from money and that savings must be considered as a monetary phenomenon. The paper consists of two parts. Starting from Adam Smith's analysis and continuing up to the approaches developed by contemporary economists, in the first part we summarize the most significant aspects and the limitations of the mainstream theory. In the second part we specify the reasons of the non-neutrality of money and of the monetary nature of savings.

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1.Introduction

The hypothesis of the existence of a relation between money and savings leads questioning a fundamental pillar of the mainstream economic theory, namely the thesis that money is no more than a tool allowing to reduce the costs of exchanges and that does not influence the structure of the economy. According to this thesis, economic phenomena such as savings can be defined independently from money.

The objective of this work is to show that in the: "economic society in which we actually live" (Keynes 1936, p. 3), the very nature of savings deeply depends on the presence of money. In other terms, we intend to show that savings cannot be defined independently from money and that savings must be considered as a monetary phenomenon. The paper consists of two parts. Starting from the analysis of Adam Smith up to the approaches developed by contemporary economists, in the first part we summarize the most significant aspects of the mainstream theory. In the second part we instead specify the reasons of the non-neutrality of money and of the monetary nature of savings.

2. The phenomenon of savings in the mainstream theory

Since childhood fables teach us the meaning of savings. Aesop contrasts the behavior of the industrious ant that collects crumbs and seeds during the summer, to that of the lazy cicada that instead spends its days singing while lying in the sun. The fable ends by describing the conditions of the ant and cicada at the arrival of winter. The ant, thanks to

hard work during the summer, will be able to survive by consuming what was saved, while the cicada is destined to suffer from hunger and cold. Aesop's fable provides an effective definition of savings: saving means not consuming today part of the goods produced through our work in order to consume these goods in the future.

This definition seems easily applicable also to contemporary economies that are populated by individuals who, in exchange for their work, receive a flow of money credited to their bank accounts. Even for these individuals, saving means deciding not to consume the entire fruit of their labor today in order to consume goods in the future. The fact that savings consist of the flow of monetary income that is not spent, and not by crumbs and seeds accumulated by the ant, apparently does not change the nature of the phenomenon of saving. In other words, money does not appear as a necessary element to define the meaning of the concept of savings. As stated in the introduction, our goal is to show that the use of money, and in particular of bank money, profoundly changes the nature of savings; in contemporary economies, savings are a monetary phenomenon because they cannot be defined independently from money.

To achieve this goal, it is necessary to complete the description of the mainstream theory. Aesop's fable considers the behavior of a single subject; if we consider an economic system made up of many individuals, we can highlight another element that characterizes the phenomenon of saving. The saver can choose to keep what he has not consumed, or decide to lend what he has saved in exchange for the promise of the return of the amount lent and a premium consisting of interest. This second choice presupposes the presence of subjects who are able to use the saved resources and to obtain an income that will allow to repay the debt and pay interest. Generally, these subjects are identified with entrepreneurs using saved resources to obtain capital goods, that is, means of

production enabling to increase the productivity of labor. In this case, saved resources give rise to a flow of investments corresponding to the variation in the capital stock owned by the firms. From a macroeconomic perspective, mainstream theory highlights the causal relation between saving decisions, investment decisions and capital accumulation; a relation that is at the heart of Adam Smith's lesson.

2.1 *The lesson of Adam Smith*

According to Adam Smith, the income of a country depends directly on the amount of capital determined by saving decisions. Therefore, Smith defines the following causal sequence: savings $(S) \rightarrow$ capital $(K) \rightarrow$ national income (Y). At first sight, this sequence seems to neglect the role of labor in the process leading to the determination of income. Actually, the role of labor is made explicit once the concept of capital defined by Smith is specified. To define the concept of capital, Smith introduces the distinction between *productive labor* and *unproductive labor*: "there is one sort of labour which adds to the value of the subject upon which it is bestowed. There is another which has no such effect. The former, as it produces a value, may be called productive; the latter unproductive labour" (Smith 1776, p. 330). For example, productive workers are those employed to produce tools such as nails, hammers or spades, or those employed to produce corn. In Smith's view, servants instead represent a typical example of unproductive workers.[1]

[1] "[…] the labour of a manufacturer adds, generally, to the value of the materials which he works upon, that of his own maintenance, and of his master's profit. The labour of a menial servant, on the contrary, adds to the value of nothing. Though the manufacturer has his wages advanced to him by his master, he, in reality, cost him no expence, the value of those wages being generally restored, together with a profit, in the improved value of the subject upon which his labour is bestowed. But the maintenance of a menial servant never is restored. A man grows rich by employing a multitude of manufacturers; he grows poor by maintaining a multitude of menial servants." (Smith, 1776, p. 330)

Smith identifies capital with the part of national income corresponding to the wages paid to productive workers, and he underlines that the total production realized in a certain period derives exclusively from the employment of productive labor: "the whole annual produce, if we except the spontaneous productions of the earth, [is] the effect of productive labour" (Smith 1776, p. 332). The higher the number of productive workers employed and, thus, the amount of capital, the higher the total level of national income.[2]

Finally, to explain the concept of savings and the relation between saving decisions and capital Smith refers to an economy characterized by the production of a surplus, that is, an economy in which the employment of productive workers generates a level of annual income higher than the amount of capital corresponding to their wages. In this case, the annual income can be divided in two parts: the first part corresponding to the amount required to replenish capital, and the second part representing the profits of entrepreneurs. Entrepreneurs can choose whether to use their profits to employ new productive workers in addition to those employed in the current period or to employ unproductive workers. According to Smith, savings correspond to the share of profits used to expand the number of productive workers and, thus, capital; by hiring unproductive workers, entrepreneurs instead consume their whole income.

It must be observed that Smith defines the concepts of savings, capital and national income in terms of goods realized by means of land and labor. This implies that the

[2] Smith observes that productive workers do not coincide only with those directly employed in the production of final goods, but also with those employed in the production of capital goods used by other workers. "The productive powers of the same number of labourers cannot be increased, but in consequence either of some addiction and improvement to those machines and instruments which facilitate and abridge labour; or of a more proper division and distribution of employment. In either case, an additional capital is almost always required. It is by means of an additional capital only that the undertaker of any work can […] provide his workmen with better machinery […]." (Smith 1776, p. 343)

necessary condition to specify a causal relation between these variables is that they can be expressed with reference to a same unit of measure. This condition is satisfied if we consider an economic system characterized by the presence of only one type of productive workers, for example, agricultural workers employed to produce corn, which represents the wage good consumed by both productive and unproductive workers. To illustrate the relation between savings, capital and national income, we assume that both productive and unproductive workers receive the same wage, which is equal to w quintals of corn, and that they completely consume their wage. Furthermore, we assume that the productivity of each agricultural worker is constant and equal to $A > w$.

Y_t indicates the total amount of production obtained at the end of period t by employing a number of productive workers equal to N_t; this means that, at the end of period t, the total amount of corn will be equal to $Y_t = AN_t$. The production realized in period t is controlled by the entrepreneurs, who decide how to use it in period $t + 1$. In particular, the income produced in period t can be divided in two parts: the first part is used to replenish the capital employed to produce corn in the current period (Y_t), which corresponds to the wages paid to productive workers $(K_t = wN_t)$.

As we have assumed that $A > w$, we will have: $Y_t > K_t$. The difference between these two values corresponds to the profits of the entrepreneurs*:* $\Pi_t = Y_t - K_t$. The level of income that will be realized in period $t + 1$ (Y_{t+1}) depends on how the entrepreneurs decide to use their profits. If they decide to use them to employ only unproductive workers, the level of national income will not change because the stock of capital remains constant. If entrepreneurs instead decide to use their profits to hire productive workers, they will increase the stock of capital and, thus, their income; in this second case, saved profits are deducted from consumption. Smith underlines that both savings and

consumption imply the absorption of resources, but that they have very different consequences.[3] The share of profits used to employ new productive workers allows expanding the stock of capital and future income, while the share of profits used to employ unproductive workers does not produce neither an increase of the stock of capital nor an increase of income.[4] This relation leads Smith to exalt the social role of parsimony and to condemn prodigality: "every prodigal appears to be a publick enemy, and every frugal man a publick benefactor" (Smith 1776, p. 340). In other terms, Smith claims that those behaving like the ant in Aesop's fable are not only able to survive winter, but that they become also public benefactors.

We can underline another element of Smith's theoretical approach, that is, the complete absence of money. In fact, money does not play any role in the definition of the concept of savings and of the relation between savings, capital and income. In other words, as in the case of Aesop's ant, the concept of savings can be defined in terms of goods and is thus independent from money.

2.2 *The neoclassical theory*

In more than two centuries, the relation between savings, capital and income defined by Smith has undergone two major modifications that, nonetheless, have not altered the substance of his analysis. The first modification concerns the concept of capital, while

[3] "What is annually saved is as regularly consumed as what is annually spent, and nearly in the same time too; but it is consumed by a different set of people." (Smith 1776, pp. 337)

[4] "Parsimony, by increasing the fund which is destined for the maintenance of productive hands, tends to increase the number of those hands whose labour adds to the value of the subject upon which it is bestowed. It tends therefore to increase the exchangeable value of the annual produce of the land and labour of the country." (Smith 1776, pp. 337-338)

the second consists in the explicit consideration of the dissociation between saving and investment decisions and in the consequent specification of the credit market.

The marginalist revolution that started in the 1870s led to abandon the distinction between productive and unproductive labor and, thus, the definition of capital as wages paid to productive workers. The servants and the unproductive workers indicated by Smith disappear from the scene, and workers are divided in two groups: the first group produces the only existing consumption good, while the second group produces the tools used by the first group of workers. Therefore, we assume that capital corresponds to the wages paid to the workers employed in the realization of the means of production. Capital is considered as a distinct productive factor assuming the same dignity as labor. The new role of capital is underlined by the introduction of a production function that defines the relation between total income (Y), capital (K) and labor (L). This production function describes an economic system characterized by the production of a single homogeneous good, for example corn or fishes, in which workers are employed to realize the only existing consumption good or capital goods such as plows, spades and tractors, or fishing rods and boats.

The relation between savings, capital and national income is specified by considering indifferently an economy with a single individual, as in the case of the economy of Robinson Crusoe, or a system characterized by the presence of a multitude of individuals. Let us begin from the economy of Robinson Crusoe. We assume that his survival depends on fishing and that, at first, his productive activity is limited to gather the fish left on the beach by the tide. In this case, production is realized only by means of direct labor. However, Crusoe could expand the future production of fish if he decides to dedicate part of his workday to realize a fishing rod, a fishing net or even a boat. Crusoe's

savings would thus consist in subtracting work time from the direct production of fish to build tools enabling to increase future production.

This causal relation between savings, capital and production can be defined also with regard to an economy populated by many individuals engaged in the production of a single good. In this second case, it is possible to consider the phenomenon of the dissociation between saving and investment decisions. Böhm-Bawerk has provided an effective example referred to a fishermen-economy:

> Let us imagine […] a tribe of people who live by fishing and who are entirely without capital. They catch their fish on the seashore by seizing with their bare hands such fish as are stranded in the pools left behind by the receding tide. A workman of this tribe catches and consumes 3 fish a day. If he had a boat and net he could catch 30 fish a day instead of 3. But he cannot construct those implements because their construction would cost him a month's time and labor, and during that interval he would have nothing to live on. (Böhm-Bawerk 1884, pp. 280-281)

The condition of Böhm-Bawerk's fisherman could improve if someone lent him sufficient fish to allow him to survive during the period required to build the boat. Thanks to the greater production of fish obtained with the boat, the fisherman will then be able to repay the loan and to pay a premium represented by interest.[5]

The explicit consideration of the dissociation between saving and investment decisions allows specifying the characteristics of the credit market by underlying the relation between saving decisions and the supply of credit and between investment

[5] "Now someone lends him 90 fish on condition that he promise to pay back 180 fish one-month later. Our man agrees to the transition, provides his subsistence out of the borrowed fish for one month and in the meantime constructs a boat and net with which in the following months he catches 900 fish instead of 90. From these he cannot only repay the stipulated amount of 180 fish but also retain a sizable net gain for himself." (Böhm-Bawerk 1884, p. 281)

decisions and the demand for credit. The rate of interest is the price allowing to equilibrate the demand for and the supply of credit and, thus, saving and investment decisions. Furthermore, the explicit consideration of the dissociation between saving and investment decisions represents the necessary premise for the introduction of financial intermediaries, whose role consists in facilitating the transfer of funds from the savers to the entrepreneurs engaged in realizing capital goods. This transfer of funds can be hampered by the presence of imperfections such as information asymmetries. Therefore, the task of financial intermediaries consists in gathering information from potential borrowers.[6] Stiglitz and Weiss (1990), for example, describe the role of the banks in a context marked by information asymmetries with reference to an agricultural economy in which the object of credit is corn used as seed in plots of land with different levels of productivity.[7]

We can thus underline that a common feature of Adam Smith's analytical approach and the contemporary mainstream theory consists in the definition of a relationship between savings, capital and income defined independently from money. In other words,

[6] See, for example, Bernanke and Gertler (1995), Bernanke et al. (1999), Stiglitz and Weiss (1990), Stiglitz and Greenwald (2003).

[7] "The need for credit arises from the discrepancy between individual's resource endowments and investment opportunities. This can be seen most simply if we imagine a primitive agricultural economy, where different individuals own different plots of land and have different endowments of seed with which to plant the land. (For simplicity we assume that seed is the only input.) The marginal return to additional seed on different plots of land may differ markedly. National output can be increased enormously if the seed can be reallocated from plots of land where it has a low marginal product to plots where it has a high marginal product. But this requires *credit*, that is, some farmers will have to get more seed than their endowment in return for a *promise* to repay the loan in the next period, when the crop is harvested. Banks are the institutions within this society for screening the loan applicants, for determining which plots have really high marginal returns, and for monitoring, for ensuring that the seeds are actually planted, rather than, say, consumed by the borrower in a consumption binge." (Stiglitz and Weiss 1990, pp. 91–92)

money has no influence at all on the phenomenon of credit, which can be defined in real terms, that is, in terms of unconsumed goods used to overcome winter as in the case of Aesop's ant, or to pay the workers employed in the production of plows and tractors or fishing rods and boats. According to this theoretical framework, credit demand and supply are a mere reflection of saving and investment decisions. For this reason, the supporters of the mainstream theory have developed macroeconomic models based on the consideration of the goods market and the complete neglect of the credit market.[8] A significant example is Solow's growth model (Solow 1956). Solow's model, which gave rise to the neoclassical theory of growth, describes "an imaginary economy that has only one produced good that can be consumed directly or stockpiled for use as a capital good" (Solow 2000, p. 351; see also: Barro and Sala-i-Martin 2004, Chou 2007).

In *The General Theory*, even Keynes describes the classical theory in this way. According to Keynes, the classical theory: "has regarded the rate of interest as the factor which brings the demand for investment and the willingness to save into equilibrium with one another. Investment represents the demand for investible resources and saving represents the supply, whilst the rate of interest is the 'price' of investible resources at which the two are equated" (Keynes 1936, p. 175). This representation of the classical

[8] In McCallum's view, for example: '[C]an it be sensible to discuss monetary economics with little attention devoted to the workings of financial markets? […] The question's answer is […] fairly straightforward. It rests basically on the fact that in making their borrowing and lending decisions, rational households (and firms) are fundamentally concerned with goods and services consumed or provided at various points in time. They are basically concerned, that is, with choices involving consumption and labor supply in the present and in the future. But such choices must satisfy budget constraints and thus are precisely equivalent to decisions about borrowing and lending – that is, supply and demand choices for financial assets. Thus, for example, a household that chooses to consume this year in excess of this year's income equivalently chooses to borrow (or to draw down its assets) to the required extent. Consequently, there is no need to consider *both* types of decisions explicitly." (McCallum 1989, pp. 29–30)

theory of credit and of the rate of interest has been criticized by the supporters of the loanable funds theory (hereinafter LFT), who on the one hand, recognize that in an economic system characterized by the use of bank money the supply of and demand for credit do not correspond to saving and investment decisions, but on the other hand, yet endorse the validity of the relation between savings, investment and capital defined by the classical theory.

2.3 *The loanable funds theory*

In this paragraph we describe the LFT with reference to Ohlin's criticism of the Keynesian liquidity preference theory. Ohlin (1937a, 1937b, 1937c) disapproves the way Keynes illustrates the classical theory of the rate of interest, and stresses that, according to the supporters of the loanable funds theory, the rate of interest is not the prices allowing to equilibrate savings and investments, but the price allowing to reach equilibrium on the credit market.[9] Following the lesson of Wicksell, Ohlin observes that in contemporary economies: "There is a credit market […] but there is no such market for savings and no price of savings. […] But there is a supply curve for savings, expressing willingness to refrain from consuming the whole expected income. There is also a curve of planned new investment" (Ohlin 1937c, p. 424).

[9] "Obviously the rate of interest cannot […] be determined by the condition that it equalizes the supply of and the demand for savings, or, in other words, equalizes savings and investment. For savings and investment are equal *ex definitione*, whatever interest level exists on the market […] the rate of interest is simply the price of credit, and […] it is therefore governed by the supply of and the demand for credit." (Ohlin 1937b, p. 221)

According to Ohlin, notwithstanding a tight relation between credit supply and demand curves and savings and investment curves,[10] these two couples of curves do not coincide. To explain this statement, Ohlin recognizes that, first, saving decisions do not automatically translate into investments because savers may decide to accumulate money.[11] If we admit the existence of this circumstance, we must conclude that, due to the decision of savers to reduce their stock of money, credit supply may increase independently from saving decisions.[12] Secondly, following Wicksell, Ohlin points out that banks are able to offer credit by creating new money. In accordance with Ohlin, the supporters of the LFT conclude that credit supply and demand curves do not coincide with savings and investment curves.

Even Keynes recognizes that in an economic system characterized by the use of bank money it is impossible to identify the supply of credit with the decisions to save, and thus to consider savings as the only source of money supply to be used to fund investments.[13] The fundamental difference between Keynes and the supporters of the LFT is that the latter continue to claim the validity of the causal relation between savings,

[10] "That the relation between the curves referring to savings and investment and those referring to credit is close should be obvious." (Ohlin 1937c, p. 425)

[11] "It is possible to plan to save and to increase the quantity of cash instead of lending." (Ohlin 1937c, p. 425)

[12] "Also one can plan to extend credit instead of planned savings, if one is willing to reduce one's own quantity of cash." (Ohlin 1937c, p. 425)

[13] A few years after the publication of *The General Theory,* Keynes explained his reasoning in a criticism of how, starting from the LFT, the Committee of Statistical Experts analyzed the process of capital formation: "According to the Committee funds for investment can only become available either from prior saving or from dishoarding and credit expansion. […] The committee have overlooked the fact that *spending* releases funds as much as saving does. […] Money which is spent on prior consumption flows into the same pool of available funds as money which is saved […]." (Keynes 1939, pp. 572-573)

investments and capital defined by the classical theory even in a world marked by the use of bank money.

To explain the thesis put forth by the supporters of the LFT, we specify the functions of credit supply and demand as follows. According to the supporters of the LFT, the supply of credit is fed not only by the flow of savings (S), net of the quantity of money savers decide to accumulate (ΔH), but also by new money created by the banks to fund businesses (ΔM); the demand for credit instead corresponds to the investment decisions (I). The rate of interest is the price that equilibrates the supply of and demand for loanable funds. Assuming that income (Y^*) is determined by a given availability of labor and capital, and that the banks exogenously fix the flow of new money by which funding businesses (ΔM^*),we can define the equilibrium condition of the loanable funds market by means of equation 1):

$$1)\ S(Y^*, r) + \Delta M^* - \Delta H(Y^*, r) = I(r)$$

Equation 1) allows the supporters of the LFT to claim that even in an economy based on the use of bank money the specification of the causal relation between savings and investments of the classical theory remains essentially unchanged. In fact, equation 1) shows that, given the flow of money created by the banks, changes in the propensity to save influence the level of the rate of interest and investment decisions. The supporters of the LFT recognize that banks can fund investments by creating new money and that savers can decide to accumulate money, but they conclude that these phenomena can cause only temporary deviations from the equilibrium condition reached when the rate of interest is determined only by saving and investment decisions. In other terms, according to the supporters of the LFT, the employment of bank money can produce only temporary deviations of the level of the rate of interest from the level corresponding to what Wicksell

has defined as the natural rate of interest, that is, the rate of interest determined if savers and firms exchanged capital goods in kind, without the intermediation of money.[14]

After the publication of *The General Theory* economists accepted the Keynes's liquidity preference theory and the concept of natural rate of interest was virtually forgotten, but it returned at the core of macroeconomic analysis following the Presidential Address to the American Economic Association delivered by Friedman in December 1967 (Friedman 1968). The concept of natural rate of interest certainly holds if we consider the economy of Robinson Crusoe, the corn economy described by Adam Smith or Böhm-Bawerk's fishermen-economy. In economies of this kind, the flow of savings can be defined in terms of goods, and represents the necessary condition for the realization of investments; this implies that, as claimed by Smith (see note 3), what has been saved will be employed similarly to what has been consumed. The supporters of the LFT believe that the concept of natural rate of interest and the corresponding concept of savings can be applied even to contemporary economies based on the use of bank money.

We intend to show that, contrary to the claims of the supporters of the LFT, the employment of bank money deeply changes the nature of savings. We will stress that the concept of savings emerging from the behaviour of Aesop's ant, or that holds in the economies described by Smith and Böhm-Bawerk, cannot be applied to contemporary economies, and that money represents an essential element to define the phenomenon of savings.

[14] "[…] if capital is lent in kind, there would undoubtedly develop, through the supply of and the demand for available capital, a certain rate of interest on the lending market, which would be the natural rate of interest on capital in the strictest sense." (Wicksell 1898, pp. 84-85). On this point see Bertocco 2013.

3. The monetary nature of savings.

3.1 *The limits of the mainstream theory and the monetary nature of savings*

To explain why it is not possible to apply the classical and neoclassical definition of savings to an economy characterized by the use of bank money, we consider the definition of credit supply specified in the equation 1), which consists of three elements $(S + \Delta M - \Delta H)$. The first element is the flow of savings (S). As we have seen, according to Ohlin it seems trivial to consider the flow of savings as a source of the supply of credit. This is perfectly acceptable if we identify savings with the flow of the goods produced but not consumed: the crumbs and seeds of Aesop's ant, or the surplus of corn obtained by Adam Smith's entrepreneur. By applying the concept of natural rate of interest to contemporary economies, the supporters of the LFT implicitly accept the definition of savings in terms of unconsumed goods.

The second component of the supply of credit is represented by the flow of money created by the banks (ΔM), net from the change in the amount of money accumulated by the savers (ΔH), which is the third element of the credit supply function. As we have seen, Ohlin recognizes that the flow of savings may not be transformed in supply of credit because the savers can decide to accumulate money. In this way, Ohlin acknowledges that the savers receive a monetary income that is partly used to buy goods and partly saved. In other terms, Ohlin acknowledges that savings consist of a flow of money and not of a flow of unconsumed goods.

We can thus observe that the function of credit supply elaborated by Ohlin and by the supporters of the LFT is based on a contradictory definition of savings. On the one hand, by accepting the concept of natural rate of interest, the supporters of the LFT identify savings with the flow of unconsumed goods. But on the other hand, by taking

into consideration the employment of bank money, they regard savings as a flow of money accumulated by the savers. These two definitions of savings are incompatible; if it is accepted that in contemporary economies individuals receive a monetary income and that saving decisions consist in the accumulation of money, it is not possible to identify savings as a flow of unconsumed goods, but it must be acknowledged that the flow of savings consists of money created by the banks and accumulated by the savers. As we have seen, Keynes points out that in a monetary economy: "*spending* releases funds as much as saving does" (see note 13). Therefore if savings (S), included in equation 1), were a flow of money, we should also consider consumption (C), in the credit supply function.

We must thus wonder if these considerations influence the specification of the causal relation between savings and investments. As seen earlier, the classical and neoclassical theory considers saving decisions as the necessary premise for the realization of investments. The employment of bank money represents only a nuisance that can temporarily break the link between savings and investments. The causal relation between savings and investments certainly holds in the corn economy described by Adam Smith or in the fishermen-economy described by Böhm-Bawerk; but we must wonder if this relation is valid even in an economy based on the use of bank money.

In other terms, we must wonder if even in the latter economic system the principle of neutrality of money holds, that is, if money can be considered as a simple veil hiding the very nature of economic phenomena that can be defined based on real factors. The objective of our work is to show that money is not neutral and that a monetary flow of savings is not equivalent to a flow of unconsumed goods. This implies that in an economy

which uses bank money the causal relation between savings and investments defined by the classical theory is not valid.

To explain this thesis we observe that in an economy characterized by the use of bank money and in which savings consist of a flow of money, saving decisions presuppose the creation of new money that will be accumulated by savers. In the same way as in a corn economy saving presupposes the production of corn, in an economy based on the use of bank money saving presupposes the production of money that will be accumulated by savers. Nevertheless, the similarities between these two economic systems stop here, since producing bank money differs from producing corn.

The first difference consists in the fact that, contrary to corn, bank money has no production costs as it is reasonable to hypothesize that it is not produced by means of labor. The second difference is represented by the fact that bank money is created in accordance with a credit contract by which banks fund spending decisions of economic agents. Suppose, for the sake of simplicity, that these economic agents are businesses going into debt to realize investments. We can thus observe that, while in a corn economy the credit market is characterized by the presence of savers and businesses and by the circumstance that the object of credit is unconsumed corn, in an economy based on the use of bank money the credit contract is the instrument by which the banks fund the investments of businesses through the creation of a flow of new money.

The decisions of businesses and banks that fuel operations on the credit market give rise to the creation of a flow of money equal to the flow of investments. This has two important consequences: i) the flow of investments is independent from the flow of savings defined by the LFT, that is, it does not depend on the production of goods that

are not consumed; ii) the flow of money created by the banks represents the source for the accumulation of money by the savers.

We can thus claim that in an economy characterized by the use of bank money investment decisions funded by means of the creation of money represent the necessary condition for the accumulation of money by the savers. This induces to stress that in contemporary economies the causal relation between savings and investments is reversed compared to that put forth in the LFT. In fact, we recall that even in an economy marked by the use of bank money the accounting identity between savings and investments holds. Therefore, the fact that investments are realized thanks to new money created by the banks must lead to conclude that it is investments to determine savings. In other terms, it must be concluded that the realization of a certain flow of investments (I) thanks to the flow of money created by the banks (ΔM) generates an equivalent flow of savings (S) employed to accumulate the money previously created by the banks $(\Delta H = \Delta M)$.

The causal relation between savings and investments already described must be integrated by the specification of the effects produced by investment decisions on the flow of income. Since in contemporary economies savers accumulate a flow of money equal to a share of their monetary incomes, for example: S = sY, and since savings depend on investments, we must conclude that even the total flow of income (Y) depends on the flow of investments. In other terms, we must conclude that investment decisions funded by the banks generate a flow of monetary income leading to the emergence of a flow of savings equaling the flow of investments.

This causal sequence represents the core of the Keynesian principle of effective demand. The significant element of the description contained in these pages consists in underlying the essential role of money and, in particular, of bank money. In his reply to

Ohlin's criticism, Keynes acknowledges that in *The General Theory* he had not dealt with the issue of investment financing. In the works following the publication of *The General Theory* Keynes maintains that savings cannot be a source of investment financing[15], and underlines the role played by the banks in funding investment decisions.[16] Even in *The General Theory* Keynes criticizes the concept of forced saving, and hints at the role of the banks in funding investments and at the fact that savers accumulate money created by the banks.[17] We must remember that Ohlin seems accepting Keynes's analysis when he states that there is not: "any contradiction between Mr. Keynes's theory and mine, when he stresses that changes in the level of income help to ensure the equality between saving and investment. A reduction of the rate of interest will increase investment and, thus,

[15] "Increased investment will always be accompanied by increased saving, but it can never be preceded by it. Dishoarding and credit expansion provides not an *alternative* to increased saving, but a necessary preparation for it. It is the parent, not the twin, of increased saving." (Keynes 1939, p. 281)

[16] "[…] in general, the banks hold the key position in the transition from a lower to a higher scale of activity. If they refuse to relax, the growing congestion of the short-term loan market or of the new issue market, as the case may be, will inhibit the improvement, no matter how thrifty the public purpose to be out of their future incomes … The investment market can become congested through shortage of cash. It can never become congested through shortage of saving. This is the most fundamental of my conclusions within this field." (Keynes 1937, p. 222)

[17] "The notion that the creation of credit by the banking system allows investment to take place to which 'no genuine saving' corresponds can only be the result of isolating one of the consequences of the increased bank-credit to the exclusion of the others. If the grant of a bank credit to an entrepreneur additional to the credits already existing allows him to make an addition to current investment which would not have occurred otherwise, incomes will necessarily be increased. […] Moreover, except in conditions of full employment, there will be an increase of real income as well as of money-income. The public will exercise a 'free choice' as to the proportion in which they divide their increase of income between saving and spending. […] Moreover, the savings which result from this decision are just as genuine as any other savings. No one can be compelled to own the additional money corresponding to the new bank-credit, unless he deliberately prefers to hold money rather than some other form of wealth." (Keynes 1936, pp. 82-83)

savings […] through the increased income and the consequent rise in unintentional and, later, in planned savings" (Ohlin 1937c, p. 626).

To complete our analysis about the nature of savings in an economy based on the use of bank money we must specify the characteristics of investments. In other words, we must wonder if in an economy marked by the use of bank money investments are the same compared to those realized in the Adam Smith's corn economy or in the Böhm-Bawerk's fishermen-economy. It appears difficult to answer this question in the affirmative, since there are no evident reasons justifying the employment of bank money in economic systems characterized by the production of a single homogeneous good. In economies of this kind, banks can act as intermediaries as illustrated by Stiglitz and Weiss (see note 7), but it is not easy to explain the presence of banks that are able to offer credit by creating new money.

In our opinion, an effective way to explain the presence of bank money and the characteristics of investments in contemporary economies consists in making use of Schumpeter's theoretical framework, in which banks and bank money represent an essential element of the phenomenon of economic development which is based on the introduction of innovations by the entrepreneurs allowing the realization of new goods that change the structure of the needs of consumers. Schumpeter claims that without bank money firms could not introduce innovations (Schumpeter 1943, p. 175).

To explain the fundamental role of bank money Schumpeter observes that the introduction of innovations consisting in new goods requires particular skills differing from those needed to manage incumbent firms. Those introducing innovations must be able to act in conditions of uncertainty since their decisions aim at changing the consumption habits and life styles of the population (Schumpeter 1912, p. 66).

Schumpeter thus concludes that, generally, innovations are introduced by 'new men' who, unlike those running incumbent firms, do not control the basic production factors (i.e. labor and land). Schumpeter explains that the expansion of the supply of credit by the banks provides new purchasing power to the entrepreneurs-innovators, allowing them to demand labor services (Schumpeter 1912, pp. 106-109). According to Schumpeter, without banks and credit it is impossible to explain the process of economic development of a capitalist economy.[18]

The specification of the relation between bank money and innovations that is central in Schumpeter's analysis allows us illustrating a fundamental aspect of the productive process characterizing contemporary economies, which Keynes defined as *monetary economies* or *entrepreneurial economies* to distinguish them from the *real-exchange economies* or *co-operative economies* described by the classical theory. Keynes (1933) explains the differences between these two kinds of economies with the help of two formulas originally developed by Marx. With the sequence $C\,(commodity) \rightarrow M(money) \rightarrow C'\,(commodity)$, Keynes characterizes a *real-exchange economy*, while with the sequence $M\,(money) \rightarrow C(commodity) \rightarrow M'\;\;(money)$ he describes the features of a *monetary economy*.

Keynes makes use of these two formulas to underline that in the economic system defined by the classical theory productive processes can be described in terms of goods and independently from money, but that in contemporary economies productive processes

[18] "The banker […] is not so much primarily a middleman in the commodity 'purchasing power' as a *producer* of this commodity. […] He is essentially a phenomenon of development. […] He makes possible the carrying out of the new combinations, authorizes people, in the name of society as it were, to form them. He is the ephor of the exchange economy." (Schumpeter 1912, p. 74). On this point see: Bertocco and Kalajzić (2019)

cannot be analyzed without taking into consideration the role played by money. The sequence used to characterize a monetary economy induces us to observe that, on the one hand, the availability of money is not only the necessary condition for the *purchase* of goods, but also the necessary condition for the *production* of goods and, on the other hand, that the goal of economic activity does not consist in the production of goods but in the obtainment of a monetary profit.[19]

We can thus conclude that, contrary to the claims of the supporters of the LFT, the employment of bank money deeply changes the nature of savings; the causal relation between savings and investments that holds in an economy in which savings are defined in terms of goods produced and not consumed, cannot be valid in an economy based on the use of bank money. In the appendix we describe a simple macroeconomic model showing how, in an economy characterized by the relation between bank money and innovations, which is at the core of Schumpeter's analytical framework, money is not neutral because it influences: i) the nature of savings; ii) the relation between savings and investments; iii) the level of income.

3.2 *The relationship between money, wealth and speculation*

As seen in the preceding paragraph, the act of saving consists in the accumulation of the money created by the banks to fund investments. This conclusion allows us emphasizing

[19] "The classical theory supposes that the readiness of the entrepreneur to start up a productive process depends on the amount of value in terms of product which he expects to fall to his share; i.e. that only an expectation of more *product* for himself will induce him to offer more employment. But in an entrepreneur economy this is a wrong analysis of the nature of business calculation. An entrepreneur is interested, not in the amount of product, but in the amount of *money* which will fall to his share. He will increase his output if by so doing he expects to increase his money profit, even though this profit represents a smaller quantity of product than before." (Keynes 1933b, p. 82)

the relation between savings and wealth, which plays a central role in Keynes's theoretical approach. In fact, at the end of each period savers accumulate a flow of money equal to the flow of investments that adds to the stock of wealth accumulated in preceding periods. Therefore, over time savers can accumulate an unlimited amount of wealth, a circumstance highlighted by Keynes, who states that savers are individuals moved by the desire to accumulate an unlimited amount of purchasing power to be able to buy any good at any future time.[20]

The consideration of the relation between savings and wealth leads us to observe that investments can be funded not only through the money created by banks, but also through the already existing money accumulated by the savers. This phenomenon has been underlined by Ohlin who, as recalled in par. 3.1, states that savers may decide to accumulate money, which means that they are able to fund investments through previously accumulated money. The fact that investments may be funded through the money accumulated by savers-wealth holders could result in the rehabilitation of the traditional theory. Indeed, the money transferred to businesses could be considered as the outcome of the decision to refrain from the consumption of a share of the goods produced. Hence, it may be concluded that refraining from consuming the goods produced represents the necessary condition for the realization of investments. For example, this is the thesis that Luigi Einaudi has always opposed to Keynes:

> Until a few years ago when talking about saving what came to mind was the typical *bonus pater familias* who earn 100 every years, month or day and, spending 80, takes

[20] "An act of individual saving means – so to speak – a decision not to have dinner to-day. But it does *not* necessitate a decision to have dinner or to buy a pair of boots a week hence or to consume any specified thing at any specified date. […] the act of saving implies […] a desire for 'wealth' as such, that is for a potentiality of consuming an unspecified article at an unspecified time." (Keynes 1936, pp. 210-211)

> the remaining 20 to the bank. If, by piling up 20 on 20, at the end of a year a fund of 10 billion is constituted, here is the expedient, the sought-after device capable of setting the mechanism in motion. […] To the man in the street and to old-fashioned economists it thus appears absurd to obtain a loan of 10 billion if the 10 billion have not first set aside and are not yet available. Without the hare, one cannot make a hare pie. It appears, instead that in the advanced countries hare pies are now made with rabbits. In other words I have the impression that for some time English economists have been assiduously engaged in the noble task of looking for rabbits to use in the place of hares. (Einaudi 1933, pp.126-127)

Actually, we can observe that in the economy described in the preceding pages the money accumulated by the savers does not originate from the choice of the savers to produce corn and to refrain from its consumption. In other terms, the object of the credit agreement between savers and businesses does not consist of goods produced and not consumed, but of money accumulated by savers. This money exists, on the one hand, because of the presence of an entrepreneur-innovator planning to realize an investment-innovation and, on the other hand, because of the willingness of the banks to fund this investment project by creating new money. If the banks did not fund the investments, the savers could not have accumulated bank deposits because bank deposits are a consequence of the loan granted to the entrepreneur. We can thus claim that savings are a monetary phenomenon: to save means accumulating money, not real goods produced independently from money. The monetary nature of savings is confirmed by the fact that the causal relation between bank loans and bank deposits is reversed with respect to the relationship defined by the mainstream theory, according to which loans depend on deposits.[21]

[21] According to Einaudi: "The theory whereby *first* the saver sets aside L20 (or L10 billion among all savers in the country), *then* he takes them to the bank and *finally* the banks lends them to entrepreneurs […] is seen as antiquated or at least inadequate. Alongside it there is another, and in modern countries apparently much weightier, theory, whereby *first* the bank grants a customer […] a line of credit, *then* the customer draws cheques on the bank up to the amount of the credit received, *next* the beneficiaries of the cheques

As underlined in the preceding pages, according to the traditional theory savings represent a real phenomenon: to save means refraining from the consumption of a share of the goods produced and to allocate it to investments. Therefore, savings cannot be substituted by money. Starting from this conception of savings, Einaudi concludes that we live in a world characterized by the scarcity of savings and, thus, that it is necessary to adopt measures stimulating its formation:

> In a troubled world with an uncertain future, on the one hand a smaller amount of 'voluntary' savings is produced; and on the other hand, no limits can be glimpsed on the investment possibilities created by the discoveries of science and technology. […] In an age in which it is really necessary that investments grow rapidly and spread all over the world; in an age in which the amount of capital needed to employ a working unit is becoming higher and higher; in an age in which the need to raise the average productive capacity of mankind and therefore his standard of living is seriously urgent and this need is felt for hundreds of millions of men living on the verge of hunger, is it enough to invest at the usual pace and is it therefore enough to produce savings in the quantity we see today? If the answer to this question is in the negative, is it not therefore urgent to remove the obstacles that today limit the formation of private savings? (Einaudi 1954, pp. 353-354)

As seen earlier, in a monetary economy, investments are funded with money and are not limited neither by the availability of savings nor by the availability of money. The fact that, in a monetary economy, investments are funded by means of money and that in such an economy there certainly does not exist a problem of scarcity of money does not mean that the problems Einaudi proposed to overcome through the increase of the propensity to save can be easily solved.

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pay in the sums to the same or other banks and thus, *finally,* bank *deposits* are credited." (Einaudi 1933, p. 127)

We can observe that the financial structure based on the production of bank money making possible the process of economic development described by Schumpeter is at the root of the crises and the fragility characterizing contemporary economies. Keynes underlined the need to develop a monetary theory of production to explain that the origin of crises lies in the reasons of the non-neutrality of money: "booms and depressions are phenomena peculiar to an economy in which […] money is not neutral" (Keynes 1933a, p. 411). Minsky (1975, 1982, 1986) has made a fundamental contribution to the comprehension of the relation between money and economic crises. Minsky has shown that the evolved financial system that is of crucial importance in Schumpeter's process of economic development introduces an element of fragility into contemporary economies that can trigger deep economic crises caused by the insufficiency of investments and the insolvency of debtors, or by the speculative behaviour of bankers and wealth-holders. We can indeed, underline that the process of wealth accumulation based on the relationship between savings and wealth justifies, as explained by Keynes in the *General Theory*, the presence of speculative markets in which financial assets, representing the value of investments-innovations made from period to period, are traded.

We thus conclude that the structural fragility of contemporary economies and the need, underlined by Einaudi, to improve the life conditions of a large share of humankind, require different interventions from the increase of the propensity to save.

4. Conclusions

In this work we have shown that the mainstream theory of savings, according to which the nature of savings is independent from money, is valid only in a corn economy characterized by the phenomenon of growth. We have shown that in contemporary

economies characterized by the phenomenon of development and by the presence of bank money, the nature of savings deeply changes. To save does not mean to collect crumbs and seeds, or to decide not to consume a part of the corn produced, but to accumulate money created by the banks to fund investments. Furthermore, we have shown that, while in the corn economy described by the classical theory the causal relation between savings and investments is valid, in contemporary economies this causal relation is reversed as investments determine savings, and savings are related to the accumulation of wealth.

Appendix

A simple macroeconomic model to explain the monetary nature of savings

The model specified in this appendix presents the following features. The first fundamental characteristic concerns the introduction of Schumpeterian innovations, which consist in the production of new goods by businesses. To take into account this phenomenon we abandon the hypothesis that the economy is marked by the production of a single homogeneous good that can be either consumed or invested.

To explicitly consider the Schumpeterian notion of innovation, we have introduced a particular concept of investments. Investments do not coincide with the production of new capital goods perfectly equal to those already existing, but consist of instruments enabling to produce new goods. We can illustrate this concept of investments by means of an example. To this end, we start from a corn economy and suppose that an entrepreneur-innovator plans the realization of an innovation, for example the construction of a railway. We further assume that labor is the only productive factor required to produce corn or to realize the railway. Therefore, in our model we distinguish between two groups of workers: those employed in the production of corn and those employed to realize tracks and locomotives. Correspondingly, we also distinguish between two kinds of businesses: agricultural businesses (farms) producing corn, and the company of the entrepreneur-innovator engaged in the construction of the railway.

Moreover, we assume that the life of businesses can be divided in two phases. During the first phase, entrepreneurs realize the instruments needed to produce a certain

good by employing labor. For example, during the first phase of their life farmers realize spades, plows and tractors that will be used during the second phase by the workers employed to produce corn. We thus assume that in each period two groups of businesses coexist. The first group consists of the businesses born in the past that in the current period are able to produce goods that can be sold to consumers. In our example these businesses are the farms employing labor to produce corn; hence, corn represents the only good sold in the period in consideration. The second group of businesses instead consists of those businesses employing labor to realize the instruments needed to produce new goods or services in the subsequent period; in our example this second group of businesses is represented by the company employing workers to realize tracks and locomotives.

The second fundamental characteristic of our model concerns the specification of the role of the financial system. Following Schumpeter, the model emphasizes the role played by the banks in the process leading to the realization of innovations. In our model the construction of the railway by the entrepreneur-innovator depends on the possibility to obtain funding from the bankers, who are able to grant credit by creating new money.

To complete the description of our model it is necessary to specify the labor market and, thus, the labor demand and supply functions. We suppose that the money wage (w_t) and the price of corn (P_t), which in the current period is the only good that can be sold, are fixed in different moments. At the beginning of the period bargaining between workers and businesses determines the level of the money wage, which will be equal for both the workers employed to produce corn and those employed to build the railway; moreover, we assume that the money wage is equal to 5 units of money, while the productivity of each agricultural worker (A) is equal to 10 quintals of corn. This implies that the cost of labor per unit of corn is equal to w_t/A. We also suppose that, once the money wage has been determined, agricultural entrepreneurs (farmers) fix the price of a quintal of corn (P_t) by applying a mark-up $(1 + m)$ to the cost of labor per unit of corn. Thus, we obtain $P_t = (1 + m)\, w_t/A$, and since we assume that $m = 1$, the price of a quintal of corn (P_t) fixed by the farmers will be equal to one unit of money. Consequently, the real wage (w_t/P_t) corresponds to $w_t < A$. According to these hypotheses, entrepreneurs are able to fix the real wage (w_t/P_t) at a level coherent with their profit objectives.

This means that, if we lived in a corn economy, in correspondence with a real wage equal to five quintals of corn $(w_t/P_t = A/(1+m) = 5)$ the function of labor demand would be perfectly elastic, that is, that entrepreneurs would be willing to hire all the available workers, which are identified by N^* (we assume that $N^* = 1{,}400$). With regard to the labor supply function, we assume that the workers accept the nominal wage fixed by the bargaining between workers and entrepreneurs, and that they accept the real wage that will be fixed by the entrepreneurs.[22] In other words, we assume that the labor supply function and the labor demand function overlap.

Given these hypotheses about the configuration of the labor market, we can show that the level of employment changes significantly depending on whether we observe a corn economy or a capitalist economy characterized by the process of development described by Schumpeter. In a corn economy the agricultural entrepreneurs employ all the workers whose productivity is higher than the real wage expressed in term of corn. Therefore, in a corn economy farmers hire all the $N^* = 1{,}400$ available workers. Nevertheless, this conclusion does not hold in a capitalist economy.

In a capitalist economy the objective of entrepreneurs does not consist in the production of goods but in the obtainment of a monetary profit through the sale of the goods produced. This implies that production decisions depend on the expectations of the entrepreneurs concerning the monetary revenues they will be able to obtain in the future by selling the goods produced. This decision criterion is adopted not only by the entrepreneurs introducing an innovation, but even by the entrepreneurs producing corn. In fact, in a monetary economy even farmers do not want to obtain a profit in terms of corn but a monetary profit. Consequently, a level of the actual real wage (w_t/P_t) lower than the marginal productivity of the workers employable in the agricultural sector (A) does not represent a sufficient condition to induce the farmers to hire all the N^* available workers.

To illustrate this point, for the sake of simplicity, we assume that the workers spend all their salary to buy corn, while entrepreneurs do not demand corn and save their profits. If the farmers hired all the available workers, they would produce 14,000 quintals of corn $(1{,}400 \cdot A)$. However, since only workers buy a quantity of corn equal to their wage, it is

[22] This is equivalent to assume that, in each period, the workers expect an inflation rate equal to zero, independently from the inflation rate observed in the past.

possible to sell just 7,000 quintals of corn $(1{,}400 \cdot 5)$. Farmers would thus realize monetary revenues equal to 7,000 units of money, which correspond to the wages paid to the 1,400 available workers. Therefore, farmers would not obtain a monetary profit, but only a surplus in terms of corn. This means that, contrary to what happens in a corn economy, the farmers will not hire all the 1,400 workers employable to produce corn.

We can underline that in a capitalist economy, the demand for labor, and thus the production decisions of entrepreneurs, do not depend only on the level of the real wage, but even on the level of aggregate demand. In a capitalist economy, the decisions of the farmers about the number of workers to be employed in the production process depend on their expectations about the future demand for corn and, thus, on the expectations about the monetary revenues they will be able to obtain.

Since only employed workers demand corn, these expectations in turn depend on the expectations concerning the total number of employed workers. For example, if the farmers expect that all the 1,400 available workers will be employed, they would estimate a demand for 7,000 quintals of corn $(1{,}400 \cdot 5)$. As the productivity (A) of agricultural workers is equal to 10 quintals of corn this implies that the farmers will hire 700 workers. To reach full employment it is necessary that the 700 workers not employed to produce corn are employed to realize investments, for example, the construction of a railway. But if there were no investments and the number of workers employed to realize the railway was equal to zero, farmers would not hire any agricultural worker since they would not be able to sell not even the corn produced by a single worker. Therefore, we can conclude that in a monetary economy the levels of income and employment depend on investments with the characteristics of Schumpeter's innovations. In other terms, in a monetary economy Say's Law does not hold and the system is characterized by the validity of the principle of effective demand.

The relationship between investments, innovations and the levels of income and employment can be illustrated with the help of some simple equations.[23] Income is identified by Y, and as we do not consider the public sector and trade relationships with foreign countries, Y is the sum of consumption (C) and investments (I):

1) $Y = C + I$.

[23] For a detailed description of the model see Bertocco and Kalajzić (2020).

Income, consumption and investments are all defined in monetary terms. Since we have hypothesized that the workers spend their whole salary to buy corn, while entrepreneurs do not demand corn, consumption corresponds to the monetary value of the corn consumed by agricultural workers $\left(C_{ag}\right)$ and railway workers (C_R):

2) $C = C_{ag} + C_R = wN_{ag} + wN_R$.

Investments, instead, correspond to the monetary value of Schumpeter's innovations, which in our example correspond to the construction of the railway. We assume that the monetary value of the railway is equal to the production costs, and since the only productive factor employed to realize the railway is labor, the value of the railway equals the wages paid to the railway workers. Investments are determined by three factors. First, they depend on the presence of entrepreneurs who, based on their *animal spirits* (AS), plan to produce innovative goods and services. Secondly, they depend on the level of the rate of interest set by the banks (r^*). We indicate investments planned by entrepreneurs-innovators with I_d. Thus, we have:

3) $I_d = f(AS, r^*)$.

Finally, investments also depend on the decisions taken by the banking system. As pointed out by Schumpeter, entrepreneurs can realize innovative investments only if they borrow from the banks. However, we assume that, after defining the level of the rate of interest (r^*), bankers do not automatically accept all the credit applications submitted by the entrepreneurs but only those deemed creditworthy. If we indicate the flow of credit created by the banks with L^*, we have:

4) $I = L^* \leq I_d$.

Equation 4) shows that usually the investments realized thanks to the creation of new money by the banks are lower than those desired by the firms: in a monetary economy banks ration credit. As we have assumed that the monetary value of investments (L^*) corresponds to the wages paid to the railway workers, that is, to the monetary value of their consumption of corn, we have:

5) $L^* = C_R = wN_R^*$.

N_R^* represents the number of railway workers hired thanks to the funds obtained by the entrepreneur-innovator. By substituting equations 4), 5) and 2) in equation 1) we obtain:

6) $Y = wN_{ag} + wN_R^* + wN_R^*$.

In order to determine the level of income (Y), it is necessary to define N_{ag}, namely the number of workers that will be employed by the farmers. Remember that the production decisions of the farmers depend on their expectations about the demand for corn and, as only employed workers demand corn, that these expectations in turn depend on the expectations concerning the total number of employed workers $\left(N_{ag} + N_R\right)$. For the sake of simplicity, we assume that the farmers are able to know the number of workers that will be employed for the construction of the railway (N_R^*).[24] Thus, we can show that once farmers have defined N_R^*, they are able to determine how many agricultural workers $\left(N_{ag}\right)$ will be employed. Indeed, each agricultural worker produces a quantity of corn equal to A and consumes a quantity of corn equal to $w < A$. Consequently, each agricultural worker produces a surplus of corn equal to $(A - w)$ allowing farmers to satisfy the demand for corn of the railway workers. The number of agricultural workers can thus be calculated from equation 7), in which wN_R^* indicates the demand for corn expressed by the railway workers, while $(A - w)N_{ag}$ enables to define the number of agricultural workers needed to satisfy this demand:

7) $wN_R^* = (A - w)N_{ag}$.

From this equation, we obtain:

8) $N_{ag} = [w/(A - w)]\ N_R^*$.

With $A = 10$ quintals of corn and $w = 5$ quintals of corn, we have $N_{ag} = N_R^*$. Equation 8) shows that the number of agricultural workers depends on the number of workers employed for the construction of the railway. If we substitute equation 8) in equation 6) we obtain:

9) $Y = w[w/(A - w)]N_R^* + wN_R^* + wN_R^*$.

Thus, we finally obtain:

10) $Y = [(2A - w)/(A - w)]wN_R^*$.

Equation 10) shows that in a monetary economy the value of income is a multiple of the monetary value of investments (wN_R^*). In our example A corresponds to 10 units of corn,

[24] By introducing this hypothesis, we eliminate the dimension of uncertainty associated to the decisions of the farmers, but we do not eliminate uncertainty from the model. In fact, the decisions of the entrepreneur-innovator intending to realize the railway and those of the bankers who must decide whether or not to fund the investment project are taken in conditions of uncertainty.

while w is equal to 5 units of money/corn (recall that we have assumed that $P = 1$). Hence, the value of the multiplier is 3. In other terms, the monetary value of income is equal to three times the monetary value of the investment consisting in the construction of the railway. The employment of a railway worker earning a wage of 5 units of money implies a corresponding investment. Since, following this investment, the demand for the consumption of corn rises by 5 units of money, farmers are induced to hire an additional agricultural worker who, in turn, will consume corn corresponding to further 5 units of money. In the end, income will rise by 15 units of money.

If the entrepreneur-innovator employed 700 workers to realize the railway, investments would rise by 3,500 units of money leading to an equivalent change in the consumption of corn by the railway workers (3,500) and by the agricultural workers (3,500). Consequently, total income would amount to 10,500 units of money. Total income corresponds to the sum of consumption (C), which is equal to the wages paid to the agricultural workers and the railway workers (7,000), and of investments (I), which instead equal the wages paid to the 700 workers employed for the construction of the railway (3,500). Total income also corresponds to the sum of wages $(R = 7{,}000)$ and profits $(\Pi = 3{,}500)$. In our example, profits are realized by the farmers as they sell 7,000 quintals of corn in exchange of 7,000 units of money, while their production costs correspond to the wages of 700 agricultural workers (3,500 units of money). As we have assumed that farmers do not consume, profits are equal to their savings (S):

11) $Y = C(7{,}000) + I(3{,}500) = R(7{,}000) + \Pi(3{,}500) = C(7{,}000) + S(3{,}500)$.

This analysis allows us showing that savings are not independent from money. At first glance, in our example agricultural workers are similar to the productive workers described by Smith. As their productivity (A) is higher than the real wage (w/P), the farmers obtain a profit by employing these workers. Furthermore, the difference between the total production of corn and the production needed to pay the agricultural workers could be identified with the flow of savings allowing to pay the workers employed to build the railway and, thus, to realize investments.

However, contrary to what happens in a corn economy, in a monetary economy savings can no more be considered the necessary premise for the realization of investments, namely the part of total production not consumed in the present to increase future consumption by means of investments. Investments are financed by money created

by the banks; if investments lacked, neither income nor savings would exist. Returning to the example described in the preceding pages, we observe that the railway has not been realized due to the decision of the farmers to produce corn and to lend unconsumed corn to the entrepreneur-innovator. On the contrary, the entrepreneur-innovator is able to build the railway only thanks to funding obtained through the creation of new money by the banks. In a second moment, the construction of the railway causes an increase in the demand for corn that leads agricultural entrepreneurs to expand production in exchange for money. Therefore, farmers do not become savers by deciding to produce an amount of corn exceeding the amount they wish to consume, but by choosing to accumulate the money created by the banks and received in exchange for the corn sold to the workers employed for the construction of the railway (3,500 units of money corresponding to their profits and savings). In other words, the creation of bank money that enabled the entrepreneur-innovator to realize the railway represents the necessary condition allowing the farmers to obtain a monetary revenue and to accumulate savings under the form of the new money created by the banks.

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