Some notes on Ricardo's analysis of the convergence process of the market rate of interest to the natural rate

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Introduction

This paper aims to be a preliminary critical discussion about one of the main accepted results of Ricardo's theory of money and interest, i.e., that the 'natural' rate of interest is determined by the profit rate.

It will be argued that some logical inconsistencies seem to affect Ricardo's representation of the tendency of the market rate of interest to the natural rate, with the latter ultimately determined by the rate of profits.

According to Ricardo, exogenous changes in the supply of, or demand for money generate short-run changes of the money-prices ratio and the market interest rate, and permanent changes in the price level play the role of bringing them back to their natural values (the natural rate of interest being taken as a fraction of the natural profit rate).

We will try to show that the convergence process envisaged by Ricardo seems to be not free from some critical considerations about its internal coherence if one takes into due account what he conceives to be the specific inducement for the public to borrow a larger quantity of money at a lower interest rate—namely, an above normal difference between profit rate and interest rate, together with the behavior of the banking system and with the main institutional features of a monetary system.

In this regard we will also argue, following Green's pioneer works (1982, 1992, 1998) about the quantity theory of money in classical political economy, that Ricardo appears to set his main arguments about the convergence of the market rate of interest to the natural level in the context of an inconvertible monetary system, in which the concept of a natural, or normal, *ratio* of the quantity of money to prices (determined by the ratio between the given volume of transactions and the given velocity of circulation of money) is consistent with different absolute levels of the latter.

The analysis consists of four sections. The first section expounds the general framework within which our analysis will be conducted as well as the basic features of Ricardo's theory of the natural rate of interest and of the mechanism through which Ricardo maintains the convergence of the market rate of interest towards the natural rate is allowed, i.e., by means of variations in the price level. As we will see, Ricardo takes for granted such convergence mechanism, without apparently providing sufficient analytical explanations for its economic relevance. The second section outlines what, in our view, seems to be the main logical inconsistency of the convergence mechanism envisaged by Ricardo. It will be pointed out that, after an

increase in the money supply, the rise in the price level need not be more than sufficient to absorb, at the same interest rate, the greater quantity of money put in circulation; hence, for the interest rate to return to its natural level, the convergence process would require an increase in the demand for money beyond that needed to meet the increased supply. The determinants of the demand for money in Ricardo, which can be traced back to transactional motives, will be discussed, as well as how these determinants appear to be extendable to the concept of 'applications to the bank for money' which Ricardo himself introduces. In the third section it will be maintained that for the increase in the price level to generate the excess demand for money that would 'spontaneously' bring the interest rate back to its natural level, a functional relationship between the rate of interest and the demand for money as such would be needed; it will be claimed that this concept - which, as it is well known, has been introduced by Keynes and then incorporated in later theoretical elaborations aimed at rehabilitating the marginalist theory - seems however to be absent in Ricardo's analysis. We will also subsume the issue concerning the convergence of the rate of interest to its natural level in three more general and closely related questions which Ricardo, to some extent, seems to hint at, albeit in an unsystematic and ill-defined way. These subjects concern the incentive for individuals to increase borrowings – that incentive represented in Ricardo by an above normal 'enterprise profit', the behaviour of the banking system and the institutional limits that banks may encounter to the expansion of loans. Through a comparison with the matter carried out by Wicksell, whose analysis shows, in some respects, some points in common with that of Ricardo, the discussion of these questions may further allow to capture how changes in the price level are not in themselves capable of warranting the convergence of the market interest rate to its natural level.

In the fourth section we will address the general features of Ricardo's theory of money in order to argue that Ricardo seems to think about an inconvertible monetary system when he describes the convergence process of the market rate of interest to its natural level. In fact, to explain the convergence of the interest rate to the natural level in a convertibility regime, Ricardo appears to hint at a mechanism other than the increase in the price level, which is based on the outflow of the 'excess' quantity of money-commodity from national borders.

In the conclusions we will summarize the main results of the paper, providing indications for possible future lines of research on the subjects covered in our discussion.

I

1. Before addressing the topics to be discussed, some remarks seem due**.** In dealing with the issues related to Ricardo's analysis of the convergence process of the rate of interest to its natural level, the perspective here adopted views the banking system as a potentially unlimited source of purchasing power, through the lending and issuing of money and/or the granting of credit facilities. Although this conception is peculiar to the later theoretical elaborations concerning the behavior of banks – like, for example, that of Wicksell (see below, section III) - it seems possible to assume that it is also to be found, to some extent, in the analysis of monetary questions put forward by Ricardo (see below, section III).

Therefore, insofar as, according to Ricardo the only reason for individuals to request money is that related to transactions (see below, section II), we shall use the terms 'money', 'credit' and 'loans' granted by the banking system as having the same meaning, being although well aware of the distinction between, for example, paper, or cash, money and overdraft facilities with regard to their use as a means of payment for transactions of different amounts. It is indeed irrelevant, in our view, to distinguish between the issuance of banknotes (convertible or inconvertible) and the granting of credit facilities, insofar as the banking system is able, at least potentially, to issue, lend or grant them in unlimited quantities for the transactions that individuals wish to carry out.

However, individual banks can cope with 'de facto' limits to the creation of purchasing power; these limits - which Ricardo seems to hint at- are ultimately represented by the availability of liquid reserves in relation to deposits (liabilities), whatever form the former may take (gold, paper money or deposits held with the central bank). The availability of reserves is, in modern economies, under the control of the monetary authority, which determines the amounts available to individual banks and the means by which they may dispose of them (whether through refinancing operations with the central bank and/or through borrowing on the interbank market). This is part of a central bank's management of monetary policy which, however, was not yet so well developed at Ricardo's time[1].

[1] Morgan ([1943] 2013, p. 24) has claimed that before 1797, i.e., the year of entry into force of the Bank Restriction Act, the directors of the Bank of England were beginning, however uncertainly, to appreciate the importance of the international balance of payments and to regulate the note issues with reference to the state of the exchanges, and to the bullion reserves in the vaults of the Bank. It is only with the Peel's Act of 1844 that a strong regulation on Bank of England's issues has been put in place (De Cecco, 1984, p. 77-8) and it was not until 1873, with Bagehot's Lombard Street, that a hint in the direction of a theory of monetary policy and of central banking emerged (cf. on this Arnon, 2011, p. 370). At Ricardo' time the Bank of England was a private institution with a monopoly on issuing banknotes and coins in London and in the surroundings of the British capital. In addition to its role of 'government banker' (cf. on this also Marcuzzo & Rosselli, 1991, p. 27) and to its business consisting of advances to individuals, purchasing securities in the market and discounting commercial bills (Morgan, [1943] 2013, p. 4), the Bank of England was a sort of 'Bank of banks', in the sense that,

Thus, Ricardo's references to exogenous changes in the money supply leading to a variation in the rate of interest below its 'natural' level, with the latter determined by the rate of profits, do not seem, in our view, to be interpretable as concerning decisions on the part of the Bank of England responding to a policy strategy of the Bank of England aimed at changing a variable under its control, the quantity of money in circulation. These references actually seem to have a twofold intention. On the one hand, in analogy with the classical economists' analysis of the variations of the market price with respect to the natural price, Ricardo seems to maintain that when the *real* quantity of money is greater than its 'effectual' demand, the latter being determined by the ratio between the given volume of transactions and the given velocity of circulation (see below, section II), the rate of interest will be lower than natural. In the classical theory, competition will tend to adjust the quantity of the commodity brought to market to the effectual demand and the market price to its natural level. In Ricardo's monetary theory, it is the increase in the price level the force this viewed as capable to bring the real quantity of money back into line with demand, as well as the interest rate back to its natural level, determined by the rate profits.[2] This mechanism seems to have been taken for granted by Ricardo, insofar as he does not bother to provide an analytical explanation for its working.

apart from the 'city banks', which were concerned with further aspects of the banking business without holding the issuing power, the banks outside the London area, the 'country banks', had the right to issue their own notes convertible in banknotes issued by the Bank of England and in gold. There was no legal tender paper money. The country banks used to pay their notes in Bank of England notes, with the Bank of England redeeming them in gold coins. These notes and the deposits in the Bank of England were used as reserve by the country banks (cf. de Boyer des Roches and Solis Rosales, 2016, p. 168; Deleplace, 2015, p. 45). This meant that the country banks, operating on a fractional reserve basis, could not add more notes in circulation without the Bank of England's prior additional issue of banknotes (Ricardo [1810-11] 1951, pp. 86-87; cf. Viner [1937] 2017 for a different view). Therefore, it can be assumed that any 'decision' by the Bank of England to increase the quantity of notes in circulation also allowed country banks to increase their issues.

When convertibility was suspended in England in 1797 by a law approved by the British parliament, the Bank Restriction Act - which Ricardo strongly opposed and which remained in force until 1821 - the Bank of England's capacity to issue notes and to provide country banks with 'liquidity' grew to the extent that there was no longer any obligation on the part of the Bank of England to pay its notes in gold. The exemption from cash payment had therefore removed the 'gold constraint' on notes issue by the Bank of England (Takenaga, 2013, p. 102) and had significantly increased the banking system's capacity to grant loans.

The conception of a 'control' exerted by the Bank of England over the quantity of money that conceives the latter as a 'monetary policy instrument' seems also to be absent in Ricardo's elaboration. As pointed out by Otomo (2013, p. 147), Ricardo described a systematic plan for the British monetary system only in his *Plan for the Establishment of a National Bank*, published posthumously in 1824, in which he called for the establishment of a national bank "led by commissioners appointed by the government to issue and regulate the quantity of banknotes intended for circulation through the open market in the country". (ibid.).

[2]As we will see in more detail in section IV, in a convertibility regime there is a unique *nominal* quantity of commodity money, or of convertible banknotes, consistent with the 'natural' or 'long-run' real quantity of money determined by the ratio between the volume of transactions and the velocity of circulation, contrary to what happens in an unconvertible monetary system in which the natural real quantity of money would be consistent with infinite absolute levels of the nominal quantity of *fiat*, or non-convertible, money. The reason for this distinction lies in the fact that, in the case of a commodity money, the long-run real quantity of money is always determined by the ratio between the volume of transactions and the velocity of circulation; in turn, the natural relative price of the commodity money determines the 'natural' nominal quantity of money. Hence, in a convertibility regime, the long-run

On the other hand, Ricardo needs to find a 'transmission mechanism' (Smith, 2013; 2017) linking changes in the rate of interest to the demand for loans and, consequently, spending, by which the banking system is able to put more money in circulation, providing an incentive for individuals to increase their monetary requests compared to what would be the 'effectual' demand. This mechanism is represented by the increase in the enterprise profit above its normal level, i.e., due to the reduction of the interest rate below its natural level (see below, sections II and III). The reduction of the interest rate seems to be considered by Ricardo also as an incentive for the banking system to increase its profits, especially after the suspension of gold convertibility of banknotes with the Bank Restriction Act (see below, section III).

Therefore, to the extent that the increase in the price level allows the absorption of the greater quantity of money in circulation, it does not, in our opinion, seem to be necessarily able a reason why the interest rate should increase. Only if, as a result of rising prices, and for an interest rate lower than natural, the continuous incentive to borrow would collide with the aforementioned limits to the expansion of the volume of loans, and/or as a result of a decision by the monetary authority, it could be reasonably argued, on the basis of Ricardo's hypotheses, for an increase in the interest rate. Ricardo, as we shall see (see below, section III), seems to mention, albeit in a non-systematic and well-defined way, the existence of those institutional limits in a convertibility regime, limits which, on the other hand, the suspension of convertibility would, in his view, have greatly relaxed. However, the moment when these limits are being put at the center of the discussion, the relevance of supposedly economic mechanisms, such as an increase in the price level, aimed at capable to make the interest rate converge towards a natural level, should at least be reconsidered in the light of institutional or, as Wicksell curiously calls them, 'routine' elements (Wicksell [1906] 1978, p. 204), influencing the behaviour of the banking system and which therefore appear to weaken the automatic character of the connection postulated by Ricardo between market and natural rates of interest.

Ricardo's analysis of the convergence of the rate of interest to its natural level seems therefore to be part of a broader argument focused on what in his view are the negative effects stemming from the suspension of convertibility following the Bank Restriction Act of 1797 and on the need for such convertibility to be soon restored. The debate joined by Ricardo did not therefore seem to have academic purposes, but rather the 'political' objective of curbing the banking system's power to create and issue money.[3]

nominal and real quantity of money coincide. This distinction is important, as we shall see in section IV, insofar as Ricardo seems to think of another convergence mechanism, not based on changes in the price level, in the case of a convertibility regime.

[3]Ricardo was mostly involved in monetary issues from 1809 to 1813 and almost exclusively until 1815, at least in relation to his published works (on the evolution of the contents of Ricardo's works cf. Boffito, 1973). In 1809 he sent to the Morning Chronicle an article titled *The Price Of Gold*, which opened a long controversy known as the *Bullion Controversy* (for an overview, see Arnon, 1998). All his later writings, until 1811, generally referred to as the Bullion Essays, are an integral part of this debate. As summarized by Kurz (2016, p. 127), Ricardo ([1821] 1951, pp. 354-361) proposed an ideal

2. For our purposes it should first be pointed out the way in which Ricardo defines natural and market interest rates and the relationship between the rate of interest and the rate of profits. Regarding the latter point, in the elaboration of Ricardo as well as in that of the classical economists from Smith to Marx, the study of the interest rate is in fact closely connected to the theory of distribution.
As is well known, in the theories of distribution up to Ricardo the normal profit is made up of two parts: the money rate of interest, conceived as the 'pure' remuneration of capital, and the enterprise profit (Pivetti, 1987; 1991; 2015). These two quantities, within the classical analysis of distribution, cannot be determined separately from each other. Given the normal rate of profits determined by the real wage and (direct and indirect) conditions of production of wage goods[4], either the interest rate or the enterprise profit should be residually determined.

3. Ricardo follows Smith in saying that the rate of interest is "ultimately and permanently governed by the rate of profit" (Ricardo, [1821] 1951, p. 297; [1809] 1951, pp. 25-26), arguing that since it "is extremely difficult to determine the rate of the profits of stock [...], the [...] rate of interest will lead us to form some notion of the rate of profits, and the history of the progress of interest affords us that of the progress of profits" (Ricardo, [1821] 1951, p. 296). This can be stated by Ricardo in that he believes that "it is evident That much will be given for the use of money, When much can be made by it" (ibid.), establishing that the income on money employed in production (the rate of profits) must be equal to the return on lending that same money (the interest rate), with the addition of a remuneration for the "risk and trouble"(the enterprise profits) for the productive employment of borrowed capital. According to Ricardo there is a minimum level below which the enterprise profit cannot go without undermining the accumulation incentive:

> "The farmer and manufacturer can no more live without profit, than the labourer without wages. Their motive for accumulation will diminish with every diminution of profit and will cease altogether when their

monetary system, according to which the quantity of paper money in circulation "should be regulated according to the value of the metal which is declared to be the standard" (Ricardo, ivi, p. 354), without the need for paper money to be payable in specie in order to secure its value, being sufficient that "paper might be increased with every fall in the value of gold, or, […] with every rise in the price of goods" (ibid.). On this Ricardo ([1821] 1951, p. 356), affirms: "Experience, however, shews, that neither a State nor a Bank ever have had the unrestricted power of issuing paper money, without abusing that power: in all States, therefore, the issue of paper money ought to be under some check and control." As claimed by Rieter (1998, p. 246, italics added), "The debate was not – at least not primarily – an academic discussion; at stake were real and substantial political interests, not theoretical niceties. *Ricardo and his comrades-in-arms were out to put a stop to the activities of those who had the power to print and issue money, because they deeply distrusted them* […]".

[4] Classical economists thought that the rate of profits was determined residually given the real wage rate, the latter determined by socially established subsistence requirements (Stirati, 1992). Hence, in the long run the wage rate being determined by the subsistence level, Ricardo maintained that the rate of profits could fall as accumulation proceeds only because of a diminished productivity of the labour employed in less fertile lands (Ricardo [1821] 1951, p. 292; cf. Garegnani, 1978, p. 340).

> profits are so low as not to afford them an adequate compensation for their trouble, and the risk which they must necessarily encounter in employing their capital productively." (Ricardo, [1821] 1951, p. 122)

This way of conceiving the relation between the rate of profits, the rate of interest and the enterprise profit suggests to Ricardo, in the wake of Smith, that since the interest rate is determined, ultimately, by the rate of profit, it is the former that represents, in that system of relations, the residual magnitude (Garegnani, 1978, p. 339), while the enterprise profit is not subject to particular changes at least in the long run; in other words, the enterprise profit is regarded by Ricardo as a "normal" magnitude (Pivetti, 1987, p. 64).
According to this view the interest rate, as determined by the rate of profits, is the "natural" rate of interest, as opposed to the market interest rate which, according to Ricardo, is determined, similarly to the market price of commodities, by the 'proportion' between supply of, and demand for, money[5]:

> "Do you think there is anything in the nature of money, or of the transactions regarding the borrowing or lending of money, which distinguishes it from other commodities which find their value in the market, according to the proportion of demand and supply?
> None, whatever; the market rate of interest for money depends on the proportion between the borrower and the lender of capital, without reference to the quantity or value of the currency by which the transactions of the country are carried on." (Ricardo, [1818] 1951, p. 346)

> "What are the grounds of your opinion of the principle by which the rate of interest is regulated?
> It is regulated by the demand and supply, in the same way as any other commodity; but the demand and supply itself is again regulated by the rate of profit to be made on capital." (Ricardo, *ibidem*)

We can thus see that in Ricardo's view the rate of profits determines the natural rate of interest, while the ratio between money supply and demand affects the market interest rate, the fluctuations of the latter around its normal or long-term level[6] and, hence, the fluctuations of enterprise profit around its normal level.

[5] As argued by Garegnani (2006, pp. 417-8) classical economists applied the word 'proportion' to the relationship between 'demand' and 'supply' of commodities, meaning that both 'demand' and 'supply' were intended as single *real* quantities and not as functions or schedules, differently from what will be postulated by the later marginalist theory.
[6] On this, Panico (1988, p. 15) points out that: "The movements of the interest rate quoted every day in the money market instead, did not reflect changes of the rate of profits in the same direction. They reflected the scarcity or abundance of money in the market." See also Caminati (1981, pp. 92-3)

The presence of both a "natural" rate of interest and a market rate necessarily implies the existence of a convergence mechanism of the latter to the former; the fluctuations of the market rate above or below the natural level are then treated as merely temporary.[7]

4. Most of Ricardo's arguments with regard to fluctuations in the market interest rate seems to refer to exogenous changes in the money supply by the Bank of England (Ahiakpor, 1985, p. 21; Smith, 2013, p. 181). About such changes in the money supply Ricardo expresses his ideas in *The High Price Of Bullion*:

> "I do not dispute, that if the Bank were to bring a large additional sum of notes into the market, and offer them on loan, but that they would for a time affect the rate of interest. The same effects would follow from the discovery of a hidden treasure of gold or silver coin. If the amount were large, the Bank, or the owner of the treasure, might not be able to lend the notes or the money at four, nor perhaps, above three per cent.; but having done so, neither the notes, nor the money, would be retained unemployed by the borrowers; they would be sent into every market, and would everywhere raise the prices of commodities, till they were absorbed in the general circulation. It is only during the interval of the issues of the Bank, and their effect on prices, that we should be sensible of an abundance of money; interest would, during that interval, be under its natural level; but as soon as the additional sum of notes or of money became absorbed in the general circulation, the rate of interest would be as high, and new loans would be demanded with as much eagerness as before the additional issues." (Ricardo, [1810-11] 1951, p. 91) [8]

[7] Ricardo seems to be quite clear and explicit on this point, although in a letter to Malthus of 1817 he claims: "Although interest is undoubtedly ultimately regulated by profits, rising when they are high, and falling when they are low, yet there are considerable intervals during which a low rate of interest is compatible with a high rate of profit, and this generally occurs when capital is moving from the employments of war to those of peace." (Ricardo, [1817]1951, p. 199).

[8] The fact that, in the passage we mention from 'The High Price of Bullion', Ricardo refers either to a decision of the Bank of England or to a discovery of a gold mine - without providing a detailed explanation of the reasons for the Bank's decision or the manner in which the gold extracted from a new mine would flow to the Bank - seems to serve his purpose of emphasising the way in which the Bank *can* put more money into circulation, i.e., through a reduction in the interest rate, and the subsequent ways by which the interest rate returns to its natural level determined by the rate of profits. As we will see (see below, sections II and III), it is through a lower-than-normal rate of interest that the Bank is able, according to Ricardo, to induce the private sector to increase its demand for loans. Insofar as, for a given rate of interest determined by the rate of profits, the demand for money according to Ricardo depends on the volume of transactions (see below, sections II and III), it is only through a lowering of the rate of interest - because of monopolistic behaviour by the banking system or, alternatively, of competition within the latter – that the banking system induces the private sector to increase its borrowing. Furthermore, the increase in the amount of loans granted, due to a lower-than-natural rate of interest, enables the banking system, in Ricardo's view, to achieve a higher amount of profits (see below, section III).

The argument is also addressed in the *Principles*, where Ricardo says:

> "The rate of interest, though ultimately and permanently governed by the rate of profit, is however subject to temporary variations from other causes. […]. If by the discovery of a new mine, by the abuses of banking, or by any other cause, the quantity of money be greatly increased, its ultimate effect is to raise the prices of commodities in proportion to the increased quantity of money; but there is probably always an interval, during which some effect is produced on the rate of interest." (Ricardo, [1821] 1951, pp. 297-8)

Based on what is claimed by Ricardo, the change in the interest rate following an exogenous change in the money supply results in a reduction in the interest rate below the natural level. According to Ricardo it is the increase in the price level, for a given volume of transactions and velocity of circulation of money[9], which brings the interest rate and the real quantity of money back to their normal levels[10].

[9] Ricardo ([1811]1951, p. 311) argues that the causation runs unambiguously from the quantity of money to the price level. He did not deny (ivi, p. 274) that the velocity of circulation of money could vary. These changes, however, were not seen as an effect of variations in the quantity of money, but rather due to circumstances such as the result of the development of the banking system and the public's habits.
As for the effects on production levels (volume of transactions) - which Ricardo supposed fixed at 'full' or 'normal' capacity utilization (Caminati, 1981, p. 81; Green, 1982, p. 74; 1992, p. 13; Smith, 2015, p. 560) - of variations in the quantity of money, Ricardo does not deny that an increase in the latter may have an impact on the former (see Marcuzzo and Rosselli, 1994, p. 1256). In this regard he states that: "There appears to me only one way in which any addition would be made to the Capital of a country in consequence of an addition of money. […] The manufacturer would be enabled to employ more labourers as he would receive an additional price for his commodities; he might therefore add to his real capital till the rise in the wages of labour placed him in his proper sphere. In this interval some trifling addition would have been made to the Capital of the community" (Ricardo, [1815] 1951, pp. 16-17). Any refusal to immediately adjust money wages to higher price levels can cause, according to Ricardo, an increase in employment levels - the real capital value, in relation to money wages, would in fact be higher than before. However, according to Ricardo, this effect would only be temporary and would be "eliminated" as soon as the real wage returns to its natural or normal level. (De Vivo, 1987, p. 187; Smith, 2013, p. 181). Ricardo also believes that the possible positive effect on activity levels resulting from additional issuing of money in circulation would be offset by reduced savings from fixed income holders. In this regard he states that: "The increase of money in my opinion can have no other effect than raising the prices of commodities. By such means some members of the community are enriched at the expence of others; there is a mere transfer of property, but no creation. Whether those who are enriched will employ their additional income more economically or more advantageously than those who before possessed it, must be matter of speculation only. My opinion however is that by no class are greater savings made than by those who are in possession of fixed monied rents and annuities. As far as they have come under my observation, and I have seen a good deal of monied men, they are amongst the most accumulating of the community." (Ricardo, *ibid*.)

[10] Ricardo also affirms that: "Reduction or Increase of the Quantity of Money always ultimately raises or lowers the Price of Commodities; when this is effected, the Rate of Interest will be precisely the same as before; it is only during the Interval, that is, before the Prices are settled at the new Rate, that the Rate of Interest is either raised or lowered." (Ricardo, [1819] 1951, p. 445, italics added).

5. In the *Principles* Ricardo also mentions the possibility of exogenous changes in the demand for money:

> "When the market prices of goods fall from an abundant supply, from a diminished demand, or from a rise in the value of money, a manufacturer naturally accumulates an unusual quantity of finished goods, being unwilling to sell them at very depressed prices. To meet his ordinary payments, for which he used to depend on the sale of his goods, *he now endeavours to borrow on credit, and is often obliged to give an increased rate of interest.* This, however, is but of temporary duration; for either the manufacturer's expectations were well grounded, and the market price of his commodities rises, or he discovers that there is a permanently diminished demand, and he no longer resists the course of affairs: prices fall, and money and interest regain their real value." (Ricardo, [1821] 1951, pp. 297-8, italics added)

In this case - despite Ricardo's surprising statement about a decrease in the price level apparently independent from variations in the quantity of money[11] - following a temporary fall in the level of prices producers will increase their demand for loans resulting from a decreased flow of cash revenues compared with contract payments (i.e., money wages), which will generate an increase in the interest rate above its normal level. If the reduction of prices is temporary, the restoration of the normal

[11] Here Ricardo seems to extend to the aggregate an argument that in his analysis, due to his adherence to Say's law (Garegnani, 1978, pp. 338-341; Green, 1992, p. 55; see below, paragraph 2), may be valid just for a single productive sector, namely an excess of production over demand.
Ricardo seems to argue that when faced with an aggregate excess of production, firms prefer not to sell all the quantity produced, as prices would fall too much, but rather to remain with a certain quantity of inventories so that prices fall a little less. If the fall in prices is only temporary, then the return of sales to normal levels with the consequent increase in prices would allow the normal flow of payments to resume along with the return of demand for loans and the interest rate to normal levels. Hence Ricardo appears to put the emphasis on the price level as the variable capable of allowing the return of the rate of interest to its natural level. Diatkine (2013, p. 128) claims in this respect that it is the fall in the market price in a *single* industry, due to an excess supply over demand, which leads the manufacturer to borrow at the bank to meet the usual payments; this entails the rise in the rate of interest. When the market price of that commodity returns to its natural level, also the rate of interest converges to its natural level (ibid.). However, it seems difficult to accept Diatkine's interpretation that an excess of production in a single productive sector can lead to an increase in the interest rate, as long as other sectors are correspondingly experiencing an excess demand for their products and, therefore, could presumably reduce, albeit temporarily, their usual demand for loans.
Furthermore, if Diatkine's argument is viewed in relation to the role assigned by Ricardo to the banking and credit system to ensure the convergence of market prices to their natural values and, hence, the tendency to a uniform rate of profits in all industries (Ricardo [1821] 1951, p. 89; cf. on this Signorino, 2015, p. 369), it is hardly deniable that an increase in the relative market price of a commodity (silk in Ricardo's example) and the corresponding decrease in the market price of, say, cloth, will *not* result in an increase in the market rate of interest as long as the clothier "discontinues his demand for the loan from bankers and monied men […]." (Ricardo, ibid.)

flow of revenues following the increase in prices will allow producers to meet contract payments; the reason for the increase in money demand ceases and, therefore, the interest rate returns to its natural level. If, conversely, the reduction in prices is permanent, a general reduction in the monetary value of transactions will be observed - therefore also a reduction in money wages - which will generate a permanent reduction in the demand for money and the return of the interest rate to the natural level.
Even in this case, as in that of a change in the money supply, the price level would ultimately be the variable able to bring the interest rate back to the natural level.

II

1. The aim of the next sections is to outline how, in our view, the convergence process of the market interest rate to its natural level resulting from an 'exogenous' change in the money supply can be challenged based on the same arguments put forward by Ricardo. The increase in the price level after the issuing of money need not be capable of pushing the market interest rate up to the natural rate, despite the real quantity of money would return to its 'natural' level (see below). Ricardo himself, in fact, states that "It is only during the interval of the issues of the Bank, and their effect on prices, that we should be sensible of an *abundance of money*" (Ricardo, [1810-11]1951, p. 91, italics added). The increase in prices might just increase the demand for money to the extent needed to meet the increased supply, which would otherwise be exceeding, and a new 'equilibrium' would be then established between demand for and supply of money at the lower-than-natural interest rate initially occasioned by bank behaviour. It cannot be agreed, in our opinion, Ricardo's statement that "as soon as the additional sum of notes or of money became absorbed into the general circulation, *the rate of interest would be as high* [...]" (Ricardo, [1821]1951, pp. 297-8, italics added). For the interest rate to return to its natural level it would be required an increase in the demand for money beyond that needed to meet the increased supply, therefore greater than the one generated by the increase in the price level which reestablishes the natural money-price ratio.

2. To strengthen our argument, it seems first appropriate to develop more clearly the concept of demand for money which Ricardo seems to have in mind. This analysis will be useful to compare Ricardo's conception with the other one of *'applications to the bank for money*' that himself introduces in the Principles. The following quotation precisely puts forward the latter concept (note that in this context Ricardo

refers to the market rate of interest meaning the natural as opposed to the bank rate, the latter being the maximum level set by the 'Usury Laws'[12]):

> "The *applications to the Bank for money*, then, depend on the comparison between the rate of profits that may be made by the employment of it, and the rate at which they are willing to lend it. If they charge less than the market rate of interest, there is no amount of money which they might not lend,—if they charge more than that rate, none but spendthrifts and prodigals would be found to borrow of them." (Ricardo, [1821] 1951, p. 364, italics added) [13]

[12] See footnote 13.

[13] A few lines following the passage quoted, Ricardo states: "The reason, then, why for the last twenty years, the Bank is said to have given so much aid to commerce, by assisting the merchants with money, is, because they have, during that whole period, lent money *below the market rate of interest; below that rate at which the merchants could have borrowed elsewhere*; but, I confess, that to me this seems rather an objection to their establishment, than an argument in favour of it." (ibid., italics added). Here Ricardo is referring to the enactment of 1714, in force until 1833, that prevented banks from charging a rate of interest on loans greater than 5 per cent (cf. Viner, [1937] 2017, p. 149; Smith, 1996, p. 39; Takenaga, 2013, p. 102). According to Ricardo, only the Bank of England applied the upper-limit interest rate, while the market rate of interest charged by other banks was somewhat above it. From Ricardo's standpoint, this gave an 'unfair' advantage to manufacturers and merchants who could turn to the Bank of England for loans, to the detriment of those who were 'forced' to rely on other financial intermediaries to obtain credit and discounts, thus paying the higher 'market' interest rate (Ricardo, ivi, p. 365; Diatkine, 2013, p. 131-2). Takenaga, (ivi, p. 110) has argued that the coexistence of different rates of interest is explained by the fact that the Bank of England restricted its discounts to the bills endorsed by merchants of sufficient credibility. Takenaga's argument does not however appear convincing insofar as, quite apart from institutional elements, the Bank of England or any other financial intermediary could likely normally charge a lower rate of interest to discounts and loans granted to those merchants and producers having sufficient 'credibility' and enough guarantees. Ricardo's argument appears however contradictory insofar as he seems to set *quantitative* limits to the loans granted by the Bank of England at the fixed interest rate, whereas a few lines earlier he seemed to be arguing that for a lower-than-normal interest rate there would be no limit to the quantity of banknotes that could be lent by the Bank of England. However, according to Ricardo the banking system as a whole had no power to permanently reduce the rate of interest below the natural level determined by the rate of profit (Ricardo, ivi, p. 364; cf. Caminati, 1981, pp. 93-4), otherwise, Ricardo argues, the conclusion should have reached that it is the rate of interest that determines the normal rate of profit: "To suppose that any increased issues of the Bank have the effect of *permanently lowering the rate of interest*, and satisfying the demands of all borrowers, so that there will be none to apply for new loans, or that the productive gold or silver mine can have such an effect, is to attribute a power to the circulating medium which it can never possess. Banks would, if this were possible, become powerful engines indeed. *By creating paper money, and lending it at three or two percent under the present market rate of interest*, the Bank would reduce the profits on trade in the same proportion; and if they were sufficiently patriotic to lend their notes at an interest no higher than necessary to pay the expenses of their establishment, profits would be still further reduced; no nation but by similar means, could enter into competition with us, we should engross the trade of the world. To what absurdities would not such a theory lead us! Profits can only be lowered by a competition of capitals not consisting of circulating medium." (Ricardo, [1810-11]1951, p. 92, italics added. Here Ricardo is still entertaining the vague notion of Smithian origin, that the rate of profits is determined by "competition of capitals not consisting of circulating medium". Cf. on this de Vivo, 1987, p. 187). The passage just quoted seems to be put by Ricardo in a context in which circulation is formed by non-convertible notes. Ricardo indeed claims that if the monetary interest rate falls below the natural level there is no limit to the quantity of money that the banking sector can place. Such an event would only be compatible with a circulation formed by non-convertible, or fiat, money, as when convertibility was suspended in England in 1797 by the Bank Restriction Act, the banking system, in the absence of a gold reserve "constraint", found according to Ricardo no limits in issuing money, thus potentially

Hence, according to Ricardo the "applications to the bank for money" depend on the difference between the interest rate and the rate of profit obtained from the productive use of money.
A reduction in the interest rate below the natural level generates, given the rate of profit, an increase in the enterprise profit above the 'normal' level. This increase induces an additional request for loans which, however, as we will try to explain in the next paragraph, it is conceivable, within the conceptual framework of Ricardo's analysis, as a sort of extension of the demand for money ultimately dependent from the value of transactions caused by the increased profitability of employing money productively.

3. In outlining the determinants of the demand for money, Ricardo seems to refer exclusively to the value of transactions. Both in *Reply to Mr. Bosanquet Practical Observations* and in the *Principles*, in fact, Ricardo provides a definition of the demand for money**:**

> "The plea that no more is issued than the wants of commerce require is of no weight; because the sum required for such purpose cannot be defined. Commerce is insatiable in its demands, and the same portion of it may employ 10 millions or 100 millions of circulating medium; the quantity depends wholly on its value". (Ricardo, [1811] 1951, p. 215)

> "the demand for money is not for a definite quantity, as is the demand for clothes, or for food. The demand for money is regulated entirely by its value, and its value by its quantity." (Ricardo, [1821] 1951, p. 193)

From the abovementioned quotations, the idea emerges of a demand for money strictly dependent on the relative value of money in terms of other commodities, expressed by the ratio $\frac{1}{P}$, where P is the general price level, given the ratio between the volume of transactions and the velocity of circulation $(\frac{T}{V})$. In the case of a commodity or convertible money, the relative value of money depends, ultimately, on the technical conditions of production of the same commodity money, while in the case of a *fiat* money, it depends, according to Ricardo, on the quantity of money put in circulation (see on this point below, section IV). In both cases, however, a reduction or an increase in the relative value of money represents, respectively, a

depreciate currency indefinitely (Ricardo, [1810-11] 1951, p. 75; see below section III; cf. on this point also Takenaga, ivi, p. 101-3; Diatkine, 2013, pp. 131-2).

greater or lesser requirement for monetary transactions, therefore, a greater or lesser demand for money.

4. How to interpret, then, the "applications to the Bank for money" mentioned by Ricardo ultimately depending on the difference between the interest rate and the profit rate, i.e., from a *greater than normal* enterprise profit? They could be defined as money requests from producers who, moved by the possibility of obtaining higher enterprise profits (given an interest rate lower than the natural level) ask, with that same money, for labor and capital goods with the aim to expand the volumes of production. This attempt, however, collides with an unchanged level of activity, since the latter in Ricardo, and more generally in the classical economists, is determined according to the stage reached by capital accumulation (Ricardo [1821] 1951, pp. 289-96 and p. 390; Garegnani, 1978, p. 338; Green, 1982, p. 62; 1992, p. 55).

This increase in the demand for labour and means of production generates an increase in the level of money prices of all commodities, which enables the economic system as a whole to absorb the increased amount of money borrowed by the producers and put into circulation. It follows that if, hypothetically, the price level was not increasing, the greater quantity of money in the system would, sooner or later, be returned to the banking system since for the aggregate economy it would be redundant relatively to an unchanged volume of transactions.

We can then see that the additional amount of money is borrowed to increase business of those who applied for it[14]. However, such producers 'hopes' are only illusory, since Ricardo believes it is not possible that, in the aggregate, there can be any increase in the production volume in response to an increased amount of money in circulation. It could happen, however, that some manufacturers manage to steal 'market shares', expanding their production at the expense of some competitor. In this regard Ricardo affirms:

> "When anyone borrows money for the purpose of entering into trade, he borrows it as a medium by which he can possess himself of "materials, provisions, &c." to carry on that trade; and it can be of little consequence to him, provided he obtain the quantity of materials, &c. necessary, whether he be obliged to borrow a thousand, or ten thousand pieces of money. If he borrow ten thousand, the produce of his manufacture will be ten times the nominal value of what it would have been, had one thousand been sufficient for the same purpose. The capital actually employed in the country is necessarily limited to the amount of the

[14] Ricardo ([1811] 1951, p. 374) maintains that those who intend to borrow money do so in view of the profits they expect to obtain from the use of capital: "The interest which a man agrees to pay for the use of a sum of money is in reality a portion of the profits which he expects to derive from the employment of a capital which that sum of money will enable him to obtain. In the interest which he is willing to pay he is guided solely by the probable extent of those profits." (ibid.)

> "materials, provisions, &c." and might be made equally productive, though not with equal facility, if trade were carried on wholly by barter. The successive possessors of the circulating medium have the command over this capital: but however abundant may be the quantity of money or of bank-notes; though it may increase the nominal prices of commodities; though it may distribute the productive capital in different proportions; though the Bank, by increasing the quantity of their1 notes, *may enable A to carry on part of the business formerly engrossed by B and C, nothing will be added to the real revenue and wealth of the country. B and C may be injured, and A and the Bank may be gainers, but they will gain exactly what B and C lose.* There will be a violent and an unjust transfer of property, but no benefit whatever will be gained by the community." (Ricardo, [1810-11] 1951, p. 93, italics added)

The passage just quoted refers to the impossibility of an increase in the aggregate volume of production in response to an additional issue of money[15]. Ricardo seems quite clear in maintaining that those who borrow money intend to "entering into trade" and, therefore, to dispose of the 'capital to start production. The economy

[15] This conclusion stems from Ricardo's adherence to Say's law. Ricardo did not pose the question of a possible divergence between saving and investment decisions, as he always identified decisions to save with decisions to invest (Garegnani, 1978, pp. 338-41; Green, 1992, p. 13). This led Ricardo to assert that demand and employment levels are only limited by production, with the latter ultimately determined by the stage reached by capital accumulation and, hence, by savings (Garegnani, ivi, p. 339), and not influenced by the quantity of money. Ricardo's monetary analysis appears therefore to be consistent with the idea of a banking system which, ultimately, can issue and lend money independently of the flow of savings. It would indeed seem reasonable to suppose that if the increased money supply by the banking system came from a higher flow of savings, there would seem to be no grounds for assuming by Ricardo a pressure exerted by aggregate demand on production with the resulting increase in price level. Higher savings, in the form of an increased quantity of money, would automatically determine a greater flow of investments and a greater capital stock, which in turn would determine higher levels of production and employment. This, however, would contradict Ricardo's statements according to which along a monetary overissue no effect is produced on capital and on output levels (cf. on this also Green, ivi, p. 166; Ahiakpor, 1985, p. 23): "State what in your Opinion is the Difference between that State of Things, in which a Stimulus is given by fictitious Capital arising from an Over-abundance of Paper in Circulation, and that which results from the regular Operation of real Capital employed in Production? I believe that on this Subject I differ from most other People. I do not think that any Stimulus is given to Production by the Use of fictitious Capital, as it is called." (Ricardo, [1819] 1951, p. 445). After an increase in the quantity of money, for a lower than natural interest rate it could actually occur, in modern parlance, an increase in investment decisions with respect to the volume of savings, which can potentially break the strict identification between the two magnitudes, as Boffito (1973, pp. 43-44) and Caminati (1981, p. 84) seem to argue. However, a discrepancy between investment and saving decisions may be relevant to the extent that it could be claimed that in Ricardo planned investments are an autonomous variable and that they could actually be realized, thus leading to a higher volume of savings, and hence reversing the classical economists' process of the determination of production levels which, although not well defined and outlined, did not see the level of production limited, and determined, by aggregate demand. The question of the independence of the amount of money and loans issued from the volume of savings becomes significant in marginalist theory, as long as that theory admits the influence of purely monetary factors on the loans market such as to detach the determination of the current, or market, rate of interest from demand and supply functions of savings (see below section III).

disposes however of an amount of 'capital' limited by the stage reached by accumulation; therefore, although a generic producer 'A' may be able to expand its production activities thanks to the higher amount of money, this could only happen at the expense of the generic producer 'B', without any possibility for the aggregate production volume to increase.
It follows that if these are, in general, the effects of an increased quantity of money in circulation, it is only the increase in prices which can absorb that higher amount; since, in this context, the volume of transactions has not increased, it is the increase in the general price level that allows the monetary value of production to grow to the extent sufficient to absorb the higher money stock.
Indeed, according to Ricardo "money cannot call forth goods" (Ricardo, [1811]1951, p. 301), so money and capital are not equivalent concepts and not dependent, in general and in a systematic way, one from the other:

> "Credit, I think, is the Means, which is alternately transferred from one to another, to make use of Capital actually existing; it does not create Capital; it determines only by whom that Capital should be employed: the removing Capital from one Employment to another may often be very advantageous, and it may also be very injurious." (Ricardo, [1819] 1951, pp. 436-7)

III

1. Based on what we have said above Ricardo seems to consider the demand for money as depending solely on the value of transactions. According to Ricardo the demand for money increases only if there is an increase either of the volume of transactions for a given price level, or of the money prices of commodities for a given volume of transactions, or both.
In this sense no functional relation linking the demand for money to the rate of interest seems to be found in Ricardo's writings (see on this point Viner [1937] 2017, p. 150, Green, 1992, pp. 165-6; King, 2013, p. 124, Takenaga, 2013, p. 80; Glasner, 2013, p. 17; p. 20). One might say, however, that an inverse relation, albeit not definable as *functional*, between the rate of interest and the demand for money is actually traceable in Ricardo because, as we have seen, following an increase in the quantity of money, the decrease in the rate of interest below its natural level generates, for a given velocity of circulation and volume of transactions, an increase in the money prices of commodities which ultimately causes an increase in the demand for money because of the increase in the value of transactions. However, such an inverse 'relation' is nonetheless mediated, so to speak, by the increase in the

price level, without which the decrease in the rate of interest cold not exert any influence on the quantity of money required by the value of transactions.
This argument is helpful to our analysis because we maintain that the return of the interest rate to the natural level would require an increase in the demand for money which goes beyond that needed to meet the increased supply, hence therefore greater than the one generated by the increase in the price level. In other words, we believe that for the convergence process to be consistent, the increase in prices must generate an *excess* demand for money with regard the increased supply. For the excess demand to occur as the price level increases the 'applications to the Bank for money' would to all purposes be conceived as a demand for money to be held as such, able to match the increased supply following the decrease in the rate of interest. This, in turn, would imply to argue that Ricardo thinks about a functional relation between the rate of interest and the demand for money *for a given price level*[16].

[16]This seems to be the view held by Ahiakpor (1999, p. 443), who argues that in Ricardo the increased money supply, by reducing the interest rate below the natural level – deemed *equal* to the rate of return on capital employed in production and ultimately determined by the *real* forces of supply and demand for capital (ivi, p. 441; cf. also Blaug 1997 pp. 156-8; Diatkine, 2013, p. 125) - generates a 'liquidity effect', and the subsequent increase in prices, due to the increased aggregate expenditure caused by the lower rate of interest, leads to a an additional request for money or credit, which brings the interest rate back to its natural level. The term 'liquidity effect' seems to be meant by Ahiakpor as the transmission mechanism according to which a reduction in the rate of interest induces the desire to change the composition of the given stock of wealth by holding the greater quantity of money at the expense of bonds and securities (cf. on this Edmond and Weill, 2008, p. 148). This mechanism would then allow the system to absorb the greater quantity of money issued and the following increase in the price level would provide the *excess* demand for money which enables the rate of interest to converge to its natural level. A similar position seems to be held by Blaug (1997, p. 158), although he does not explicitly refer to the liquidity effect or to analogous transmission mechanisms, who claims that Ricardo and, more generally, the classical economists, rely on an inverse relationship between the demand for money and the rate of interest. It is interesting to note that Ahiakpor (1985, pp. 20-23) claims that in Ricardo it is with the increase in the price level that the grater money supply is absorbed by the economic system, thus not referring to any alleged liquidity effect operating, so to speak, before the effect on the price level. Nevertheless, he maintains that "the increase demand for credit, when the prices of investment goods rise, pushes the market rate of interest up again." (ivi, p. 23).
Such interpretations seem to attribute to Ricardo both the marginalist conception of an inverse functional relation between the rate of interest and aggregate expenditure, which was alien to Ricardo's thought (Garegnani, 1978, p. 341; Smith, 2013, p. 190; 2017, p. 55) and of an inverse relation between the rate of interest and the demand for money as an asset, i.e., as an alternative form of wealth compared to bonds. As is well known (Garegnani, 1979, p. 74), the latter interpretation of the relation between the rate of interest and the demand for money is peculiar to those contributions following the publication of Keynes' General Theory and aimed at a rehabilitation of the marginalist theory. The theoretical distance of these doctrines from Ricardo's approach can be appreciated (see below, paragraph 2) if it is taken into due account the main role assigned by the former to the convenience and security deriving from holding wealth in the form of money, which implies a *choice* made by individuals among money and other assets with different yields and risks (cf. on this Vassèi, 2016, p. 380). Under the assumption of continuous full employment, these theories have properly focused on the specifics of the portfolio-balance effect and on the decreasing demand curve for investments, by which a monetary impulse is transmitted to aggregate spending, to discuss the gravitation mechanism of the market rate of interest to the natural rate and to assert that monetary policy cannot ultimately control the rate of interest (Friedman, 1968, see below).
Within the revival of the classical surplus approach, Caminati (1981, p. 84) affirms that classical economists failed to show how supply and demand for loans were brought in equilibrium, arguing that the "stress on transactions motive demand for money was insufficient to justify the widely accepted view that a change in the money supply had only a temporary effect on the rate of interest, while exerting a permanent effect on the price level" (ivi, p. 80). This conclusion was based, according to

Ricardo's "applications to the Bank for money" do not however appear to be viewed as a demand for money to be held as such in so far as such loan applications, following the decrease in the rate of interest, are only intended to employ productively the money issued in the hope of every producer to increase his business because of an above-than-normal profit of enterprise. Hence, according to Ricardo's statements, those 'applications' can be seen as an extension of the 'transactions motive' based on which money is demanded. Indeed, we can suppose that, for a given level of production - determined by the stage reached by capital accumulation - and for a given velocity of circulation of money, for individuals the quantity of money stands at any time in a certain and *given* proportion to the volume of transactions.

This ratio would not be altered by changes in the quantity of money and by temporary changes in the interest rate – as would be instead the case if money were also required for precautionary or speculative purposes - insofar as, according to Ricardo, for the same individuals there are no other reasons for money to be demanded other than those related to transactions motive. Thus, an increase in the quantity of money bringing an increase in the enterprise profit above the 'normal' level, i.e., a reduction in the interest rate below its normal level, leads individuals to borrow that greater amount of money for the sole purpose of increasing their *own* business, hence leaving, at least in their intentions, unaltered, for them, the ratio between the quantity of money and the volume of transactions. Obviously, not everyone will be able to increase its business, with the consequence that this higher aggregate monetary expenditure will result in an increase in the price level to absorb the greater quantity of money in circulation.

However, every individual hopes that by borrowing that greater quantity of money it would be possible to increase its level of activity, because no other reason exists, except the transactional one, to demand and request money.

Hence, as we argued in the previous paragraph, if, following the increase in the 'applications', the price level were not increasing, the greater quantity of money in the system would, sooner or later, be returned to the banking system since *for the*

Caminati (ibid.), on a sensitivity ascribed by classical economists of aggregate expenditure to variations in the rate of interest with respect to the rate of profits and on a fully or normally utilized productive capacity, so that the increased expenditure affects prices rather than output. Smith (2013, p. 186; 2017, p. 55) has claimed that this 'sensitivity' cannot be view as a solid transmission mechanism by which Ricardo can suppose that an exogenous increase in the quantity of money is absorbed into circulation via an increase in the price level. According to Smith (2013, ibid), Ricardo gave no serious consideration as to how, given the profit rate, an increase (or decrease) in the rate of interest would precisely induce an increase (reduction) in the demand for credit to finance an increase (reduction) in monetary expenditure. Ricardo simply took for granted such a causal relationship. Panico (1988, p. 17), although he does not discuss in detail the convergence mechanism of the rate of interest envisaged by Ricardo, claims that the increase in the price level following the increased demand for loans for a lower than natural interest rate will go on until the market rate adjusts to the average rate. Panico therefore seems to believe that if the interest rate is below its natural level, the continued demand for loans will lead to an increase in the amount of money in circulation, with the associated increase in prices. Panico, however, does not discuss why the increase in prices should lead to a convergence of the interest rate towards the natural level, and not simply to an absorption of the greater quantity of money in circulation.

aggregate economy it would be redundant relatively to an unchanged volume of transactions, with the latter being determined by the stage reached by capital accumulation and on which Ricardo explicitly denies any influence resulting from an additional issue of money (Ricardo, [1819] 1951, p. 445). From this point of view the 'applications to the Bank for money' could be juxtaposed more to a demand for transactive purposes than to a demand for money to be held as such.

2. From our present-day perspective, assuming a functional relation between the rate of interest and the demand for money for a given price level is tantamount to say that money might be held for speculative purposes (Keynes, 1936, pp. 85-6) or that a reduction in the interest rate leads to an increase in the demand for money as an asset, on account of a reduction in the yields of alternative form of wealth, such as bonds (Tobin, 1947, p. 126; Friedman, 1968, pp. 5-7; see also Gibson, 1970, p. 431). Similar conceptions appear to be completely absent in Ricardo who emphasizes the peculiar nature of the demand for money, depending solely on the value of transactions and conceived as distinct from that for other commodities:

> "A country might have a monopoly of silk, or of wine, and yet the prices of silks and wine might fall, because from caprice or fashion, or taste, cloth and brandy might be preferred, and substituted; the same effect might in a degree take place with gold, as far as its use is confined to manufactures: but while money is the general medium of exchange, the demand for it is never a matter of *choice*, but always of necessity." (Ricardo, [1821] 1951, p. 194, italics added)

To make the convergence process of the market rate of interest logically consistent, Ricardo would then probably need something like a functional relation between the rate of interest and the demand for money for a given price level: the only way, in effect, by which the decrease in the interest rate would allow the aggregate economy to *hold* a greater quantity of money. As we have seen, however, the 'applications to the Bank for money', to the extent that they are dependent on the rate of interest, do not seem to be in this sense considered as a demand for money to be held as such.
The presence of a functional relation between the interest rate and the demand for money would be in many respects in radical conflict with Ricardo's views as have been considered so far. This can be verified by taking into consideration the implications which are associated with that functional relation, for instance in an author such as Milton Friedman who, by the way, was a strong supporter of the quantity theory of money and who precisely relies on that relation in order to explain the convergence of the market rate of interest to its natural level. The way in which Friedman clarifies the convergence process enlightens how the theoretical context in which the relation at issue is inserted radically diverges from that of Ricardo:

> "How can people be induced to hold a larger quantity of money? Only by bidding down interest rates. Both are right, up to a point. The initial

> impact of increasing the quantity of money at a faster rate than it has been increasing is to make interest rates lower for a time than they would otherwise have been. But this is only the beginning of the process not the end. The more rapid rate of monetary growth will stimulate spending, both through the impact on investment of lower market interest rates and through the impact on other spending and thereby relative prices of higher cash balances than are desired. But one man's spending is another man's income. Rising income will raise the liquidity preference schedule and the demand for loans; it may also raise prices, which would reduce the real quantity of money. These three effects will reverse the initial downward pressure on interest rates fairly promptly, say, in something less than a year. Together they will tend, after a somewhat longer interval, say, a year or two, to return interest rates to the level they would otherwise have had." (Friedman, ibid.)

According to Friedman it is precisely the reduction of the interest rate that allows the absorption of the amount of an additional quantity of money by the economic system. The reduction in the interest rate then generates an increase in expenditure, which produces an upward price pressure. The latter causes an excess demand for money, shifting to the right the liquidity preference schedule, bringing the interest rate back to its natural or long-term level.

Differently from Friedman, in Ricardo's analysis of the convergence process no reference is found to a functional relation between the interest rate and the demand for money. Furthermore, Friedman's analysis, in line with the long-standing conception of marginalist economic theory, is based on a precise inverse relation between the rate of interest and the aggregate demand which is absent in Ricardo's framework as in classical economics the separability between the analysis of distribution and the determination of output rules out any functional relationship between the rate of return on capital and investment-related expenditure (Garegnani, 1990; Caminati, ivi, p. 102, Smith, 2013, p. 190) which can ensure the correspondence between decisions to invest and full employment savings.

What we find in Ricardo is that, for a given level of production, the decrease in the rate of interest, via the 'applications to the Bank for money', induces an increase in spending, although not defined and formalized in general terms, justified by the increased profit of enterprise, with a subsequent increase in prices; this, however, does not mean that Ricardo postulates a sufficiently general functional relation between the interest rate and the level of expenditure.

Moreover, what we *do not* find in Ricardo is that a reduction in the interest rate may entail an increase in the quantity of money to be held as such, i.e., as an asset or as a store of value. This seems also to be consistent with Ricardo's idea that in the aggregate there cannot be overproduction of commodities, hence no possibility of accumulation of money (hoarding) following a disruption of the normal monetary circuit of cash receipts and payments (Green, 1992, p. 87)

3. According to the arguments put forward by Ricardo the increase in prices would allow the economic system to absorb the increased amount of money injected into circulation. Although this increase allows the ratio between money and prices to return to its 'natural' level, it is our contention that the interest rate would not receive any upward pressure towards the normal level.

Our argument could, however, give rise to a doubt in the reader: if the interest rate remains at the lower level - and thus the enterprise profit remains higher than normal – would not this generate further requests for loans, even after the increase in prices, to push up the interest rate? In other words, would not the persistently higher enterprise profit induce a further demand for loans which, given the money supply, would eventually generate an excess demand for loans able to bring back the interest rate to its natural level?

Although this argument may apparently help to solve the problem we just raised, it shows some weaknesses which we will now put forward.

First, when Ricardo speaks about the magnitude capable of bringing the rate of interest back to the natural level, he refers exclusively to the price level. There is no reference to additional circumstances, or to possible excesses of loan requests generated by the reduction in the interest rate. However, even if it were to be admitted that it is an excess demand for loans which pushes the interest rate up, nothing would prevent, in principle, that this upward pressure would operate immediately – assuming, so to speak, an infinite elasticity of the demand for loans to the interest rate – with the interest rate rapidly returning to the natural level.

It could alternatively be assumed that the excess demand for money does not manifest itself, so to speak, entirely at once, but takes the form of several successive steps until the profit of the enterprise remains at the above-normal level, thus leading to a gradual increase in the interest rate towards its natural level. Although this hypothesis cannot be ruled out, it does not appear more convincing than the previous one, given the arbitrary character of both.

However, such adjustments would seem to conflict with Ricardo's claim that it is the price level which allows the interest rate to return to its natural level.

Furthermore, as we have seen, Ricardo talks about the "applications to the Bank for money" claiming that if banks charge "less than the market rate of interest, there is no amount of money which they might not lend,—if they charge more than that rate, none but spendthrifts and prodigals would be found to borrow of them" (Ricardo, [1821] 1951, p. 364, already quoted), thereby highlighting, on the one hand, that the requests for loans would increase if the interest rate were diminished below the 'natural' level, and claiming on the other hand, always in the case in which the interest rate is lower than natural, that there are no limits to the issue of money by the banking system. In this regard, it is possible to understand Ricardo's statement by placing it within the context of a circulating *fiat* money (see Takenaga, 2013, p. 102).

To better outline our argument, it seems appropriate to introduce the subjects concerning the incentives for the banking system[17] to lower, and subsequently raise, the interest rate, as well as the possible limits it encounters, according to Ricardo, on the amount of money and loans that can be granted.

4. As we have discussed, it is ultimately through raising enterprise profits above the normal level that the banking system, according to Ricardo, induces the private sector to increase its demand for loans above a 'normal' level determined by the given volume of transactions. This can be achieved, according to Ricardo, if the banking system puts an additional quantity of money into circulation by reducing the rate of interest.

Ricardo seems to believe that, in general, a lower than natural interest rate enables the banking system to increase the volume of loans granted and, to the extent that the greater volume of loans more than compensates the reduction in the rate of interest, to obtain a higher amount of profits (Ricardo [1816] 1951, pp. 109-10)[18]. One might therefore wonder why the banking system, following the increase in the price level, should be induced to bring the interest rate back to its natural level. In other words, provided there is an incentive for *individual* producers and entrepreneurs to borrow - represented by the higher enterprise profit - why should *individual* banks not continue to grant the higher volume of credit demanded and thus continue to obtain a higher amount of profits? It is at this point that we can introduce the possible limits - institutional and/or based on conscious decisions by the banking system – envisaged by Ricardo on the quantity of money that can be issued by the banking system.

Ricardo maintains that during the so-called Restriction Period (1797-1821) – which, as we have mentioned (see above, section I), was the situation in Britain at the time when Ricardo wrote, when convertibility was suspended by a law approved by the British parliament, the Bank Restriction Act - "Parliament, by restricting the Bank from paying in specie, have enabled the conductors of that concern to increase or decrease at pleasure the quantity and amount of their notes; and the previously existing checks against an over-issue having been thereby removed, those conductors have acquired the power of increasing or decreasing the value of the paper currency."

[17] As we have already stressed (see above, section I), the mentions made by Ricardo to the Bank of England appear to be extendable to the banking system as a whole.

[18] This can only be assumed to be correct if we suppose that, other things being equal including an unchanged deposit rate, the fall in the interest rate on loans is accompanied by an increase in the volume of loans that more than compensate the reduction in the interest margin; alternatively, it must be assumed that the fall in the rate on loans leads to a fall in the rate on deposits, ensuring the invariance of the interest 'margin' per unit of loans granted. The increased volume of loans would allow therefore the banking system to obtain a higher absolute volume of profits in relation to the capital employed. In more general terms taking into account the rate of interest on loans goes necessarily hand-in-hand with the need to introduce the banking system as a productive sector that, if we assume conditions of perfect capital mobility, earns the normal rate of profits on capital employed. In this context, the level of the interest rate on loans seems no more to be qualified as a free-risk rate since it represents the 'price of production' of a particular commodity, i.e., money, which should be determined in a classical surplus approach, like other prices, on the basis of the technical conditions of production of the banking sector, and not by the rate of profits (cf. on this Panico, 1988; see below Conclusions).

(Ricardo, [1810-11] 1951, p. 75). According to Ricardo, as long as banknotes are no longer required to be convertible into gold on demand by the banking system, "all checks to the over issue of notes were removed, excepting that which the Bank *voluntarily* placed on itself" (Ricardo, [1809] 1951, p. 17, italics added) thus suggesting that if, following the increase in prices the interest rate would not return to the natural level and if this would generate a request for additional loans, individual banks would have no constraints to provide additional amounts of money and there would be no reason for the increase in the rate of interest other than the limits to the overissue voluntarily placed by the banking system itself. Therefore, in an unconvertible monetary system, Ricardo seems to believe that the increase in the price level would not generate an economic incentive for individual banks to raise the interest rate. Ricardo does not seem to explicitly define and specify those limits to the over-issuance of money, as if he wanted to stress their general ineffectiveness insofar as they depend on factors and conditions linked to the will of the banking system. An element that probably explains the negligible role attributed by Ricardo to the 'checks' in limiting the over-issuance of money is that Ricardo himself believes that after the suspension of convertibility the Bank of England has significantly increased its profits since the amount of notes issued by the banking system was no more limited by the constraints of its gold reserve (Ricardo, [1816] 1951, p. 52; p. 100; cf. Takenaga, 2013, p. 102; Sayers, 1953, p. 44).
Conversely, under a convertibility regime Ricardo claims that "No efforts of the Bank could keep more than a certain quantity of notes in circulation, and if that quantity was exceeded, its effects on the price of gold always brought the excess back to the Bank for specie." (Ricardo, [1809] 1951, p. 16). In the case of a convertibility regime there would be a constraint on an additional issue of money, represented by the gold reserves held by the banking system. This constraint is quite stringent as "This is the only check which can exist to an overissue from the Bank and was so well known that the Bank never ventured on it with impunity." (Ricardo, ibid.). We could then assume that, under a convertibility a regime, any further request for loans, i.e., any further 'applications' to the bank for money, after an increase in the price level, would in principle be able to allow the convergence process of the rate of interest, as the banking system probably would not be willing to provide additional amounts of credit at the lower rate of interest. However, as we shall see in the next section, Ricardo seems, without any systematic basis, to mention an explanation of the convergence process under a convertible monetary system, where the key determinant of the return of interest rates seems to be the outflow of the 'superfluous' quantity of money from the country because of an increase in the price level and not any excess demand for money coming from a lower than natural rate of interest.

5. We can try to better qualify the limits, to which Ricardo seems to allude, the banking system encounters in granting credit and provide loans. Such specifications can probably better help to understand how the analysis of the convergence mechanism of the interest rate to its natural level moves away from the simple

spontaneous mechanism of price level changes that Ricardo himself seems to consider sufficient for gravitation to take place. In modern parlance, provided the banking system is, according to Ricardo, induced to lower the rate of interest in order to, ultimately, increase its profits, only an insufficient amount of bank reserves in relation to deposits can limit the continuous granting of loans. Such a 'constraint' could, in principle, may apply regardless of the monetary system in force. Indeed, the structure of the monetary system at Ricardo's time seemed to attribute, as we have mentioned, to the Bank of England the role of 'Bank of banks', in the sense that, as long as the Bank of England notes, as well as gold coins, were used as reserve by the banking system and, in particular, by the country banks (Arnon, 2011, p. 73), this meant that each bank operated on a fractional reserve basis, thus incurring a liquidity risk, i.e., the possibility of being unable to pay *their* notes issued and demand deposits (de Boyer des Roches and Solis Rosales, 2016, p. 168; cf. also Laidler, 1987, p. 289). It is therefore possible to assume that to the extent that the Bank of England was inclined to lend its notes, it helped the banks to manage their liquidity. The constraint of gold convertibility of banknotes limited the Bank of England's capacity to issue notes and, hence, to provide banks with liquidity while, conversely, the suspension of the Bank's obligation to pay its notes in gold allowed, in principle, according to Ricardo, the Bank an unlimited possibility - except for those 'voluntarily checks' - to provide reserves to the banking system and hence to allow a continuous granting of loans by each individual bank.

6. Wicksell ([1906] 1978), in discussing Ricardo's monetary theory[19], maintains that, to the extent that the increase in the price level allows the absorption of the excess quantity of money in circulation, Ricardo does not need to continue to expect the banking system to keep the interest rate below the normal level, the latter determined in Ricardo, according to Wicksell's view, by supply and demand for real capital (ivi, p. 179). To bring about a permanent fall in the rate of interest, Wicksell ([1898] 1962) claims that in Ricardo "the excess of money would have to be constantly renewed and the relative amount of money would have to be continually increasing" (ivi, p. 24). Wicksell's interpretation of Ricardo's monetary theory seems therefore to set limits on the quantity of money the banking system can issue; for a lower than natural rate of interest and when the increase in prices has absorbed the greater quantity of money issued, the excess demand for investments with respect to savings should bring the rate of interest back to its natural level. The reason for this, according to Wicksell, is that *if* banks are required to redeem their notes in gold, "a powerful brake" is applied to them because the increase in the price level in a country cannot increase above the price level in all other countries using gold as money commodity, "for this would involve the loss of metal to the country, thus compelling banks to restrict credit facilities" ([1906] 1978, p. 171; cf. also below,

[19] For a complete discussion of Wicksell's analysis of Ricardo's monetary questions see Chiodi (1991). According to Ingrao and Sardoni (2019, p. 25) "Wicksell's monetary theory is centred on his attempt to provide a more satisfactory version of the quantity theory of money, which he regarded as the most satisfactory theory of the general price level."

section IV). But this, Wicksell seems to highlight, occurs according to Ricardo in a convertibility regime, because if the obligation to redeem notes in metal does not apply, “the banks possess, by the granting of credit, and especially by the issue of notes, an unlimited power to increase the circulating medium and therefore to raise commodity prices” (ibid.). In Wicksell's interpretation of Ricardo, it would then seem that only in the presence of the constraint represented by the metallic reserves is the price increase able to force the banking system to raise the interest rate. In addition, since Wicksell attributes to Ricardo a determination of the natural rate of interest based on supply and demand schedules for savings, it is that determination which makes it possible, one prices have risen and for an interest rate lower than natural, to conceive an excess demand for investment such as to enable the gravitation of the rate of interest to it natural level. Such a determination of the natural rate of interest being alien to Ricardo's thought and since, as we have seen, his elaboration contains only a vague and ill-defined relationship between the variation of the interest rate and the ‘applications to the bank for money’, it does not seem possible to define in a clear and systematic manner that, in a convertibility regime, according to Ricardo it is the ‘excess demand’ due to the lower interest rate the cause of the rise in the latter[20].

Wicksell also argues that, if we look at the world economy, and if all countries adopt the same metal as a ‘measure of values’, nothing would in principle prohibit the banks of other countries “from following the same policy and from issuing a number of notes side by side with the metallic money. The general price level might then rise to any height, and since there would then be no reason why metallic money should flow in any particular direction, *the convertibility of the notes would no longer constitute a check on the rise of prices*, […]” (ibid., italics added). The same conclusion can be reached, according to Wicksell, if an incessant flow of new gold came to the banks. In this event, “there can scarcely be any difference if for gold we substitute banknotes, fictious deposits, or other bank credit.” (ivi, p. 198).

Wicksell attributes to the banking system a potentially unlimited power to grant credit and issue money (ivi, p. 194; 1907, p. 214)[21]. This power according to Wicksell appears to be 'limited' only by institutional constraints, such as the monetary system in force at a given moment in history (see below).

[20] Smith (1996, p. 46) has observed that in marginalist theory the functions of supply and demand for savings may however in principle be able to provide per se a basis for an automatic convergence of the rate of interest to the natural level, differently from what happens in classical theory where “no such analysis can be logically formulated which would accommodate the systematic gravitation of the rate of interest towards the normal rate of profit ” (ibid.).

[21] Wicksell maintains that the amount of bank loans is generally larger than the amount of funds deposited with them (Wicksell [1906] 1978, pp. 83-4; cf. Ingrao and Sardoni, 2019, p. 26). Wicksell adopts initially the hypothesis of a ‘pure credit’ system (Wicksell ivi, p. 194; cf. on this also Garegnani, 1979a, p.), in which banks are virtually not restricted in their lending. However, this is a “completely ‘imaginary’ case’” (Chiodi, 1991, p. 88) that seems functional to Wicksell’s intention to give “an indication of the properties of banks’ behaviour as well as the consequences of its working within the productive system, which otherwise would be somehow ‘obscured’ by the presence of proper ‘money’” (Chiodi, ibid.).

Ricardo too, albeit not as clearly defined, also seems to recognize this power in the hands of the banking system, although Ricardo appears to confine it to the historical phase when there was no longer an obligation to convert banknotes into gold[22].
In Wicksell, however, contrary to Ricardo, the influence of purely monetary factors and of a developed banking system on the loans market detaches the volume of bank loans from the flow of savings and, hence, the determination of the current, or market, rate of interest from demand and supply of savings, thus breaking the automatic and spontaneous connection between the market and the natural rate of interest (Garegnani, 1979, pp. 64-7)[23].
In this regard Wicksell maintained that the banking system can accommodate any variation in the demand for loans whatever deviation of the market interest rate from the natural rate occurs, without changing the money rate of interest (Wicksell, ivi, p. 194), thus causing potential cumulative processes of inflation which absorb the higher amount of money or credit in circulation. For example, starting from an equilibrium situation in which the general price level is constant and there is equality between quantities demanded and supplied, following an increase in the profitability of investment, i.e., an increase in the 'natural' rate of interest, Wicksell claimed that the banking system can meet the increased demand for loans by an expansion of credit without changing the rate of interest on loans. Wicksell explains the increased demand for loans with the incentive that the difference between the rate of profits obtainable in production (equal to the natural rate of interest) and the market interest rate would offer entrepreneurs to expand aggregate output (Wicksell [1906] 1978, p.195; cf. on this Garegnani, 1979, p. 66). For the banking system, therefore, to meet the increased demand for loans there would be no economic reason to change the money rate of interest, in view of the allegedly unlimited possibility of granting loans[24]. The difference between the natural and the money rate of interest resulting from an increase in the former generates a rise in the demand for loans that the

[22] The capacity of the banking sector to create purchasing power can be read in terms of a relative elasticity of credit and of the amount of *paper* money issued with respect both to the means of production and to the quantity of labour employed. Ricardo seems to have noticed this when he stated that "In the first place, since 1797, the amount of Bank notes in circulation has increased from about twelve millions to twenty-eight millions, but the expences of their circulation, instead of increasing in the same proportion only, have, at least, increased as one to ten." (Ricardo, Vol. IV, p. 98).
[23] According to Wicksell, if savings and investments could directly 'operate' in the loans market, any difference between the natural and monetary interest rate would be eliminated by the excess of the demand (supply) for (of) investments (savings) over the supply (demand) of (for) savings (investments) (Wicksell [1906] 1978, p. 193). For this argument to be valid, it is necessary to assume, in addition to an inverse functional relationship between the rate of interest and the demand for investments, a continuous full employment of resources even in 'out-of-equilibrium' situations. In fact, if it were not the case, realized savings would not be equal to the decisions to save corresponding to full employment income and the excess demand for investments coming from a lower tan natural rate of interest would lead to an increase in the volume of realized savings, thus undermining the convergence of the interest rate to the natural level (cf. on this Garegnani, 1979a, p. 54).
[24] In these terms we can assume that, other things being equal, the difference between the natural and the market rate of interest leads to greater profit opportunities also for the banking system. For an unchanged interest margin per unit on loans – determined by the positive difference between the interest rate on loans and that on deposits (Wicksell [1898] 1962, pp. 139-140) - the increase in the volume of loans granted leads to an increase in the absolute profits for the banking system in relation to the capital employed.

banking system is able and is willing to satisfy. For a given full-employment production level, the resulting flow of monetary expenditure will then cause an increase in the price level which can, in principle, continue indefinitely if the banking system does not change the interest rate. The increased profitability of investments, for a given money rate of interest, represents indeed according to Wicksell a 'temptation' for entrepreneurs to borrow, leading to a continuous monetary expenditure and to a continuous increase in the price level (Wicksell, ivi, pp. 195-197). In this sense Wicksell seems then to conceive the 'passive' role assumed by banks in the loans market when he deals with the reasons that in his view explain the slow adjustment of the interest rate to its natural level (Wicksell, ivi, p. 205). The banking system has an incentive not to change the interest rate as a result of those increased profit opportunities taken by entrepreneurs precisely because it intends to exploit the opportunities coming from an increase in the volume of loans to be granted as a result of the greater demand for them. Banks are therefore passive according to Wicksell as long as the rise in the price level is determined by the difference between the natural and the money rate of interest resulting, in most cases, from an increase in the former and not from a deliberate intention of the banking system to change the latter for a given same natural rate (ibid.).[25]

It seems important to point out that for Wicksell, as in Ricardo, the increase in prices simply allows the absorption of the greater amount of money and credit granted. However, according to Wicksell, contrary to Ricardo, an increase in the price level is not in itself able to bring the interest rate back to its natural level.

Wicksell then introduces a constraint to the fulfilment by the banking system of the potentially continuous increase in the demand for loans generated by the lower than natural interest rate. This constraint, according to Wicksell, will 'oblige' the banking system to bring back the loan rate of interest in accordance with the natural rate, the only at which price stability can be achieved[26]:

[25] Wicksell maintains that variations in the natural rate of interest due to changes in the conditions of production and distribution take place continuously, belonging to "everyday phenomena" (Wicksell [1897] 1963, p. 239; cf. Chiodi, 1991, p. 21), as opposed to the variations in money rate of interest due to banking policy (ibid.). According to Wicksell, the individual bank has no incentive to spontaneously raise or lower the monetary interest rate: in the first case, it would lose market share to the other banks, while in the second case, although this might allow it to increase its lending volumes, the resulting increase in deposits, for a given volume of money reserves, would lead it to a "speedy insolvency" (Wicksell, 1907, p. 217). Even for the banking system as a whole, according to Wicksell, there would be no incentive to change the money rates of interest because "a too high or too low rate would influence its balance of trade, and thereby cause an influx or reflux of gold in the well-known way, so as to force the banks to apply their rates to the state of the universal money market." (ibid.). See below.

[26] From the definition of the natural rate of interest in terms of the demand for borrowed capital and the supply of savings, Wicksell seems to draw the conclusion that it ensures the constancy of the price level (Wicksell [1906] 1978, pp. 195-197;1907, p. 216; cf. Garegnani, 1979a, p. 56). Garegnani (ivi, pp. 56-7) has claimed that "the constancy of the price level to which Wicksell refers is to be understood in the sense that, if the rate of interest was always at its natural level, the monetary price of a composite commodity, sufficiently representative of the composition of the social product, could undergo only small variations during a not excessively long period of time." (ibid. our translation).
Leijonhufvud (1997) has questioned Wicksell's argument according to which when market and natural rates of interest are brought in line "a new level of prices has formed itself […]. Therefore, if

> "If we take as our starting point the view that a lowering of the loan rate below the normal rate (determined by the existing demand for capital and the volume of saving) in itself tends to bring about a progressive rise in all commodity prices, […], then all monetary phenomena would be extraordinarily clear and simple and *at the same time the obligation of the banks to maintain the rate of interest in agreement with the normal or real rate of interest would be obvious*." (Wicksell, ivi, p. 201, italics added).

According to Wicksell, if the banking system would not accommodate the rate of interest to its natural level, thus stopping the continuous increase in prices, there could be an "untenable shifting of the balance of payments […] through the medium of price changes" (ibid.) or, especially when gold constitutes part of circulation, the increase in the price level of commodities other than gold would cause an increase in the gold withdrawal from the banks because of "cash requirements of business for smaller payments" (ibidem), which could mine the convertibility regime.
For Wicksell, the problem of a potential shortage of reserves[27] due to a continuous demand for credit caused by the lower interest rate seems to be independent of whether these reserves are physically limited (gold) or whether they are made up of simple banknotes[28]:

> "When interest is low in proportion to the existing rate of profit, and if, as I take it, the prices thereby rise, then, of course, trade will require more sovereigns and bank-notes, and therefore the sums lent will not all come back to the bank, but part of them will remain in the boxes and purses of the public; in consequence, *the bank reserves will melt away while the amount of their liabilities very likely has increased, which will*

the bank-rate now goes up to its normal height, the level of prices will not go down; it will simply remain where it is, there being no force in action which could press it down;" (Wicksell, 1907, p. 216). Leijonhufvud maintains that when the natural and market rates of interest are again equal, the demand for 'cash money' at the elevated price level will exceed the supply, thus setting in motion a real balance effect that, arguably, will lead to a reduction in monetary expenditure which, given the hypothesis of full employment, will cause a decrease in the price level (Leijonhufvud, 1997, p. 5). Hence, according to Leijonhufvud, "metallic money "anchors" the nominal price level in Wicksell's theory" (ibid.).

[27]As noted by Chiodi (1991, p. 82), Wicksell seemed to have doubts about the limits regarding an inadequate volume of bank gold reserves if it is admitted that the latter are large relatively to deposits and could be diminished without endangering banks' solvency; if that were the case, "banks could lower their rates of interest still further if they desired to do so; at the most it could only be the unnecessary stringency of legal restrictions which prevents them." (Wicksell [1898] 1962, p. 115). See below.

[28] Wicksell claims that "What is really of importance is that the banks should possess sufficient *reserves* of the medium of exchange for use when required, […]. […] the view is becoming more and more widely held that the various systems of note convertibility are only of value in so far as they compel the maintenance of such a reserve. If notes of lower denominations were permissible, then for all internal requirements this reserve might without any risk be composed only of notes, i.e. of unused bank credit […]." (Wicksell [1906] 1978, p. 91).

force them to raise their rate of interest." (Wicksell, 1907, p. 215, italics added)

In the above quote Wicksell seems quite clear in stating that the rise in prices due to the additional supply of credit only makes it possible to absorb the increased issue; however, as long as credit facilities generate an increase in deposits, and for a *given* quantity of banknotes which constitute the reserves of the banking system, the ratio of bank reserves to deposits will tend to fall, thus *forcing* the banking system to increase the interest rate towards the natural level. Wicksell thus seems to introduce the possibility of a limited willingness of the monetary authority to grant reserves to the banking system, which then induces banks to raise the interest rate to curb the demand for loans. In this sense, Wicksell's analysis can be referred, in general terms, to the institutional constraints of a particular monetary system - which may take the form of deliberate choices by monetary authorities about the availability of reserves - that can curb the banking system's unlimited capacity to create purchasing power and, hence, to stop the increase in prices, by inducing banks to raise the money rate of interest.[29]

The remarks made by Wicksell seem therefore to be quite far from the spontaneous adjustment mechanism of the interest rate to its natural level envisaged by Ricardo (cf. Chiodi, 1991, p. 12)[30]. Although in fact, as we have pointed out, Ricardo refers in a sporadic and not well prearranged way to the potentialities of the banking system

[29] Although Wicksell identifies in the historical experience of his time the availability of gold reserves as the real limit to the continuous rise in the price level, he seems to imagine this constraint as 'circumventable', insofar as the supply of gold is 'abundant' (Wicksell, 1907, p. 218). Therefore, the function of stabilising the price level should have been the task of central banks - which were recognised as an institutional set up superior to a pure metallic standard - through "a proper manipulation of general bank-rates, lowering them when prices are getting low, and raising them when prices are getting high." (ivi, p. 2019; cf. on this de Cecco, 1987, p. 544). As is well known, the 'anchoring' of the money rate of interest to the natural rate by central banks has become important recently due to the resurgence of interest in neo-Wicksellian or New Keynesian monetary policy (cf. Woodford, 2003; for a critical review of the neo-wicksellian approach see Pivetti,).

[30] Sayers (1953, p. 47) has pointed out that the Ricardian emphasis on long-run forces "prevented him from realizing the potentialities of banking policy, but also lent to much of his exposition an air of unreality that wakened its political effect, and I would go so far as to say that it prevented him from perceiving certain major inconsistencies in his general position.". A different opinion is maintained by Marget (1966, p. 98), according to which the Wicksellian doctrine "with respect to the relation between money and the rate of interest was identical with the heart of Ricardian doctrine on the subject" and by Ahiakpor (1999, p. 444; see also above, paragraph 1), according to which in Ricardo's argument we find "a clear precursor of Wicksell's "cumulative process" argument", although "Wicksell's argument cannot be correct if money is defined as currency or specie. Even bank credit, which is the lending of depositors' savings has to have a limit on its supply" (ivi, p. 449), and in spite of the fact that "Only when the means of payment (money) have increased relative to output (real income) would all prices rise" (ivi, p. 450). Therefore, Ahiakpor concludes, "It is quite possible that had Wicksell well understood the classical "capital" theory of interest, he would have appreciated the short- and long-run movements of interest rates in response to changes in the supply of money, as the classics and Marshall explained". (ivi, p. 452). From a totally opposite point of view, Boffito (1973, pp. 68-69, our translation) claimed that "Wicksell, like Ricardo, explains the cyclical nature of the capitalist economy through the presence and action of banks. In fact, due to the continuous pressure on the loan market and due to the increase in prices, which continues indefinitely, the banks see their reserves continuously diminishing, and in order to avoid their exhaustion they are forced to increase the interest rate".

to grant an unlimited amount of loans for a lower than natural rate of interest - hinting at this possibility in the case of an inconvertibility regime – he seems however taking for granted that as the price level increases, the banking system rises the interest rate, making it converge to the natural level determined by the rate of profits. In Ricardo's view the banking system cannot exert any lasting control on the rate of interest and the only attractive force capable of bringing the rate of interest back to its natural level is the rate of profits. More precisely, insofar as Ricardo recognizes the existence of peculiar characteristics of the banking system and/or of institutional factors that may influence the determination of the rate of interest, the attractive force of the rate of profits will in any case be stronger and such as to allow an automatic convergence of the rate of interest towards it as the price level increases. According to Wicksell, on the other hand, the convergence mechanism does not seem to take on such spontaneous features, to the extent that the level of the 'natural' rate of interest does not seem to be able to represent *per se* an automatic attractive force for the monetary interest rate. Provided that Wicksell acknowledges the banking system the power of creating purchasing power, for an interest rate lower than the natural level as a result of an increase in the latter, Wicksell seems to believe that in the absence of some 'external forces', the banking system would not be induced to raise the former just because it is below the natural level or simply because prices have risen. In this regard Wicksell seems to place the banking system within the institutional structure of a monetary system which plays a decisive role in enabling the gravitation of the money rate of interest to the natural rate[31].

IV

1. According to what we have argued the convergence process described by Ricardo seems to have general characteristics, i.e., not strictly dependent on a particular monetary system. Ricardo seems to believe that an increase in the general level of prices can bring the interest rate to its natural level and that such a process generally applies both to a convertible and unconvertible monetary system. Ricardo also affirms that the only way for the banking system to enter an additional exogenous amount of money in circulation is via a reduction in the interest rate, and this is valid both in a system in which a convertible money or a fiat money circulates (Ricardo, [1810-11] 1951, pp. 91-2; [1821] 1951, pp. 363-4).

[31] Cf. Ingrao & Sardoni (2019, p. 24). As has been noted by Chiodi (1991, p. 52), "The banking system is able to create 'money' - and this is what Wicksell especially needs for his purpose. In such a system the economic power exerted through the management of money and credit, even if in different ways, must have an elasticity and a readiness to act which in no economic system, especially the capitalist one, can be left to the play of 'free forces' of the market".

As far as we are concerned, based on the above arguments we believe that an increase in the price level is not able *per se* to provide an incentive to bring the market rate of interest back to the natural level, being therefore unable to operate the convergence mechanism of the first towards the second.
We can however presume - without any claim to be exhaustive – that Ricardo thinks of an inconvertible monetary system when he describes the convergence process of the market rate of interest to its natural rate. For the purposes of our argument, it is therefore necessary to address, albeit briefly, the general features of Ricardo's monetary theory.

2. An interpretation which can be traced back to Marx ([1859] 1904, pp. 239-244) maintains that, although Ricardo was a strong supporter of the quantity theory of money (Ricardo [1811] 1951, p. 193; cf. Sayers, 1953, p. 33; de Vivo, 1987, p. 186; Smith, 2017, p. 51), his quantity theory is different under a gold (or silver) convertible monetary system from an inconvertible monetary system in which *fiat* money circulates (Green 1992, p. 51; Smith, 2017, pp. 51-2)[32].
In a gold (or silver) convertible monetary system, Ricardo essentially confined the quantity theory to the short run (Green, 1998, p. 137; Smith, 2013, p. 183). The reason for this is that in a gold-convertible monetary system the price level of commodities in terms of gold would be determined by the circumstances which regulate the relative value of gold, normalized by the official mint price of gold, as well as by the given velocity of circulation and the volume of transactions (cf. also Arnon, 2011, p. 128).
This conception was consistent with the longstanding conception in classical economics that in the long run the quantity of gold used as money was endogenously determined by its value for a given level of aggregate output (volume of transactions) and for a given velocity of circulation (Smith, 2013; Green 1982, p. 63; 1992, pp. 14–15).
The long run price level in Ricardo's analysis then depends on the technique of production of commodities, and, in particular, on the technical conditions of production which determine the value of gold (Ricardo, [1816] 1951, pp. 55-56; Smith, 2017, p. 52).
According to Ricardo, an exogenous increase in a country in the quantity of convertible paper money in circulation will only cause a short run increase in money prices of all commodities other than gold (i.e., a short run reduction in the relative value of gold) since the money price of gold is fixed at the level established by the mint. This will then make gold effectively cheaper relative to all other commodities, so it becomes 'the cheapest exportable commodity' in the country. As a result, according to the price–specie flow mechanism, on the balance of payments there would be a larger importation of commodities other than gold which, in turn, would lead to a reduction in gold-convertible banknotes up to the previous quantity, and,

[32] For a different view of Ricardo's monetary theory cf. Marcuzzo and Rosselli (1994; 1998; 2015); Deleplace (2015); Quadrio Curzio & Rotondi (2015).

thereby, to a reduction in the price level. On this basis Ricardo reasoned that in a convertible monetary system an exogenous increase of convertible paper money in circulation could have only a temporary, or short run, effect on the price level.
It is under an inconvertible monetary system that Ricardo argues the increase in price level caused by an additional issue of paper money in circulation must be regarded no longer as simply a temporary or short-run phenomenon but also a long run one.
The reason lies in the fact that in a system in which fiat money circulates the price level is no longer determined by technical conditions of production determining the relative values of commodities other than gold to gold, but, instead, it is simply determined by the quantity of paper money issued by the banking system.
Under an inconvertible monetary system money is not a commodity and therefore we cannot identify a 'natural' or 'normal' level of the quantity of money endogenously determined in the long run by the relative value of the commodity (gold or silver) standard that circulates all other commodities at their "normal" prices.
What can be identified is instead a 'normal' proportion between the quantity of fiat money and the price level, i.e., the 'natural' *real* quantity of money, exclusively determined by the ratio between the volume of transactions and the velocity of money circulation (Ricardo, [1810-11] 1951, p. 90), i.e., the *effectual* demand for money. Starting from the simple form of the equation of exchange $MV = PT$, where M is the quantity of fiat money, V the velocity of circulation, P the level of money prices and T the volume of transactions, suitably reordering we'll obtain the equality $\frac{M}{P} = \frac{T}{V}$. The ratio between the nominal quantity of money and the price level will be determined for a given velocity of circulation and volume of transactions. In Ricardo's analysis, in fact, the velocity of circulation and the volume of transactions are determined independently of the quantity of money and the level of prices.
In short, when a fiat money circulates, the 'normal' proportion between the quantity of money and the price level is compatible with several quantities of fiat-money and several price levels. Conversely, in a convertibility regime, the 'natural' proportion between the quantity of money and the price level is still determined by the ratio between the volume of transactions and the velocity of circulation, but in this case, there is a unique quantity of commodity, or convertible, money consistent with that ratio, i.e., the amount ultimately determined by the relative price system and necessary to circulate commodities at their normal prices.

3. Ricardo seems to have clear in mind, in a convertibility regime, the interconnection between the role played by the rate of interest and the international price-specie-flow mechanism (cf. on this Petri, 1983, p. 18):

> "If the Bank had doubled its circulation, it still would have no permanent effect upon the value of money. If such a thing had taken place, the general level of interest would be restored in less than six months. The country only required, and could only bear, a certain circulation; and when that amount of circulation was afloat, *the rate of interest would find*

its wholesome and natural level" (Ricardo, [1822] 1951, pp. 222-3, italics added)

Although the basis of this conception is not clarified by Ricardo in the remainder of the Speech, the price-specie-flow mechanism seems to ensure, in Ricardo's opinion, that - in a regime of convertibility or when a commodity money circulates– the amount of money will ultimately be what "the country only required". This condition is also satisfied when the rate of interest converges toward its natural level. Thanks to the gold flowing out of national borders, in fact, the amount of additional commodity money previously entered circulation by means of a reduction of the interest rate, would be reduced to such an extent as to generate that excess demand for money, which would allow an increase in the market interest rate and, therefore, the convergence of the latter to its natural level. The gold outflow is the counterpart of the purchase of foreign goods which have become more competitive. This does not allow the domestic producers to sell the quantities produced at the new higher prices. That is why there will be an increase in the demand for money by the same producers as the sales volume does not allow them to make payments set by contract (e.g., money wages). Thus, a shortage of liquidity in the economy occurs. The banking system, however, is not willing to provide additional money at a lower interest rate, since gold reserves required to warrant the convertibility of banknotes would further diminish. Hence, competition between manufacturers will raise the interest rate back to its natural level.

This increase in the rate of interest cannot, however, eliminate the excess demand for money, since, as we have seen, the idea of a decreasing functional relation between the rate of interest and the demand for money seems to be absent in Ricardo. In this case only a *decrease* in the general price level, caused by an excess of aggregate supply with respect to the monetary expenditure, would allow the reduction in the demand for money, thereby allowing the new lower amount of money in circulation to be absorbed by the economic system.

Hence, variations in the price level cannot under a convertible monetary system ensure the convergence of the market rate of interest to its natural level. In a convertibility regime the convergence process is ultimately affected by the commodity money outflow from the national borders, which would, moreover, remove the excess of money in circulation and ensure the return of the quantity of money to its 'natural' level.

4. As we have discussed, Ricardo maintains it is the price level that ensures the market interest rate returns to its natural level. He seems to hold this view at least until 1822, that is one year after the restoration of convertibility in England, when he seems to provide a different explanation of the convergence process. We might then presume that his reliance on the increase in prices for the tendency of the market rate of interest to the natural rate is precisely based on the premise of the inconvertibility of banknotes into gold. In this case, as we have seen in paragraph 2, what can be defined is no longer a 'natural' quantity of money but rather a 'natural' ratio of *fiat*

money to the price level determined on a basis of a given ratio of the volume of transactions to the velocity of circulation of money. An exogenous increase in the quantity of money would cause, for a given rate of profits, a fall of the rate of interest below its natural level and an increase in the money-prices ratio above natural. According to Ricardo, the subsequent increase in prices would bring the latter ratio as well as the interest rate back to their natural levels.

In the course of our discussion, we have tried to show, however, that the convergence process of the market interest rate to its natural level envisaged by Ricardo seems to show some inconsistencies, particularly with regard to the capacity of changes in the price level to guarantee that result.

We could ask, however, why under an inconvertible monetary system the convergence process does not rely, according to Ricardo, on the outflow of money from the country. The reason might be looked for in the fact that under an inconvertibility regime Ricardo believes that the increase in domestic prices would not feed the outflow of money because, differently from what would happen under convertibility, it would not determine a reduction, albeit temporary, in the relative value of gold, and it would be accompanied by the fall of the exchange rate.

When convertibility is suspended, indeed, banknotes cannot be exchanged anytime for gold at the mint, but only on the market (Boffito, 1973, p. 22). Therefore, against an increase in the quantity of banknotes in circulation, there will not be a reduction in the relative value of gold since for both gold and other commodities there will be a permanent increase in their money prices. In this regard, Ricardo stresses that:

> "When the circulation consists wholly of paper, any increase in its quantity will raise the *money* price of bullion without lowering its *value*, in the same manner, and in the same proportion, as it will raise the prices of other commodities, and for the same reason will lower the foreign exchanges; but this will only be a *nominal*, not a *real* fall, and will not occasion the exportation of bullion, because the real value of bullion will not be diminished, as there will be no increase to the quantity in the market." (Ricardo, [1810-11] 1951, p. 64)

Under an inconvertible monetary system, an increase in the quantity of paper money in circulation will raise the sterling price of all commodities, including gold. Since the monetary authority is no more obliged to sell gold at the mint in exchange for banknotes at a fixed price, the market price of gold in terms of pound sterling will permanently increase, and consequently the relative value of gold will not decrease. Therefore, no temptation to export gold arises, i.e., no net outflow of gold from the country occurs.

Furthermore, the sterling price increase of commodities other than gold will cause the exchange rate to fall, thus offsetting the incentive to purchase foreign goods through the purchase of the foreign currency (Ricardo [1810-11] 1951, p. 92).

In this sense Ricardo speaks of a *nominal* and not of a *real* fall in the exchange rate, as the latter reflected for Ricardo the ratio between the bullion price of commodities

in the domestic and the world economy, which has not changed following the increase in the quantity of inconvertible paper money in circulation (Feldman, 2013, p. 12). Moreover, according to Ricardo in an inconvertibility regime there are no limits, as it is instead the case when banknotes are freely convertible into gold at the mint, to the fall in the nominal exchange rate following an increase in the quantity of paper money (Ricardo [1810-11] 1951, p. 72).

5. Therefore, according to Ricardo short run, or temporary, variations in the real quantity of money – due, other things being equal, to changes in the *nominal* quantity of money – determine temporary changes in the rate of interest. The increase in the price level, under an inconvertible monetary system, and the outflow of commodity money from national borders, in a convertibility regime, bring the real quantity of money back into line with the effectual demand and, hence, with its 'natural' long-term level, together with the rate of interest to its natural level.
However, as we have seen, following Ricardo's premises the mechanism based on the outflow of money seems to be more consistent, regarding the convergence of the interest rate, than that based on the increase in the price level. The reason could be found in the fact that, according to Ricardo, what causes variations in the rate of interest is the change in the *nominal* quantity of money. Consequently, in order for the interest rate to be brought back to its natural level, would be required the action of forces capable of more than offsetting that nominal variation; these forces would be either an excess demand for money, or the 'removal' of the quantity of money issued. Insofar as, as we have seen, the rise in the price level is not per se capable of generating the necessary pressure, it is the leakage of the excess quantity of money issued a possible solution to the problem. The latter, however, would seem to be a useful mechanism only in a convertibility regime. We can argue, therefore, that Ricardo seems to set his main arguments about the convergence process of the rate of interest in the context of an inconvertible monetary system; Ricardo's insistence on identifying the rise in the price level as exerting the adequate stimulus for the rate of interest to return to its natural level may indeed be dictated by the fact that, in an inconvertibility regime, since the increase in the price level is capable of bringing the real quantity of money to its natural level determined by the effectual demand, other variables that had undergone variations, such as the interest rate, must *necessarily* return to their natural level. Price increase will therefore *have* to bring the rate of interest back to its normal level. It would be indeed unconceivable, according to Ricardo, to have a permanent disequilibrium situation in which the rate of interest is constantly lower than the level determined by the rate of profits.

Conclusions

The aim of this paper is to highlight some critical points of Ricardo's analysis which, in our opinion, may lead to formulate some doubts about the coherence of the envisaged convergence process of the market rate of interest to the natural level

First, we have highlighted how the convergence process postulated by Ricardo is not entirely convincing from a logical point of view. Ricardo seems to take for granted that the increase in the price level ensures the gravitation of the market rate of interest to its natural level. In our opinion this mechanism is barely sufficient to ensure the absorption of the greater quantity of money put in circulation, but not to allow the market rate of interest to converge to its normal level, with the latter ultimately determined by the rate of profits. The increase in the price level therefore does not seem likely to represent the economic force that would make the natural interest rate take on the role of centre of gravitation for the market rate.

The comparison with Wicksell's analysis - who, although from a completely different theoretical point of view from that of Ricardo, seems to maintain that the increase in the price level is not in itself able to bring the interest rate back to its natural level - seems useful to understand how the gravitation mechanism of the market interest rate towards its natural level is in fact linked to institutional and 'conventional' elements - which Ricardo seems to glimpse but towards which he probably does not devote all the necessary attention for the analysis of the convergence process - aimed at curbing the power of the banking system to create purchasing power and, in modern parlance, at guarantee its ‘resilience’. These elements therefore appear to downgrade the role of the rise in the price level as an automatic upward pressure on the rate of interest.

The increase in the price level is, however, in Ricardo's view, the mechanism by which the real quantity of money, in an inconvertibility regime - the monetary system in force at the time Ricardo wrote and that he strongly opposed - is brought back into line with its natural level determined by the effectual demand. Ricardo therefore seems spontaneously inclined to think that, thanks to the rise in prices, also the interest rate should return to its natural level determined by the rate of profits, without bothering to analytically justify this mechanism.

In the case of a convertibility regime, in which the level of the nominal and the real quantity of money coincide, Ricardo seems to hint at another and apparently more consistent mechanism to support the convergence of the interest rate, no longer based on the increase in the price level, but rather on the outflow of the excess quantity of money.

Finally, there is one point that seems worth emphasizing which, in our opinion, provides a possible route for further research developments.

As we have seen, Ricardo studies the convergence of the rate of interest to its natural level always referring to the loans granted by the banking system to the private sector (entrepreneurs). Considering the rate of interest on loans goes necessarily together with the need to introduce the banking system as a productive sector that, if we assume conditions of perfect capital mobility, earns the normal rate of profits on capital employed. In this context, the interest rate on loans cannot be qualified as a

free-risk rate, since it represents the 'price of production' of a particular commodity, i.e., money or credit, which should be determined, like other prices, based on the technical conditions of production of the banking sector, and not by the rate of profits. As is well known, Panico (1988) has provided major contributions about the introduction of the financial sector into Sraffa's (1960) system of price equations. His analysis, however, does not focus on the implications that the study of the characteristics and properties of the banking system has for the relationship between the rate of interest and the rate of profits. This is the direction we aim to follow for further research.

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