International Review of Financial Analysis 36 (2014) 1–19

Contents lists available at ScienceDirect

International Review of Financial Analysis

Can banks individually create money out of nothing? — The theories and the empirical evidence☆

Richard A. Werner

Centre for Banking, Finance and Sustainable Development, University of Southampton, United Kingdom

ARTICLE INFO

Available online 16 September 2014

JEL classification:
E30
E40
E50
E60

Keywords:
Bank credit
Credit creation
Financial intermediation
Fractional reserve banking
Money creation

ABSTRACT

This paper presents the first empirical evidence in the history of banking on the question of whether banks can create money out of nothing. The banking crisis has revived interest in this issue, but it had remained unsettled. Three hypotheses are recognised in the literature. According to the *financial intermediation theory of banking*, banks are merely intermediaries like other non-bank financial institutions, collecting deposits that are then lent out. According to the *fractional reserve theory of banking*, individual banks are mere financial intermediaries that cannot create money, but collectively they end up creating money through systemic interaction. A third theory maintains that each individual bank has the power to create money 'out of nothing' and does so when it extends credit (the *credit creation theory of banking*). The question which of the theories is correct has far-reaching implications for research and policy. Surprisingly, despite the longstanding controversy, until now no empirical study has tested the theories. This is the contribution of the present paper. An empirical test is conducted, whereby money is borrowed from a cooperating bank, while its internal records are being monitored, to establish whether in the process of making the loan available to the borrower, the bank transfers these funds from other accounts within or outside the bank, or whether they are newly created. This study establishes for the first time empirically that banks individually create money out of nothing. The money supply is created as 'fairy dust' produced by the banks individually, "out of thin air".

© 2014 Published by Elsevier Inc.

> "The choice of a measure of value, of a monetary system, of currency and credit legislation — all are in the hands of society, and natural conditions … are relatively unimportant. Here, then, the decision-makers in society have the opportunity to directly demonstrate and test their economic wisdom — or folly. History shows that the latter has often prevailed."[1]
>
> [Wicksell (1922, p. 3)]

1. Introduction

Since the American and European banking crisis of 2007–8, the role of banks in the economy has increasingly attracted interest within and outside the disciplines of banking, finance and economics. This interest is well justified: Thanks to the crisis, awareness has risen that the most widely used macroeconomic models and finance theories did not provide an adequate description of crucial features of our economies and financial systems, and, most notably, failed to include banks.[2] These bank-less dominant theories are likely to have influenced bank regulators and may thus have contributed to sub-optimal bank regulation: Systemic issues emanating from the banking sector are impossible to detect in economic models that do not include banks, or in finance models that are based on individual, representative financial institutions without embedding these appropriately into macroeconomic models.[3]

☆ The author wishes to acknowledge excellent research support from Dr. Kostas Voutsinas and Shamsher Dhanda. Moreover, the author is grateful to the many bank staff at numerous banks involved in this study, who have given their time for meetings and interviews. Most of all, the author would like to thank Mr. Marco Rebl, Director of Raiffeisenbank Wildenberg e.G., for his cooperation and arranging the cooperation of his colleagues in conducting the empirical examination of bank credit creation and making the facilities, accounts and staff of his bank accessible to the researcher. Finally, should grains of wisdom be found in this article, the author wishes to attribute them to the source of all wisdom (Jeremiah 33:3).

[1] Translated into English by the author. See also Wicksell (1935).

[2] Federal Reserve Vice-Chairman Kohn (2009) bemoaned this issue. Examples of leading macroeconomic and monetary models without any banks include Walsh (2003) and Woodford (2003), but this problem applies to all the conventional macromodels proposed by the major conventional schools of thought, such as the classical, Keynesian, monetarist and neo-classical theories, including real business cycle and DSGE models.

[3] The 'Basel' approach to bank regulation focuses on regulation of capital adequacy. Werner (2010a) has argued that this is based on economic theories that do not feature a special role for banks. For an overview and critique, see Werner (2012).

http://dx.doi.org/10.1016/j.irfa.2014.07.015
1057-5219/© 2014 Published by Elsevier Inc.

Consequently, many researchers have since been directing their efforts at incorporating banks or banking sectors in economic models.[4] This is a positive development, and the European Conferences on Banking and the Economy (ECOBATE) are contributing to this task, showcased in this second special issue, on ECOBATE 2013, held on 6 March 2013 in Winchester Guildhall and organised by the University of Southampton Centre for Banking, Finance and Sustainable Development. As the work in this area remains highly diverse, this article aims to contribute to a better understanding of crucial features of banks, which would facilitate their suitable incorporation in economic models. Researchers need to know which aspects of bank activity are essential — including important characteristics that may distinguish banks from non-bank financial institutions. In other words, researchers need to know whether banks are unique in crucial aspects, and if so, why.

In this paper the question of their potential ability to create money is examined, which is a candidate for a central distinguishing feature. A review of the literature identifies three different, mutually exclusive views on the matter, each holding sway for about a third of the twentieth century. The present conventional view is that banks are mere financial intermediaries that gather resources and re-allocate them, just like other non-bank financial institutions, and without any special powers. Any differences between banks and non-bank financial institutions are seen as being due to regulation and effectively so minimal that they are immaterial for modelling or for policy-makers. Thus it is thought to be permissible to model the economy without featuring banks directly. This view shall be called the *financial intermediation theory of banking*. It has been the dominant view since about the late 1960s.

Between approximately the 1930s and the late 1960s, the dominant view was that the banking system is 'unique', since banks, unlike other financial intermediaries, can collectively create money, based on the fractional reserve or 'money multiplier' model of banking. Despite their collective power, however, each individual bank is in this view considered to be a mere financial intermediary, gathering deposits and lending these out, without the ability to create money. This view shall be called the *fractional reserve theory of banking*.

There is a third theory about the functioning of the banking sector, with an ascendancy in the first two decades of the 20th century. Unlike the *financial intermediation theory* and in line with the *fractional reserve theory* it maintains that the banking system creates new money. However, it goes further than the latter and differs from it in a number of respects. It argues that each individual bank is not a financial intermediary that passes on deposits, or reserves from the central bank in its lending, but instead creates the entire loan amount out of nothing. This view shall be called the *credit creation theory of banking*.

The three theories are based on a different description of how money and banking work and they differ in their policy implications. Intriguingly, the controversy about which theory is correct has never been settled. As a result, confusion reigns: Today we find central banks – sometimes the very same central bank – supporting different theories; in the case of the Bank of England, central bank staff are on record supporting each one of the three mutually exclusive theories at the same time, as will be seen below.

It matters which of the three theories is right — not only for understanding and modelling the role of banks correctly within the economy, but also for the design of appropriate bank regulation that aims at sustainable economic growth without crises. The modern approach to bank regulation, as implemented at least since Basel I (1988), is predicated on the understanding that the *financial intermediation theory* is correct.[5] Capital adequacy-based bank regulation, even of the counter-cyclical type, is less likely to deliver financial stability, if one of the other two banking hypotheses is correct.[6] The capital-adequacy based approach to bank regulation adopted by the BCBS, as seen in Basel I and II, has so far not been successful in preventing major banking crises. If the *financial intermediation theory* is not an accurate description of reality, it would throw doubt on the suitability of Basel III and similar national approaches to bank regulation, such as in the UK.[7]

It is thus of importance for research and policy to determine which of the three theories is an accurate description of reality. Empirical evidence can be used to test the relative merits of the theories. Surprisingly, no such test has so far been performed. This is the contribution of the present paper.

The remainder of the paper is structured as follows. Section 2 provides an overview of relevant literature, differentiating authors by their adherence to one of the three banking theories. It will be seen that leading economists have gone on the record in support of each one of the theories. In Section 3, I then present an empirical test that is able to settle the question of whether banks are unique and whether they can individually create money 'out of nothing'. It involves the actual processing of a 'live' bank loan, taken out by the researcher from a representative bank that cooperates in the monitoring of its internal records and operations, allowing access to its documentation and accounting systems. The results and some implications are discussed in Section 4.

2. The literature on whether banks can create money

Much has been written on the role of banks in the economy in the past century and beyond. Often authors have not been concerned with the question of whether banks can create money, as they often simply assume their preferred theory to be true, without discussing it directly, let alone in a comparative fashion. This literature review is restricted to authors that have contributed directly and explicitly to the question of whether banks can create credit and money. During time periods when in the authors' countries banks issued promissory notes (bank notes) that circulated as paper money, writers would often, as a matter of course, mention, even if only in passing, that banks create or issue money. In England and Wales, the Bank Charter Act of 1844 forbade banks to "make any engagement for the payment of money payable to bearer on demand." This ended bank note issuance for most banks in England and Wales, leaving the (until 1946 officially privately owned) Bank of England with a monopoly on bank note issuance. Meanwhile, the practice continued in the United States until the 20th century (and was in fact expanded with the similarly timed New York Free Banking Act of 1838), so that US authors would refer to bank note issuance as evidence of the money creation

[4] One older attempt that has stood up to the test of time is Werner (1997).

[5] See, for instance, the first BCBS Working Paper (BCBS, 1999), looking back on the first decade of experience with Basel I for insights into the thinking of the Basel bank regulators. In a section headlined 'Do fixed minimum capital requirements create credit crunches affecting the real economy?', the authors argue: "It would in fact be strange if fixed minimum capital requirements did not bite in some periods, thereby constraining the banks, given that the purpose of bank [capital] requirements is to limit the amount of risk that can be taken relative to capital. However, for this to have an effect on output, it would have to be true that any shortfall in bank lending was not fully made up through lending by other intermediaries or by access to securities markets." This statement presupposes that the *financial intermediation theory* holds. If banks are the creators of the money supply, and in this role unique and different from non-bank financial intermediaries, as the other two hypotheses maintain, then a reduction in bank credit (creation) must have effects that non-bank financial intermediaries cannot compensate for.

[6] See, for instance, Werner (2005, 2010a).

[7] As seen in the work of the Independent Commission on Banking, ICB, 2011, also known as the Vickers Commission. For contributions to the consultation of the ICB, see, for instance, Werner (2010b). The recommendations therein, especially the recommendation to discard the *financial intermediation theory*, were not heeded.

function of banks until much later.[8] For sake of clarity, our main interest in this paper is the question whether banks that *do not issue bank notes* are able to create money and credit out of nothing. As a result, earlier authors, writing mainly about paper money issuance, are only mentioned in passing here, even if it could be said that their arguments might also apply to banks that do not issue bank notes. These include John Law (1705), James Steuart (1767), Adam Smith (1776), Henry Thornton (1802), Thomas Tooke (1838), and Adam Müller (1816), among others, who either directly or indirectly state that banks can individually create credit (in line with the *credit creation theory*).[9]

2.1. The credit creation theory of banking

Influential early writers that argue that non-issuing banks have the power to individually create money and credit out of nothing wrote mainly in English or German, namely Wicksell (1898, 1907), Withers (1909), Schumpeter (1912), Moeller (1925) and Hahn (1920).[10] The review of proponents of the *credit creation theory* must start with Henry Dunning Macleod, of Trinity College, Cambridge, and Barrister at Law at the Inner Temple.[11] Macleod produced an influential opus on banking, entitled *The Theory and Practice of Banking*, in two volumes. It was published in numerous editions well into the 20th century (Macleod, 1855–6; the quotes here are from the 6th edition of 1905). Concerning credit creation by individual banks, Macleod unequivocally argued that individual banks create credit and money out of nothing, whenever they do what is called 'lending':

> "In modern times private bankers discontinued issuing notes, and merely created Credits in their customers' favour to be drawn against by Cheques. These Credits are in banking language termed Deposits. Now many persons seeing a material Bank Note, which is only a Right recorded on paper, are willing to admit that a Bank Note is cash. But, from the want of a little reflection, they feel a difficulty with regard to what they see as Deposits. They admit that a Bank Note is an "Issue", and "Currency," but they fail to see that a Bank Credit is exactly in the same sense equally an "Issue," "Currency," and "Circulation"."
>
> [Macleod (1905, vol. 2, p. 310)]

> "… Sir Robert Peel was quite mistaken in supposing that bankers only make advances out of *bona fide* capital. This is so fully set forth in the chapter on the Theory of Banking, that we need only to remind our readers that all banking advances are made, in the first instance, by **creating credit**" (p. 370, emphasis in original).

In his *Theory of Credit* Macleod (1891) put it this way:

> "A bank is therefore not an office for "borrowing" and "lending" money, but it is a Manufactory of Credit."
>
> [Macleod (1891: II/2, 594)]

According to the *credit creation theory* then, banks create credit in the form of what bankers call 'deposits', and this credit is money. But how much credit can they create? Wicksell (1907) described a credit-based economy in the *Economic Journal*, arguing that

> "The banks in their lending business are not only not limited by their own capital; they are not, at least not immediately, limited by any capital whatever; by concentrating in their hands almost all payments, they themselves create the money required…."
>
> "In a *pure* system of credit, where all payments were made by transference in the bank-books, the banks would be able to grant at any moment any amount of loans at any, however diminutive, rate of interest."[12]
>
> [Wicksell (1907, 214)]

Withers (1909), from 1916 to 1921 the editor of the *Economist*, also saw few restraints on the amount of money banks could create out of nothing:

> "… it is a common popular mistake, when one is told that the banks of the United Kingdom hold over 900 millions of deposits, to open one's eyes in astonishment at the thought of this huge amount of cash that has been saved by the community as a whole, and stored by them in the hands of their bankers, and to regard it as a tremendous evidence of wealth. But this is not quite the true view of the case. Most of the money that is stored by the community in the banks consists of book-keeping credits lent to it by its bankers."
>
> [Withers (1909, pp. 57 ff.)]

> "… The greater part of the banks' deposits is thus seen to consist, not of cash paid in, but of credits borrowed. For every loan makes a deposit …."
>
> [Withers (1909, p. 63)]

> "When notes were the currency of commerce a bank which made an advance or discounted a bill gave its customer its own notes as the proceeds of the operation, and created a liability for itself. Now, a bank makes an advance or discounts a bill, and makes a liability for itself in the corresponding credit in its books."
>
> [Withers (1909, p. 66)]

[8] The practice of issuance of promissory notes by commercial banks has continued for far longer in Scotland and Northern Ireland — namely until today. This did not seem, however, to result in a sizeable literature on bank money creation in the UK throughout the 20th century.

[9] Referring to the issuance of bank notes that circulate as paper money, Smith comments "The banks, when their customers apply to them for money, generally advance it to them in their own promissory notes" (p. 242). … "It is chiefly by discounting bills of exchange, that is, by advancing money upon them before they are due, that the greater part of banks and bankers issue their promissory notes. … The banker, who advances to the merchant whose bill he discounts, not gold and silver, but his own promissory notes, has the advantage of being able to discount to a greater amount by the whole value of his promissory notes, which he finds, by experience, are commonly in circulation. He is thereby enabled to make his clear gain of interest on so much a larger sum" (Smith, 1776, p. 241). "Jeder Provinzialbanquier strebt dahin, sein Privatgeld zum Nationalgelde zu erheben: er strebt nach der größtmöglichen und möglichst allgemeinen Umsetzbarkeit seines Privatgeldes. Es ist in England nicht bloß die Regierung, welche Geld macht, sondern die Bank von England, jede Privatbank, ja jede einzelne Haushaltung (ohne gerade bestimmte Noten auszugeben, aber, in wie fern sie sich an eine bestimmte Bank thätig anschließt) helfen das Geld machen" (Müller, 1816, p. 240). "Sobald die Regierung also die Geldzeichen mechanisch vermehrt, ohne in demselben Maaße jene andern Organe, denen die Vortheile der Geldvermehrung nur indirekt zu gute kommen, zu stärken, ohne um so kräftiger und gerechter das Ganze zu umfassen, so überträgt sie im Grunde nur das Privilegium der Gelderzeugung, das sie im Nahmen des Ganzen ausübt, auf ein einzelnes Organ. … sollte sie [die Regierung] also ihr Privilegium der Gelderzeugung nicht bloß aufheben, sondern das bisher erzeugte Geld zurück nehmen, so gibt sie damit nur dem Privatcredit, das heißt, dem verwöhnten verderbten Privatcredit, oder dem Wucher die förmliche Befugniß in die Hände, die Lücken zu ergänzen, selbst Geldmarken zu machen, und somit seinen verderblichen und vernichtenden Einfluß auf das Ganze nun erst recht zu äußern" (Müller, 1816, p. 305).

[10] There is also another group of writers who to some extent agree with this description, but one way or another downplay its role or importance in practice. In terms of the history of economic thought it can be said that the latter group laid the groundwork and were the founding fathers of the *fractional reserve theory*. To the extent that they recognise the creation of credit by banks out of nothing under certain circumstances one might argue that they could be classified as supporter of either the *credit creation theory* or the *fractional reserve theory*, but to minimise confusion, here the impact their work has had in its common interpretation was chosen, as well as their emphasis on reserves as a key mechanism, so that they were included in the latter theory.

[11] An Inn of Court with the status of a local authority, inside the territory of the City of London Corporation.

[12] This paper was read by Wicksell in London in the Economic Section of the British Association in 1906 and it is recorded in the Economic Journal that Palgrave and Edgeworth commented on it. There is no mentioning of any objections to the claims about the ability of banks to create money out of nothing.

> "… It comes to this that, whenever a bank makes an advance or buys a security, it gives some one the right to draw a cheque upon it, which cheque will be paid in either to it or to some other banks, and so the volume of banking deposits as a whole will be increased and the cash resources of the banks as a whole will be unaltered."
>
> [Withers (1916, p. 45)]

> "When once this fact is recognised, that the banks are still, among other things, manufacturers of currency, just as much as they were in the days when they issued notes, we see how important a function the banks exercise in the economic world, because it is now generally admitted that the volume of currency created has a direct and important effect upon prices. This arises from what is called the "quantity theory" of money …."
>
> [Withers (1916, p. 47)]

> "If, then, the quantity theory is, as I believe, broadly true, we see how great is the responsibility of the bankers as manufacturers of currency, seeing that by their action they affect, not only the convenience of their customers and the profits of their shareholders, but the general level of prices. If banks create currency faster than the rate at which goods are being produced, their action will cause a rise in prices which will have a perhaps disastrous effect …."[13]
>
> [Withers (1916, pp. 54 ff.)]

> "And so it becomes evident, as before stated, that the deposits of the banks which give the commercial community the right to draw cheques are chiefly created by the action of the banks themselves in lending, discounting, and investing" (pp. 71 ff.).

> "… then, it thus appears that credit is the machinery by which a very important part of modern currency is created …" (p. 72).

Withers argues that the sovereign prerogative to manufacture the currency of the nation has effectively been *privatised* and granted to the commercial banks:

> "By this interesting development the manufacture of currency, which for centuries has been in the hands of Government, has now passed, in regard to a very important part of it, into the hands of companies, working for the convenience of their customers and the profits of their shareholders."
>
> [Withers (1916, p. 40)]

While Withers was a financial journalist, his writings had a high circulation and likely contributed to the dissemination of the *credit creation theory* in the form proposed by Macleod (1855–6). This view also caught on in Germany with the publication of Schumpeter's (1912, English 1934) influential book *The Theory of Economic Development*, in which he was unequivocal in his view that each individual bank has the power to create money out of nothing.

> "Something like a certificate of future output or the award of purchasing power on the basis of promises of the entrepreneur actually exists. That is the service that the banker performs for the entrepreneur and to obtain which the entrepreneur approaches the banker. … (The banker) would not be an intermediary, but *manufacturer of credit*, i.e. he would create himself the purchasing power that he lends to the entrepreneur …. One could say, without committing a major sin, that the banker creates money."[14]
>
> [Schumpeter (1912, p. 197, emphasis in original)]

> "[C]redit is essentially the creation of purchasing power for the purpose of transferring it to the entrepreneur, but not simply the transfer of existing purchasing power. … By credit, entrepreneurs are given access to the social stream of goods before they have acquired the normal claim to it. And this function constitutes the keystone of the modern credit structure."
>
> [Schumpeter (1954, p. 107)]

> "The fictitious certification of products, which, as it were, the credit means of payment originally represented, has become truth."[15]
>
> [Schumpeter (1912, p. 223)]

This view was also well represented across the Atlantic, as the writings of Davenport (1913) or Robert H. Howe (1915) indicate. Hawtrey (1919), another leading British economist who like Keynes, had a Treasury background and moved into academia, took a clear stance in favour of the *credit creation theory*:

> "… for the manufacturers and others who have to pay money out, credits are still created by the exchange of obligations, the banker's immediate obligation being given to his customer in exchange for the customer's obligation to repay at a future date. We shall still describe this dual operation as the creation of credit. By its means the banker creates the means of payment out of nothing, whereas when he receives a bag of money from his customer, one means of payment, a bank credit, is merely substituted for another, an equal amount of cash" (p. 20).

Apart from Schumpeter, a number of other German-language authors also argued that banks create money and credit individually through the process of lending.[16] Highly influential in both academic discourse and public debate was Dr. Albert L. Hahn (1920), scion of a Frankfurt banking dynasty (similarly to Thornton who had been a banker) and since 1919 director of the major family-owned Effecten- und Wechsel-Bank, Frankfurt. Like Macleod a trained lawyer, he became an honorary professor at Goethe-University

[13] "Since, then, variations in the quantity of currency have these widespread effects, it is a matter which bankers have to consider seriously, how far it is possible from them to apply some scientific regulation to the volume of currency, and whether it is possible to modify the evils that follow from wide fluctuations in prices by some such regulation" (p. 55). For a more recent application and more precise formulation of this principle, see Werner's Quantity Theory of Credit (Werner, 1992, 1997, 2005, 2012). "… the most important of the modern forms of currency, namely the cheque, is, in effect, manufactured for the use of its customers by banks; and, further, that since the volume of currency has an important effect upon raising prices, the extent to which currency is thus created is a responsibility which has to be seriously considered by those who work the financial machine. This manufacture of currency is worked through the granting of credit, and credit may thus be defined, for the purposes of this inquiry, as the process by which finance makes currency for its customers. As we saw in the last chapter, deposits, which are potential currency as they carry with them the right to draw a cheque, are produced largely through the loans, discounts and investments made by bankers" (p. 63). "The creation of credit is thus seen clearly to result in the manufacture of currency whenever the banks buy bills of exchange … or make an advance …. In either case the banks give somebody the right to draw cheques. … When a bank makes an advance to a stock broker the result is exactly the same …. The same result, in rather a different form, happens when a bank makes investments on its own account. … There has thus been, in each case, an increase in deposits through the operation of the bank in lending, discounting, or investing. If we can imagine all the banks suddenly selling all their investments and bills of exchange and calling in all their advances, the process could only be brought about by the cancelling of deposits, their own and one another's" (p. 72).

[14] "Etwas Ähnliches wie eine Bescheinigung künftiger Produkte oder wie die Verleihung von Zahlkraft an die Versprechungen des Unternehmers gibt es nun wirklich. Das ist der Dienst, den der Bankier dem Unternehmer erweist und um den sich der Unternehmer an den Bankier wendet. … so wäre er nicht Zwischenhändler, sondern *Produzent von Kredit*, d.h. er würde die Kaufkraft, die er dem Unternehmer leiht, selbst schaffen …. Man könnte ohne große Sünde sagen, daß der Bankier Geld schaffe" (S. 197). Translated by author.

[15] "Die fiktive Bescheinigung von Produkten, die die Kreditzahlungsmittel sozusagen ursprünglich darstellten, ist zur Wahrheit geworden" (Schumpeter, 1912, S. 223). Translated by author.

[16] For instance, Moeller (1925) states that "In the modern monetary system the creation of new paper or bank accounting currency ('Buchungsgeld', or 'bank book money') is primarily in the hands of the banks. … For the deposit money the same largely applies as for paper money …" (pp. 177 ff.).

Frankfurt in 1928. Clearly not only aware of the works of Macleod, whom he cites, but also likely aware of actual banking practice from his family business, Hahn argued that banks do indeed 'create money out of nothing':

> "Every credit that is extended in the economy creates a deposit and thus the means to fund it. … The conclusion from the process described can be expressed in reverse by saying … that every deposit that exists somewhere and somehow in the economy has come about by a prior extension of credit."[17]
>
> [Hahn (1920, p. 28)]

> "We thus maintain – contrary to the entire literature on banking and credit – that the primary business of banks is not the liability business, especially the deposit business, but that in general and in each and every case an asset transaction of a bank must have previously taken place, in order to allow the possibility of a liability business and to cause it: The liability business of banks is nothing but a reflex of prior credit extension. The opposite view is based on a kind of optical illusion …."[18]
>
> [Hahn (1920, p. 29)]

Overall, Hahn probably did more than anyone to popularise the *credit creation theory* in Germany, his book becoming a bestseller, and spawning much controversy and new research among economists in Germany. It also greatly heightened awareness among journalists and the general public of the topic in the following decades. The broad impact of his book was likely one of the reasons why this theory remained entrenched in Germany, when it had long been discarded in the UK or the US, namely well into the post-war period. Hahn's book was however not just a popular explanation without academic credibility. Schumpeter cited it positively in the second (German) edition of his *Theory of Economic Development* (Schumpeter, 1926), praising it as a further development in line with, but beyond, his own book. The English translation of Schumpeter's influential book Schumpeter (1912 [1934]) also favourably cites Hahn.

It can be said that support for the *credit creation theory* appears to have been fairly widespread in the late 19th and early 20th century in English and German language academic publications. By 1920, the *credit creation theory* had become so widespread that it was dubbed the 'current view', the 'traditional theory' or the 'time-worn theory of bank credit' by later critics.[19]

The early Keynes seemed to also have been a supporter of this dominant view. In his *Tract on Monetary Reform* (Keynes, 1924), he asserts, apparently without feeling the need to establish this further, that banks create credit and money, at least in aggregate:

> "The internal price level is mainly determined by the amount of credit created by the banks, chiefly the Big Five …" (p. 178).
>
> "The amount of credit, so created, is in its turn roughly measured by the volume of the banks' deposits — since variations in this total must correspond to the variations in the total of their investments, bill-holdings, and advances" (p. 178).

We know from Keynes' contribution to the Macmillan Committee (1931) that Keynes meant with this that each individual bank was able to create credit:

> "It is not unnatural to think of the deposits of a bank as being created by the public through the deposit of cash representing either savings or amounts which are not for the time being required to meet expenditure. But the bulk of the deposits arise out of the action of the banks themselves, for by granting loans, allowing money to be drawn on an overdraft or purchasing securities a bank creates a credit in its books, which is the equivalent of a deposit" (p. 34).

Concerning the banking system as a whole, this bank credit and deposit creation was thought to influence aggregate demand and the formation of prices, as Schumpeter (1912) had argued:

> "The volume of bankers' loans is elastic, and so therefore is the mass of purchasing power …. The banking system thus forms the vital link between the two aspects of the complex structure with which we have to deal. For it relates the problems of the price level with the problems of finance, since the price level is undoubtedly influenced by the mass of purchasing power which the banking system creates and controls, and by the structure of credit which it builds …. Thus, questions relating to the volume of purchasing power and questions relating to the distribution of purchasing power find a common focus in the banking system" (Macmillan Committee, 1931, pp. 12 ff.).
>
> "… if, finally, the banks pursue an easier credit policy and lend more freely to the business community, forces are set in motion increasing profits and wages, and therefore the possibility of additional spending arises" (p. 13).

Concerning the question whether credit demand or credit supply is more important, the report argued that the root cause is the movement of the supply of credit:

> "The expansion or contraction of the amount of credit made available by the banking system in other directions will, through a variety of channels, affect the ease of embarking on new investment propositions. This, in turn, will affect the volume and profitableness of business, and hence react in due course on the amount of accommodation required by industry from the banking system. … Thus what started as an alteration in the *supply* of credit ends up in the guise of an alteration in the *demand* for credit" (p. 99).[20]

While money is thus seen as endogenous to credit, when what is called a 'bank loan' is extended, the Committee argued that bank credit was exogenous as far as loan applicants are concerned:

> "There can be no doubt as to the power of the banking system … to increase or decrease the volume of bank money" (p. 102).
>
> "In normal conditions we see no reason to doubt the capacity of the banking system to influence the volume of active investment by

[17] "Jeder Kredit der gegeben wird, erzeugt seinerseits ein Deposit und damit die Mittel zu seiner Unterbringung. … Die Folgerung aus dem skizzierten Vorgang kann man auch umgekehrt ausrücken, indem man sagt – und dieser Schluß ist ebenso zwingend – , daß jedes irgendwie und irgendwo in der Volkswirtschaft vorhandene Scheck- oder Ueberweisungsguthaben sein Entstehen einer vorausgegangenen Kreditgewährung, einem zuvor eingeräumten Kredit zu verdanken hat" (S. 28). Translated by author.

[18] "Wir behaupten also im Gegensatz zu der gesamten, in dieser Beziehung so gut wie einigen Bank- und Kreditliteratur, daß nicht das Passivgeschäft der Banken, insbesondere das Depositengeschäft das Primäre ist, sondern daß allgemein und in jedem einzelnen Falle ein Aktivgeschäft einer Bank vorangegangen sein muß, um erst das Passivgeschäft einer Bank möglich zu machen und es hervorzurufen: Das Passivgeschäft der Banken ist nichts anderes als ein Reflex vorangegangener Kreditgewährung. Die entgegengesetzte Ansicht beruht auf einer Art optischer Täuschung …" (S. 29). Translated by author.

[19] See, for instance, Phillips (1920, p. 72, p. 119).

[20] This is in line with the credit supply determination view proposed by Werner (1997, 2005) and his Quantity Theory of Credit, as opposed to the endogenous credit supply view of many post-Keynesians.

increasing the volume and reducing the cost of bank credit. … Thus we consider that in any ordinary times the power of the banking system … to increase or diminish the active employment of money in enterprise and investment is indisputable" (p. 102).

The Macmillan Committee also argued that bank credit could be manipulated by the Bank of England, and thus was also considered exogenous in this sense.

The credit creation theory remained influential until the early post-war years. The links of credit creation to macroeconomic and financial variables were later formalised in the Quantity Theory of Credit (Werner, 1992, 1997, 2005, 2012), which argues that credit for (a) productive use in the form of investments for the production of goods and services is sustainable and non-inflationary, as well as less likely to become a non-performing loan, (b) unproductive use in the form of consumption results in consumer price inflation and (c) unproductive use in the form of asset transactions results in asset inflation and, if large enough, banking crises. However, since the 1920s serious doubts had spread about the veracity of the *credit creation theory of banking*. These doubts were initially uttered by economists who in principle supported the theory, but downplayed its significance. It is this group of writers that served as a stepping stone to the formulation of the modern *fractional reserve theory*, which in its most widespread (and later) version however argues that individual banks cannot create credit, but only the banking system in aggregate. It is this theory about banks that we now turn to.

2.2. The fractional reserve theory

An early proponent of the *fractional reserve theory* was Alfred Marshall (1888). He testified to a government committee about the role of banks as follows:

"I should consider what part of its deposits a bank could lend and then I should consider what part of its loans would be redeposited with it and with other banks and, vice versa, what part of the loans made by other banks would be received by it as deposits. Thus I should get a geometrical progression; the effect being that if each bank could lend two thirds of its deposits, the total amount of loaning power got by the banks would amount to three times what it otherwise would be."

[Marshall (1888), as quoted by Yohe (1995, p. 530)]

With this, he contradicted Macleod's arguments. However, Marshall's view was still a minority view at the time. After the end of the First World War, a number of influential economists argued that the 'Old Theory' (Phillips, 1920:72) of bank credit creation by individual banks was mistaken. Their view gradually became more influential. "The theory of deposit expansion reached its zenith with the publication of C.A. Phillips' Bank Credit …" (Goodfriend, 1991, as quoted by Yohe, 1995, p. 532).

Phillips (1920) argued that it was important to distinguish between the theoretical possibility of an individual bank 'manufacturing money' by lending in excess to cash and reserves on the one hand, and, on the other, the banking system as a whole being able to do this. He argued that the 'Old Theory' (the *credit creation theory*) was

"predicated upon the contention that a bank would be able to make loans to the extent of several times the amount of additional cash newly acquired and held *at the time the loans were made*, whereas a representative bank in a system is actually able ordinarily to lend an amount only roughly equal to such cash" (p. 72).[21]

According to Phillips (1920), individual banks cannot create credit or money, but collectively the banking system does so, as a new reserve is "split into small fragments, becomes dispersed among the banks of the system. Through the process of dispersion, it comes to constitute the basis of a manifold loan expansion" (p. 40). Each bank is considered mainly a financial intermediary: "… the banker … handles chiefly the funds of others" (pp. 4–5). Phillips argued that since banks target particular cash to deposit and reserve to deposit ratios (as cited in the money multiplier), which they wish to maintain, each bank effectively works as an intermediary, lending out as much as it is able to gather in new cash. Through the process of dispersion and re-iteration, the financial intermediation function of individual banks, without the power to create credit, adds up to an expansion in the money supply in aggregate.[22]

Crick (1927) shared this conclusion (with some minor caveats). Thus he argued:

"The important point, which is responsible for much of the controversy and most of the misunderstanding, is that while one bank receiving an addition to its cash cannot forthwith undertake a full multiple addition to its own deposits, yet the cumulative effect of the additional cash is to produce a full multiple addition to the deposits of all the banks as a whole" (p. 196).

"Summing up, then, it is clear … that the banks, so long as they maintain steady ratios of cash to deposits, are merely passive agents of the Bank of England policy, as far as the volume of money in the form of credit is concerned. … The banks … have very little scope for policy in the matter of expansion or contraction of deposits, though they have in the matter of disposition of resources between loans, investments and other assets. But this is not to say that the banks cannot and do not effect multiple additions to or subtractions from deposits as a whole on the basis of an expansion of or contraction in bank cash" (p. 201).

The role of banks remained disputed during the 1920s and 1930s, as several writers criticised the *credit creation theory*. Views not only diverged, but were also in a flux, as several experts apparently shifted their position gradually — overall an increasing number moving away from the *credit creation theory* and towards the *fractional reserve theory*.

Sir Josiah C. Stamp, a former director of the Bank of England, summarised the state of debate in his review of an article by Pigou (1927):

"The general public economic mind is in a fair state of muddlement at the present moment on the apparently simple question: "Can the banks create credit, and if so, how, and how much?" and between the teachings of Dr. Leaf and Mr. McKenna, Messrs. Keynes, Hawtrey, Cassel and Cannan and Gregory, people have not yet found their way."

[Stamp (1927, p. 424)]

[21] His analysis was based on the "overlooked … pivotal fact that an addition to the usual volume of a bank's loans tends to result in a *loss of reserve* for that bank only somewhat less on average than the amount of the additional loans. … Manifold loans are not extended by an individual bank on the basis of a given amount of reserve" (Phillips, 1920, p. 73).

[22] It should be noted here that Phillips' (1920) work can be interpreted in a more differentiated manner. For instance, Phillips did also point out that if all banks increased their lending at roughly the same pace, each bank *would*, after all, be able to create credit without losing reserves or cash, on balance (pp. 78 ff.). However, subsequent writers citing Phillips usually do not mention this. While a more detailed discussion of Phillips is, however, beyond the scope of this paper, it is here merely claimed that Phillips' argument was an important stepping stone towards the formulation of the *fractional reserve theory* of banking, which is unequivocal in treating individual banks as mere financial intermediaries without the power to create credit or money individually under any and all circumstances, even though it could possibly be argued that Phillips himself may not have agreed with the latter in all respects.

Contributions to this debate were also made by Dennis Robertson (1926), who was influenced by Keynes.[23] Keynes (1930) explains the role of reserve holdings and the mechanics of determining a bank's behaviour based on its preference to hold cash and reserves, together with the amount of reserves provided by the central bank — the fairly predetermined mechanics postulated by the money multiplier in a fractional reserve model:

> "Thus in countries where the percentage of reserves to deposits is by law or custom somewhat rigid, we are thrown back for the final determination of M, the Volume of Bank-money on the factors which determine the amount of these reserves" (p. 77).

Keynes (1930) also backed a key component of the *fractional reserve theory*, namely that banks gather deposits and place parts of them with the central bank, or, alternatively, may withdraw funds from their reserves at the central bank in order to lend these out to the non-banking sector of the economy:

> "When a bank has a balance at the Bank of England in excess of its usual requirements, it can make an additional loan to the trading and manufacturing world, and this additional loan creates an additional deposit (to the credit of the borrower or to the credit of those to whom he may choose to transfer it) on the other side of the balance sheet of this or some other bank."
>
> [Keynes (1930, vol. 2, p. 218)]

Keynes here argues that new deposits, based on new loans, are dependent upon and connected to banks' reserve balances held at the central bank. This view is sometimes also supported by present-day central bankers, such as in Paul Tucker's or the ECB's proposal to introduce negative interest rates on banks' reserve holdings at the central bank, as an incentive for them to 'move' their money from the central bank and increase lending.[24] Nevertheless, part of Keynes (1930), and much of his most influential work, his *General Theory* (1936), appears more in line with the *financial intermediation theory*, as will be discussed in the following section.

A representative example of the *fractional reserve theory* that at the same time was beginning to point in the direction of the *financial intermediation theory* is the work by Lutz (1939), who published in *Economica*, a forum for some of these debates at the time:

> "The expansion of the economic system leads to an increase in the volume of deposits to a figure far in excess of the amount of the additional cash in use, simply because the same cash is deposited with the banking system over and over again. … The fact that banking statistics show an aggregate of deposits far above the amount of cash in the banking system, is therefore not of itself a sign that the banks must have *created* the whole of the difference. This conclusion is also, of course, somehow implicit in the "multiple expansion" theory of the creation of bank deposits (of the Phillips or Crick variety). That theory explains the creation of deposits by the fact that the same cash (in decreasing amounts) is successively paid into different banks. It does, however, look upon this cash movement rather in the nature of a technical affair between banks … which would disappear if the separate banks were merged into one. In that case the deposits would be regarded as coming into existence by outright creation. In our example we assume throughout only one bank, and still the deposits grow out of the return, again and again, of the same cash *by the public*. … The force which really creates expansion is the trade credit given by producers to one another. … The bank plays the role of a mere intermediary."
>
> … This seems to lead not to a new, but to a very old theory of the function of banks: the function of a mere intermediary … (pp. 166 ff.).

> "The modern idea of banks being able to create deposits seemed to be a startling departure from the view held by most economists in the nineteenth century. If, however, we approach this modern idea along the lines followed above, we find that it resolves itself into much the same elements as those which many of the older writers regarded as the essence of banking operations: the provision of confidence which induces the economic subjects to extend credit to each other by using the bank as an intermediary" (p. 169).

Phillips' influence has indeed been significant. Even in 1995 Goodfriend still argued that

> "… Phillips showed that the summation of the loan- and deposit-creation series across all individual banks yields the multiple expansion formulas for the system as a whole. Phillips' definitive exposition essentially established the theory once and for all in the form found in economics textbooks today."
>
> [as reprinted in Yohe (1995, p. 535)]

Statements like this became the mainstream view in the 1950s and 1960s.[25] The view of the *fractional reserve theory* in time also came to dominate textbook descriptions of the functioning of the monetary and banking system. There is no post-war textbook more representative and influential than that of Samuelson (1948). The original first edition is clear in its description of the *fractional reserve theory*: Under the heading "Can banks really create money?", Samuelson first dismisses "false explanations still in wide circulation" (p. 324):

> "According to these false explanations, the managers of an ordinary bank are able, by some use of their fountain pens, to lend several dollars for each dollar left on deposit with them. No wonder practical bankers see red when such behavior is attributed to them. They only wish they could do so. As every banker well knows, he cannot invest money that he does not have; and any money that he does invest in buying a security or making a loan will soon leave his bank" (p. 324).

Samuelson thus argues that a bank needs to gather the funds first, before it can extend bank loans. This is not consistent with the *credit creation theory*. However, Samuelson argues that, in aggregate, the banking system creates money. He illustrates his argument with the example of a 'small bank' that faces a 20% reserve requirement, and considering the accounts of the bank (B/S). If this bank receives a new cash deposit of $1000, "What can the bank now do?", Samuelson asks (p. 325).

> "Can it expand its loans and investments by $4000 …?"
>
> "The answer is definitely 'no'. Why not? Total assets equal total liabilities. Cash reserves meet the legal requirement of being 20

[23] In the Introduction, Robertson says: "I have had so many discussions with Mr. J. M. Keynes on the subject matter of chapters V and VI, and have rewritten them so drastically at his suggestion, that I think neither of us now knows how much of the ideas therein contained is his, and how much is mine (p. 5)." (As cited in Keynes, 1930.)

[24] On Paul Tucker's proposal, see BBC (2013), and also the critique by Werner (2013a). Negative rates on bank reserves at the central bank were actually imposed by the Swedish central bank in 2009, the Danish central bank in 2012 and for the first time by the Swiss central bank in 1978 on deposits by foreign banks.

[25] Even though a closer reading of Alhadeff (1954) shows that the author agreed that, under certain circumstances, banks can create credit and money: "In certain cases, the proportion between the legal reserve ratio and residual deposits is such that even a single bank can expand its deposits to a somewhat greater amount than its primary deposits. … Again, it might be possible for a very large bank, or a bank in an isolated community with few business connections with outside banks, literally to create money because of flow back deposits. [Footnote: 'Flow-back deposits refer to the circulation of deposits among the depositors of the same bank.'] In either case, this amounts to a partial reduction in the average cost of producing credit (making loans), at least in terms of the raw material costs …" (Alhadeff, 1954, p. 7). Although Alhadeff, if studied closely, could be said to have agreed that an individual bank can create credit out of nothing, he clearly thought this to be a special case without practical relevance, while it is normally only the banking system in aggregate that creates credit.

per cent of total deposits. True enough. But how does the bank pay for the investments or earning assets that it buys? Like everyone else it writes out a check — to the man who sells the bond or signs the promissory note. … The borrower spends the money on labor, on materials, or perhaps on an automobile. The money will very soon, therefore, have to be paid out of the bank. … A bank cannot eat its cake and have it too. Table 4b gives, therefore a completely false picture of what an individual bank can do" (pp. 325 ff.).

Instead, Samuelson explains, since all the money lent out will leave the bank, an individual bank cannot create credit out of nothing:

"As far as this first bank is concerned, we are through. Its legal reserves are just enough to match its deposits. There is nothing more it can do until the public decides to bring in some more money on deposit" (p. 326).

On the other hand, Samuelson emphasises that

"The banking system as a whole can do what each small bank cannot do!" (p. 324),

namely create money. This, Samuelson explains via the iterative process of one bank's loans (based on prior deposits) becoming another bank's deposits, and so forth. He shows "this chain of deposit creation" in a table, amounting to total deposits in the banking system of $5000 (out of the $1000), due to the reserve requirement of 20% implying a 'money multiplier' of 5 times (assuming no cash 'leakage').

What Samuelson calls the "multiple deposit expansion" is described in the same way and with remarkable similarity in the fifteenth edition of his book (Samuelson & Nordhaus, 1995) half a century later, only that the reserve requirement cited as example has been lowered to 10%: "All banks can do what one can't do alone" (p. 493). There are subtle though important differences. The overall space devoted to this topic is much smaller in 1995 compared to 1948. The modern textbook says that the central bank-created reserves are used by the banks "as an input" and then "transformed" "into a much larger amount of bank money" (p. 490). There is far less of an attempt to deal with the *credit creation theory*. Instead, each bank is unambiguously represented as a pure financial intermediary, collecting deposits and lending out this money (minus the reserve requirement).[26] The *fractional reserve theory* had become mainstream:

"Each small bank is limited in its ability to expand its loans and investments. It cannot lend or invest more than it has received from depositors" (p. 496).

Meanwhile, bank deposit money is "supplied" by "the financial system" in an abstract process that each individual bank has little control over (p. 494). The unambiguous fractional reserve theory thus appears to have come about in the years after the 1950s. It can be described in Fig. 1.

In this scheme, funds move between the public, the banks and the central bank without any barriers. Each bank is a financial intermediary, but in aggregate, due to fractional reserve banking, money is created (multiplied) in the banking system. Specifically, each bank can only grant a loan if it has previously received new reserves, of which a fraction will always be deposited with the central bank. It will then only be able to lend out as much as these excess reserves, as is made clear in major textbooks. In the words of Stiglitz (1997):

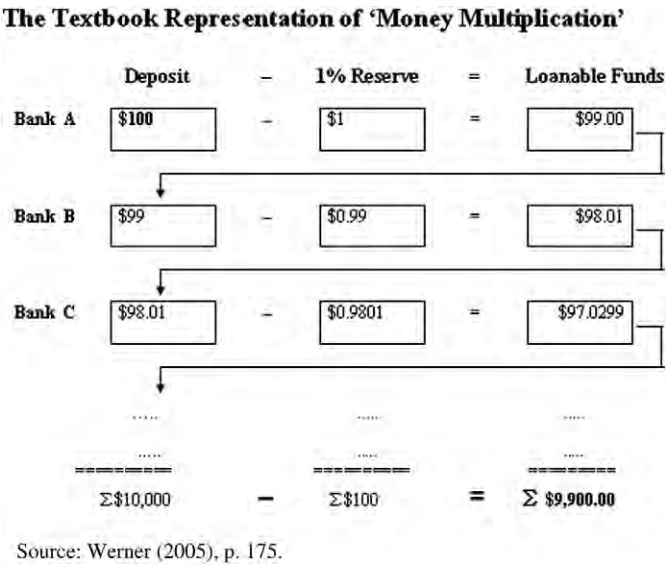

Fig. 1. The fractional reserve theory as represented in many textbooks.

"It should be clear that when there are many banks, no individual bank can create multiple deposits. Individual banks may not even be aware of the role they play in the process of multiple-deposit creation. All they see is that their deposits have increased and therefore they are able to make more loans" (p. 737).

In another textbook on money and banking:

"In this example, a person went into bank 1 and deposited a $100,000 check drawn on another bank. That $100,000 became part of the reserves of bank 1. Because that deposit immediately created excess reserves, further loans were possible for bank 1. Bank 1 lent the excess reserves to earn interest. A bank will not lend more than its excess reserves because, by law, it must hold a certain amount of required reserves."

[Miller and VanHoose (1993, p. 331)]

The deposit of a cheque from another bank does not however increase the "total amounts of deposits and money":

"Remember, though, that the deposit was a check written on another bank. Therefore, the other bank suffered a decline in its transactions deposits and its reserves. While total assets and liabilities in bank 1 have increased by $100,000, they have decreased in the other bank by $100,000. *Thus the total amount of money and credit in the economy is unaffected by the transfer of funds from one depository institution to another*. Each depository institution can create loans (and deposits) only to the extent that it has excess reserves. The thing to remember is that new reserves are not created when checks written on one bank are deposited in another bank. The Federal Reserve System, however, can create new reserves" (p. 331).

The textbook by Heffernan (1996) says:

"To summarise, all modern banks act as intermediaries between borrowers and lenders, but they may do so in a variety of different ways, from the traditional function of taking deposits and lending a percentage of these deposits, to fee-based financial services" (p. 18).

"For the bank, which pools these surplus funds, there is an opportunity for profit through fractional reserve lending, that is, lending out

[26] Moreover, the original Samuelson (1948: 331) offered an important (even though not prominently displayed) section headed 'Simultaneous expansion or contraction by all banks', which provided the caveat that each individual bank could, after all, create deposits, if only all banks did the same at the same rate (thus outflows being on balance cancelled by inflows, as Alhadeff, 1954, also mentioned). There is no such reference in the modern, 'up-to-date' textbook.

money at an interest rate which is higher than what the bank pays on the deposit, after allowing for the riskiness of the loan and the cost of intermediation" (p. 20).

While the *fractional reserve theory* succeeded in attracting many followers, rendering it an important and influential theory until this day, it is not famous for its clarity:

> "The problem of the manner in which the banking system increases the total volume of the circulating medium, while at the same time the lending power of the individual banks is severely limited, has proved to be one of the most baffling for writers on banking theory."
> [Mints (1945, p. 39)]

Several attempts were made to resolve this within the *fractional reserve theory* of banking, such as that by Saving (1977), who rendered the supply of bank deposits a function of the behaviour of the savers — arguing that the money supply is endogenous. This effectively pushed out the intermediary function from the individual bank level to the economy level, and helped ushering in the formulation of the *financial intermediation theory* to which we now turn.

2.3. The financial intermediation theory

While the *fractional reserve theory* of banking was influential from the 1930s to the 1960s, Keynes may have sown important seeds of doubt. Already in his 'Treatise', Keynes (1930) makes use of inverted commas in order to refer, suggestively, to 'The "Creation" of Bank-Money' (a section title). This rhetorical device, employed by the expert already hailed as the leading economist in the world, implied disapproval, as well as mockery of the concept that banks could create money out of nothing. The device was copied by many other writers after Keynes who also emphasised the role of banks as 'financial intermediaries'. In Keynes' words:

> "A banker is in possession of resources which he can lend or invest equal to a large proportion (nearly 90%) of the deposits standing to the credit of his depositors. In so far as his deposits are Savings-deposits, he is acting merely as an intermediary for the transfer of loan-capital. In so far as they are Cash-deposits, he is acting both as a provider of money for his depositors, and also as a provider of resources for his borrowing-customers. Thus the modern banker performs two distinct sets of services. He supplies a substitute for State Money by acting as a clearing-house and transferring current payments backwards and forwards between his different customers by means of book-entries on the credit and debit sides. But he is also acting as a middleman in respect of a particular type of lending, receiving deposits from the public which he employs in purchasing securities, or in making loans to industry and trade mainly to meet demands for working capital. This duality of function is the clue to many difficulties in the modern Theory of Money and Credit and the source of some serious confusions of thought."
> [Keynes (1930, vol. 2, p. 213)]

The Keynes of the *Treatise* seems to say that the two functions of banks are to either act as financial intermediary fulfilling the utility banking function of settling trades, or to act as financial intermediary gathering deposits and lending the majority of these out. There seems no money creation at all involved, certainly not on the individual bank level. Keynes' most influential opus, *General Theory* (Keynes, 1936) quickly eclipsed his earlier *Treatise on Money* in terms of its influence on public debate. In the *General Theory*, Keynes did not place any emphasis on banks, which he now argued were financial intermediaries that needed to acquire deposits before they could lend:

> "The notion that the creation of credit by the banking system allows investment to take place to which 'no genuine saving' corresponds can only be the result of isolating one of the consequences of the increased bank-credit to the exclusion of the others. … It is impossible that the intention of the entrepreneur who has borrowed in order to increase investment can become effective (except in substitution for investment by other entrepreneurs which would have occurred otherwise) at a faster rate than the public decide to increase their savings. … No one can be compelled to own the additional money corresponding to the new bank-credit, unless he deliberately prefers to hold more money rather than some other form of wealth. … Thus the old-fashioned view that saving always involves investment, though incomplete and misleading, is formally sounder than the newfangled view that there can be saving without investment or investment without 'genuine' saving."
> [Keynes (1936, pp. 82 ff.)]

Schumpeter (1954) commented on this shift in Keynes' view:

> The "deposit-creating bank loan and its role in the financing of investment *without any previous saving up of the sums thus lent* have practically disappeared in the analytic schema of the General Theory, where it is again the saving public that holds the scene. Orthodox Keynesianism has in fact reverted to the old view …. Whether this spells progress or retrogression, every economist must decide for himself" (p. 1115, italics in original).

The early post-war period saw unprecedented influence of Keynes' General Theory, and a Keynesian school of thought that managed to ignore Keynes' earlier writings on bank credit creation, became dominant in academia. Given that a former major proponent of both the *credit creation* and the *fractional reserve theories* of banking had shifted his stance to the new *financial intermediation theory*, it is not surprising that others would follow.

A highly influential challenge to the *fractional reserve theory* of banking was staged by Gurley and Shaw (1955, 1960). They rejected the view that "banks stand apart in their ability to create loanable funds out of hand while other intermediaries in contrast are busy with the modest brokerage function of transmitting loanable funds that are somehow generated elsewhere" (1955, p. 521). Beyond the usual rhetorical devices to denigrate the alternative theories, Gurley and Shaw's actual argument was that banks should not be singled out as being 'special', since the banks' financial intermediation function is identical to that of other financial intermediaries:

> "There are many similarities between the monetary system and non-monetary intermediaries, and the similarities are more important than the differences. Both types of financial institutions create financial claims; and both may engage in multiple creation of their particular liabilities in relation to any one class of asset that they hold."
> [Gurley and Shaw (1960, p. 202)]

Banks and the banking system, we are told, like other financial intermediaries, need to first gather deposits, and then are able to lend these out. In this view, any remaining special role of banks is due to outmoded regulations, which treat banks differently. Therefore, they argue, the Federal Reserve should extend its banking supervision to the growing set of non-bank financial intermediaries, thus treating them equally to banks.

Initial challenges by proponents of the *fractional reserve theory* of banking (see Guttentag & Lindsay, 1968) were swept away during the 1960s, when James Tobin, a new rising star in economics, took a clear stand to proclaim another 'new view' of banking, formulating the modern version of the *financial intermediation theory* of banking.

> "Tobin (1963), standing atop the wreckage in 1963 to set forth the 'new view' of commercial banking, stands squarely with Gurley and Shaw against the traditional view."
> [Guttentag and Lindsay (1968, p. 993)]

Like Keynes, Alhadreff and others before him, Tobin only referred to bank credit creation in inverted commas, and used rhetorical devices to ridicule the idea that banks, individually or collectively, could create money and credit. Tobin (1963) argued:

> "Neither individually nor collectively do commercial banks possess a widow's cruse" (p. 412).

> "The distinction between commercial banks and other financial intermediaries has been too sharply drawn. The differences are of degree, not of kind …. In particular, the differences which do exist have little intrinsically to do with the monetary nature of bank liabilities … The differences are more importantly related to the special reserve requirements and interest rate ceilings to which banks are subject. Any other financial industry subject to the same kind of regulations would behave in much the same way" (p. 418).

Banks only seem to be different from others, because regulators erroneously chose to single them out for special regulation. In Tobin's view, "commercial banks are different, because they are controlled, and not the other way around" (Guttentag & Lindsay, 1968, p. 993). Tobin and Brainard's (1963) portfolio model made no distinction between banks and non-bank financial intermediaries, indeed, ignored the role of banks altogether and contributed much towards the modern mainstream view of economics models without banks. Branson (1968) further developed Tobin's new approach, which was popular in the leading journals.

Guttentag and Lindsay (1968) wrote in the *Journal of Political Economy* that despite the challenge by Gurley and Shaw (1955) "The uniqueness issue, on the other hand, remains unsettled" (p. 992). Banks, they argued, are different in their role and impact from non-bank financial intermediaries, since "commercial banks have a greater capacity for varying the aggregate volume of credit than other financial intermediaries" (p. 991). "These points provide a rationale for special controls on commercial banks that goes beyond the need to prevent financial panic. It is the rationale that has been sought by defenders of the traditional view that commercial banks are 'unique' ever since the Gurley–Shaw challenge to this view" (p. 991).

Undaunted, Tobin (1969) re-states his view in an article establishing his portfolio balance approach to financial markets, which argues that financial markets are complex webs of assets and prices, leaving banks as one of many types of intermediaries, without any special role.[27] This was the first article in the first edition of a new journal, the *Journal of Money, Credit and Banking*. While its name may suggest openness towards the various theories of banking, in practice it has only published articles that did not support the *credit creation theory* and were mainly in line with the *financial intermediation theory*. This is also true for most other journals classified as 'leading journals' in economics (for instance, using the 4-rated journals from the UK Association of Business Schools list in economics). Henceforth, the portfolio balance approach, which treated all financial institutions as mere portfolio managers, was to hold sway. It helped the *financial intermediation theory* become the dominant creed among economists world-wide.

Modern proponents of the ubiquitous *financial intermediation theory* include, among others, Klein (1971), Monti (1972), Sealey and Lindley (1977), Diamond and Dybvig (1983), Diamond (1984, 1991, 2007), Eatwell, Milgate, and Newman (1989), Gorton and Pennacchi (1990), Bencivenga and Smith (1991), Bernanke and Gertler (1995), Rajan (1998), Myers and Rajan (1998), Allen and Gale (2000, 2004a,b), Allen and Santomero (2001), Diamond and Rajan (2001), Kashyap, Rajan, and Stein (2002), Hoshi and Kashyap (2004), Matthews and Thompson (2005), Casu and Girardone (2006), Dewatripont, Rochet and Tirole (2010), Gertler and Kiyotaki (2011) and Stein (2014). There are many more: It is impossible to draw up a conclusive list, since the vast majority of articles published in leading economics and finance journals in the last thirty to forty years is based on the *financial intermediation theory* as premise.[28]

Quoting only a few examples, Klein (1971), Monti (1972) (later to become EU commissioner and prime minister of Italy), and others model banks as financial intermediaries, gathering deposits and lending these funds out:

> "The bank has two primary sources of funds; the equity originally invested in the firm … and borrowed funds secured through the issuance of various types of deposits …."
>
> [Klein (1971, p. 208)]

> "… It will be shown how the bank determines the prices it will pay for various types of deposits and how these prices, in conjunction with the deposit supply functions the bank confronts, determine the scale and composition of the bank's deposit liabilities the bank will assume."
>
> [Klein (1971, p. 210)]

Diamond and Dybvig (1983) are cited as the seminal work on banking, and they argue that "Illiquidity of assets provides the rationale both for the existence of banks and for their vulnerability to runs" (p. 403). But in actual fact their theory makes no distinction between banks and non-banks. They therefore are unable to explain why we have heard of bank runs, but not of 'insurance runs' or 'finance company runs', although the latter also hold illiquid assets and give out loans. Diamond and Dybvig fail to identify what could render banks special since they assume that they are not.

Other theories of banks as financial intermediaries are presented by Mayer (1988) and Hellwig (1977, 1991, 2000), who also believe that banks are merely financial intermediaries:

> "The analysis uses the original model of Diamond (1984) of financial contracting with *intermediation as delegated monitoring*. … Monitoring is assumed to be too expensive to be used by the many households required to finance a firm or an intermediary. However direct finance of firms based on nonpecuniary penalties may be dominated by intermediated finance with monitoring of firms by an intermediary who in turn obtains funds from households through contracts involving nonpecuniary penalties."
>
> [Hellwig (2000, pp. 721 ff.)]

Banking expert Heffernan (1996) states:

> "The existence of the "traditional" bank, which intermediates between borrower and lender, and which offers a payments service to its customers, fits in well with the Coase theory" (p. 21).

[27] The conclusion of Tobin's paper: "According to this approach, the principal way in which financial policies and events affect aggregate demand is by changing the valuations of physical assets relative to their replacement costs. Monetary policies can accomplish such changes, but other exogenous events can too. In addition to the exogenous variables explicitly listed in the illustrative models, changes can occur, and undoubtedly do, in the portfolio preferences – asset demand functions – of the public, the banks, and other sectors. These preferences are based on expectations, estimates of risk, attitudes towards risk, and a host of other factors. In this complex situation, it is not to be expected that the essential impact of monetary policies and other financial events will be easy to measure in the absence of direct observation of the relevant variables (q in the models). There is no reason to think that the impact will be captured in any single exogenous or intermediate variable, whether it is a monetary stock or a market interest rate" (Tobin, 1969, p. 29).

[28] This also means that the innumerable PhD theses and Masters dissertations produced in this area in the last thirty years or so are mainly based on the *financial intermediation theory*. For instance, Wolfe (1997) states: "Banks possess the power of intermediation, which is the ability to transform deposits into loans. Deposits with one set of characteristics are transformed into assets with other or different characteristics" (p. 12).

… or a leading textbook on international economics and finance, by Krugman and Obstfeld (2000):

> "Banks use depositors' funds to make loans and to purchase other assets …" (p. 659).

A widely used reference work on banking and money – the New Palgrave *Money* (Eatwell et al., 1989) – contains a number of contributions by leading monetary economists and banking experts. In it, Baltensperger (1989) clearly supports the *financial intermediation theory*:

> "The role of credit as such must be clearly separated from the economic role of credit institutions, such as banks, playing the role of specialised intermediaries in the credit market by buying and simultaneously selling credit instruments (of a different type and quality). Since the ultimate borrowers and lenders can, in principle, do business with each other directly, without the help of such an intermediary, the function of these middlemen must be viewed as separate from that of credit as such. Two main functions of institutions of this kind can be distinguished. The first is the function of risk consolidation and transformation. … The second major function of these institutions is that of a broker in the credit markets. As such, they specialise in producing intertemporal exchange transactions and owe their existence to their ability to bring together creditors and debtors at lower costs than the latter can achieve in direct transactions themselves" (pp. 100 ff.).

Indeed, almost all authors in this reference book refer to banks as mere financial intermediaries, even Goodhart (1989):

> "'Intermediation' generally refers to the interposition of a financial institution in the process of transferring funds between ultimate savers and ultimate borrowers. … Disintermediation is then said to occur when some intervention, usually by government agencies for the purpose of controlling, or regulating, the growth of financial intermediaries, lessens their advantages in the provision of financial services, and drives financial transfers and business into other channels. … An example of this is to be found when onerous reserve requirements on banks lead them to raise the margin (the spread) between deposit and lending rates, in order to maintain their profitability, so much that the more credit-worthy borrowers are induced to raise short-term funds directly from savers, for example, in the commercial paper market" (p. 144).

Myers and Rajan (1998) state:

> "We model the intermediary as a bank that borrows from a number of individual investors for its own core business and to lend on to a project. … Even though the bank can extract more from the ultimate borrower, the bank has to finance these loans by borrowing from individual investors" (p. 755).

Allen and Santomero (2001), in their paper entitled 'What do financial intermediaries do?' state:

> "In this paper we use these observations as a starting point for considering what it is that financial intermediaries do. At center, of course, financial systems perform the function of reallocating the resources of economic units with surplus funds (savers) to economic units with funding needs (borrowers)" (p. 272).

Kashyap (2002) also believes that banks are pure financial intermediaries, not materially distinguishable from other non-bank financial institutions.[29]

Stein (2014) states, albeit with some hesitation:

> "… at least in some cases, it seems that a bank's size is determined by its deposit franchise, and that, taking these deposits as given, its problem then becomes one of how best to invest them" (p. 5).

> "Overall, our synthesis of these stylised facts is that banks are in the business of taking deposits and investing these deposits in fixed-income assets that have certain well-defined risk and liquidity attributes but which can be either loans or securities" (p. 7).

The *financial intermediation theory* includes the 'credit view' in macroeconomics, proposing a 'bank lending channel' of monetary transmission (Bernanke & Blinder, 1989; Bernanke & Gertler, 1995), as well as the neo-classical and new classical macroeconomic models (if they consider banks at all). To these and most contemporary authors in economics and finance, banks are financial intermediaries like other firms in the financial sector, which focus on the 'transformation' of liabilities with particular features into assets with other features (e.g. with respect to maturity, liquidity and quantity/size), or which focus on 'monitoring' others (Sheard, 1989, another adherent of the *financial intermediation theory of banking*), but do not create credit individually or collectively. This is true for many 'Post-Keynesians' who argue that the money supply is determined by the demand for money. It is also true for popular descriptions, such as that by Koo and Fujita (1997) who argue that banks are merely financial intermediaries:

> "But those financial institutions that are counterparties of the Bank of Japan obtain their funding primarily from the money that depositors have deposited with them. This money they cannot pass on for consumption and capital investment, because they have to lend it at interest to earn money. In other words, for this money to support the economy, these financial institutions must lend it to firms and individuals. Those borrowers must then use it to buy assets such as machinery or housing or services" (p. 31).

A recent paper by Allen, Carletti, and Gale (2014) introduces money — albeit only cash created by the central bank, while banks are mere financial intermediaries that cannot create money or credit.

As a result, the leading forecasting models used by policy makers also do not include banks (Bank of England, 2014a). Even the original meaning of credit creation seems forgotten by the modern literature: Bernanke (1993) uses the expression 'credit creation' much in his article, but explains that this concept is defined as "the process by which saving is channeled to alternative uses", i.e. financial intermediation of savers' deposits into loans:

> "This fortuitous conjunction of events and ideas has contributed to an enhanced appreciation of the role of credit in the macroeconomy by most economists and policymakers. The purpose of this paper is to review and interpret some recent developments in our understanding of the macroeconomic role of credit or, more accurately, of the credit creation process. By *credit creation process* I mean the process by which, in exchange for paper claims, the savings of specific individuals or firms are made available for the use of other individuals or firms (for example to make capital investments or simply to consume). Note that I am drawing a strong distinction between credit creation, which is the process by which saving is channeled to alternative uses, and the act of saving itself …. In my broad conception of the credit creation process I include most of the value-added of the financial industry, including the information-gathering, screening, and monitoring activities required to make sound loans or investments, as well as much of the risk-sharing, maturity transformation, and liquidity provision services that attract savers and thus support the basic lending and investment functions. I also want to include in my definition of the credit creation process activities undertaken by potential borrowers to transmit information about themselves to lenders: for example, for firms, these activities include provision of data to the

[29] See Werner (2003b) for a detailed critique of Kashyap (2002).

public, internal or external auditing, capital structure decisions, and some aspects of corporate governance. The *efficiency* of the credit creation process is reflected both in its ability to minimise the direct costs of extending credit (for example, the aggregate wage bill of the financial industry) and in the degree to which it is able to channel an economy's savings into the most productive potential uses. The presumption of traditional macroeconomic analysis is that this credit creation process, through which funds are transferred from ultimate savers to borrowers, works reasonably smoothly and therefore can usually be ignored."

[Bernanke (1993, pp. 50 ff.)]

As Bernanke points out, those works that assume such a financial intermediation role for banks will therefore often ignore banks entirely: they cannot be particularly important or relevant in the economy. Many went as far as to leave out any kind of money (there are no monetary aggregates in Kiyotaki & Moore, 1997; Woodford, 2003). The most widely used textbook in advanced Master-level economics at leading British universities in 2010 was Romer (2006). On page 3, Romer tells us:

"Incorporating money in models of [economic] growth would only obscure the analysis" (p. 3).

2.4. Conclusion of the literature review

Since the 1960s it has become the conventional view not to consider banks as unique and able to create money, but instead as mere financial intermediaries like other financial firms, in line with the *financial intermediation theory of banking*. Banks have thus been dropped from economics models, and finance models have not suggested that bank action has significant macroeconomic effects. The questions of where money comes from and how the money supply is created and allocated have remained unaddressed.

The literature review has identified a gradual progression of views from the *credit creation theory* to the *fractional reserve theory* to the present-day ubiquitous *financial intermediation theory*. The development has not been entirely smooth; several influential writers have either changed their views (on occasion several times) or have shifted between the theories. Keynes, as an influential economist, did little to enhance clarity in this debate, as it is possible to cite him in support of each of the three hypotheses, through which he seems to have moved sequentially.[30] Some institutions, such as the Bank of England, manage to issue statements in support of all three theories.

We conclude from the literature survey that all three theories of banking have been well represented in the course of the 20th century, by leading figures of the day. However, the conclusion by Sir Josiah Stamp (1927), a director at the Bank of England, still seems to hold today, namely that there is "a fair state of muddlement … on the apparently simple question: 'Can the banks create credit, and if so, how, and how much?'" Despite a century or so of theorising on the matter, there has been little progress in establishing facts unambiguously. Thus today the conclusion of 1968 applies, namely that the issue cannot be considered as 'settled'. It is possible that the pendulum is about to swing away from the *financial intermediation theory* to one of the other two. But how can we avoid that history will merely repeat itself and the profession will spend another century locked into a debate without firm conclusion?

How can the issue be settled and the 'muddlement' cleared up? One reason for this "state of muddlement" is likely to be the methodology dominant in 20th century economics, namely the hypothetico-deductive method. Unproven 'axioms' are 'posed' and unrealistic assumptions added, to build a theoretical model. This can be done for all three theories, and we would be none the wiser about which of them actually applied. How can the issue be settled? The only way the facts can be established is to leave the world of deductive theoretical models and consider empirical reality as the arbiter of truth, in line with the inductive methodology. In other words, it is to empirical evidence we must turn to settle the issue.

3. The empirical test

The simplest possible test design is to examine a bank's internal accounting during the process of granting a bank loan. When all the necessary bank credit procedures have been undertaken (starting from 'know-your-customer' and anti-money laundering regulations to credit analysis, risk rating to the negotiation of the details of the loan contract) and signatures are exchanged on the bank loan, the borrower's current account will be credited with the amount of the loan. The key question is whether as a prerequisite of this accounting operation of booking the borrower's loan principal into their bank account the bank actually withdraws this amount from another account, resulting in a reduction of equal value in the balance of another entity — either drawing down reserves (as the *fractional reserve theory* maintains) or other funds (as the *financial intermediation theory* maintains). Should it be found that the bank is able to credit the borrower's account with the loan principal without having withdrawn money from any other internal or external account, or without transferring the money from any other source internally or externally, this would constitute prima facie evidence that the bank was able to create the loan principal out of nothing. In that case, the credit creation theory would be supported and the theory that the individual bank acts as an intermediary that needs to obtain savings or funds first, before being able to extend credit (whether in conformity with the *fractional reserve theory* or the *financial intermediation theory*), would be rejected.

3.1. Expected results

With a bank loan of €200,000, drawn by the researcher from a bank, the following changes in the lending bank's accounting entries are expected a priori according to each theory:

(a) Bank credit accounting according to the *credit creation theory*. According to this theory, banks behave very differently from financial intermediaries, such as stock brokers, since they do not separate customer funds from own funds. Money 'deposited' with a bank becomes the legal property of the bank and the 'depositor' is actually a lender to the bank, ranking among the general creditors. When extending bank credit, banks create an imaginary deposit, by recording the loan amount in the borrower's account, although no new deposit has taken place (credit creation out of nothing). The balance sheet lengthens. Cash, central bank reserves or balances with other banks are not immediately needed, as reserve and capital requirements only need to be met at particular measurement intervals. The account changes are shown in Table 1.

(b) Bank credit accounting according to the *fractional reserve theory*. The distinguishing feature of this theory is that each individual bank cannot create credit out of nothing. The bank is a financial intermediary indistinguishable from other financial intermediaries, such as stock brokers and securities firms. However, banks are said to be different in one respect, namely the regulatory treatment: regulators have placed onerous rules concerning reserves that have to be held with the central bank only on banks, not other financial intermediaries. A bank can only lend money,

Table 1
Account changes due to bank loan (*credit creation theory*).

Assets		Liabilities	
Loans and investments	+E 200	Deposits (borrower's A/C)	+E 200
Total	+E 200	Total	+E 200

[30] Though with the caveat that several of his statements, made at the same time, seem to support different theories of banking.

when it has previously received the same amount in excess reserves from another bank, whose own reserve balances will have declined, or from the central bank (Table 2).

Table 2
Account changes due to bank loan (*fractional reserve theory*).

Step 1. Precondition for the bank loan			
Assets		Liabilities	
Excess Reserves	+E 200	Deposits	+E 200
Total	+E 200	Total	+E 200
Step 2. The bank loan			
Assets		Liabilities	
Excess Reserves	– E 200		
Loans and investments	+E 200		
Total	0	Total	0

> "A bank will not lend more than its excess reserves because, by law, it must hold a certain amount of required reserves. … Each depository institution can create loans (and deposits) only to the extent that it has excess reserves."
>
> [Miller and VanHoose (1993, p. 331)]

Following the exposition in Miller and VanHoose (1993, pp. 330–331), the balance sheet evolution in case of a €200,000 loan is as shown in Table 2.

In other words, for the bank to be able to make a loan, it first has to check its excess reserves, as this is, according to this theory, a strictly binding requirement and limitation, as well as its distinguishing feature. The bank cannot at any moment lend more money than its excess reserves, and it will have to draw down the reserve balance to lend. (Thus, as noted, another distinguishing feature is that the balance sheet expansion is driven by the prior increase in a deposit that boosted excess reserves, *not* by the granting of a loan).

It needs to be verified when the empirical test of bank lending is implemented, whether the bank first confirmed the precise amount of its available excess reserves before entering into the loan contract or paying out the loan funds to the customer, so as not to exceed that figure. If the bank is found not to have checked or not to have drawn down its reserve balances then this constitutes a rejection of the *fractional reserve theory*.

(c) Bank credit accounting according to the *financial intermediation theory*.

According to this theory, banks are, as far as payments and accounts are concerned, not different from non-bank financial institutions. The reserve requirement is not an issue — a claim supported by the empirical observation that reserve requirements have been abolished in a number of major economies, such as the UK and Sweden many years ago. However, UK financial intermediaries are required by FSA/FCA-administered Client Money rules to hold deposits in custody for customers (a form of warehousing, the deposits legally being bailments). Client funds of financial intermediaries, such as securities firms, stock brokers and the like are therefore still owned by the depositors and thus kept separately from the financial institutions' own funds, so that customer deposits are not shown on the balance sheet as liabilities. If banks are merely financial intermediaries, indistinguishable from other intermediaries, then all bank funds are central bank money that can be held in reserve at the central bank or deposited with other banks. The balance sheet implications are shown below in Table 3.

According to this theory, the bank balance sheet does not lengthen as a result of the bank loan: the funds for the loan are drawn from the bank's reserve account at the central bank.

Table 3
Account changes due to bank loan (*fin. intermediation theory*).

Assets		Liabilities	
Excess Reserves	– E 200		
Loans and investments	+ E 200		
Total	0	Total	0

3.2. A live empirical test

The design of the empirical test takes the form of a researcher entering into a live loan contract with the bank, and the bank extending a loan, while its relevant internal accounting is disclosed. Several banks in the UK and Germany were approached and asked to cooperate in an academic study of bank loan operations.

The large banks declined to cooperate. The reason given was usually twofold: the required disclosure of internal accounting data and procedures would breach their confidentiality or IT security rules; secondly, the transactions volumes of the banks were so large that the planned test would be very difficult to conduct when borrowing sensibly sized amounts of money that would not clash with the banks' internal risk management rules. In that case, any single transaction would not be easy to isolate within the bank's IT systems. Despite various discussions with a number of banks, in the end the banks declined on the basis of the above reasons and additionally that the costs of operating their systems and controlling for any potential other transactions would be prohibitive.

It was therefore decided to approach smaller banks, of which there are many in Germany (there are approximately 1700 local, mostly small banks in Germany). Each owns a full banking license and engages in universal banking, offering all major banking services, including stock trading and currencies, to the general public. A local bank with a balance sheet of approximately €3 billion was approached, as well as a bank with a balance sheet of about €700 million. Both declined on the same grounds as the larger banks, but one suggested that a much smaller bank might be able to oblige, pointing out the advantage that there would be fewer transactions booked during the day, allowing a clearer identification of the empirical test transaction. At the same time the empirical information value would not diminish with bank size, since all banks in the EU conform to identical European bank regulations.

Thus an introduction to Raiffeisenbank Wildenberg e.G., located in a small town in the district of Lower Bavaria was made. The bank is a cooperative bank within the Raiffeisen and cooperative banking association of banks, with eight full-time staff. The two joint directors, Mr. Michael Betzenbichler and Mr. Marco Rebl both agreed to the empirical examination and also to share all available internal accounting records and documentation on their procedures. A written agreement was signed that confirmed that the planned transactions would be part of a scientific empirical test, and the researcher would not abscond with the funds when they would be transferred to his personal account, and undertakes to immediately repay the loan upon completion of the test (Supplementary material 1 in online Appendix 3). One limitation on the accounting records which is common to most banks is that they are outsourcing the IT to a specialised bank IT company, which maintains its own rules concerning data protection and confidentiality.

The IT firm serves the majority of the 1,100 cooperative banks in Germany, using the same software and internal systems and accounting rules, ensuring that the test is representative of more than 15% of bank deposits in Germany.

It was agreed that the researcher would personally borrow €200,000 from the bank. The transaction was undertaken on 7 August 2013 in the offices of the bank in Wildenberg in Bavaria. Apart from the two (sole) directors, also the head (and sole staff) of the credit department, Mr. Ludwig Keil was present. The directors were bystanders not engaging in any action. Mr. Keil was the only bank representative involved in processing the loan from the start of the customer documentation, to

the signing of the loan contract and finally paying out the loan into the borrower's account. The entire transaction, including the manual entries made by Mr. Keil, was filmed. The screens of the bank's internal IT terminal were also photographed. Moreover, a team from the BBC was present and filmed the central part of the empirical bank credit experiment (Reporter Alistair Fee and a cameraman).

The bank disclosed their standard internal credit procedure. The sequence of the key steps is shown in Appendix 1. As can be seen, the last two steps are the signing of the 'credit documents' by the borrower (the researcher) and, finally, the payment of the loan at the value date.[31]

The loan conditions were agreed: the researcher would borrow EUR 200,000 from the bank at the prime rate (the interest rate for the best customer). In the event the bank waived the actual interest proceeds, in support of the scientific research project.

When the bank loan contract was signed by both the bank and the borrower on 7 August 2013, the loan amount was immediately credited to the borrower's account with the bank, as agreed in the loan contract. Supplementary material 2 in online Appendix 2 shows the original borrower's accounts and balances with Raiffeisenbank Wildenberg. The key information from the account summary table is repeated here, in English, in Table 4.

The bank also issued the following accounts overview, which is a standard T-account of the transaction from the borrower's perspective (Table 5).

The borrower confirmed that his new current account with the bank now showed a balance of EUR 200,000 that was available for spending (An extension of the experiment, to be reported on separately, used the balance the following day for a particular transaction outside the banking institution, transferring the funds to another account of the researcher, held with another bank; this transfer was duly completed, demonstrating that the funds could be used for actual transactions).

We are now moving to the empirical test of the three banking theories. The critical question is: where did Raiffeisenbank Wildenberg e.G. obtain the funds from that the borrower (researcher) was credited with (and duly used and transferred out of the bank the following day)? When the researcher inquired about the bank's reserve holdings, in line with the *fractional reserve theory of banking*, director Marco Rebl explained that the bank maintained its reserves with the central organisation of cooperative banks, which in turn maintained an account with the central bank. These reserves amounted to a fixed amount of €350,000 that did not change during the observation period. Concerning the bank credit procedure, the researcher attempted to verify the source of the funds that were about to be lent.

Firstly, the researcher confirmed that the only three bank officers involved in this test and bank transaction were present throughout, whereby two (the directors) only watched and neither accessed any computer terminal nor transmitted any instructions whatsoever. The accounts manager (head of the credit department, Mr. Keil) was the only operator involved in implementing, booking and paying out the loan. His actions were filmed. It was noted and confirmed that none of the bank staff present engaged in any additional activity, such as ascertaining the available deposits or funds within the bank, or giving instructions to transfer funds from various sources to the borrower's account (for instance by contacting the bank internal treasury desk and contacting bank external interbank funding sources). Neither were instructions given to increase, draw down or borrow reserves from the central bank, the central cooperative bank or indeed any other bank or entity. In other words, it was apparent that upon the signing of the loan contract by both parties, the funds were credited to the borrower's account immediately, without any other activity of checking or giving instructions to transfer funds. There were no delays or deliberations or other bookings. The moment the loan was implemented, the borrower saw his current account balance increase by the loan amount. The overall credit transaction, from start to finish, until funds were available in the borrower's account, took about 35 min (and was clearly slowed down by the filming and frequent questions by the researcher).

Secondly, the researcher asked the three bank staff present whether they had, either before or after signing the loan contract and before crediting the borrower's account with the full loan amount inquired of any other parties internally or externally, checked the bank's available deposit balances, or made any bookings or transfers of any kind, in connection to this loan contract. They all confirmed that they did not engage in any such activity. They confirmed that upon signing the loan contract the borrower's account was credited immediately, without any such steps.

Thirdly, the researcher obtained the internal daily account statements from the bank. These are produced only once a day, after close of business. Since the bank is small, it was hoped that it would be possible to identify the impact of the €200,000 loan transaction, and distinguish the accounting pattern corresponding to one of the three banking hypotheses.

Table 4
The empirical researcher's new bank account.
Bank: Raiffeisenbank Wildenberg e.G.
Customer: Richard Werner.
Date: 7 August 2013.

Account no.	Type of product	Currency	A/C balance
Current account			
44636	Current account w/o fees	EUR	200,000.00
Total in EUR:			200,000.00
Loan			
20044636	Other private financing	EUR	−200,000.00
Total in EUR:			−200,000.00

4. Results

Supplementary material 3 in online Appendix 3 shows the scan of the bank's balance sheet at the end of 6 August 2013, the day before the transaction of the empirical test was undertaken. Supplementary material 4 in online Appendix 3 shows the daily balance of the following day. In Table 6 the key asset positions are summarised and account names translated, for the end of the day prior to the loan experiment, and for the end of the day on which the researcher had borrowed the money. Table 7 shows the key liability positions for the same periods:

Starting by analysing the liability side information (Table 7), we find that customer deposits are considered part of the financial institution's balance sheet. This contradicts the *financial intermediation theory*, which assumes that banks are not special and are virtually indistinguishable from non-bank financial institutions that have to keep customer deposits off balance sheet. In actual fact, a bank considers a customers' deposits starkly differently from non-bank financial institutions, who record customer deposits off their balance sheet. Instead we find that the bank treats customer deposits as a loan to the bank, recorded under rubric 'claims by customers', who in turn receive as record of their loans to the bank (called 'deposits') what is known as their

Table 5
The empirical researcher's new bank account balances.

Accounts' overview				
EUR	Credit	Liabilities	Balance	No. contracts
Current account	200,000.00		200,000.00	1
Loan		200,000.00	−200,000.00	1
Bank sum total	200,000.00	200,000.00	0.00	2

[31] It is of interest that the last step expressly requires the bank staff implementing this credit procedure to only pay out the loan for the agreed purpose, as evidence for which a receipt for any purchases undertaken with the loan funds are demanded by the bank. This demonstrates that the implementation of policies of credit guidance by purpose of the loan is practically possible, since such data is available and the use of the loan is monitored and enforced by each bank.

Table 6
Raiffeisenbank Wildenberg e.G.: daily accounts' assets.
6 August 2013, 22.46 h. vs. 7 August 2013, 22.56 h.
EUR.

Assets	Balance 6 Aug. 2013	Balance 7 Aug. 2013	Difference
1. Cash	181,703.03	340,032.89	158,329.86
2. Bills of exchange			
3. Claims on financial. inst.	5,298,713.76	5,079,709.21	−219,004.55
4. Claims on customers	23,712,558.13	23,947,729.92	235,171.79
–Maturing daily	*932,695.44*	*967,767.32*	*35,071.88*
–Maturity under 4 years	*1,689,619.97*	*1,889,619.97*	*200,000.00*
–Maturity 4 years or longer	*21,090,242.72*	*21,090,342.72*	*100.00*
5. Bonds, bills, debt instr.	19,178,065.00	19,178,065.00	
6. Stocks and shares			
7. Stake holdings	397,768.68	397,768.68	
8. Stakes in related firms			
9. Trust assets	5262.69	5262.69	
10. Compensation claims on the public sector			
11. Immaterial assets	102.00	102.00	
12. Fixed assets	221,549.46	221,549.46	
13. Called but not deployed capital			
14. Other assets	707,569.26	711,288.64	3719.38
15. Balancing item	2844.32	2844.32	
16. Sum of assets	49,706,136.33	49,884,352.81	178,216.48

'account statement'. This can only be reconciled with the *credit creation* or *fractional reserve theories* of banking.

We observe that an amount not far below the loan balance (about €190,000) has been deposited with the bank. This is itself not far from the increase in total liabilities (and assets). Since the *fractional reserve hypothesis* requires such an increase in deposits as a precondition for being able to grant the bank loan, i.e. it must precede the bank loan, it is difficult to reconcile this observation with the *fractional reserve theory*. Moreover, the researcher confirmed that in his own bank account the loan balance of €200,000 was shown on the same day. This means that the increase in liabilities was driven by the increase by €200,000 in daily liabilities (item 2B BA in Table 7). Thus the total increase in liabilities could not have been due to a coincidental increase in customer deposits on the day of the loan. The liability side account information seems only fully in line with the *credit creation theory*.

Turning to an analysis of the asset side, we note that the category where we find our loan is item 4, claims on customers — fortunately the only one that day with a maturity below 4 years and hence clearly identifiable on the bank balance sheet. Apparently, customers also took out short-term loans (most likely overdrafts) amounting to €35,071.88, producing a total new loan balance of €235,071.88. In order to keep the analysis as simple as possible, let us proceed from here assuming that our test loan amounted to this total loan figure (€235,071.88). So the balance sheet item of interest on the asset side is ΔA4, the increase in loans (claims on customers) amounting to €235,071.88.

We now would like to analyse the balance sheet in order to see whether this new loan of €235,071.88 was withdrawn from other accounts at the bank, or how else it was funded. We first proceed with considering activity on the asset side. Denoting balances in thousands below, we can summarise the balance sheet changes during the observation period, within the balance sheet constraints as follows:

$$\begin{aligned}\Delta\text{Assets} = {} & \Delta A1(\text{cash}) + \Delta A3(\text{claims on other FI}) \\ & + \Delta A4(\text{claims on customers}) + \Delta A14(\text{other assets}).\end{aligned} \tag{1}$$

Numerically, these are, rounded in thousand euro:

$$178 = 158 - 219 + 235 + 4. \tag{2}$$

The *fractional reserve theory* says that the loan balance must be paid from reserves. These can be either cash balances or reserves with other banks (including the central bank). The deposits (claims) with other financial institutions (which effectively includes the bank's central bank reserve balances) declined significantly, by €219,000. At the same time cash reserves increased significantly. What may have happened is that the bank withdrew legal tender from its account with the cooperative central bank, explaining both the rise in cash and decline in balances with other financial institutions. Since the theories do not distinguish between these categories, we can aggregate A1 and A3, the cash balances and reserves. Also, to simplify, we aggregate A14 (other assets) with A4 (claims on customers), to obtain:

$$\underset{(\Delta\text{Assets})}{178} \quad \underset{(\Delta\text{reserves})}{= -61} \quad \underset{(\Delta\text{claims on customers, others})}{+239}. \tag{3}$$

We observe that reserves fell, while claims on customers rose significantly. Moreover, total assets also rose, by an amount not dissimilar to our loan balance. Can this information be reconciled with the three theories of banking?

Considering the *financial intermediation hypothesis*, we would expect a decline in reserves (accounts with other financial institutions and cash) of the same amount as customer loans increased. Reserves however declined by far less. At the same time, the balance sheet expanded, driven by a significant increase in claims on customers. If the bank borrowed money from other banks in order to fund the loan (thus reducing its balance of net claims on other banks), in line with the *financial intermediation* theory of banking, vault cash should not increase and neither should the balance sheet. We observe both a significant rise in cash holdings and an expansion in the total balance sheet (total assets and total liabilities), which rose by €178,000. This cannot be reconciled with the *financial intermediation theory*, which we therefore must consider as rejected.

Considering the *fractional reserve theory*, we confirmed by asking the credit department's Mr. Keil, as well as the directors, that none of them checked their reserve balance or balance of deposits with other banks before signing the loan contract and making the funds available to the borrower (see the translated letter in Appendix 2, and the original letter in the online Appendix 3. Furthermore, there seems no evidence that reserves (cash and claims on other financial institutions) declined in an amount commensurate with the loan taken out. Finally, the observed increase in the balance sheet can also not be reconciled with the standard description of the *fractional reserve theory*. We must therefore consider it as rejected, too.

This leaves us with the *credit creation theory*. Can we reconcile the observed accounting asset side information with it? And what do we learn from the liability side information?

The transactions are linked to each other via the accounting identities of the balance sheet (Eqs. (1), (2) and (3)). We can therefore ask the question what would have happened to total assets, if we assumed for the

Table 7
Raiffeisenbank Wildenberg e.G.: daily accounts' liabilities.
6 August 2013, 22.46 h. vs. 7 August 2013, 22.56 h.
EUR.

Liabilities	Balance 6 Aug. 2013	Balance 7 Aug. 2013	Difference
1. Claims by financial inst.	5,621,456.60	5,621,879.66	423.06
2. Claims by customers	39,589,177.09	39,759,156.42	169,979.33
2A. Savings accounts	*10,234,806.01*	*10,237,118.24*	*2312.23*
2B. Other liabilities	*29,354,371.08*	*29,522,038.18*	*167,667.10*
–BA daily	*13,773,925.93*	*13,963,899.89*	*189,973.96*
–BB maturity less 4 years	*13,296,042.92*	*13,273,736.06*	*−22,306.86*
–BC maturity 4 years or longer	*2,284,402.23*	*2,284,402.23*	
4. Trust liabilities	5262.70	5262.70	
5. Other liabilities	12,378.81	12,599.44	220.63
6. Balancing item	16,996.04	16,996.04	
7. Reserves	1,138,497.64	1,138,497.64	
11. Fund for bank risk	250,000.00	250,000.00	
12. Own capital	3,057,248.57	3,057,248.57	
13. Sum liabilities	49,706,136.33	49,884,352.81	178,216.48

moment that no other transaction had taken place, apart from the loan (235). We can set the change in each asset item (except for ΔA4, our loan) to zero, if we subtract the same amount from the change in total assets. The new total asset balance in this hypothetical scenario would be:

$$178-158+219-4=235 \quad (4)$$

or, in general,

$$\Delta A4(\text{claims on customers}) = \Delta\text{Assets} - \Delta A1(\text{cash}) - \Delta A3(\text{claims on other FI}) - \Delta A14(\text{other assets}). \quad (5)$$

In other words, if the other transactions had not happened, the bank's balance sheet would have expanded by the same amount as the loans taken out. This finding is consistent only with the *credit creation theory* of bank lending.

The evidence is not as easily interpreted as may have been desired, since in practice it is not possible to stop all other bank transactions that may be initiated by bank customers (who are nowadays able to implement transactions via internet banking even on holidays). But the available accounting data cannot be reconciled with the *fractional reserve* and the *financial intermediation* hypotheses of banking.

5. Conclusion

This paper was intended to serve two functions. First, the history of economic thought was examined concerning the question of how banks function. It was found that a long-standing controversy exists that has not been settled empirically. Secondly, empirical tests were conducted to settle the existing and continuing controversies and find out which of the three theories of banking is consistent with the empirical observations.

5.1. Three theories but no empirical test

Concerning the first issue, in this paper we identified three distinct hypotheses concerning the role of banks, namely the *credit creation theory*, the *fractional reserve theory* and the *financial intermediation theory*. It was found that the first theory was dominant until about the mid- to late 1920s, featuring leading proponents such as Macleod and Schumpeter. Then the second theory became dominant, under the influence of such economists as Keynes, Crick, Phillips and Samuelson, until about the early 1960s. From the early 1960s, first under the influence of Keynes and Tobin and the *Journal of Money, Credit and Banking*, the *financial intermediation theory* became dominant.

Yet, despite these identifiable eras of predominance, doubts have remained concerning each theory. Most recently, the *credit creation theory* has experienced a revival, having been championed again in the aftermath of the Japanese banking crisis in the early 1990s (Werner, 1992, 1997) and in the run-up to and aftermath of the European and US financial crises since 2007 (see Bank of England, 2014b; Benes & Kumhof, 2012; Ryan-Collins, Greenham, Werner, & Jackson, 2011, 2012; Werner, 2003a, 2005, 2012). However, such works have not yet become influential in the majority of models and theories of the macro-economy or banking. Thus it had to be concluded that the controversy continues, without any scientific attempt having been made at settling it through empirical evidence.

5.2. The empirical evidence: credit creation theory supported

The second contribution of this paper has been to report on the first empirical study testing the three main hypotheses. They have been successfully tested in a real world setting of borrowing from a bank and examining the actual internal bank accounting in an uncontrolled real world environment.

It was examined whether in the process of making money available to the borrower the bank transfers these funds from other accounts (within or outside the bank). In the process of making loaned money available in the borrower's bank account, it was found that the bank did not transfer the money away from other internal or external accounts, resulting in a rejection of both the *fractional reserve theory* and the *financial intermediation theory*. Instead, it was found that the bank newly 'invented' the funds by crediting the borrower's account with a deposit, although no such deposit had taken place. This is in line with the claims of the *credit creation theory*.

Thus it can now be said with confidence for the first time – possibly in the 5000 years' history of banking - that it has been empirically demonstrated that each individual bank creates credit and money out of nothing, when it extends what is called a 'bank loan'. The bank does not loan any existing money, but instead creates new money. The money supply is created as 'fairy dust' produced by the banks out of thin air.[32] The implications are far-reaching.

5.3. What is special about banks

Henceforth, economists need not rely on assertions concerning banks. We now know, based on empirical evidence, why banks are different, indeed unique — solving the longstanding puzzle posed by Fama (1985) and others — and different from both non-bank financial institutions and corporations: it is because they can individually create money out of nothing.

5.4. Implications

5.4.1. Implications for economic theory

The empirical evidence shows that of the three theories of banking, it is the one that today has the least influence and that is being belittled in the literature that is supported by the empirical evidence. Furthermore, it is the theory which was widely held at the end of the 19th century and in the first three decades of the twentieth. It is sobering to realise that since the 1930s, economists have moved further and further away from the truth, instead of coming closer to it. This happened first via the half-truth of the *fractional reserve theory* and then reached the completely false and misleading *financial intermediation theory* that today is so dominant. Thus this paper has found evidence that there has been no progress in scientific knowledge in economics, finance and banking in the 20th century concerning one of the most important and fundamental facts for these disciplines. Instead, there has been a regressive development. The known facts were unlearned and have become unknown. This phenomenon deserves further research. For now it can be mentioned that this process of unlearning the facts of banking could not possibly have taken place without the leading economists of the day having played a significant role in it. The most influential and famous of all 20th century economists, as we saw, was a sequential adherent of all three theories, which is a surprising phenomenon. Moreover, Keynes used his considerable clout to slow scientific analysis of the question whether banks could create money, as he instead engaged in ad hominem attacks on followers of the *credit creation theory*. Despite his enthusiastic early support for the *credit creation theory* (Keynes, 1924), only six years later he was condescending, if not dismissive, of this theory, referring to credit creation only in inverted commas. He was perhaps even more dismissive of supporters of the *credit creation theory*, who he referred to as being part of the "Army of Heretics and Cranks, whose numbers and enthusiasm are extraordinary", and who

[32] Thanks to Charlie Haswell for the 'fairy dust' allegory.

seem to believe in "magic" and some kind of "Utopia" (Keynes, 1930, vol. 2, p. 215).[33]

Needless to mention, such rhetoric is not conducive to scientific argument. But this technique was followed by other economists engaged in advancing the *fractional reserve* and later *financial intermediation* theories. US Federal Reserve staffer Alhadeff (1954) argued similarly during the era when economists worked on getting the fractional reserve theory established:

> "One complication worth discussing concerns the alleged "creation" of money by bankers. It used to be claimed that bankers could create money by the simple device of opening deposit accounts for their business borrowers. It has since been amply demonstrated that under a fractional reserve system, only the totality of banks can expand deposits to the full reciprocal of the reserve ratio. [Original footnote: 'Chester A. Phillips, *Bank Credit* (New York: Macmillan, 1921), chapter 3, for the classical refutation of this claim.'] The individual bank can normally expand to an amount about equal to its primary deposits" (p. 7).

The creation of credit by banks had become, in the style of Keynes (1930), an "alleged 'creation'", whereby rhetorically it was suggested that such thinking was simplistic and hence could not possibly be true. Tobin used the rhetorical device of abductio ad absurdum to denigrate the *credit creation theory* by incorrectly suggesting it postulated a 'widow's cruse', a miraculous vessel producing unlimited amounts of valuable physical goods, and thus its followers were believers in miracles or utopias.

This same type of rhetorical denigration of and disengagement with the *credit creation theory* is also visible in the most recent era. For instance, the New Palgrave *Money* (Eatwell et al., 1989), is an influential 340-page reference work that claims to present a 'balanced perspective on each topic' (Eatwell et al., 1989, p. viii). Yet the *financial intermediation theory* is dominant, with a minor representation of the *fractional reserve theory*. The *credit creation theory* is not presented at all, even as a possibility. But the book does include a chapter entitled "Monetary cranks". In this brief chapter, Keynes' (1930) derogatory treatment of supporters of the *credit creation theory* is updated for use in the 1990s, with sharpened claws: Ridicule and insult is heaped on several fateful authors that have produced thoughtful analyses of the economy, the monetary system and the role of banks, such as Nobel laureate Sir Frederick Soddy (1934) and C.H. Douglas (1924). Even the seminal and influential work by Georg Friedrich Knapp (1905), still favourably cited by Keynes (1936), is identified as being created by a 'crank'. What these apparently wretched authors have in common, and what seems to be their main fault, punishable by being listed in this inauspicious chapter, is that they are adherents of the *credit creation theory*. But, revealingly, their contributions are belittled without it anywhere being stated what their key tenets are and that their analyses centre on the *credit creation theory*, which itself remains unnamed and is never spelled out. This is not a small feat, and leaves one pondering the possibility that the Eatwell et al. (1989) tome was purposely designed to ignore and distract from the rich literature supporting the *credit creation theory*. Nothing lost, according to the authors, who applaud the development that due to

> "the increased emphasis given to monetary theory by academic economists in recent decades, the monetary cranks have largely disappeared from public debate …" (p. 214).

And so has the *credit creation theory*. Since the tenets of this theory are never stated in Eatwell et al. (1989), the chapter on 'Cranks' ends up being a litany of ad hominem denigration, defamation and character assassination, liberally distributing labels such as 'cranks', 'phrase-mongers', 'agitators', 'populists', and even 'conspiracy theorists' that believe in 'miracles' and engage in wishful thinking, ultimately deceiving their readers by trying to "impress their peers with their apparent understanding of economics, even though they had no formal training in the discipline" (p. 214). All that we learn about their actual theories is that, somehow, these ill-fated authors are "opposed to private banks and the 'Money Power' without their opposition leading to more sophisticated political analysis" (p. 215). Any reading of the highly sophisticated Soddy (1934) quickly reveals such labels as unfounded defamation.

To the contrary, the empirical evidence presented in this paper has revealed that the many supporters of the *financial intermediation theory* and also the adherents of the *fractional reserve theory* are flat-earthers that believe in what is empirically proven to be wrong and which should have been recognisable as being impossible upon deeper consideration of the accounting requirements. Whether the authors in Eatwell et al. (1989) did in fact know better is an open question that deserves attention in future research. Certainly the unscientific treatment of the *credit creation theory* and its supporters by such authors as Keynes, who strongly endorsed the theory only a few years before authoring tirades against its supporters, or by the authors in Eatwell et al. (1989), raises this possibility.

5.4.2. Implications for government policy

There are other, far-reaching ramifications of the finding that banks individually create credit and money when they do what is called 'lending money'. It is readily seen that this fact is important not only for monetary policy, but also for fiscal policy, and needs to be reflected in economic theories. Policies concerning the avoidance of banking crises, or dealing with the aftermath of crises require a different shape once the reality of the *credit creation theory* is recognised. They call for a whole new paradigm in monetary economics, macroeconomics, finance and banking (for details, see for instance Werner, 1997, 2005, 2012, 2013a,b) that is based on the reality of banks as creators of the money supply. It has potentially important implications for other disciplines, such as accounting, economic and business history, economic geography, politics, sociology and law.

5.4.3. Implications for bank regulation

The implications are far-reaching for bank regulation and the design of official policies. As mentioned in the Introduction, modern national and international banking regulation is predicated on the assumption that the *financial intermediation theory* is correct. Since in fact banks are able to create money out of nothing, imposing higher capital requirements on banks will not necessarily enable the prevention of boom–bust cycles and banking crises, since even with higher capital requirements, banks could still continue to expand the money supply, thereby fuelling asset prices, whereby some of this newly created money can be used to increase bank capital. Based on the recognition of this, some economists have argued for more direct intervention by

[33] "There is a common element in the theories of nearly all monetary heretics. Their theories of Money and Credit are alike in supposing that in some way the banks can furnish all the real resources which manufacture and trade can reasonably require without real cost to anyone …. For they argue thus. Money (meaning loans) is the life-blood of industry. If money (in this sense) is available in sufficient quantity and on easy terms, we shall have no difficulty in employing to the full the entire available supply of the factors of production. For the individual trader or manufacturer "bank credit" means "working capital"; a loan from his bank furnishes him with the means to pay wages, to buy materials and to carry stocks. If, therefore, sufficient bank credit was freely available, there need never be unemployment. Why then, he asks, if the banks can create credit, should they refuse any reasonable request for it? And why should they charge a fee for what costs them little or nothing? … There can only be one answer: the bankers, having a monopoly of magic, exercise their powers sparingly in order to raise the price. … Where magic is at work, the public do not get the full benefit unless it is nationalised. Our heretic admits, indeed, that we must take care to avoid "inflation"; but that only occurs when credit is created which does not correspond to any productive process. To create credit to meet a genuine demand for working capital can never be inflationary; for such a credit is "self-liquidating" and is automatically paid off when the process of production is finished. … If the creation of credit is strictly confined within these limits, there can never be inflation. Further, there is no reason for making any charge for such credit beyond what is required to meet bad debts and the expense of administration. Not a week, perhaps not a day or an hour, goes by in which some well-wisher of mankind does not suddenly see the light — that here is the key to Utopia" (vol. 2, pp. 217 ff.).

the central bank in the credit market, for instance via quantitative credit guidance (Werner, 2002, 2003a, 2005).

5.4.4. Monetary reform

The Bank of England's (2014b) recent intervention has triggered a public debate about whether the privilege of banks to create money should in fact be revoked (Wolf, 2014). The reality of banks as creators of the money supply does raise the question of the ideal type of monetary system. Much research is needed on this account. Among the many different monetary system designs tried over the past 5000 years, very few have met the requirement for a fair, effective, accountable, stable, sustainable and democratic creation and allocation of money. The view of the author, based on more than twenty-three years of research on this topic, is that it is the safest bet to ensure that the awesome power to create money is returned directly to those to whom it belongs: ordinary people, not technocrats. This can be ensured by the introduction of a network of small, not-for-profit local banks across the nation. Most countries do not currently possess such a system. However, it is at the heart of the successful German economic performance in the past 200 years. It is the very Raiffeisen, Volksbank or Sparkasse banks – the smaller the better – that were helpful in the implementation of this empirical study that should serve as the role model for future policies concerning our monetary system. In addition, one can complement such local public bank money with money issued by local authorities that is accepted to pay local taxes, namely a local public money that has not come about by creating debt, but that is created for services rendered to local authorities or the community. Both forms of local money creation together would create a decentralised and more accountable monetary system that should perform better (based on the empirical evidence from Germany) than the unholy alliance of central banks and big banks, which have done much to create unsustainable asset bubbles and banking crises (Werner, 2013a,b).

Appendix 1. Sequence of steps for the extension of a loan Raiffeisenbank Wildenberg e.G.

1. Negotiations concerning the details of the loan.
2. Receipt of KYC information and opening of a new customer file (new customer).
3. Opening of a current account (new customer).
4. Calculation of the loan and repayment schedule, model calculation, European required customer notification information, record of customer advisory.
5. Entry of loan application into the bank IT system.
6. Check of ability to service and repay the loan/conducting liquidity calculation in loan application.
7. Credit rating of customer, entry into customer file.
8. Search of customer data on central bank data base for singular economic dependencies and entry of results into bank IT.
9. Bank board recommendation on loan application with justification (2 directors).
10. Print out of loan contract, general loan conditions, with handover receipted by customer.
11. Print out of the protocol of the loan process.
12. Approval of credit by bank directors by signing the protocol and the loan contract.
13. Creation of loan account in the IT system.
14. Establishment of credit limit and availability of credit.
15. Appointment with customer.
16. Customer signs credit documents.
17. Payment of loan at the value date, in exchange for evidence of use of the loan in line with the declared use in the loan application.

Appendix 2. Letter of confirmation of facts by Raiffeisenbank Wildenberg e.G. (Translation; original in online Appendix 3).

10 June 2014

Dear Prof. Dr. Werner,

Confirmation of Facts

In connection with the extension of credit to you in August 2014 I am pleased to confirm that neither I as director of Raiffeisenbank Wildenberg eG, nor our staff checked either before or during the granting of the loan to you, whether we keep sufficient funds with our central bank, DZ Bank AG, or the Bundesbank. We also did not engage in any such related transaction, nor did we undertake any transfers or account bookings in order to finance the credit balance in your account. Therefore we did not engage in any checks or transactions in order to provide liquidity.

Yours sincerely,

M. Rebl,
Director, Raiffeisenbank Wildenberg e.G.

Appendix 3. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.irfa.2014.07.015.

References

Alhadeff, David A. (1954). *The Rise of Commercial Banking.* Berkeley: University of California Press (reprinted in 1980 by Arno Press as: *Monopoly and Competition in Banking*).

Allen, Franklin, Carletti, Elena, & Gale, Douglas (2014). Money, financial stability and efficiency. *Journal of Economic Theory, Vol. 149(C).* (pp. 100–127). Elsevier.

Allen, F., & Gale, D. (2000). Financial contagion. *Journal of Political Economy, 108*, 1–33.

Allen, F., & Gale, D. (2004a). Financial intermediaries and markets. *Econometrica, 72*, 1023–1061.

Allen, F., & Gale, D. (2004b). Competition and financial stability. *Journal of Money, Credit and Banking, 36*, 453–480.

Allen, F., & Santomero (2001). What do financial intermediaries do? *Journal of Banking & Finance, 25*, 271–294.

Baltensperger, Ernst (1989). Credit. In John Eatwell, Murray Milgate, & Peter Newman (Eds.), *The New Palgrave Money*. Basingstoke: Macmillan.

Bank of England (2014a). The Bank of England's forecasting platform: COMPASS, MAPS, EASE and the suite of models. *Bank of England working paper no. 471.*

Bank of England (2014b). Money in the modern economy: An introduction, by Michael McLeay, Amar Radia and Ryland Thomas of the bank's monetary analysis directorate. *Quarterly Bulletin, Q1.*

BBC (2013, February 26). *Negative interest rates idea floated by bank's Paul Tucker.* (accessed online).

BCBS (1999, April). *Capital requirements and bank behaviour: The impact of the Basel Accord.* BCBS working paper no. 1. Basel: BIS.

Bencivenga, V. R., & Smith, B. (1991). Financial intermediation and endogenous growth. *Review of Economic Studies, 58*, 195–209.

Benes, Jaromir, & Kumhof, Michael (2012). *The Chicago plan revisited.* WP/12/202. Washington, DC: IMF.

Bernanke, Ben (1993). Credit in the macroeconomy. *FRBNY Quarterly Review*, 50–70 (Spring 1992–93).

Bernanke, Ben, & Blinder, Alan S. (1989). Credit, money and aggregate demand. *American Economic Review, 78*, 435–439.

Bernanke, Ben, & Gertler, Mark (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives, 9*(4), 27–48.

Branson, William (1968). *Financial Flows in the US Balance of Payments.* Amsterdam: North-Holland.

Casu, Barbara, & Girardone, Claudia (2006). Bank competition, concentration and efficiency in the single European market. *The Manchester School, 74*(4 Special Issue), 441–468.

Crick, W. F. (1927). The genesis of bank deposits. *Economica*, 191–202 (says the same).

Davenport, Herbert J. (1913). *The Economics of Enterprise.* New York: Augustus M. Kelley.

Dewatripont, Mathias, Rochet, Jean-Charles, & Tirole, Jean (2010). *Balancing the Banks: Global Lessons from the Financial Crisis.* Princeton: Princeton University Press.

Diamond, Douglas W. (1984). Financial intermediation as delegated monitoring. *Review of Economic Studies, 51*, 393–414.

Diamond, Douglas W. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy, 99*(4), 689–721.

Diamond, Douglas W. (2007, Springg). Banks and liquidity creation: A simple exposition of the diamond-dybvig model. *Economic Quarterly, 93*(2), 189–200.

Diamond, Douglas W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy, 91*(3), 401–419.

Diamond, Douglas W., & Rajan, Raghuram G. (2001, June). Banks, short-term debt and financial crises: Theory, policy implications and applications. *Carnegie-Rochester Conference Series on Public Policy, Vol. 54(1)*. (pp. 37–71). Elsevier.

Douglas, C. H. (1924). *Social Credit.* London: Eyre & Spottiswoode.

Eatwell, John, Milgate, Murray, & Newman, Peter (Eds.). (1989). *The New Palgrave Money.* Basingstoke: Macmillan.

Fama, Eugene (1985). What's different about banks? *Journal of Monetary Economics*, *15*(1985), 29–39.

Gertler, M., & Kiyotaki, N. (2011). Financial intermediation and credit policy in business cycle analysis. In B. Friedman, & M. Woodford (Eds.), *Handbook of Monetary Economics, Vol. 3A*, North Holland: Elsevier.

Goodfriend, Marvin (1991, Jan/Febb). *Money, credit, banking, and payments system policy. Economic Review.* Federal Reserve Bank of Richmond, 7–23.

Goodhart, C. A. E. (1989). Disintermediation. In John Eatwell, Murray Milgate, & Peter Newman (Eds.), *The new Palgrave money*. Basingstoke: Macmillan.

Gorton, Gary, & Pennacchi, George (1990, Mar.). Financial intermediaries and liquidity creation. *The Journal of Finance*, *45*(1), 49–71.

Gurley, John G., & Shaw, E. S. (1955, September). Financial aspects of economic development. *AER, XLV*, 515–528.

Gurley, John G., & Shaw, E. S. (1960). *Money in a Theory of Finance.* Washington, D.C.: The Brookings Institution.

Guttentag, Jack M., & Lindsay, Robert (1968, Sep.–Oct.t). The uniqueness of commercial banks. *Journal of Political Economy*, *76*(5), 991–1014.

Hahn, Albert C. (1920). *Volkswirtschaftliche Theorie des Bankkredits.* Tübingen: J.C.B. Mohr.

Hawtrey, Ralph George (1919). *Currency and Credit.* Longmans, Green and Co

Heffernan, Shelagh (1996). *Modern Banking in Theory and Practice.* Chichester: John Wiley and Sons.

Hellwig, Martin (1977). A model of borrowing and lending with bankruptcy. *Econometrica*, *45*, 1879–1906.

Hellwig, Martin (1991). Banking, financial intermediation and corporate finance. In Alberto Giovannini, & Colin Mayer (Eds.), *European Financial Integration*. Cambridge: Cambridge University Press.

Hellwig, Martin F. (2000). Financial intermediation with risk aversion. *Review of Economic Studies*, *67*(4), 719–742.

Hoshi, Takeo, & Kashyap, Anil K. (2004). Japan's financial crisis and economic stagnation. *Journal of Economic Perspectives*, *18*(1), 3–26.

Howe, Robert Harrison (1915). *The evolution of banking; A study of the development of the credit system.* Chicago: C.H. Kerr & Company.

Kashyap, Anil K. (2002). Sorting out the Japanese financial crisis. *Federal Reserve Bank of Chicago Economic Perspectives*, *26*(4), 42–55.

Kashyap, A., Rajan, R., & Stein, J. (2002). Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. *Journal of Finance*, *57*, 33–73.

Keynes, John Maynard (1924). *Tract on Monetary Reform.* London: Macmillan.

Keynes, John Maynard (1930). *A Treatise on Money.* London: Macmillan.

Keynes, John Maynard (1936). *The General Theory of Employment, Interest and Money.* London: Macmillan.

Kiyotaki, Nobuhiro, & Moore, John (1997). Credit cycles. *Journal of Political Economy*, *105*, 211–248.

Klein, Michael A. (1971, May). A theory of the banking firm. *Journal of Money, Credit and Banking, 3*, 205–218.

Knapp, Georg Friedrich (1905). *Staatliche Theorie des Geldes.* Leipzig: Duncker & Humblot.

Kohn, Donald (2009, October 9). Monetary policy research and the financial crisis: Strength and shortcomings. *Speech at the Federal Reserve Conference on key developments in monetary policy, Washington, D.C.*

Koo, Richard, & Fujita, Shigeru (1997, March 26). *Koka asai ryoteki kin'yu kanwa [Quantitative monetary easing is hardly effective].* Keizai Kyoshitsu, Nikkei, 31.

Krugman, Paul R., & Obstfeld, Maurice (2000). *International Economics, Theory and Policy.* Reading, MA: Addison-Wesley Publishing Company.

Law, John (1705). *Money and Trade Consider'd with a Proposal for Supplying the Nation with Money.* Glasgow: R. & A. Foulis Glasgow: R. & A. Foulis.

Lutz, F. A. (1939, May). Velocity analysis and the theory of the creation of deposits. *Economica*, *6*(22), 156–169.

Macleod, Henry Dunning (1855–6). *The Theory and Practice of Banking, in 2 volumes* Citations from the. (6th ed.). London: Longman, Greens and Co (1905).

Macleod, Henry Dunning (1891). *Theory of Credit, Vol. 2*.

Macmillan Committee (1931). *British Parliamentary Reports on International Finance: The Report of the Macmillan Committee.* London: H.M. Stationery Office.

Marshall, Alfred (1888). *Report by the Gold and Silver Commission of 1887, command 5512xxx.*

Matthews, Kent, & Thompson, John (2005). *The Economics of Banking.* Chichester: John Wiley and Sons.

Mayer, Colin (1988). New issues in corporate finance. *European Economic Review*, *32*, 1167–1188.

Miller, Roger L., & VanHoose, David D. (1993). *Modern Money and Banking, International Editions* (3rd ed.). New York: McGraw-Hill.

Mints, Lloyd W. (1945). *A History of Banking Theory in Great Britain and the United States.* Chicago: University of Chicago Press.

Moeller, Hero (1925). *Die Lehr vom Gelde.* Leipzig: Quelle und Meyer.

Monti, Mario (1972). Deposit, credit and interest rates determination under alternative bank objective functions. In G. P. Szegö, & K. Shell (Eds.), *Mathematical Methods in Investment Finance*. Amsterdam: North-Holland.

Müller, Adam Heinrich (1816). *Versuch einer neuen Theorie des Geldes, mit besonderer Rücksicht auf Großbritannien.* Leipzig: F. A. Brockhaus.

Myers, S. C., & Rajan, R. G. (1998). The paradox of liquidity. *The Quarterly Journal of Economics*, *113*(3), 733–771.

Phillips, Chester A. (1920). *Bank Credit.* New York: Macmillan.

Pigou, Arthur C. (1927). *Industrial Fluctuations.*

Ryan-Collins, Josh, Greenham, Tony, Werner, Richard A., & Jackson, Andrew (2011). *Where does Money Come From?* London: New Economics Foundation.

Robertson, Dennis (1926). *Banking Policy and the Price.*

Romer, David (2006). *Advanced Macroeconomics* (3rd ed.).

Ryan-Collins, Josh, Greenham, Tony, Werner, Richard A., & Jackson, Andrew (2012). *Where does Money Come From?* (2nd ed.). London: New Economics Foundation.

Samuelson, Paul (1948). *Economics.* New York: McGraw-Hill.

Samuelson, Paul, & Nordhaus, William (1995). *Economics.* New York: McGraw-Hill.

Saving, Thomas R. (1977). A theory of the money supply with competitive banking. *Journal of Monetary Economics*, *3*, 289–303.

Schumpeter, Joseph Alois (1912). *Die Theorie der wirtschaftlichen Entwicklung.* Boston: Harvard University Press).

Schumpeter, Joseph A. (1926). *Theorie der wirtschatlichen Entwicklung* (2nd edition). Leipzig: Duncker & Humblot.

Schumpeter, Joseph Alois (1954). *History of Economic Analysis.* New York: Oxford University Press.

Sealey, C., & Lindley, J. T. (1977). Inputs, outputs and a theory of production and cost at depositary financial institutions. *Journal of Finance*, *32*, 1251–1266.

Sheard, Paul (1989). The mainbank system and corporate monitoring and control in Japan. *Journal of Economic Behavior and Organization*, *11*, 399–422.

Smith, Adam (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations.*

Soddy, Frederick (1934). *The Role of Money.* London: Elkin Mathews & Marrot.

Stamp, Josiah (1927, Sep.). Industrial fluctuations, by A.C. Pigou, review by: J.C. Stamp. *The Economic Journal*, *37*(147), 418–424.

Stein, Jeremy C. (2014, January 3). Banks as patient debt investors. *American Economic Association/American Finance Association Joint Luncheon, Philadelphia, Pennsylvania.*

Steuart, James (1767). *An inquiry into the principles of political economy.*

Stiglitz, Joseph (1997). *Economics* (2nd ed.). New York: W.W. Norton.

Thornton, Henry (1802). *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain.*

Tobin, James (1963). Commercial banks as creators of 'money'. In D. Carson (Ed.), *Cowles foundation paper 205. Banking and Monetary Studies*. Homewood: Irwin.

Tobin, James (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, *1*, 15–29.

Tobin, James, & Brainard, William C. (1963). Financial intermediaries and the effectiveness of monetary controls. *American Economic Review*, *53*, 383–400.

Tooke, Thomas (1838). *An Inquiry into the Currency Principle.*

Walsh, Carl (2003). *Monetary Theory and Policy.* Cambridge: MIT Press.

Werner, Richard A. (1992). Towards a quantity theory of disaggregated credit and international capital flows. *Paper presented at the Royal Economic Society Annual Conference, York, April 1993 and at the 5th Annual PACAP Conference on Pacific–Asian Capital Markets in Kuala Lumpur, June 1993, reviewed by the Economist on 19 June 1993 in the Economics Focus.*

Werner, Richard A. (1997, July). Towards a new monetary paradigm: A quantity theorem of disaggregated credit, with evidence from Japan. *Kredit und Kapital*, *30*(2), 276–309.

Werner, Richard A. (2002). Monetary policy implementation in Japan: What they say versus what they do. *Asian Economic Journal*, *16*(2), 111–151.

Werner, Richard A. (2003a). *Princes of the Yen, Japan's Central Bankers and the Transformation of the Economy.* New York: M.E. Sharpe.

Werner, Richard A. (2003b). A discussion of Anil K. Kashyap's paper 'Sorting out Japan's financial crisis'. *The Japanese Economy, Vol. 30 (no. 4)*, New York: M.E. Sharpe.

Werner, Richard A. (2005). *New paradigm in macroeconomics.* Basingstoke: Palgrave Macmillan.

Werner, Richard A. (2010a). Comment on "Strengthening the resilience of the banking sector". *Official submission to public call for comments on 'Strengthening the resilience of the banking sector, consultative document' by the Basel Committee on Banking Supervision, September 2009.* Basel: Bank for International Settlements (http://www.bis.org/publ/bcbs164.htm Submitted 16 April 2010).

Werner, R.A. (2010b), Towards stable and competitive banking in the UK — Evidence for the ICB, University of Southampton CBFSD Discussion Paper 2010, submitted to the Independent Commission on Banking, UK (Chair: Professor Sir John Vickers), submitted 19 November 2010 http://eprints.soton.ac.uk/342277/1/Werner_Soton_Towards_Stable_Banking_201011.pdf.

Werner, Richard A. (2012). Towards a new research programme on 'Banking and the economy' — Implications of the quantity theory of credit for the prevention and resolution of banking and debt crises. *International Review of Financial Analysis*, *25*, 94–105, http://dx.doi.org/10.1016/j.irfa.2012.06.002.

Werner, Richard A. (2013a). Towards a more stable and sustainable financial architecture — A discussion and application of the quantity theory of credit. *Kredit und Kapital*, *46*(3), 353–389.

Werner, Richard A. (2013b). Commentary: Crises, the spatial distribution of economic activity and the geography of banking. *Environment & Planning A*, *45*, 2789–2796.

Wicksell, Knut (1898). *Geldzins und Güterpreise.*

Wicksell, Knut (1907). The influence of the rate of interest on prices. *Economic Journal*, *17*, 213–220.

Wicksell, Knut (1922). *Vorlesungen über Nationalökonomie auf Grundlage des Marginalprinzipes/Bd. 2.* Jena: Geld und Kredit.

Wicksell, Knut (1935). *Lectures on Political Economy.* London: Routledge.

Withers, Hartley (1909). *The Meaning of Money.*

Withers, Hartley (1916). *The Business of Finance.*

Wolf, Martin (2014, Apr. 24). *Strip private banks of their power to create money.* Financial Times.

Wolfe, Simon (1997). *An Economic Analysis of Financial Institutions' Accounting Practice.* (Dissertation submitted in the). Department of Management, Faculty of Social Sciences, University of Southampton.

Woodford, Michael (2003). *Interest and Prices.* Princeton: Princeton University.

Yohe, William P. (1995). *Interactive Money and Banking.* Oxford: Blackwell.