

Working Paper

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Does Saving Increase the Supply of Credit? A Critique of Loanable Funds Theory

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The paper presents a critique of loanable funds theory by using simple accounting relationships. It is shown that many economists identify saving and the credit supply by interpreting the macroeconomic saving-investment identity as a budget constraint. According to that interpretation, more saving through lower consumption (and government spending) leads to a higher supply of credit and thus more funds to be invested by firms for investment. The paper shows that proponents of this theory commit accounting fallacies or need very strong and somewhat peculiar assumptions for their theory to hold. In the first step, the concepts of 'saving' and 'credit' will be clearly distinguished using simple accounting. It will be shown that credit is not limited by anybody's saving and that no one has to abstain from consumption in order for a credit to be provided. Also, it will be shown that financial saving (an increase in net financial assets) through a reduction in expenses reduces other economic units' ability to spend and save. The identification of saving and the provision of credit is likely to stem from the invalid application of neoclassical growth models to a monetary economy. In those models, there are either only tangible assets, so that no coordination failures in financial saving can occur, or in those models real goods are lent and borrowed, not money.

Keywords: Saving, Wealth, Investment, Production, Financial Markets

JEL classification: E210, E220, E230, E440, E500

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Does Saving Increase the Supply of Credit? A Critique of Loanable Funds Theory

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Abstract

The paper presents a critique of loanable funds theory by using simple accounting relationships. It is shown that many economists identify saving and the credit supply by interpreting the macroeconomic saving-investment identity as a budget constraint. According to that interpretation, more saving through lower consumption (and government spending) leads to a higher supply of credit, lower interest rates and thus more funds to be invested by firms for investment. The paper shows that proponents of this theory commit accounting fallacies or need very restrictive assumptions for their theory to hold. In the first step, the concepts of “saving” and “credit” will be clearly distinguished using simple accounting. It will be shown that credit is not limited by anybody’s saving and that no one has to abstain from consumption in order for a credit to be provided. Also, it will be shown that financial saving (an increase in net financial assets) through a reduction in expenses reduces other economic units’ ability to spend and save. Using the concept of excess demand and supply, it will be shown that excess saving does not lead to an excess supply of credit - which would lower interest rates - but necessarily lead to an excess supply of goods, services and/or labor which will lower prices and production. How interest rates change is not determined ex ante: They could increase, stay the same or decrease. Finally, it will be argued that the identification of saving and the provision of credit is likely to stem from the invalid application of neoclassical growth models to a monetary economy. In those models, there are either only tangible assets, so that no coordination failures in financial saving can occur, or in those models real goods are lent and borrowed, not money.

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Introduction

“The subject of money, credit, and moneyflows is a highly technical one, but it is also one that has a wide popular appeal. For centuries it has attracted quacks as well as serious students, and there has too often been difficulty in distinguishing a widely held popular belief from a competently formulated and tested scientific hypothesis.” (Copeland, 1949, p. 255)

Many economists hold the position that “saving finances investment”. They argue that saving - a reduction of consumption relative to income - is necessary for the provision of loans and the financing of investment. This view has been influential both to explain the global economic crisis that began in 2007 and in proposing policies to combat the crisis.

A prominent explanation of the crisis is the “Saving Glut” hypothesis put forward by Bernanke (2005). According to this hypothesis, “savings” by East Asian and commodity exporting economies were “exported” to the United States via high current account surpluses, reduced interest rates there and led to high housing investment and housing prices.

A similar hypothesis has been proposed by Sinn (2010) for the euro area. He argues that Germany exported its saving to finance investment in the countries that now face financial crises due to too high debts. Sinn explicitly argues that the savings which were exported to the crisis countries were not available for investment in Germany itself, i.e. that current saving limits the current supply of credit.

The alleged need for austerity in the crisis is also sometimes explained by the view that saving limits credit. For instance, Cochrane (2009) and Fama (2009) argue that higher government spending “absorbs” household savings that would otherwise be available to finance investment. The view that government deficits absorb limited savings is also expressed by Ball and Mankiw (1995).

In this paper, it will be shown that the underlying view of the “saving finances investment” doctrine implies that the amount of loans that can be lent in a period is limited by the amount of saving in the same period and that, consequently, an abstention from consumption is necessary for more credit to be available for investors. This view is the basis of loanable funds theory (Robertson, 1936; Ohlin, 1937a,c,b; Tsiang, 1956) and also held by many modern economists.

The view that saving is needed for the creation of loans is not new. Already in 1944, the German economist Hans Gestrich summarized this view thus:¹

“According to traditional theory, the quantity of credit is uniquely determined by the the amount of saved money. [...] Therefore, the amount of credit is strictly limited by the amount of saving. The amount of saving determines the quantity of investment, i.e. the amount of goods production that cannot be directly and immediately consumed.” (1947, p. 23-24)

¹The original German reads: “Die Menge des Kredits ist nach der traditionellen Auffassung durch die Menge der ersparten Geldbeträge eindeutig bestimmt. [...] Das Kreditvolumen ist demnach durch das Ersparnisvolumen starr begrenzt. Die Menge der Ersparnisse bestimmt die Höhe der Investitionen, d.h. den Umfang der Erzeugung von nicht direkt und sofort konsumierbaren Gütern.”

In this paper, it will be argued that this view is either wrong or rests on highly arbitrary assumptions. Using simple accounting rules in the vein of Stützel (1978; 1979), the paper will show that credit is never limited by anyone's saving. The provision of money via credit is a portfolio decision: lenders who cannot issue money themselves exchange one financial asset - money - for another financial asset - a loan or a newly issued bond. In this case, the provision of a credit does not depend on a lender's abstention from spending but an abstention from holding money. Credit can then be created as long as lenders are willing to part with their money.

Lenders like commercial or central banks which can issue money extend their balance sheets by simultaneously increasing their financial assets - the newly created loan - and their liabilities - the newly created deposit (the borrower's his money) - is created. Here, lenders again do not have to abstain from consumption and not even from holding money since they create new money.

On the other hand, the act of saving is *not* identical with an act of providing money. Saving is an economic unit's increase in net worth, i.e an increase in its *net* financial assets (financial saving) or its tangible assets (machines, houses etc.). By definition, the act of investment already *is* an act of saving. *Financial* saving means that units increase their *gross* financial assets relative to their *gross* financial liabilities.

The act of financial saving does not imply that a saver increases her gross financial assets; she could also reduce her gross liabilities, i.e. reduce debts. Further, even if she increased her gross financial assets, financial saving does not necessitate a particular portfolio decision concerning the *composition* of gross financial assets: a decision to increase gross financial assets is not yet a decision to make a loan or buy a newly issued bond.

Further, a unit's act to reduce its expenditures in order to save financially necessarily leads to a cut in other units' revenues and thus reduces other units' ability to spend themselves. For the whole economy, financial saving is a zero-sum game: some unit's increase in net financial assets necessarily is some other unit's decrease in net financial assets.

As will be argued in the paper, excess saving is likely to lead to a fall in income, not in interest rates. Excess saving will lead to an excess supply on the markets for goods, services and labor and thus to a fall in production. But excess saving is not an excess supply of money via the credit markets - only such an excess supply of money would lead to falling interest rates.

The problem of a limited saving fund has not figured prominently in the discussion between Keynesian economists on the one hand and loanable funds theorists on the other after the publication of Keynes' General Theory (1936/1997). This discussion has mainly been about whether the supply and demand of the *flow* of credit - identified with loanable funds theory (Patinkin, 1958, 1969; Snippe, 1985; Tsiang, 1956) - or the *stock* of money - identified with Keynesian liquidity preference theory (Keynes, 1937; Lerner, 1944) - determine interest rates.

Hicks (1939) and Patinkin (1958) showed that the implications for interest rate theory are the same whether one uses an analysis of the stocks or flows of credit or money. The loanable funds theorist Tsiang (1956) accepted that view and it is now common to see both theories as being identical (Blanchard, 2000). While Patinkin and Hicks are right in their analysis, the central question is however *not* whether stocks or flows of money or credit determine interest rates, but whether one sees higher saving as a condition for the provision of loans. This issue has hardly been discussed, with a short interchange on the matter between Ohlin (1937a, p. 425) and Keynes (1937, p. 243-245) being an exception.

While some authors tackled the loanable funds fallacy - most recently Bibow (2001) and Hayes (2010) -, they did not apply the logic of simple accounting to the question of loanable funds theory. This has been done by the German economists Wilhelm Lautenbach² (1937; 1952) and Hans Gestrinch (1940; 1947) who both tried to understand the Great Depression in Germany³. The article will use their insights and embed them in the analytical framework developed by Lautenbach's pupil Wolfgang Stützel (1978; 1979) (see Schmidt (2009; 2012) for very good introductions into Stützel's work). Furthermore, following Patinkin (1958), an excess demand analysis will be employed to analyze the dynamic interaction of different saving, spending and portfolio plans and their macroeconomics consequences.

While not embedding it in the broader debate about loanable funds theory, Borio and Disyatat (2011) came to the same conclusions as Lautenbach and Gestrinch, using simple accounting as a starting point for their analysis. However, they limit themselves to a critique of Bernanke's "Saving Glut" hypothesis and do not draw the wider implications for the whole of loanable funds theory. Their argument will be extended and generalized to all kinds of financial saving - not only national current account balances.

The article is structured as follows. In the first section, it will be argued that many contemporary economists have the view that saving is either identical or a pre-requisite for credit and propose an increase in (household and/or government) saving in order to increase investment. In the second section, standard business and national accounting concepts are used to show the difference between saving, finance and investment. In the third section, the accounting relations between saving, finance and investment in the aggregate economy will be clarified. In section four, it will be argued that excess saving is likely to lead to a fall in aggregate income while interest rates might increase, decrease or stay the same. That means that none of the claims of loanable funds theorists is likely to hold in reality. In section five, the implicit assumptions of loanable funds theory will be discussed and how they are related to neo-classical growth models. A final section concludes.

²In looking at the actual processes of credit creation, saving and investment, Lautenbach and after him Gestrinch reached very similar conclusions as Keynes, but even before the publication of the General Theory (Garvey, 1975; Lautenbach, 1952). Kindleberger (1999) thus referred to Lautenbach as a pre-Keynesian Keynesian. While Gestrinch, Lautenbach and others were well aware of the Anglo-Saxon debate of their time, the reverse was unfortunately not the case. Neither Lautenbach nor Gestrinch could make their point after the war when the Keynesian revolution began its course: Gestrinch died in 1943, Lautenbach in 1948.

³It is telling that Gestrinch's 1940 article is called "Credit Theory and Reality" (in German: "Kredittheorie und Wirklichkeit")

1 The Loanable Funds Theory or: the Saving-Fund Theory of Credit

In this section, it will be demonstrated that loanable funds theorists believe that the amount of credit available to finance investment is constrained by saving. That means that they interpret the identity of saving (income minus consumption) and investment of the national accounts as a budget constraint. This can be summarised as the thesis that “saving finances investment”. As a consequence, loanable funds theorists believe that higher saving through lower consumption and lower government deficits (or, ideally, surpluses) would lead to a higher credit supply, lower interest rates, more investment and thus a higher capital stock and higher future income.

There is hardly any academic paper in which loanable funds theorists themselves clearly and systematically develop their theory. Keynes already deplored that he was not able to find a systematic exposition of the theory (1937; 1936/1997). This is why Gregory Mankiw’s intermediate textbook version of the loanable funds theory (Mankiw, 1997) is presented. In his introductory economics textbook, Krugman gives the same account (2009, ch. 26).

That Mankiw’s textbook exposition is an accurate depiction of what Mankiw (and also others) actually believe has been justified by Mankiw himself. In an article with Ball (1995), he states that he accepts the textbook treatment of loanable funds theory:

“The analysis [consistent with Mankiw’s textbook treatment, F.L.] follows the conventional wisdom as captured, for example, in most undergraduate textbooks. In our view, the conventional wisdom in this area is mostly on the right track.” (1995, p. 95).

Further, the use of a textbook presentation has the advantage that many assumptions are made explicit and justified that are implicit or taken for granted in academic writings (Naples and Aslanbeigui, 1996).

In his textbook, Mankiw starts from the accounting identity of a closed economy with a government:

$$(1) \quad Y = C + I + G$$

Y is income, C is consumption, I is investment and G are government expenditures. Then he introduces taxes, T , in order to derive the economy’s saving:

$$(2) \quad S = (Y - T - C) + (T - G) = I$$

He goes on to call the first term “private saving” and the second “government saving”. According to Mankiw, the sum of private and government savings are the “flows into the financial markets” and investment the flows “out of the financial markets” (Mankiw, 1997, p. 67). That means that he interprets the national accounting identity between saving

and investment as a budget constraint: no flows of loanable funds would be available to investors without prior saving. Leijonhufved (1981) has used a similar formulation when he describes loanable funds theory:

“Household savings flow into, business investment flows out of banks.” (1981, p. 152)

Mankiw further assumes investment to be a negative function of interest rates, so that both private and government saving determine the interest rate and thus equilibrium investment and saving. Mankiw writes:

“In fact, saving and investment can be interpreted in terms of supply and demand. In this case, the “good” is loanable funds, and its “price” is the interest rate. *Saving is the supply of loans* [emphasis added, F.L.]- individuals lend their saving to investors, or they deposit their saving in a bank that makes the loan for them. Investment is the demand for loanable funds - investors borrow from the public directly by selling bonds or indirectly by borrowing from banks. [...] *At the equilibrium interest rate, saving equals investment, and the supply of loans equals the demand* [author’s emphasis].” (1997, p. 63)

While Mankiw introduces the loanable funds mechanism in a chapter about “The Economy in the Long Run”, he also uses it when he discusses the short run. Indeed, he uses it to derive the short run IS curve of the IS/LM model (1997, p. 260).

From this follows that an increase in saving brought about by a cut in expenditures (less consumption relative to income for households and less government expenses relative to government revenues) increases the supply of loans. If households and the government (by government surpluses) did not save, not enough finance would be forthcoming that is needed by firms. Thus, the maximum amount of credit for investment (loanable funds) in a (closed) economy is limited by the fund of current household and government saving.

The whole view is not Mankiw’s idiosyncrasy but reflects the opinion of many economists.

That credit is constrained by saving in the loanable funds literature is also made clear by D. H. Robertson (1934):

“And we have a curve SS’ representing the rate of new available savings per atom of time - available that is, after deducting new savings absorbed in financing consumption by Governments or individuals.” (Robertson, 1934, p. 651)

Woodford (2010) is very explicit in stating that it is a restriction of expenditures that is necessary for credit to be created:

“The loan supply curve LS shows the amount of lending L that ultimate savers are willing to finance (*by refraining from expenditure themselves* [emphasis added, F.L.]) for each possible value of the interest rate i received by savers [...]” (Woodford, 2010, p. 26)

Bernanke (2005) in his speech on the “global saving glut” also makes the “saving finances investment”-view explicit:

“All investment in new capital goods must be financed in some manner. In a closed economy without trade or international capital flows, the funding for investment would be provided entirely by the country’s national saving. By definition, national saving is the sum of saving done by households [...] and saving done by businesses [...] less any budget deficit run by the government.”

One can also open the economy and derive saving by adding net exports, NX (exports minus imports):

$$(3) \quad S = (Y - T - C) + (T - G) = I + NX$$

Bernanke (2005) applies the “saving finances investment” view explicitly to the open economy:

“[...] in fact, virtually all economies today are open economies, and well-developed international capital markets allow savers to lend to those who wish to make capital investments in any country, not just their own. Because saving can cross international borders, a country’s domestic investment in new capital and its domestic saving need not be equal in each period. If a country’s saving exceeds its investment during a particular year, the difference represents *excess saving that can be lent on international capital markets* [emphasis added, F.L.]. By the same token, if a country’s saving is less than the amount required to finance domestic investment, the country can close the gap by borrowing from abroad.”

In the view of the “saving-fund theory of credit”, a trade surplus leads to an export of saving so that loans cannot be used any more in the country realising the surpluses. For instance, this view has been applied to Germany’s export surpluses by Hans-Werner Sinn (2010). Sinn argues, consistent with loanable funds theory, that saving which is exported cannot be used to finance domestic investment (see, for an analysis of this point, Horn and Lindner (2011)). Consequently, he claims that there is a direct trade-off between domestic loans and investment and export surpluses:

“Germany exported its savings instead of using them as loans for investment in the domestic economy. [...] Germany lost a huge amount of capital under the euro even though it urgently needed the capital to rebuild its ex-communist east.” (Sinn, 2010, p. 7)

The policy implications of the loanable funds model are straight forward: policies that lead to lower consumption relative to income (higher household saving) and lower government deficits (even surpluses) provide more saving, lower the interest rate and lead to higher investment. Naturally, the reduction of fiscal deficits would be a way to increase national saving:

“Budget deficits have many effects. But they all follow from a single initial effect: deficits reduce national saving. [...] When budget deficits reduce national saving, they must reduce investment, reduce net exports, or both. [...] A decline in national saving reduces the supply of loans available to private borrowers, which pushes up the interest rate (the price of a loan).” (1995, p. 96-98)

To summarize: According to loanable funds theory, credit is provided by saving. The higher saving is, the more credit will be supplied which *ceteris paribus* lowers interest rates. Higher saving through lower consumption (relative to income), lower government deficits, and/or lower export surpluses would then induce firms to invest more which would increase long run income through a higher capital stock.

2 Accounting Rules, Saving, Investment and Finance

In the following section, saving, investment and finance will be clearly defined using common business and national accounting concepts and rules (European Communities, 1996; Lequiller and Blades, 2006; Brümmerhoff, 2007; Möller et al., 2011). It will be shown that first, saving is an increase in net worth. Net worth consists of tangible assets (machines, houses etc.) and *net* financial assets - the difference between *gross* financial assets and *gross* liabilities. Thus, a change in tangible assets - investment - *is* by definition already an act of saving. A unit can only increase its net financial assets by spending less than it earns. A change in net financial asset can mean both a change in gross financial assets or gross liabilities.

On the other hand, financing is the provision of *money* to somebody else. By providing money via a credit, a unit exchanges the gross financial asset money for another gross financial asset - a loan or a bond. Neither the sum of its gross financial assets nor its net financial assets change by an act of financing, only the composition of gross financial assets changes. When a unit - like a bank - can create money, it will simultaneously increase its gross financial assets (create a loan) and its gross liabilities (create a deposit) which does not change its *net* financial assets.

Thus, loanable funds theorists confuse the provision or creation of money via a pure financial transaction with a change in net financial assets - financial saving - that can only take place by spending less than one earns. The next section will show that in more detail.

2.1 Key Accounting Concepts

A first step in order to clearly distinguish between saving and financing is to understand the concept of income, production, the current account, the financial account and the balance of payments. Those concepts are normally used for national economies. However, they apply to every economic unit or group of economic units, be it an individual, a household, a firm, the firm sector, the household sector etc.

Both Eurostat (1996) and the US Integrated Macroeconomic Accounts (Bond et al., 2007) use the same accounting concepts developed for national economies for all domestic economic sectors.

In general, income y measures the net production (net of depreciation) of an economic unit plus its revenues (r) received from the rest of the world. Expenses to the rest of the world (e) have to be deducted from income since they are the revenues and thus income of other units (Lequiller and Blades, 2006, p. 18-19).

$$(4) \quad y = \text{production} + r - e$$

For a national economy, *production* is an economy's net domestic product (net, since depreciation has been deducted), and y its net national income. Revenues and expenses contain wage and capital income (dividends, interest), the sale and purchase of goods and services, transfers, taxes, gifts etc.

Income is an ambiguous concept since it contains both a unit's production and its revenues. Even when a unit does not receive any revenues, it yields income if it produces goods and services for itself. On the other hand, if a unit does not produce anything at all but only receives revenues, it receives income.

Expenses and revenues change a unit's net financial assets, nfa , which consist of its gross financial assets, fa , and its gross liabilities l . Expenses decrease a unit's net financial assets, revenues increase its net financial assets:

$$(5) \quad r - e = \Delta nfa = \Delta fa - \Delta l$$

Equation (6) is a unit's *balance of payments*. It contains its *current account* which is on the left hand side of equation (6), and its *financial account* which is on the right hand side. On the current account, all revenues and expenses are booked. On the financial account all financial transactions are booked, i.e. changes in gross financial assets and gross liabilities (see IMF for details on the balance of payment (2009, p. 9)).

One can further differentiate financial assets into means of payment - money -, m , and all other financial assets, ofa :

$$(6) \quad fa = m + ofa$$

Other financial assets are loans, bonds, equity, derivatives and all other financial claims that are not used as means of payment. Money is special in that other financial assets and liabilities are claims and commitments to receive and to pay money.

All transactions that change a unit's amount of money are *payments* and *receipts*. Those are a unit's *cash flows*. Payments decrease a unit's money holdings; receipts increase its money holdings. Equation (6) can be rewritten in terms of changes of money:

$$(7) \quad \Delta m = r - e - \Delta ofa + \Delta l$$

It is central to distinguish the cash flow concepts payments / receipts on the one hand and expenses / revenues on the other (table 1). A unit's money holdings can change due to revenues or expenses but also due to changes in other financial assets or in liabilities. When a unit sells a bond, it receives money, i.e. it realises a receipt; if it increases its liabilities, it also realizes a receipt.

On the other hand, there are also revenues and expenses which do not change a unit's money holdings. If a seller gives a trade or consumer credit to his customer, the seller realizes a revenue and receives a financial claim vis-à-vis the customer for later payment. Thus, he receives an other financial asset but no receipt. The customer realizes an expense and increases his liabilities, i.e. his commitment to pay later.

Table 1: Changes in net financial assets and in money holdings

Revenue	<i>Increase in net financial assets</i>
Expense	<i>Decrease in net financial assets</i>
Receipt	<i>Increase in money holdings</i>
Payment	<i>Decrease in money holdings</i>

Doubly-entry accounting applies to the balance of payments. Each transaction has to show up twice in the balance of payments. From this necessity, the following types of transactions can be deduced:

- a) **Pure exchange:** A unit exchanges a good or service against another good or service so that its revenues are as high as its expenses ($r = e$). There are two entries in the balance of payment (a revenue and an expense), but only in the current account. There will thus be neither a balance on the current nor on the financial account. Net financial assets will not change.
- b) **Current account surplus / deficit:** A unit spends more (less) than it receives in revenues. This will lead to a current account deficit (surplus) and thus necessarily a financial account deficit (surplus). Net financial assets will decrease (increase): either gross financial assets will decrease (increase) and/or gross liabilities increase (decrease).
- c) **Pure financial transaction:** If no revenues or expenses take place but units change the composition of their portfolio, a pure financial transaction takes place that is only booked in the financial account. By such transactions a unit's *gross* financial assets and/or liabilities change. The sale of an other financial assets is such a transaction in which a unit's holdings of other financial assets decrease ($-\Delta ofa$) and its holdings of money increase ($+\Delta m$). A loan is also a pure financial transaction since a lenders' holdings of money decreases ($-\Delta m$) and his holdings of other financial assets (the loan) increases ($+\Delta ofa$).

Item b) is financial saving (or dissaving), item c) contains financing. Loanable funds theorists confuse those two transactions. The consequences of this will be discussed in the next section.

2.2 Saving

In general, a unit saves when it increases its net worth, nw . A unit's net worth consists of its tangible assets, ta , and its net financial assets:

$$(8) \quad \Delta nw = s = \Delta ta + \Delta nfa$$

A change in tangible assets is an act of investment ($\Delta ta \equiv i$), so that:

$$(9) \quad \Delta nw = s = i + \Delta nfa$$

A unit can only save if it does not consume all of its income (which consists of a unit's production and its revenues):

$$(10) \quad y - c = \Delta nw = s = i + \Delta nfa$$

Note that the act of investing (increasing net financial assets) *is* an act of saving by pure accounting convention. A unit that produces goods but does not consume them all in a period increases its tangible assets (invests) and thus saves; a unit that does not spend all of its revenues on either consumption or investment goods increases its net financial assets and thus saves financially.

Thus - like income - saving is an ambiguous concept. While it is always true that a unit saves if it does not consume all of its income, the *form* of its saving is not determined by this saving act since a unit can either save in the form of higher tangible or higher net financial assets.

Thus, when the concept "saving" is discussed, one should always clarify which exact economic act is meant (Stützel and Grass, 1988, p. 365):

- a) **A restraint in consumption:** Every economic unit increases its overall net worth by consuming less than it consumes. But this definition of saving does not say in what form a unit increases its net worth.
- b) **An increase in tangible assets:** When an economic unit increases its tangible assets (invests), it saves. Thus, investment is just one subcategory of the broader concept of saving. A unit can invest by either producing itself a new tangible asset or by purchasing one.
- c) **An increase in net financial assets:** When a unit spends less than it earns, it increases its gross financial assets relative to its gross liabilities.

Further, it is important to note what financial saving is *not*. A unit's decision to increase its net financial assets by spending less than it earns is not necessarily the decision to demand a specific *gross* financial asset like a loan or a bond. A unit can also hold more money or it could reduce its gross liabilities.

2.3 Credit Creation

On the other hand, the provision of a loan is quite a different act from saving since it is a pure financial transaction. Generally, lenders that cannot create money themselves exchange money for other financial assets; and lenders that can create money can extend their balance sheets. In neither of those two cases does saving take place.

When a lender cannot create money himself, he decreases his money holdings and increase his holdings of other financial assets (the loan or the bond):

$$(11) \quad 0 = \Delta ofa - \Delta m$$

A lender who can create money himself (like a central or commercial bank) increases both its gross financial assets (the new loan that it creates) and its gross financial liabilities (which are the borrower's deposit):

$$(12) \quad 0 = \Delta ofa - (+\Delta l)$$

A borrower always increases his money holdings (be it central bank money or a deposit at the lending bank) but also his liabilities:

$$(13) \quad 0 = \Delta m - \Delta l$$

Neither act of credit creation leads to a surplus or deficit in the current or financial account of any unit - the lender or the borrower - and thus do not constitute an act of saving. A lender does not need to abstain from consumption in order to provide a loan; he needs to abstain from holding his financial assets in the form of money. If he can create money himself, he does not even have to abstain from holding money.⁴

3 Aggregate Income, Saving and Finance

Until now, only individual economic units and groups of economic units have been analyzed. However, loanable funds theory is a theory about the interaction of groups within the aggregate economy and aims at deriving statements valid for aggregate variables like aggregate saving, aggregate investment and aggregate credit. In this section, accounting

⁴A caveat is in order here. It is true that commercial banks can create deposits which are normally accepted as means of payment by non-banks. Thus, a bank creates money. However, once the borrower wants to withdraw his money from the bank, the bank has to pay *central bank money* which it can by definition not produce itself - only the central bank can do that. The bank is thus restricted in its ability to create money by its ability to meet its commitments to pay in central bank money.

relations will be presented that are valid for the aggregate economy. Based on this, the fallacy can be tackled that financial saving adds to some fund out of which investment can be financed. Aggregate net financial assets are always zero in the aggregate (closed or world) economy so that financial saving can neither add nor financial dissaving subtract from some saving fund.

3.1 The Relation between Groups of Economic Units and the Aggregate Economy

Sützel (1978, p. 20-23) has developed a formal schema to analyse the relations between single economic units and the aggregate economy. He defines the *aggregate economy* as consisting of N economic units. Those N economic units can be divided into a group, g , and its complementary group, cg . Groups consist of j economic units with $1 \leq j < N$. The complementary group to the j economic units is the rest of the economy, i.e. $N - j$ economic units.

Depending on the problem at hand, one can separate the economy into various groups, for instance, lenders and borrowers, banks and non-banks, the private and the public sector, the domestic and the foreign sector etc. Aggregate economic outcomes can then be derived from the interaction of the two groups.

For each group one can formulate *partial statements*. Those are statements that are only valid for groups. *Global statements* are statements that are valid for all N economic units. Most often, partial statements cannot be applied to the aggregate economy. To do so would constitute a fallacy of composition. The link between global and partial statements are *relational statements*. They show how partial statements for a group depend on its complementary group's behaviour.

3.2 Financial Saving and Investment

Any group g (be it households, businesses or the government) can increase (decrease) its net financial assets by realizing a current account surplus (deficit) (partial statement):

$$(14) \quad r_g - e_g = \Delta nfa_g$$

However, to every expense corresponds a revenue and vice versa. Thus, the sum of all expenses of all N economic units is necessarily equal to the sum of all revenues (aggregates are written with capital letters):

$$(15) \quad 0 = \sum_{i=1}^N (r_i - e_i) = R - E$$

Also, every financial asset fa_k is also a financial liability l_k so that both the stock of and change in financial assets and financial liabilities is equal:

$$(16) \quad 0 = \sum_{k=1}^O (fa_k - l_k) = \sum_{k=1}^O (\Delta fa_k - \Delta l_k)$$

Combining (15) and (16) means that the aggregate economy's net *financial* assets are zero. The aggregate economy cannot save or dissave in the form of net financial assets (global statement):

$$(17) \quad 0 = \sum_{i=1}^N (r_i - e_i) = \sum_{i=1}^N \Delta nfa_i = \sum_{k=1}^O (\Delta fa_k - \Delta l_k)$$

Given that the economy's financial saving is always zero due to pure accounting, the only way the economy can save is in the form of new tangible assets, i.e. investment:

$$(18) \quad \begin{aligned} \sum_{i=1}^N s_i &\equiv \sum_{i=1}^N (\Delta nfa_i + i_i) \equiv \\ S &\equiv \Delta NFA + I \equiv 0 + I \equiv \\ S &\equiv I \end{aligned}$$

The trade of existing tangible assets cancels out in the aggregate since it means the dis-saving of the investment good's seller and the buyer's saving. The accounting identity $S \equiv I$ does say *nothing* about a) *how* investment is financed and b) about the size of any group's financial saving. All of investment could be 100 % internally financed by businesses if they had enough liquidity at hand or it could be 100 % externally financed. But both the kind of financing and the amount of investment are independent from any group's financial saving, be it households, the government or businesses themselves. Condition (20) just states that the economy's financial saving is zero, whether single groups in the economy save financially or not.

Let us make that clearer: There is no necessary relation between the amount of aggregate investment in a period and the amount of financial saving by any group in the economy. Groups could have a current account surplus approaching infinity, provided that their complementary group has the matching deficit, but investment could be zero or even negative (with depreciation being high enough).

On the other hand, investment could approach infinity but financial saving be zero for each group. Thus, there is no necessary relation between financial saving of any one group - be it the government or the household sector - and aggregate saving. Aggregate saving is only as high as investment is, whatever any group's financial saving or dis-saving amounts to. Note that this is only an accounting insight. A group's financial saving of

course influences other groups' *ability* to make expenses, among them investment. This will be discussed shortly.

The identity of saving and investment simply means that all expenses are equal to all revenues:

$$(19) \quad \begin{aligned} S - I = \Delta NFA = R - E = 0 \\ \Rightarrow R = E \end{aligned}$$

Also, since all revenues and expenses sum to zero in the aggregate, aggregate income Y is equal to an economy's *production* which can be either consumed or invested - where investment is all production that is not consumed:

$$(20) \quad \begin{aligned} \sum_{i=1}^N y_i &= \sum_{i=1}^N (c_i + i_i + r_i - e_i) = \\ Y &= C + I + R - E = \\ Y &= C + I \end{aligned}$$

From (17) follows that groups can only increase their net financial assets to the extent that their complementary group (cg) accepts to decrease theirs (relational statement):

$$(21) \quad \begin{aligned} r_g - e_g &= -(r_{cg} - e_{cg}) = \\ \Delta nfa_g &= -\Delta nfa_{cg} \end{aligned}$$

Remember that expenses and revenues contain wage income, capital income (interest rates and dividends), the income from the sale of goods and services and transfers. Then, wage income is the product of wages and employment, $w * emp$, income from the sale of goods and services is an item's price times its quantity, pq , and capital income is the product of interest rate and the financial asset's face value, $int * fv$.⁵

If the economy consisted only of households, hs , and businesses, bs , business revenues would consist of households' purchases of goods and services and its expenses of the wage bill, as well as interest payments. Household revenues would consist of the wage bill and interest receipts, households' expenses would consist of goods and services:

$$(22) \quad \begin{aligned} r_{bs} - e_{bs} &= -(r_{hs} - e_{hs}) = \\ pq - w * emp - int * fv \end{aligned}$$

If either of the two groups wanted to increase their net financial assets, they would have to decrease their expenses relative to their revenues. Households would have to decrease their spending on goods; businesses would have to decrease their spending on wages. Households' reduction in spending would reduce business revenues; business reduction in

⁵Here, int is the implicit interest rate and not the current market rate since a unit might have contracted different kinds of debt with different interest rates in the past.

spending would reduce household revenues. This shows that financial saving is a zero-sum game. A group can only increase its net financial assets when other reduce theirs.

But the act of increasing net financial assets is *not* an act of financing the complementary group's deficit. If households saved more, businesses had less revenues; if businesses wanted to maintain their own expenses on interest payments and wages, they would have to find the finance somewhere. They would either have to reduce their own liquidity, sell some other financial assets or increase their debts. But whether they want to and whether somebody is willing to give them credit is a completely different question.

3.3 Credit and Financial Markets

Since aggregate net financial assets, NFA , are zero, all *gross* financial assets and liabilities have to sum to zero as do changes in net financial assets (global statement):⁶

$$(23) \quad \begin{aligned} 0 &= NFA = M + OFA - L = \\ \Delta NFA &= \Delta M + \Delta OFA - \Delta L \end{aligned}$$

Financing happens between two groups in the economy. When money is lent, a group of lenders, *lender*, exchanges money for other financial assets and its complementary group, the borrowers, *borrower*, increase their money holdings and their liabilities (relational statement):

$$(24) \quad \begin{aligned} \Delta ofa_{lender} - \Delta m_{lender} &= \Delta m_{borrower} - \Delta l_{borrower} = \\ \Delta nfa_{lender} &= \Delta nfa_{borrower} = 0 \end{aligned}$$

Financing has as such no bearing on the $I = S$ accounting relationship and does not occur there. Further, the ability of lenders to lend does not depend on their amount of saving but on whether they hold money or not or whether they are able to create money. Whether a loan is made depends on the willingness of money holders to part with some of their money and hold other financial assets, i.e. their liquidity preference.

Exogenous Money and Endogenous Credit

One might assume that loanable funds theory might be valid in a world in which money is exogenously given, for instance when the money stock is fixed, \bar{M} , (which can be the case with a fixed supply of silver or gold). But this is not the case. Even if the stock of money was fixed and thus exogenous, both credit and expenses can be infinite since *credit* is endogenous.

To see that, note that a unit changes its money holdings once it makes a payment:

$$(25) \quad \Delta m = -\Delta ofa + \Delta l + r - e$$

⁶This is only strictly true if all money also constituted a financial asset to which a liability corresponds. If the stock of money consisted of metal (gold or silver), the economy's aggregate net financial assets would be equal to the stock of monetized metals.

With a fixed money stock, a unit's (or group's) payment is necessarily its complementary group's receipt:⁷

$$(26) \quad \Delta m_g = \Delta m_{cg}$$

If we sum every transaction s over all transactions T in one period, we see that a given stock of money does not limit the number of total transactions. Total transactions are only limited by the frequency in which the stock of money changes hands, i.e. by the velocity of money:

$$(27) \quad \sum_{s=1}^T \Delta \overline{M}_s = \sum_{s=1}^T \Delta l_s = \sum_{s=1}^T \Delta of a_s$$

When units provide credit in the form of money, they decrease their money holdings and increase their other financial assets; while debtors' money holdings increase as do their liabilities. On the other hand, if debtors decrease their liabilities by paying off their creditors, creditors' money holdings increase and debtors' money holdings decrease. With each credit given or debt paid off, money changes hands and other financial assets as well as liabilities change.

The total stock of other financial assets and liabilities at the beginning of the period, t , changes by the frequency by which money has changed hands:

$$(28) \quad \sum_{s=1}^T \Delta \overline{M}_s = OFA_t + \Delta OFA_t = L_t + \Delta L_t$$

$$OFA_{t+1} = L_{t+1}$$

In principle, with T going to infinity, the stock of other financial assets (and thus necessarily also of liabilities) could also go to infinity (if debt is not reduced). If debt is reduced, money only has to change hands often enough and all liabilities and thus other financial assets could become zero.

Thus, the amount of debts and financial assets at any point does *not* depend on the stock of money, \overline{M} , but on the frequency of its changing hands, $\sum_{s=1}^T \Delta \overline{M}_s$. Thus, in principle, the amount of money could reach zero while - when it is exchanged often enough - the amount of debts and financial assets could go to infinity.

The same reasoning is also valid (and more frequently discussed) for expenses: The amount of expenses in a period do not depend on the stock of money but on the frequency at which it changes hands. Expenses and revenues have just to be added to equation (27):

$$(29) \quad \sum_{s=1}^T \Delta \overline{M}_s = \sum_{s=1}^T (\Delta l_s - e_s) = \sum_{s=1}^T (\Delta of a_s - r_s)$$

⁷with endogenous money in which a bank creates new money, the bank does not reduce its money holdings since it creates money anew.

An infinity of expenses, $\sum_{s=1}^T e_s = E$, could be financed with a stock of money approaching zero.

Wicksell already summarized this nicely in 1898 (Wicksell, 1936):

“No matter how great the economic complications, money must always be somewhere; and provided that it is not at the actual moment being employed in effecting a payment, it can be lent by its present owner to some other person, who can complete a payment with its aid. So there is no “theoretical” limit to the velocity of circulation of money other than that provided by its physical mobility or speed of transport. Were it possible to increase these to an unlimited extent a very large proportion of all the world’s business of exchange and lending could actually be paid for in cash by sending backwards and forwards (very rapidly, it is true) one single ten-mark piece (or, for all I care, one single ten-pfennig piece). [...]

For the necessary quantity of money can be supposed to be infinitely small, and its (virtual) velocity of circulation to be infinitely great. Then its power of making payments would be represented mathematically by the expression $0 \times \infty$. The bills might be finally discharged by an indefinitely small sum of money being passed round among the interested parties, paying off at each step the outstanding debt.” (1936, p. 60/65)

Thus, the amount of lending and expenses (and thus borrowing and revenues) does not depend on the stock of money but it depends on the willingness of those holding money to either spend or lend it. No money needs to be newly created to show that it always depends on money holders’ willingness to part with their money (their liquidity preference) for credit to be created. Further, it is important to note that credit is always endogenous and that there is no inherent limit to the expansion of credit even when the stock of money is fixed. Thus, credit is always endogenous, even if money is not.

3.4 Interim Results

Using those basic accounting rules, a central fallacy of loanable funds theorists can be tackled, namely that aggregate *financial* saving can be positive and add to some fund out of which an expense can be financed. Mankiw and Ball (1995) write - based, as they claim, on “simple (and irrefutable) accounting identities” (1995, p. 97):

“Budget deficits have many effects. But they all follow from a single initial effect: deficits reduce national saving. National saving is the sum of private saving (the after-tax income that households save rather than consume) and public saving (the tax revenue that the government saves rather than spends). When the government runs a budget deficit, public saving is negative, which reduces national saving below private saving. [...] A decline in national saving reduces the supply of loans available to private borrowers, which pushes up the interest rate (the price of a loan)” (1995, p. 96-98)

By that statement, Mankiw and Ball commit the fallacy of composition that aggregate *financial* saving - which they identify with the supply of loans - can be different from zero.

To show that, we will reason within a closed economy and thus leave out the current account balance vis-à-vis foreigners. Equation (20) shows that national saving can only change when investment changes. A group's deficit (be it the government, households, businesses etc.) can as such *never* reduce aggregate saving. All deficits and surpluses add to zero - whatever the absolute amount of a group's financial saving.

If one defines the government sector (*gov*), the household sector (*hs*) and the business sector (*bs*) as the groups that exist in the economy, one can write aggregate *financial* saving as:

$$\begin{aligned}
 (30) \qquad &= \Delta nfa_{gov} + \Delta nfa_{hs} + \Delta nfa_{bs} \\
 &= \Delta NFA = 0
 \end{aligned}$$

A group's deficit would only reduce national saving if the deficit somehow reduced aggregate investment. But that would be an argument about behavior and could not be derived from accounting rules.

Further, public saving does *not* need to be negative when the government runs deficits. When the government invests the amount of its deficit or even more, its saving is higher or equal to zero: $s_{gov} = i_{gov} - \Delta nfa_{gov} \geq 0$. The government can only reduce national saving (as can the private sector) if depreciation of its capital stock is higher than its current gross investment.

One might make the point that government deficits cause aggregate investment to fall, e.g. due to Ricardian equivalence. But this is an argument that would have to be based on behavioral assumptions, not on "simple (and irrefutable) accounting identities".

Second, if one assumes an open economy, a government deficit *might* lead to a decline of national saving if *a)* it led to a national current account deficit *and b)* the induced national current account deficit was higher than government investment. Again, this is not a statement that could be made based on accounting identities but would need some argument about economic units' behavior.

The change in national saving has no necessary accounting relation to the supply of loans available to private borrowers. If firms only used their own liquidity to finance their investment (e.g. because household financial saving would be zero and all wages and interest paid to households came back in the form of business revenues), national saving (= national investment) would increase without any change in either the supply or demand for credit.

On the other hand, if the government reduced its deficit, the rest of the economy would necessarily have lower revenues and would thus need to *demand* more loans if it wanted to maintain its own expenses and had no money on its own. The consequences of this will be discussed in more detail in the next section.

4 Inconsistent Plans and Changes in Interest and Aggregate Income

It is true, as Ohlin (1937a) remarked in his discussion with Keynes, that one needs behavioral assumptions to understand the dynamics of the economy and that accounting - while necessary - will not be sufficient. Thus, one has to make explicit the ex ante plans that economic units have and how those plans interact.

It will be shown that an increase in desired saving - excess saving - means that planned expenses are lower than expected revenues, i.e. revenue expectations will be disappointed. This leads to an excess supply of goods and services and/or labor which will lower prices and production. On the other hand, excess saving is not likely to lead to an excess supply of money on financial markets which would be needed for interest rates to decline. Excess saving could lead to an increase, a decrease or no change at all in interest rates since the direction interest rates take depends on units' portfolio decisions, not their spending decisions.

The following analysis is inspired by Patinkin (1958) with the exception that it is not assumed that full employment holds.

4.1 Plans, Expectations, Supply and Demand

In the following discussion, the assumption will be made that units are able to decide about their expenses but not about their revenues. This implies that they can only *expect* their revenues (and the corresponding receipts). This assumption means that the economy is dominated by buyer's markets, i.e. buyers determine the amount of revenues sellers can realize (Stützel, 1979, p. 183-193). This assumption makes sure that the aggregate demand plans determine actual purchases.

Then, planned expenses, e^{pl} , become effective in determining actual expenses, e . Since the sum of all actual revenues is necessarily equal to the sum of all actual expenses, planned expenses also determine actual revenues:

$$(31) \quad \sum e_i^{pl} = E^{pl} = E = R$$

Remember that expenses and revenues contain wage income, capital income (interest rates and dividends), the income from the sale of goods and services and transfers. Thus, expense plans and revenue expectations are plans and expectations concerning those variables. This is where supply and demand analysis can be introduced in the expense/revenue framework. For simplicity, we will only look at the purchase and sale of goods and services, the employment of labor and interest rates and leave taxes and transfers out at this point.

Units plan to demand a certain quantity of goods or services, q^d at a certain price p ; they plan to demand labor, emp , at a wage w and they plan to pay a certain amount of interest, equal to $(int * fv)^{pl}$. A unit's expense plans can thus be written:

$$(32) \quad e^{pl} = pq^d + w * emp^d + (int * fv)^{pl}$$

On the other hand, units can expect revenues on their goods and services supplied at a certain price, their labor supplied at a certain wage and their receipts of interest payments:

$$(33) \quad r^{exp} = pq^s + w * emp^s + (int * fv)^{exp}$$

Summing over all planned expenses and expected revenues, with P being a price index for goods and services and W the average wage, one can write

$$(34) \quad \begin{aligned} E^{pl} &= PQ^d + W * EMP^d + (INT * FV)^{pl} \\ R^{exp} &= PQ^s + W * EMP^s + (INT * FV)^{exp} \end{aligned}$$

Prices change when there is excess demand on some markets. The standard assumption will be made that if excess demand is positive, prices will increase; when it is negative (i.e. when there is excess supply) prices will decrease over time t :

$$(35) \quad \begin{aligned} \frac{\partial P}{\partial t} &= F_Q(Q^d - Q^s) \\ \frac{\partial W}{\partial t} &= F_{EMP}(EMP^d - EMP^s) \\ F'_Q &= F'_{EMP} > 0 \end{aligned}$$

Equilibrium in all markets is reached if there is no excess demand which implies that expectations are fulfilled and plans realized:

$$(36) \quad \begin{aligned} 0 &= P(Q^d - Q^s) = \\ &W(EMP^d - EMP^s) = 0 \\ &(INT * FV)^{pl} - (INT * FV)^{exp} \end{aligned}$$

Equilibrium on the markets for goods, services and labor and the absence of default implies that expected revenues are equal to planned expenses and that thus the sum of plans to save financially sum to zero:

$$(37) \quad R^{exp} - E^{pl} = \Delta NFA^{pl} = 0$$

It is important to note that this condition does not imply that all groups' net financial saving in a period is zero. It means that a groups' net financial saving is willingly matched by its complementary group:

$$\begin{aligned}
 (38) \quad & r_g^{exp} - e_g^{pl} = -(r_{cg}^{exp} - e_{cg}^{pl}) = \\
 & \Delta nfa_g^{pl} = -\Delta nfa_{cg}^{pl} \\
 & \Rightarrow r_g^{exp} + r_{cg}^{exp} = e_g^{pl} + e_{cg}^{pl} = \\
 & R^{exp} = E^{pl}
 \end{aligned}$$

Further, this condition - by the simple aggregate accounting rule (20) - also implies that planned saving is equal to planned investment:

$$(39) \quad S^{pl} \equiv \Delta NFA^{pl} + I^{pl} = 0 + I^{pl} = I^{pl}$$

Again, note that this does not imply in any way that any group's financial saving - for instance, households' financial saving - is equal to aggregate investment. This condition just implies that financial saving plans are mutually consistent.

4.2 Saving Disequilibria and the Paradox of Thrift

What happens in disequilibrium? Suppose some group is willing to increase its net financial assets more than its complementary group is willing to accept. That could be the case because

- a) the government wants to balance its books and thereby either cuts expenses or increases taxes
- b) the household sector wants to increase its financial saving for old age or has to decrease its debts and thus cuts its consumption expenses
- c) the corporate sector wants to increase its profits and cuts wages and/or employment
- d) the foreign sector wants to decrease its imports or its other expenses on capital, wage or transfer income

Either way, if the complementary group - the rest of the economy - does not expect this, the sum of planned expenses will be lower than the sum of expected revenues; planned net financial saving higher than zero and thus planned saving higher than planned investment:

$$\begin{aligned}
 (40) \quad & E^{pl} < R^{exp} \\
 & \Rightarrow \Delta NFA^{pl} > 0 \\
 & \Rightarrow S^{pl} > I^{pl}
 \end{aligned}$$

A disequilibrium in financial saving (excess saving) *necessarily* means that there is an excess supply on the goods and services and/or labor markets (and/or default):

$$(41) \quad \begin{aligned} E^{pl} < R^{exp} = \\ P(Q^d - Q^s) + W(EMP^d - EMP^s) + (INT * FV)^{pl} - (INT * FV)^{exp} < 0 \end{aligned}$$

For illustration, let us play through the case in which households unexpectedly reduce their consumption expenses in order to increase their net financial assets (this has also been described by Bibow (2001), Schmidt (2012), Lautenbach (1952) and Keynes (1963)). Let us assume that there are only two sectors, a household sector, *hs*, and a business sector *bs*. Let us further assume that there is full employment. There is neither a government nor a central bank that could intervene. Thus, the following discussion takes place in as perfect a market economy as one can imagine.

In the first instance, households' higher saving leads to an excess supply on consumption goods since the amount of actually purchased consumption goods q_c is lower than expected sales, q_c^s .

The excess supply on goods markets has four consequences: businesses' actual revenues fall short of their expected revenues, their actual receipts (cash flow) fall short of expected receipts, their actual net financial saving is lower than their expected net financial saving, and their actual investment is higher than their planned investment due to the accumulation of higher unplanned inventories (unsold consumption goods):

$$(42) \quad \begin{aligned} p(q_c - q_c^s) = \\ r_{bs} < r_{bs}^{exp} = \\ \Delta m_{bs} < \Delta m_{bs}^{exp} = \\ \Delta nfa_{bs} < \Delta nfa_{bs}^{exp} = \\ i > i^{pl} \end{aligned}$$

By the lower than expected revenues and cash flows businesses' risk increases: they now have less means to service their debts, $int * fv$, and to pay their employees, $w * emp$.

In reaction to the disappointment to their expectations, producers of consumption goods are likely to cut employment and/or wages and spending on new investment goods. They will do so for two reasons: first, with lower actual than expected sales, firms have accumulated unplanned inventories. They will thus need less labor and lower production capacities for their production. Second, the higher default risk means that they will try to cut all kinds of expenses in order to make interest payments and avoid default.

Consequently, the initial excess supply in the market for consumption goods is likely to lead to excess supplies of labor and investment goods. Excess supply for investment goods will intensify the excess supply of labor since investment goods producers will face the same decline in revenues, cash flows etc. that consumption goods producers suffer from. They are thus also likely to try to reduce wage costs to avoid default.

Further, in the period in which households have saved, aggregate income stays the same since businesses have already produced their goods: lower consumption will be matched by higher inventories, so that:

$$(43) \quad \Delta Y = -\Delta C + \Delta I$$

However, in the following period, firms will reduce their production which will also lead to lower income. Thus, initial higher saving by one group is likely to lead to a fall in the group's income and in aggregate income. But will income stay the same at a lower level? That depends on the behaviour of households.

When firms reduce wages and/or employment, households's income is reduced in line with their initial reduction in consumption. Their initial plan to increase their net financial assets has thus not materialized. This is the paradox of thrift in which higher desired saving does not lead to higher saving but lower income. When households accept that they are not able to increase their net financial saving, they will maintain their consumption spending on a now reduced level and a new equilibrium with lower income, lower wages and prices (due to the initial excess supply) will take place.

But when households still want to increase their net financial saving, they will react to the fall in their income by cutting their consumption still further which again leads to excess supply for consumption goods, higher default risk for businesses etc. As long as neither households nor firms are willing or able to accept lower financial saving, expenses and revenues and thus income tend to fall, in extremis until zero.

This vicious cycle is especially likely when households and/or firms have to reduce their debts in order to avoid default. Households might wish to maintain their consumption level but are not able to do so because they have to repay debt; the same goes for firms which might want to maintain employment but risk default if they do. The higher the debt service relative to revenues is, the more will revenues and production fall.

In conclusion, the inconsistency in financial saving plans leads - excess saving - leads to excess supplies on the goods and/or labor markets which are likely to lead to excess supplies on other markets due to an increase in default risk. There is thus no ex ante equilibrating process which stops an initial excess supply on some markets to spill over to other markets. This in turn leads to lower production.

Until now, financial conditions and the supply and demand for money and financial assets have not been discussed. The consequences for financial markets and interest rates of an inconsistency in financial saving plans will be discussed in the next section.

4.3 How do Interest Rates Change?

Interest rates could increase, decrease or stay the same when there is excess supply on the goods and labor markets due to excess saving. In order to see that, units' portfolio plans have to be analyzed. In the following, we will assume an exogenously given stock

of money and no banks. But the conclusions drawn would not change with money being endogenous and banks acting as creators of money.

An economic unit can make plans about the allocation of its portfolio, i.e. about how much of its financial assets it holds in the form of money or other financial assets and how much debt it wants to owe:

$$(44) \quad m^{pl} = -ofa^{pl} + l^{pl}$$

Both the expression ofa and l are values. All financial assets (which are liabilities for other units) have a price p_{fa} and a face value, fv , so that:

$$(45) \quad ofa \equiv l \equiv p_{fa} * fv$$

When the actual holdings of money, other financial assets or liabilities and planned holdings diverge, units supply or demand one of those items in the period:

$$(46) \quad \begin{aligned} m^{pl} - m &= \Delta m^{pl} \\ ofa^{pl} - ofa &= \Delta ofa^{pl} = p_{fa} * \Delta fv^{pl} \\ l^{pl} - l &= \Delta l^{pl} = p_{fa} * \Delta fv^{pl} \end{aligned}$$

If the difference between planned and actual holdings is positive, units demand one of the items ($\Delta m^d; p_{fa} * \Delta fv^d$); if it is negative, units supply them ($\Delta m^s; p_{fa} * \Delta fv^s$).

Like on goods and labor markets, when there is an excess demand for other financial assets, their price changes (P_{pa} being an index of financial asset prices):

$$(47) \quad \begin{aligned} \frac{\partial P_{fa}}{\partial t} &= F_{fa}(\Delta FV^d - \Delta FV^s) \\ F'_{fa} &> 0 \end{aligned}$$

When financial asset prices increase, interest rates decrease and vice versa. Thus, an excess supply of other financial assets leads to an increase in interest rates and an excess demand to a decrease of interest rates. Given this, what is likely to happen to interest rates when a group plans to increase its net financial assets?

First, excess saving means an excess of the sum of planned financial saving over planned financial dissaving, i.e. $\Delta NFA > 0$. In terms of the financial account, this means that there is an excess of plans to change financial assets over liabilities, i.e.:

$$(48) \quad \Delta NFA^{pl} = \Delta FA^{pl} - \Delta L^{pl} > 0$$

Using (46), it follows that this equation can be rewritten thus:

$$(49) \quad \Delta NFA^{pl} = \Delta M^d - \Delta M^s + P_{fa}(\Delta FV^d - \Delta FV^s) > 0$$

This condition does *not* make sure that interest rates decrease when there is excess saving. Where the interest rate goes when there is excess saving depends on the portfolio reactions of the different units to the cut in revenues that excess saving implies. Interest rates would only decrease (P_{fa} increase), if there were an excess demand for other financial assets, i.e. $P_{fa}(\Delta FV^d - \Delta FV^s) > 0$. But interest rates could also increase or stay the same.

Let us go through each of the possibilities.

- a) **Interest rates could increase:** Revenue shocks due to excess saving plans increase default risk. Then, potential lenders are less likely to demand the liabilities of potential borrowers. Units that increase their net financial assets by reducing their expenses are more likely to hold their additional net financial assets in the form of money and *not* provide this money to the units whose default risk has increased.

If the units hit by a revenue shock maintained their initial borrowing plans, there would be an excess *supply* of financial assets and thus an *increase* in interest rates (Bernanke et al., 1996; Kalecki, 1937; Stiglitz and Greenwald, 2003).

Formally, this means that the demand for money would have to be sufficiently high so that condition (49) holds:

$$(50) \quad \Delta M^d - \Delta M^s > 0 \text{ and } |\Delta M^d - \Delta M^s| > |P_{fa}(FV^d - FV^s)|$$

- b) **Interest rates could stay the same:** Potential borrowers are likely to change their borrowing plans once their revenues and cash flows are reduced. Since their default risk has increased, they are not likely to maintain their initial borrowing plans since additional borrowing would lead to a higher debt service in the future. Businesses' supply of liabilities would fall in line with households' demand so that excess demand for other financial assets would be zero and interest rates would *not change at all*:

$$(51) \quad P_{fa}(FV^d - FV^s) = 0 \text{ and thus } \Delta M^d - \Delta M^s > 0$$

- c) **Interest rates could decrease:** Debtors might even be willing to reduce their debts - to deleverage - in order to decrease their debt service. The decline in the supply of liabilities would be higher than the decline in lenders' demand so that interest rates would fall:

$$(52) \quad P_{fa}(FV^d - FV^s) > 0 \text{ and } \Delta M^d - \Delta M^s < P_{fa}(FV^d - FV^s)$$

While this fall in interest rates is in line with the prediction of loanable funds theorists, it stems from an altogether different factor, namely the decline in the willingness to borrow, not the increase in the willingness to lend.

Of course, the decisions to lend and borrow also influence the ability and willingness of both households and businesses to further change their expenses. The more businesses need to or are willing to reduce their debts, the more they will reduce their expenses and thus households' revenues. The reduction in debt is likely to be higher, the higher the ratio of the debt service to business revenues is ($int * fv_{bs}/r_{bs}$) because default risk increases with this ratio.

The process of excess saving could also be initiated by units' need to deleverage. If they wanted to reduce their liabilities and did not have a) enough money or b) other financial assets and c) do see their revenues decline, they have to reduce their expenses:

$$(53) \quad -\Delta l = r - e - \Delta fa$$

If the share of units that want to deleverage is high enough, there will be an excess supply of other financial assets since a reduction in liabilities implies a negative supply of other financial assets:⁸

$$(54) \quad \Delta NFA^{pl} = \Delta FA^{pl} - (-\Delta L^{pl}) = P_{fa}(\Delta FV^d - (-\Delta FV^s)) > 0$$

This case is what Koo has termed a "Balance Sheet Recession" (2008) and what Fisher has termed a "debt deflation" 1933. Both approaches - while they differ in detail (see Koo, pages 180-184) - constitute theories of why financial saving plans become inconsistent due to units' need to deleverage and why the paradox of thrift is especially likely to bite in such a situation.

None of the above discussions of interest rates is affected by the existence of banks and endogenous money. While banks can create money when they make loans, they are still bankrupt when their debtors cannot repay. This means that higher default risk by debtors whose revenues fall will lead banks to either increase interest rates to compensate for their higher risk or to ration their loans (with the same effect of lower loans supplied) (Stiglitz and Weiss, 1981). The same goes for every other lender.

All of the above conclusions can of course be applied when any other sector or unit in the economy reduces its expenses more than its complementary group is willing to bear.

To sum up, none of the predictions of loanable funds theory is likely to hold: Income and production are not likely to stay constant but to decline; interest rates might move in every direction but do not necessarily have to fall; and it is not likely that additional loans are provided when there is excess saving.

Loanable funds theorist have to rely on some very unrealistic assumption to reach contrary arguments. This will be discussed in the next section.

⁸A liability is another unit's financial asset. When a unit wants to reduce its liabilities, its supply of liabilities and thus other financial assets is negative.

5 The Likely Root of the Loanable Funds Fallacy: Neo-Classical Growth Models

In the following section, it will be argued that the fallacies loanable funds theory commit might be explainable by the mis-application of some ideas and concepts of neoclassical growth models to the sphere of money and finance. Specifically, the seminal neoclassical growth models will be analyzed, i.e. the Ramsey model (1928), the Solow model (1956) and the Diamond model (1965). Those models are routinely taught in contemporary graduate economics classes (Blanchard and Fischer, 1989; Romer, 1996).

The Solow and Ramsey models are models of real investment only. Financial markets, financial assets and financial saving do not play any role in those models. However, there is a limited saving and investment fund in both models which consists of the *goods* that are produced but not consumed. On the other hand, in the Diamond model, there are financial assets and lending and borrowing take place. However, while the financial sphere plays some role, it is goods which are lent and borrowed. There is no money in the Diamond model.

While the models differ in many respects, they share two important features. First, there is only one good which, for simplicity, will be called “corn”. Corn has three functions: it can be consumed, invested and used as a means of payment since wages and interest payments are made with it. Second, full employment is assumed.

I will first discuss the Solow and Ramsey model. In the Ramsey and Solow model, there are no financial assets and the only way units can save is to increase their tangible assets, i.e. to invest. Given full employment and thus maximum production, there is only a limited amount of corn in each period. If the corn is consumed, it cannot be invested; if it is invested, it cannot be consumed. There is thus a real trade-off between consumption and investment. It does indeed make sense to talk about a limited saving fund which is increased when it not consumed.

However, this trade-off between consumption and investment does not constitute *finance* constraint, but a *resource* constraint (see Kornai (1979) for this distinction). The loanable fund is no fund of money that can be lent and borrowed, but a fund of newly produced goods that can be consumed or invested. It is obvious that such a model cannot be used to analyze any aspect of finance, money and other financial assets since none exist in the model.

Further, “saving” in the models is only an increase in tangible assets. Financial saving is not discussed at all. This is legitimate since only the aggregate economy is analyzed.⁹ Thus, even though a “saving fund” exists in the model, it would be invalid to derive any conclusions about finance and credit from those models.

⁹The Ramsey model is also a model of the aggregate economy since it is only one agent who makes his decisions.

In contrast to Solow and Ramsey, Diamond's model also contains loans, financial assets and thus financial saving. But it will be shown that no conclusions about a real monetary economy can be derived from his model.

In Diamond's model, there are two sectors, the household sector - consisting of young and old households - and the entrepreneur sector. Since there is no money, all payments are made in corn. At the beginning of each period, households receive all the entrepreneur's corn production in the form of wages (the young) and interest (the old).

Young households lend the corn they do not consume to entrepreneurs. They make a one-period loan and expect the loan to be repaid with interest once they are old (households live for two periods). On the "capital" market, the loanable funds are not money but capital goods.

Stiglitz and Greenwald (2003) make the logic of the Diamond mode clear:

"We begin our analysis with a simple model of a corn economy, a particular case of an economy without money. At the end of each harvest, farmers must decide how much seed they want to plant next year, and how much seed they want to consume today. Some farmers will want to save (not consume) more than they want to plant. Thus is created a capital market - a market where those with excess demand for seed are brought together with those with excess supply. However, in this seed market corn today is traded for a promise of more corn tomorrow." (2003, p. 105)

Like in the Solow and Ramsey model, the full employment assumption makes sure that there is actually a limited saving fund and thus a trade-off between consumption and investment. But this is again only a resource, not a financing constraint. However, since there are two sectors, there could possibly be a coordination problem between households and entrepreneurs.

The problem with Diamond's model is that those coordination problems and thus inconsistencies in ex ante plans are assumed away.

First, he *assumes* that households always lend all their non-consumed corn to entrepreneurs, so that:

$$(55) \quad \Delta nfa_{hs} = \Delta ofa_{hs}^d$$

He makes this assumption by identifying household saving and the supply of capital (=corn) (1965, p. 1131), i.e. he ex ante assumes households to make a particular portfolio decision so that

$$(56) \quad s_{hs} = \Delta ofa_{hs}^d$$

Although no money or bonds are present in the model, households could still choose between holding loans or corn, i.e. not to lend the corn to businesses. Diamond does not discuss this possibility. His specific portfolio assumption is thus implicit.

Second, he assumes that entrepreneurs pay out all of their corn and always borrow and invest exactly the amount households are willing to lend (and save) (1965, p. 1130), so that:

$$(57) \quad i_{bs} = \Delta l_{bs}^s = \Delta ofa_{hs}^d = s_{hs}$$

Only because of those two assumptions, *household financial* saving is equal to *business investment*.

However, this has an unintended consequence, namely that the aggregate excess demand for corn is zero. When households supply by assumption all corn not consumed and firms demand by assumption all corn not consumed, prices (interest rates) cannot play any role since supply and demand are assumed to be equal ex ante. This is the consequence of limiting households' portfolio choice and assuming businesses to simply demand all the corn households supply.

But with excess demand being zero, interest rates cannot change (Schmidt (2009) makes a similar argument). How can interest rates change, then? The interest rate on the one period loans will be determined by the technically given marginal productivity of capital. The more corn can be lent and invested, the lower is the marginal productivity of capital and thus the rate of return businesses can pay in the form of corn to households.

Supply and demand plans could only differ if households' and businesses' portfolio plans were not fixed ex ante. If households had the choice to save either in the form of corn or of loans, and businesses were allowed not to pay out all of their corn, aggregate excess demand could differ from zero.

But why should households and businesses keep their corn? Because there is risk. In lending their corn for the promise of more corn in the next period, households trust businesses not to consume or mis-invest the corn; on the other hand, by paying out all corn, businesses trust households that they are willing to lend the corn once businesses need it.

Without risk and thus different incentives and expectations of the different units, there can be no inconsistency of plans. Without such an inconsistency, Diamond's model collapses into a one-agent model - like the Ramsey model (1928) - in which Robinson plants, produces, consumes and invests the corn and thinks about its optimal consumption and investment (saving) over the future.

One can of course build risk and informational asymmetries into such a model. Households could keep rather than lend their corn, entrepreneurs could keep some of their corn in order to directly use it for investment. Bernanke and Gertler (1989) do just that and use the basic structure of the Diamond model.

Due to risk, the market for credit could play a role on its own by either raising or lowering the interest rate relative to the marginal productivity of capital. Such models have been developed by Kiyotaki and Moore (1997) or by Stiglitz and Greenwald (2003). Hubbard provides a good overview (Hubbard, 1998).

However, common to those models based on neo-classical growth theory which analyze the role of credit more fully, it is still capital *goods* which are lent and borrowed, not money. The loanable funds are thus always literally funds that are increased by household saving. The problem then is how to coordinate the transfer of capital goods via the capital market to their most efficient use. But the idea of such a limited saving fund is not applicable to an economy in which *money* is lent and borrowed.

Since money does not vanish by being consumed and invested but stays in circulation and can in principle finance *any* amount of spending in a period, those models cannot be applied to a world with money.

Conclusion

The paper has shown that saving does not finance investment. No saving and abstention of consumption is needed for any lending to take place since lending and borrowing money are pure financial transactions that only affect *gross* financial assets and liabilities.

This result has both important analytical as well as political consequences. For instance, Bernanke (2005) argued in his “Global Saving Glut” hypothesis that south-east Asian and oil-exporting current account surplus countries financed US housing investment, i.e. that their increase in *net* financial assets was equal to the provision of money via financial markets to the US.

While those current account surplus countries invested some of their dollar receipts from current account surpluses in the US, the largest creditors were European banks, especially from Germany, France, the UK and Switzerland (Acharya and Schnabl, 2010; Shin, 2012; Borio and Disyatat, 2011). They provided the *gross* means which are not visible in current account balances. Neither south-east asian countries nor oil-exporters were among the lenders that suffered the biggest losses in the US subprime crisis, but the European banks. Users of the loanable funds view could thus not foresee the risks that large gross flows and gross international financial claims created in the run-up to the financial crisis.

Similarly, Sinn’s (2010) thesis that Germans exported their savings and could not use them at home is hard to accommodate with simple accounting rules. First, while German banks were indeed among the biggest creditors of today’s crisis countries, the second biggest creditors are French banks although France had a roughly balanced current account balance since 1999 (Waysand et al., 2010; Lindner, 2012). Second, the money given by German banks to foreigners most often came back to Germany in the form of sales proceeds earned by German exporters. This money could then be relent and gave foreign importers the means to purchase German goods etc. Sinn argues that Germany lost liquidity while the exact opposite was (and is) the case (for details on Sinn’s arguments and a thorough critique, see Horn and Lindner (2011)).

As far as policy is concerned, the doctrine of austerity is related to the doctrine that government saving has to be reduced for private investment to increase. In many countries

that pursue austerity policies, governments are hardly able to reduce their deficits since spending and thus taxes by their complementary group fall due to their own need to deleverage.

Thus, the present paper has not only criticized a core belief held by many economists but also tried to sketch an alternative on the basis of common accounting rules and widely accepted behavioral assumptions. The hope is that such a kind of reasoning will be more widely used in future economic research and inform economic policy.

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