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THE THEORY OF CREDIT AND MACRO-ECONOMIC STABILITY

Joseph E. Stiglitz

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ABSTRACT

In the aftermath of the Great Recession, there is a growing consensus, even among central bank officials, concerning the limitations of monetary policy. This paper provides an explanation for the ineffectiveness of monetary policy, and in doing so provides a new framework for thinking about monetary policy and macro-economic activity. What matters is not so much the money supply or the T-bill interest rate, but the availability of credit, and the terms at which credit is made available. The latter variables may not move in tandem with the former. In particular, the spread between the T bill rate and the lending rate may increase, so even as the T bill rate decreases, the lending rate increases. An increase in credit availability may not lead to more spending on produced goods, but increased prices for land or other fixed assets; it can go to increased margins associated with increases in speculative activity; or it may go to spending abroad rather than at home. The paper explains the inadequacy of theories based on the zero low bound, and argues that the ineffectiveness of monetary policy is more related to the multiple alternative uses—beyond the purchase of domestically produced goods—of additional liquidity and to its adverse distributional consequences. The paper shows that while monetary policy is less effective than has been widely presumed, it is also more distortionary, identifying several distinct distortions.

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A data appendix is available at http://www.nber.org/data-appendix/w22837

The Theory of Credit and Macro-economic Stability

Joseph Stiglitz[1]

The post 2008 world has been one dominated by monetary policy, as politics and ideology—and sometimes financial markets—constrain the use of fiscal policy. But in spite of massive increases in the balance sheets of key central banks –the Federal Reserve's reaching 25% (2016) percent of GDP, Japan, 82% (2016) percent, the Bank of England 21% (2016) per cent, and the ECB, late to embark on quantitative easing, but as of 2016 already over 31% percent of GDP----the best that can be said is that the monetary policy prevented matters from becoming worse: growth in GDP in the advanced countries was an anemic 2% percent.

The growth in base money has become disjoint with the growth in the economies. Figure 1 shows the growth in central bank assets and the growth in real GDP for each of the four countries. Rather than GDP growing proportionate to the growth of the central bank balance sheet, the figure shows significant variability in the ratio of central bank assets to GDP, and especially large changes in the money supply being associated with small changes in nominal GDP in recent years in the US.

A simple regression shows a very low correlation in recent years, weaker than in the period immediately after World War II. This weak relationship appears robust to a variety of specifications, including variable lags and

[1] University Professor, Columbia University. The author is indebted to the Institute for New Economic Thinking for financial support, and to Martin Guzman and Andrew Kosenko, for comments and suggestions. This paper represents a summary of my research in this area and hence the disproportionate number of references to my earlier work.

different measures of money (e.g. the Fed's balance sheet or more standard measures of M2—see figure 2.) These results naturally raise the question: where is the extra liquidity provided by the Fed going? What's happening? Standard theory suggests putting more money into people's pockets should lead to more spending, leading either to higher prices or greater output. If this isn't happening, it suggests a fundamental flaw with standard formulations of monetary theory.

The absence of a clear link between money (however measured) and output (nominal or real) has led naturally to a shift of attention of monetary authorities away from quantitative measures (base money, M2, etc.) to a focus on interest rates. But even here, without further massaging of the data, the relationship is weak. The Appendix discusses the weak relationship between output (nominal and real) and money supply and interest rates (nominal and real). Our empirical investigation suggests, moreover, that the relationship has not been stable over time. In particular, the relationship between money and output has become weaker in the last quarter of a century. As the analysis below makes clear, this should not come as a complete surprise: there have been large changes in institutional arrangements, and one might have expected such institutional changes to be reflected in the relationships discussed in the appendices.

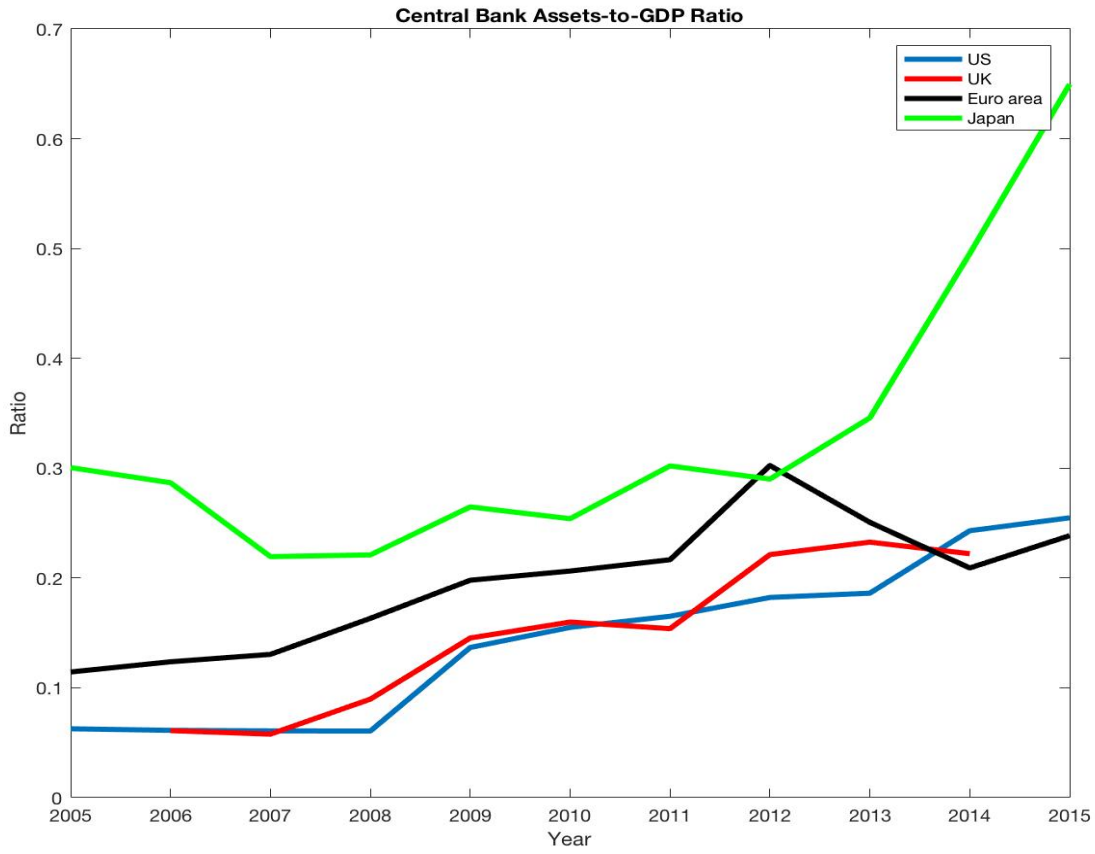

Figure 1

Ratio of central bank assets to GDP has varied markedly[2]

In the aftermath of the Great Recession, there is a growing consensus, even among central bank officials, concerning the limitations of monetary policy. Central banks may have prevented another Great Depression, but they have not restored the economy to robust growth. Our analysis is suggestive that this experience sheds broader light on the limitations of monetary policy.

[2] All data in this paper was obtained from the Federal Reserve Economic Data base (FRED), available at https://fred.stlouisfed.org/.

This paper provides an explanation for this extra-ordinary ineffectiveness of monetary policy, and in doing so provides a new framework for thinking about money and finance.

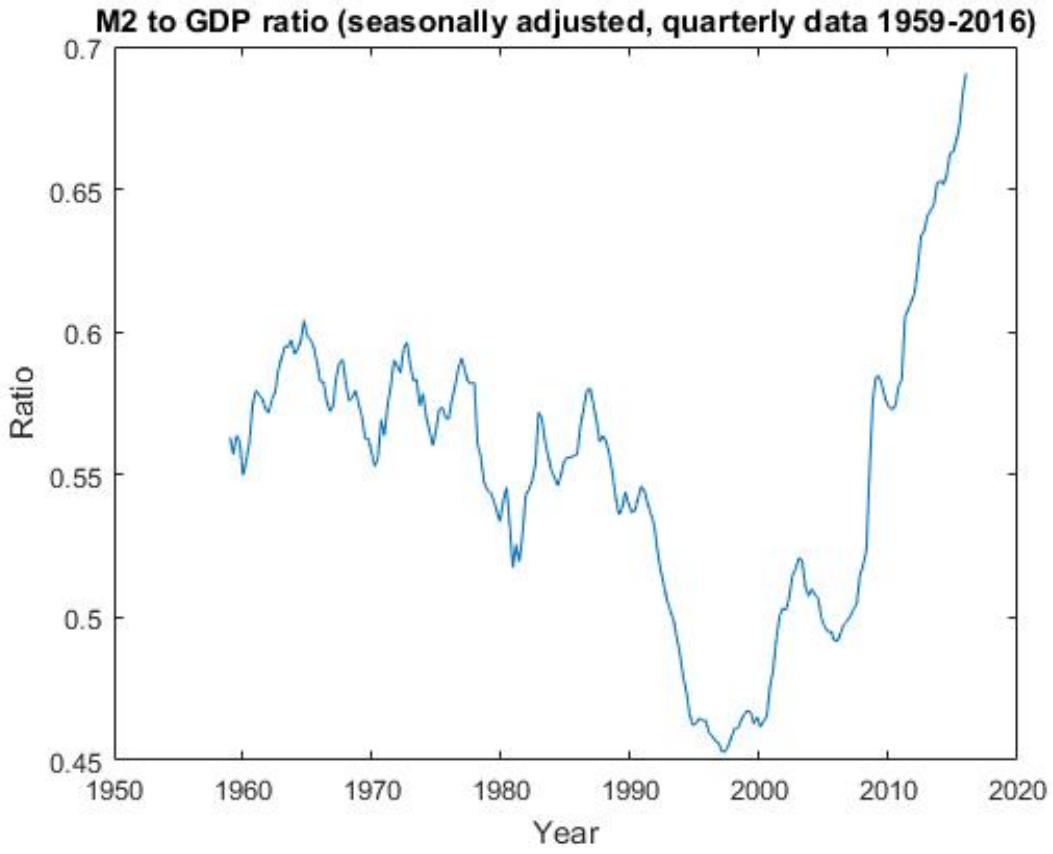

Figure 2.

Figure 2. M2 to GDP ratio. It is obvious that this too has exhibited enormous variability

The second part of the paper builds on the insights of part I and shows how advances in technology allow for the creation of an electronic monetary

system which enables better macro-economic management and a greater share of the rents associated with "money," that is, with the payments system, to be captured for the public treasury.

Part I. Towards a New Theory of Money and Credit[3]

Standard modern monetary theory is based on the hypothesis that the T-bill rate is the central variable in controlling the economy and that the money supply, which the government controls, enables the government to regulate the T-bill rate.

Prevailing economic doctrines earlier argued that there was a simple link between the supply of money (say M_2), which the government could control, and the value of nominal GDP, p (the price level) x Q (real output), described by the equation

(1) $MV \equiv pQ$

where V is the velocity of circulation. (1) is essentially a definition of the velocity of circulation. Monetarism translated (1) from a definition into an empirical hypothesis, arguing that V was constant. This meant that nominal income and the money supply moved in proportion.

Monetarists like Milton Friedman claimed further that (at least over the long run) Q was fixed at full employment, so that an increase in M would lead to a proportionate increase in Q. Shortly after these monetarism doctrines became fashionable, especially in central banks, the links between money

[3] This section represents a development of ideas earlier presented in Greenwald and Stiglitz (2003)

supply (in virtually any measure), and the variables describing the economy (income, or even (real) interest rates) seemed to become tenuous. The velocity of circulation was evidently not a constant. Of course, there never had been a theory explaining why it should be.

Even before this, Keynesians had argued that V was a function of the interest rate. An increase in M is split in three ways, an increase in p, an increase in Q, and a decrease in velocity, with the exact division depending on the relevant elasticities (e.g. the interest elasticity of the demand for money, of investment, and of consumption.)

But beginning in the 1980's velocity was not only not constant, it did not appear to be even a stable function of the interest rate—not a surprise, given as we have noted the large institutional changes going on in the financial sector (such as the creation of money market funds and the abolition of many regulations.) The natural response was a switch from a focus on the quantity of money to the interest rate. But while this experience should have led to a deeper rethinking of the premises of monetary theory, it did not.

Prevailing theories also held that monetary policy provided the best (most effective, least distortionary) regulator of the economy, and that the way it did this was through adjusting the interest rate. A lowering of the interest rate led to more consumption and investment. In an open economy, it led to a lower exchange rate, which led to more exports. The extra-ordinary ineffectiveness of monetary policy to restore the economy to full economy in the aftermath of the Great Recession has led to a modification of the standard theory: monetary policy is the instrument of choice so long as the economy is above the zero lower bound; and to the extent that the zero lower bound can be breached, it should be.

This paper questions the primacy given to monetary policy, suggesting that the problem is not the zero lower bound, but a host of other limitations—effects of monetary policy which were given short shrift. Most fundamentally, we argue that standard theory has given too much attention to the interest rate and too little attention to the primary mechanism through which monetary policy affects the economy, the quantity and terms (including the non-price terms) at which *credit* is available. In normal times, money and credit represent two sides of a bank's balance sheet, so they may be highly correlated. But more generally, and especially in crises, credit may be only weakly related either to the supply of money, or even the T-bill interest rate. This weak link—and not the zero lower bound-- helps explain the ineffectiveness of monetary policy at certain times such as the post-2008 world. We argue further that the expansion of credit itself is weakly linked to GDP, with increases in credit going towards multiple uses other than an increase in the demand for produced goods—most notably, towards the acquisition of assets such as land.

After setting out the basic argument for the focus on credit in section 1.1., we turn to the determinants of the supply of credit—primarily through the banking system (section 1.2), observing that changes in monetary policy may be limited in overcoming other changes in the determinants of credit availability. Section 1.3 focuses on the demand for credit, noting that there are many other uses to which credit can be put other than an increased demand for produced goods. Section 1.4. then turns to a more expansive explanation of the ineffectiveness of monetary policy. Section 1.5. explains that the distortionary effects of monetary policy may be far greater than earlier analyses have assumed; for instance, the conventional use of an

aggregative model hides intersectoral distortions. Section 1.6. argues, by the same token, that there may be serious adverse distributional effects which cannot be ignored, and which contribute to the ineffectiveness of monetary policy. Section 1.7 re-examines these issues from the perspective of an open economy, explaining why monetary policy may be more or less effective, and more or less distortionary, with a different set of distributive effects.

The analysis of the relative ineffectiveness of monetary policy provides the background for part 2, where we show how a move to an electronic banking system, combined with a direct focus on credit availability, and the use of new monetary instruments described there, can increase the effectiveness of macro-economic management, even in an open economy.

1.1. The importance of credit—not money

In earlier work, Greenwald and Stiglitz (1991, 2003) argued that what matters for the level of macro-economic activity was neither the supply of money (the quantity variable upon which monetarism was focused) or the T-bill rate (the rate of interest which the government had to pay on its short term bonds, and the focus of recent monetary policy) but the *availability* of credit and the *terms* at which credit is available. They thus criticized standard monetary theory in terms of its theory of the determination of the lending rate, the relevance of the T bill rate, and the assumption that credit markets always clear.

In the standard model, the interest rate is determined by the intersection of the demand and supply for *money.* Government controls the supply of money. In that model, the demand for money is related to income and the

interest rate (with the interest rate being the opportunity cost of holding money). But G-S point out that in a modern economy, most money is interest bearing (e.g. money market funds), with the cost of holding money a matter just of transactions costs, unrelated to either monetary policy or the level of economic activity[4]. (See Figure 3). Moreover, money is not required for engaging in transactions, but credit. Even if money were required for transactions, most transactions are exchanges of assets, and not directly related to the production of goods and services; hence the demand for money is related not just to the level of macro-economic activity ("Y", GDP), but to other kinds of transactions, and there is no fixed relationship between these and GDP. There is, in short, no theoretical foundation underlying the usual theory of interest determination.

[4] In the 2008 financial crisis this relationship broke down temporarily. Apart from that, there appears to be no significant cyclical movement in the difference between the T-bill rate and the money market rate.

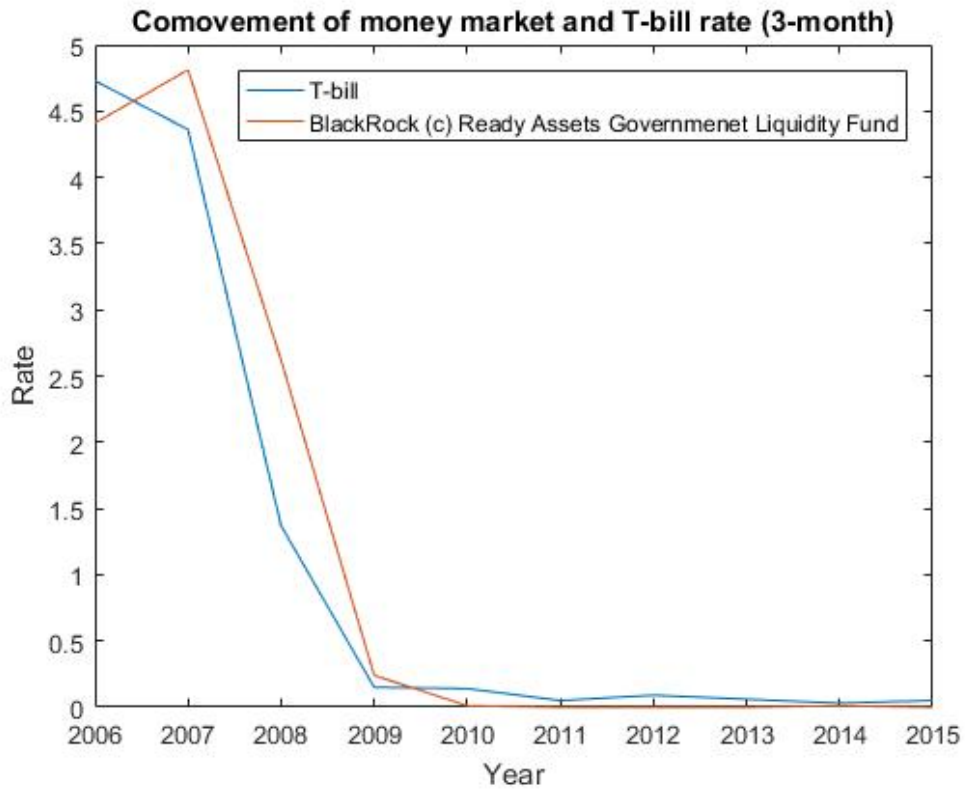

Figure 3.

Figure 3. The relationship between T bill rate and Money Market Rate. The two track each other almost perfectly, the difference being largely transactions cost, with no significant cyclical component.

Robertson[5] had earlier proposed an alternative theory of interest determination, based on the demand and supply of savings. Some farmers decide not to consume or plant all their seeds, and some wish to use more than the seeds they have available, and the interest rate equilibrates the supply and demand of "loanable" seeds. (See Greenwald and Stiglitz, 2003.) While such a theory may have made sense in a primitive agriculture economy, his theory does not describe a modern credit economy, where banks are central, and can create credit, within constraints imposed by

[5] See Robertson (1934) and Ohlin (1937).

government. In particular, there is no need for a bank to have seeds on deposit for it to create credit.

While there is thus a lacuna in the theory of interest rate determination, even were we to have a well-developed theory, with a clear link between the interest rate and monetary policy, there is a further problem: it is not clear that the T-bill rate (so determined) plays the critical role assumed in modern macro and monetary theory. First, as G-S show, the T-bill rate is only loosely related to the lending rate.[6] Moreover, the lending rate is not the only variable affecting macro-economic activity. With credit rationing (Stiglitz-Weiss, 1981), the availability of credit matters too, as do other non-price terms of credit contracts (like collateral requirements, (Stiglitz-Weiss, 1986))[7]. These are endogenous, and while they may be affected by the T bill rate, they are affected by other policy and environmental variables. In short, modern macro-economics has focused on certain substitution effects (e.g. the interest elasticity of consumption), and these may be (and we would suggest typically are) overwhelmed by income, wealth, risk, and other non-price effects[8], or price effects operating in other ways, for instance through their impact on collateral, self-selection, or incentive compatibility constraints.

The correlation between money and credit

[6] That is, the spread between the two is endogenous, and can vary with economic conditions and policy.

[7] More broadly, with imperfect information, behavior is constrained by collateral, self-selection and incentive compatibility constraints.

[8] Effects which may arise from the change in policy (interest rates) itself—some of which we describe in greater detail below—or which may arise simultaneously from other sources.

Our analysis emphasizes the role of credit in determining the level of economic activity. For a variety of reasons, data on the money supply (measured somehow) seems more widely available than data on credit, either its "availability" or even the actual level of lending. But these variables are closely related: typically, when a bank lends more, its deposits (or more broadly, the deposits of the banking system) increase (a liability) and so do the bank's assets—the loan. Thus, money (demand deposits) and credit increase in tandem. So too, if a foreigner were to make a deposit in a country's bank, the bank would normally have an incentive and ability to increase lending.

But as we explain below, there are times when this normal relationship breaks down, and policies predicated on the normal relationships may be very misguided. If a bank faces a great deal of uncertainty, it may not lend out as much as it could; it has excess reserves. In the East Asia crisis, the IMF became worried when, say, there were large excess reserves in Indonesia. It meant that, suddenly, the banks could start lending, and that would be inflationary. As a precautionary measure, it thought it was wise to "mop up" the excess reserves or to take other actions to eliminate the excess reserves, e.g. tighten reserve requirements. The problem was that with the blunt instruments available, even banks that had no excess reserves were typically affected by the tightening. Their customers lost access to credit—deepening the on-going recession. The cost of tightening was palpable; the risk of inflation that the tightening was supposed to reduce was imaginary—there was virtually no realistic scenario in which the banks with excess reserves would turn around and lend so much that inflation would be excessive.

Economies in deep downturns—recessions and depressions—behave differently than those in more normal times, and policies, including and especially monetary policies, suitable for one situation may not be suitable for the other. (See Stiglitz, 2016d). Even if the correlation between money and credit were close in normal times, it is not in deep downturns, as banks are willing to hold on to excess reserves. As we explain below, it is this which gives rise to the modern liquidity trap.

1.2 The Supply of credit

In standard monetary theory, banks play no role—this is true even for the models used by central banks, ironic since if there were no banks, there would be no central banks. In institution free neoclassical economics one sees underneath the institutions, to the underlying economic forces. Thus, as we have noted, in standard models, the (real) interest rate is set at the rate that equilibrates the demand and supply of funds (in Robertsonian monetary theory; in Keynesian theory, the demand and supply of money[9]). Though

[9] As we have already noted, as influential as Keynes' work has been, it provides a poor description of a modern credit-based economy. (In the Appendix, for instance, we provide convincing evidence against the hypothesis that individuals are on a stable demand function of the kind hypothesized by Keynes.) But while Robertson' focus on the demand and supply of funds is more convincing, his analysis is flawed, partly because he failed to recognize the central role of asymmetric information in the provision of credit, partly because he failed to take adequately into account the role of banks in the provision of credit (the subject of the discussion here.) In the standard loanable funds theory (without banks), the role of government was limited: It was individual farmers who decide how much seed to supply and demand. Our theory, by contrast, says even here there can be a role, through the rules government sets for the functioning of the critical intermediary institutions.

that model may provide a reasonable if incomplete[10] description of the capital markets on which large enterprises raise funds, small and medium sized enterprises have to rely on banks, and much of the variability in economic activity is related to investment by such enterprises; and much of that variability is related to credit availability.[11] Interest rates are not set at the intersection of demand and supply curves—there may be credit rationing; but even when there is not credit rationing, the supply curve of funds needs to be *derived* from the behavior of banks, and when one does that, one gets a very different picture.

Greenwald and Stiglitz (1991, 1993b, 2003) provide a simple model describing bank behavior, showing how lending is related not just to the T bill rate, but to their net worth, their risk perceptions, their existing portfolio of existing assets, and the constraints provided by regulators. They describe too how banks adjust not only their lending rate, but the other terms of the contract in response to changes in these variables. Thus, credit (money) supply is determined not just by conventional monetary instruments (open market operations, reserve requirements), but also by macro- and micro-prudential requirements. Indeed, the two aspects of central bank policy (regulatory and "macro-control) cannot and should not be separated.

[10] It leaves out, for instance, the role of rating agencies, investment analysts, etc. That these markets often do not work well is an understatement, evidenced by the problems in the financial crisis of 2008 and the scandals of the early 2000s. See Stiglitz (2003, 2010)

[11] Moreover, ultimately, the supply of funds to large enterprises depends on the funds made available to a variety of intermediaries, which in turn depends on the credit creation mechanisms described here.

Their model of banks (combined with their earlier model of the risk averse firm[12] facing equity rationing (Greenwald-Stiglitz, 1993), Greenwald, Stiglitz, and Weiss, 1984)[13] thus shows how changes in economic circumstances today (a shock which affects their net worth or even the value or risk of particular assets[14]) can have large long lasting effects—the effects of an economic shock can be persistent; and at the same time, they explain why an increase in liquidity—a conventional open market operation, lowering the T-bill or the lending rate—may have little effect on credit availability.[15]

Banks typically respond to a lower cost of funds by lending more, and lending at lower interest rates (whether they choose to ration credit or not.) But there are some circumstances in which they do not, or do not do so to any significant extent. In particular, G-S explain why, if risk perceptions have increased and if the risk of the banks' existing portfolio has increased—that is the risk of both new and past loans has increased-- then the bank may be at a corner solution, where it will not undertake further loans, even when the interest rate is lowered. And this is especially so if because of asymmetric information, the bank can only divest itself of the

[12] There are other reasons that firms (including banks) may act in a risk averse manner: Imperfect information means that there is a separation of ownership and control (Berle and Means (1932), Stiglitz (1985)) and firms typically construct incentive arrangements that lead managers to act in a risk averse manner. (Greenwald and Stiglitz, 1990))

[13] Their analysis also assumes that the risks confronting banks (and other firms in the economy) can neither be insured nor distributed across the economy, e.g. because of information asymmetries.

[14] In their model, bank assets are not fully tradable, because of information asymmetries. Accordingly, if the perceived risk associated with certain assets the bank holds increases, its willingness to undertake more risks may be adversely affected.

[15] Their models also explain amplification, why a seemingly small shock can have large effects.

risk associated with past loans by taking large capital losses on its loan portfolio.[16]

This problem is exacerbated by the fact in severe economic downturns, the value of highly leveraged banks' net worth is severely decreased, so risk averse banks are even more overly exposed to risk, unless they cut back severely on lending. (The inability to divest oneself of risk generates an important hysteresis effect. There are, in addition, effects on banks' optimal portfolio, e.g. shifting away from more risky lending).

Changes in government (central bank) policy, as desirable as they may be, typically give rise to new risks, which have their own adverse effects even when the intent of the policy change is to stimulate the economy. Thus a decrease in the interest rate changes asset values of different firms in different ways, depending on their assets. A firm which has outstanding short term liabilities and long term assets (with returns fixed at a higher rate) may be much better off, but a firm with a different maturity structure of assets and liabilities could actually be worse off. Lenders may have to have detailed information about all the assets and liabilities of a firm to know precisely how each firm is affected; and in the absence of that information, uncertainty will have increased. Thus, an increase in the interest rate will

[16] The inability to divest oneself of risk generates an important hysteresis effect. Government regulatory policy may exacerbate these problems: when there are, for instance, capital adequacy requirements and banks' net worth is not evaluated on a mark-to-market basis, then a sale results in the recognition of a loss which is otherwise "hidden." On the other hand, marking to market forces banks to contract lending (or raise new equity) when there is a (what the bankers believe is a) temporary change in market sentiment against the assets which they hold. Of course, the irony is that in other contexts, bankers, as a group, have been the strongest advocates of the "market" and its rationality. But as the 2008 crisis demonstrated, they have demonstrated an impressive level of cognitive dissonance—arguing against subsidies for others (such subsidies would distort markets) but for themselves (without state aid, the whole economy was at risk.) See Stiglitz, 2010.

have a more adverse effect than anticipated, but a lowering of the interest rate will have a smaller effect—or even an effect that is adverse. This is especially so once one takes into account all the general equilibrium effects. A lowering of the interest rate will lower the exchange rate, thus hurting importers and domestic firms that use imported inputs.

With risk aversion, the benefits of the winners from such changes in relative prices do not offset the losses of the losers. The aggregate effect can be negative. (Greenwald and Stiglitz, 1993)

The ability and willingness of banks to lend depends not just on what may be called the environmental variables (risk perceptions[17] and net worth) described in earlier paragraphs, but on all the constraints facing banks today—and the expectations of future constraints. For instance, banks face capital adequacy constraints, specifying say net worth relative to outstanding loans. If that constraint is tightened, then the bank either has to raise new capital or reduce outstanding loans. But because of capital market imperfections, in fact firms typically face constraints in raising new equity;

[17] As we have noted, risk perceptions relate now just to macro-economic risks, but to risks of particular individuals, firms, and institutions, which in turn have macro-economic consequences. Thus, it does not suffice to know that the value of say equity has decreased *somewhere* in the economic system. A bank contemplating making a loan to a particular firm wants to know the economic situation of that particular firm. Uncertainties surrounding that are affected both by rules governing transparency and the structure of the economy—the nature of the interlinkages among firms.

We need to distinguish too between structural breaks—the move from agriculture to industry or from industry to services—with shocks to the system that, though large, do not fundamentally alter the structure of the economy. Thus, while Greenwald and Stiglitz (1993, 2003, as well as the large number of papers leading up to those two studies and cited there) provided the intellectual foundations for what has since come to be called *balance sheet recessions,* they have argued that the current economic downturn is not fully described as a balance sheet recession, but rather is best seen as part of a deep structural transformation. See Delli Gatti *et al* 2012, 2016.

at the very least, doing so may be very costly to existing shareholders.[18] Hence, an increase in the capital adequacy ratio—or an increase in defaults on loans which reduces capital—reduces lending. But because a quick reduction in lending may be costly, firms need to anticipate that they might face such a situation, and hence well before the constraints bind, banks may curtail lending and firms may curtail borrowing.

This simply emphasizes that all of the constraints facing a bank—whether binding today or possibly binding in the future—can affect lending and borrowing today. And it is not just the standard instruments (e.g. open market operations or the discount rate) by which central banks affect lending activity.

Banks who focus on lending to SME's (small and medium sized enterprises) face an additional problem: this lending is typically collateral based, and the collateral is typically real estate. In a crisis such as that of 2008, the value of this collateral decreases enormously, and thus *given existing rules and constraints*, the amount of exposure to SME risk should be significantly reduced. The focus of the bank is thus on reducing SME exposure, not making new loans.[19]

By the same token, severe economic downturns are often associated with increased disparities in *judgments* (probabilities associated with different contingencies). This increased disparity in judgments may give rise to an increase in trading in existing assets, rather than for newly produced assets,

[18] For a review of the arguments, see Greenwald and Stiglitz, 2003

[19] I should emphasize that the significant bank contraction in lending to SME's is not just a response to conventions, rules, and regulations. In 2008 there was a significant increase in risk perceptions, and such changes have a particularly large adverse effect on undercapitalized firms, among which SME's are heavily represented.

and an increase in the demand for credit to support such trades. To see this, consider the 2008 crisis. Some believed that the market had overshot—real estate prices had fallen excessively. The banks argued that that was the case, not wanting to believe that they had made massive misjudgments about the real estate market. The more optimistic market participants believed that, and were willing to pay a risk premium to get access to funds to buy these depressed assets. The banks agreed with their judgments (for reasons given in the previous sentence.) These *new* borrowers could offer the real estate (at the new low price) as collateral. Thus, from the perspective of the bank, these new real estate loans offered a low risk (in their calculus)- high return loan —far better than the high risk loans to *real* firms. From the perspective of the banks as a group, this lending has a further benefit: it raises real estate prices, improving the value of their existing portfolio. [20]

In short, in a deep downturn changes in the balance sheet of the bank and in its risk perceptions typically lead to a significant contraction in the supply of funds and an increase in the interest rate which it charges and corresponding changes to its non-price terms; the magnitude of these effects overwhelms any ability of the central bank to stimulate lending by lowering interest rates and other actions designed to ease credit availability.

Of course, when we observe a net contraction in lending in a recession it does not *necessarily* mean that monetary policy has been totally ineffective: it simply means that it was unable to counteract fully the other effects.[21]

[20] This discussion illustrates a more general principle: in markets with asymmetric information, there are marked discrepancies between private and social returns. This can be especially so in the presence of rationing. See Greenwald-Stiglitz (1986)

[21] This has been a long standing criticism of Friedman's criticism of monetary policy in the Great Depression. The fall in the money supply does not necessarily mean that the Fed *caused* the

And even when we see an expansion of credit, it does not mean that monetary policy has been effective: the expansion of credit may not have facilitated the purchase of newly produced goods, and thus may not have contributed to an increase in GDP.

Moreover, a lowering of interest rates on T bills does not translate into a lowering of the lending rate, and it is that rate which matters for firm and consumer behavior; and even that rate may not provide an adequate description of the financial market: there may be credit rationing and collateral and other non-price terms.

We have even identified some circumstances in which lowering T-bill interest rates may be counterproductive (we'll identify some further circumstances below), because of the increased risk associated with the *change* in interest rates which (in association with the other relative prices effects generated) increases risk perceptions. By the same token, negative interest rates may adversely affect banks' balance sheets, if not carefully designed, and in doing so, lead to a contraction in lending.[22]

1.3 The Demand for and Uses of Credit

depression through its contractionary policy. The fall in money holding could be the result of the reduction in (anticipated) economic activity. And the Fed may have been powerless to overcome the exogenous perturbations giving rise to the decline in GDP. Indeed, while it may not have been able to fully offset the underlying forces, it may still have had an unambiguously positive effect: the decline in GDP could have been smaller than it otherwise would have been. See, e.g. Tobin (1970).

[22] Not surprisingly, there has been enormous controversy over whether the negative interest rates have had a positive or negative effect. Japan's central bank governor Kuroda tried to design the negative interest rate program in ways which limited the balance sheet effect, while retaining the intertemporal substitution effect. Whether he fully succeeded is part of the debate.

The previous section focused on the determinants of the supply or credit, explaining in particular why an "easing" of monetary policy might not result in a lower lending rate and a greater availability of credit. Here, we explain why the same thing is also true on the demand side: In a severe downturn, risk averse firms will face an adverse shock to their balance sheet and an adverse increase in their risk perceptions, both of which will lead to a contraction in production and investment. Lowering interest rates *at which they can borrow* (which is not the same as lowering the T bill rate, as we explained in the previous section) may lead them to borrow more than they otherwise would have borrowed; but this increase may be small compared to the contraction in investment from the increase in risk and worsening of the balance sheet. Moreover, even when interest rates *for those who can get loans* are lowered, credit may be rationed.

In addition, for reasons explained earlier, *changes* in interest rates by themselves can give rise to an increase in uncertainty, with adverse effects on the demand for credit. (Each firm is embedded in a complex general equilibrium system, in which it has an array of assets and liabilities, some explicit, some implicit, in part related to it economic relations with other entities. A marked lowering of interest rates can increase uncertainty and the perception of risk, and firm risk management may entail a corresponding adjustment in its activities, including decreases in production and investment. Later in this paper, we shall identify some distributional effects of lowering interest rates which too may result in a reduction in the demand for credit as interest rates fall.

While a change in interest rates thus may not be effective in increasing the demand for and use of credit, even when it does, the increases in credit

(money) do not necessarily translate into increases in economic activity—greater consumption or increased investment in newly produced capital goods: there is many a slip between the cup and the lip. Increases in credit (money) can go into several uses:

(a) Increased purchases of existing assets, and especially land. Indeed, much of increased wealth is an increase in land values—so much so that the ratio of the value of produced capital to GDP is actually declining.[23] Of course, when more money goes to the purchases of land, it does not lead to more land, but rather, to an increase in the price of land. This wealth effect can lead to more real spending, but this effect is normally likely to be small, far smaller than that which would have been predicted by any model where it is simply assumed that the increase in money leads to more spending on *produced* goods.

(b) Increased margin to facilitate taking larger speculative positions, e.g. in zero sum bets, such as futures markets.

(c) Increased lending abroad (either for "productive" or non productive purposes). If the foreign country to which the money goes has an increase in income, it may (slightly) enhance exports, and exports may be further strengthened from the effect on foreign exchange. (Monetary policy in an open economy is discussed briefly further in section 1.7.)

It is, accordingly, not surprising that the link between money and economic activity may be much weaker than standard monetary theory assumed.

[23] See Stiglitz (2016b, 2016c, 2015d). and Turner (2015). Stiglitz (2015b) provides a theoretical model linking monetary policy to land values.

1.4. Limitations on the effectiveness of monetary policy

Liquidity trap and the zero lower bound

The Greenwald-Stiglitz analysis provides an alternative explanation of the "liquidity trap" to that of Keynes. Keynes' explanation of the inefficacy of monetary policy was that because the demand curve for short term government bonds become horizontal at low interest rates, monetary policy could not push interest rates down below a certain level. Empirically, recent experiences have shown that the interest rate on government bonds can even become negative. Our argument focuses on banks, and their unwillingness to lend more under certain circumstances, no matter how low the T-bill rate is pushed.

So too, our analysis provides a counter to the recent fixation with the constraint on monetary policy imposed by the zero lower bound. It takes the view that even if the interest rate were lowered below zero, the response would be limited, largely because banks would still not increase their lending, partly that banks would not (fully) pass on the lower cost of funds to their customers, but partly too because the interest elasticity of investment and consumption is low. Of course, if the interest rate became negative enough, to the point where individuals could borrow and effectively never repay, then there would be an increase in economic activity. But that is not what advocates of the ZLB mean.

Elsewhere, I have provided other arguments for why the ZLB argument is questionable: if it were true, there are other ways of achieving the desired change in intertemporal prices, through investment tax credits and

consumption tax rates that change over time. Yet no one is proposing such a scheme. Doing so would provide a test of the hypothesis, and I believe the ZLB theory would be shown to be wanting.

Diversion of credit creation and the creation of instability

Our analysis also provides an additional explanation for the ineffectiveness of monetary policy even short of the ZLB: Standard monetary theory *assumes* that any additional liquidity created goes towards the purchase of *produced* goods. But, as we have noted above, much of the additional liquidity not go to the purchase of newly produced assets, but rather into existing fixed assets (such as land), helping create credit bubbles, and into institutionally constrained "gambling," transactions in futures markets in which some form of margin has to be put up. This diversion helps explain the regression findings noted in the beginning of this paper, showing a low correlation between (the change in) money and the (change in the) value of output.

The observation that increases in credit go into increased speculation and an increased value of fixed assets helps explain why a low interest rate environment is often associated with financial instability. (Other reasons are associated with the distortionary effects of monetary policy discussed in the next subsection.) Guzman and Stiglitz [24)] have shown, for instance, that increased gambling in futures markets leads to an increase in what they call pseudo-wealth: each of the market participants believes their wealth goes up as they make more of these bets, simply because they expect to win. But the

[24] See Martin M. Guzman and Joseph E. Stiglitz (2015, 2016).

bets are zero sum: the gains of one person occur at the expense of others. But the extent of such gambles can change suddenly, as happened in the lead up to and the aftermath of the Great Recession—and thus the amount of pseudo-wealth can change quickly, and so too the level of aggregate demand. If monetary or regulatory policy tightens, then the extent of such gambles may decrease, and so too the value of the pseudo-wealth. So too if there are changes in perceptions and/or the willingness to engage in such bets.

Similarly, if credit is used to finance the purchase of fixed assets, like land (and/or there is borrowing on the basis of land as collateral), an increase in credit can give rise to an increase in the price of land, which, if monetary policy is sufficiently accommodating, can lead to more lending, fueling further increases in prices. This credit-collateral spiral can suddenly break, e.g. when market participants no longer believe that the price of land will continue to rise—and in fact, it can be shown that it is impossible for prices to continue to rise *forever* at the rate necessary to satisfy the capital arbitrage equation (giving the same rate of return across all assets. See Shell-Stiglitz 1967, Hahn 1966, Stiglitz 2015b).

The problem is not just that additionally provided liquidity goes to these purposes which directly do not lead to an increase in GDP, but also that the proportion of any additional money that actually goes to support GDP is highly variable. [25]Hence, without further constraints, monetary authorities cannot be sure about the link between GDP and money (credit).

[25] As the regressions reported in the Appendix amply illustrate.

Of course, if there were a stable relationship between the nominal or real interest rate and GDP, then it could expand or contract the money supply until it reached the targeted interest rate. But the discussions of preceding sections made clear that the relationship between the T bill rate and either the supply or demand for money/credit on the one hand and the T bill rate and the level of economic activity on the other was also highly variable.[26]

Distributive effects

In section 1.6 we explain how monetary policy may have adverse distributive effects. There are winners and losers—but if the reduction in spending by the losers is greater than the increase in spending by the winners, then the net effect on aggregate demand may be negative, and these distributive effects may again overwhelm the direct interest rate effect leading each to spend more than they otherwise would have. Moreover, the adverse distributive effects may be compounded by the rationing effects described earlier: the losers may be *forced* to contract their spending, while the gainers may choose to increase their spending only a little; and the lower interest rates may then have no effect on the former.

The argument is parallel to that which has become standard in international economics. There has long been a concern about persistent global imbalances—China and Germany's surplus, and the US deficit. The worry is that there will be a "disorderly unwinding" of these imbalances—that if global financial markets suddenly stopped being willing to finance the deficits of the deficit countries (Calvo, 1998), the contraction of their

[26] Again, as evidenced in the regressions described in the Appendix.

spending would not be offset by the expansion of the spending of the surplus countries. (See Stiglitz, 2010.)

1.5 Distortionary effects of monetary policy

Advocates of the use of monetary policy often argue that it is preferable to fiscal policy not only because it can be implemented more quickly, but also because it is less distortionary. That is one of the reasons that so many of those economists supporting the view that monetary policy policy should bear the brunt of macro-economic adjustment have been so disturbed by the inefficacy of monetary policy in recent years, and why the ZLB argument has become so popular. For it says their prior view was correct; but there is a special "regime" where interest rates hit zero, where the results are no longer applicable.

But those conclusions are made in the context of highly special models. In this section, we note several reasons why the conclusion that monetary policy should be at the center of macro-stability may be wrong.

(a) Mispricing of risk

Market participants talk about how the recent low-interest environment leads to a distorted price of risk. The reason that they argue that the low interest environment leads to a distorted price of risk is the "search for yield," that in this low interest rate environment, in order to get "yield" there is excessive demand for risky assets yielding a slight risk premium. That drives up the

price of these assets, driving down risk premia to irrational levels, which eventually get corrected.

The consequences of this mispricing have been severe: funds flow into uses where with more rational pricing they would not go. And the later re-adjustment of prices can itself have severe consequences.

But there is a kind of intellectual inconsistency in this perspective. Financial market participants typically believe in the efficiency of markets. That traditionally has been part of their argument against government regulation. But the entire argument for why there is mispricing is based on behavioral finance: market participants fail to take into account the fact that the irrationally low levels of risk premia will not be sustained.

There are risks associated with such market irrationality—but market irrationality does not suddenly just appear as interest rates get near zero. Market irrationality is pervasive. And because of this, and because of the macro-economic externalities that are associated with the consequences, both of the excessively low risk premia and of the corrections that follow, there is a need for much greater market regulation than advocates of unregulated markets claim. They cannot have it both ways: to claim that markets are efficient, but that we need to be wary of low interest rates because it creates distortions in the price of risk.

They are, however, perhaps correct in their warning against low interest rates, providing a quite different argument for the limitations of monetary policy than provided by Keynes: it is not that interest rates *cannot* be lowered (indeed, some central banks have lowered interest rates below zero); nor is it that lowering interest rates will not have much effect on real

economic activity (true, and even, as we argue below, worse than that); but that the *consequences* of low interest rates mean that central banks should eschew such policies, especially over an extended period of time.

(b) Intersectoral misallocations[27]

The aggregate models so beloved by macro-economists hide a key problem with the excessive reliance on monetary policy: it gives rise to intersectoral distortions. It makes interest sensitive sectors bear the brunt of adjustment. It may be desirable to make such sectors bear *more* of the costs of adjustment than others; but there may be (and typically is) a cost to the reliance on monetary policy.

Optimal macro-economic policy would distribute the costs of adjustment, and to do that requires both monetary and fiscal policies.[28]

The Ricardo-Barro argument that fiscal policy is ineffective (since it will simply be undone by actions in the private sector) rests on simplistic models. Government spending can be complementary to private spending (either to private consumption or investment) today, and thus affect changes in intertemporal allocations, just as changes in intertemporal prices brought on by monetary authorities can. Even government spending which is complementary to future private spending can elicit more private spending

[27] This effect has been stressed by Jonathan Kreamer in his Ph. D. thesis (Kreamer 2014)

[28] There may be a loss of intertemporal welfare from the variability in fiscal expenditures. But if the variability takes the form of infrastructure investments, and if the investment authority (say an investment bank, like the EIB) were to keep an inventory of good, high return projects, then the flow of "services" from the aggregate stock of public capital would not be highly variable. If the inputs used in public infrastructure investment were highly substitutable with those used in say private construction, and if one of the main sources of variability in aggregate output is private construction, then the social costs of putting the burden of adjustment on public infrastructure investment may be relatively low.

today, e.g. because consumers rationally take the future impact on their budget constraints into their current spending. (Neary-Stiglitz, 1983).[29]

So too, the reliance on using the short term interest rate for macro-economic adjustment may lead (even with full rationality) to distortions in intertemporal and risk prices (as we noted), and optimal macro-economic adjustment may seek to optimize by minimizing the resulting distortions through the use of appropriately designed fiscal policies.[30]

(c) *Choice of technique/creating a jobless recovery*

Here, we discuss one piece of evidence that reliance on changing intertemporal prices for equilibrating the economy may not be optimal. There are many alternative theories attempting to explain why the economy fails to attain full employment, including those related to wage and price rigidities (with those rigidities in fact being endogenous in some variants of these theories.) Monetary policy attempts to correct for these distortions by controlling the interest rate (usually the short term interest rate), setting it at a level different from what it otherwise would be. But intuitively, if the source of the distortion is in the labor or product market, it might make far more sense to attempt to correct at least some of the distortion more directly.

[29] Of course, debt financed government spending may lead to an offsetting effect through the expectation of future taxes, but the conditions under which the adverse consequences of this is fully offsetting are highly restrictive. See Stiglitz (1988)

[30] That is, Ramsey showed that optimal taxation entailed distorting all prices a little from their marginal costs, rather than a single price a lot. Modern monetary practice is based on the hypothesis that government intervention should be limited to interventions only in the short term interest rate. There is, to my knowledge, no general proof that it is optimal to limit interventions in this way.

The standard argument for monetary policy is that it increases investment (and possibly consumption) leading to higher GDP and thus employment today. But there is another effect: lower interest rates induce firms to invest in more capital intensive technologies, lowering future demand for labor. It affects the choice of technique. Even if real wages go down in a recession, the decline in the cost of capital is every larger. The original distortion is an excessively high price of labor relative to capital because of wage rigidities; the interest rate policy exacerbates that distortion. We see the consequences: firms replacing unskilled checkout clerks and tellers with machines.

Thus, as the economy recovers, there will be a lower demand for labor than there would otherwise have been—it will take a higher level of GDP to achieve a restoration of full employment.

The problem is that we are asking too much from a single instrument, and in principle, there are more instruments in the government's tool kit. The government could, for instance, provide a larger investment tax credit for more labor intensive technologies. But most governments have eschewed using this broader set of instruments. With a more constrained set of instruments, monetary policy may not only have these adverse distributional effects, but also may be less effective, as we shall explain shortly.

1.6 Distributive effects of monetary policy[31]

[31] For a more extensive discussion of the issues raised here, see Stiglitz, 2015a. Even the Fed has begun to recognize the potential importance of these effects. See Yellen 2014.

The economist's focus on aggregative models with a representative agent has shifted attention away from another important set of effects of monetary policy: their implications for the distribution of income. The presumption has been (a) the focus of monetary policy should be macro-economic management, and if there are distributive effects, they are likely to be minor and correctable through fiscal/tax and transfer policies. (b) Ensuring that the economy is at full employment is the most important thing that government can do to ensure that well-being of workers. Higher employment helps workers directly and indirectly: lower unemployment will lead to higher wages and higher GDP will lead to higher tax revenues and greater benefits for ordinary citizens. Recent failures of monetary policy have highlighted, however, that there can be significant adverse distributional effects, and the politics in US and Europe have shown that the likelihood of any adverse effects on distribution being offset by government are nil. (More generally, research over the past three decades has shown that there are significant costs of such redistributions, and unless the growth benefits are significant, the distributional effects may thus outweigh them.[32])

Among the distributional effects two stand out: the first, its role in creating a jobless recovery, was discussed in the previous subsection. The second arises from the fact that better off individuals disproportionately hold equities, worse off individuals hold debt, including government bonds. Lowering the interest rate on government bonds to stimulate the economy hurts bondholders, at the expense of those who own equity, thus leading to

[32] These are associated with the "repeal" of the second fundamental theorem of welfare economics, implying that issues of distribution and efficiency cannot be separated, as suggested by earlier analyses. See, e.g. Stiglitz (1994, 2002a).

more wealth inequality.[33] Indeed, elderly retirees who have acted prudently, in a risk averse manner, holding onto government bonds, have been devastated by quantity easing.

The distributive effects may undermine the effectiveness of monetary policy. Since the marginal propensity to consume (out of income or wealth) of those at the top is much lower than at the bottom, any adverse distributive effect lowers aggregate demand. [34]Moreover, target savers (those saving for retirement, to obtain a down payment on a home, or to finance the education of their children) have to save more to meet their targets.[35] If the distributive effect is large, and the stimulative effect on investment is small (which has been the case since the 2008 crisis, with investment as a share of GDP actually lower in 2015 than it was in 2007 in spite of QE (in 2007 gross domestic investment for the US was 22% of GDP, and fell to 20% by 2015)), then the net effect on the economy of lowering interest rates or more accommodative monetary policies (QE) may have been negative.[36]

1.7 Open Economy

[33] See Stiglitz 2015a, c. We should expect such differentials in wealth holdings: life cycle savers have to be more prudent in their wealth management than wealthy "capitalists." Giovannoni 2014, 2015 provides evidence.

[34] See Stiglitz (2015d) and the references cited there.

[35] This may be especially so if individuals are saving to purchase a home, since the lower interest rate may itself give rise to higher house prices, meaning that the down payment required is also larger.

[36] Of course, these numbers do not answer the relevant hypothetical, what investment would have been but for the lowering of interest rates. Still, the fact that lowering interest rates from 5% to 0 has had such small an effect suggests that lowering the interest rate from 0 to minus 2% is unlikely to have a large effect.

The previous discussion focusing on a closed economy emphasized that the government, having delegated the allocation of credit to the private sector, with limited restrictions, had relatively little control over the use to which money/credit would be put, and therefore there was at best a loose connection between monetary policy and macro-economic activity. Matters are even worse in an open economy, for two reasons. Now, there is a further use to which the credit created can be put—purchasing assets abroad. This was evidenced in the aftermath of the 2008 crisis, where much of the liquidity created in the US went to purchase assets and make loans in emerging markets—not a surprise given the boom in these economies and the lackluster performance of the US. In short, the money went where it was not wanted and needed; and didn't go where it was wanted and needed. The stimulative effect of this loose monetary policy in the US for the US economy was thus limited.

There is a second effect: now there is an alternative supply of credit, from lenders outside the country. Thus, even if monetary authorities tighten credit, there can be an offsetting effect from a flow of money into the country. Indeed, there has been a regular pattern of exactly this happening: when countries tighten credit, raising interest rates, out of concern about overheating, the higher interest rates attract an inflow of capital partially or fully offsetting the domestic contraction.[37] Only by controlling the sources and uses of funds carefully can some semblance of control over the macro-economy be achieved.

[37] See Stiglitz (2002b, 2015c) and Guzman and Stiglitz (2013) for a discussion of these issues and the consequent importance of monetary policy coordination.

1.8 Concluding comments

Standard monetary theory has sought a neat set of instruments and targets by which the macro-economy could be well-regulated. There was perhaps as much a political drive for such parsimony as an intellectual one: if one could find a simple variable that could lead to macro-stability, the nature of government intervention would be very limited; there would be little need for discretion. It was as if, when it was realized that Adam Smith's beautiful economic machine didn't work quite as perfectly as his latter day descendants believed (though Smith himself was far more aware of these limitations), a slight modification to that machine would ensure its smooth running. Monetarism held that the government should simply expand the money supply at a fixed rate. New theories focused on controlling the interest rate (and indeed, some proposed a simple rule by which that might be done, reflecting inflation, a rule which would work regardless of the source of the disturbance to the economy giving rise to the inflation.) Today, these theories are largely discredited (see the various papers in Blanchard *et al,* 2012, Akerlof *et al* 2014). The discussion here has provided the underlying analytics explaining why we should not be surprised at the failures of these simple theories, and of the broader institutional theory attributed to Tinbergen of assigning to the central bank a single target, inflation, and a single instrument, the short term interest rate.[38]

Government only controls the supply of credit very indirectly through the instruments under its control, and it does even a poorer job at controlling that part of credit that goes to purchase newly produced goods—say machine goods, buildings, or consumption, within the country. As a result, monetary

[38] See, e.g. Stiglitz 1998b, 2014

policy is a weak instrument for controlling the economy, in the sense that the link between the actions taken and the desired effects are uncertain. In certain circumstances, we have explained why it is an ineffective instrument—it simply may not be able to restore the economy to full employment. Its ineffectiveness goes well beyond the usual "zero lower bound" argument, a generalization of the Keynesian' liquidity trap. Indeed, seemingly more accommodative monetary policies may, under certain circumstances, even have perversely contractionary effects, especially when they are not well designed to take into account likely effects on the banking system and broader distributive consequeences. Some evidence of this has been seen in recent forays into negative interest rates.

Earlier IS-LM analysis was largely predicated on a stable demand curve for money. What was variable was the "real" economy, the interest rate at which full employment could be attained. Hence, with an unstable IS curve and a stable LM curve, monetary policy sought to increase M, the money supply, to the point where the rate of interest fell, to level which induced full employment.

It became clear, however, that the LM curve itself was unstable, and this naturally led government to target the interest rate. In effect, M increased until the desired interest rate was achieved. It was assumed that lowering the (real) interest rate would lead to higher output. Hence, all that needed to be done was to lower the interest rate enough. But then, in the Great Recession, monetary authorities hit the zero lower bound. Clever economists responded that it was only the nominal interest rate that was constrained. If somehow we could raise inflationary expectations, credibly committing to a higher inflation rate, then the real interest rate would fall,

and the faith that one could rely on monetary policy to restore the economy to full employment would itself be restored. Putting aside the fact that no one has figured out how to make such a credible commitment[39], we have argued that this framework is badly flawed.

We have explained that the links between the instruments under the control of monetary authorities and the variables that affect aggregate activity are weak, unstable and uncertain, and even of ambiguous sign. For instance, lowering the T-bill rate may or may not lead to a lowering of the lending rate. Because of distributive effects, we have explained that lowering interest rates may lower aggregate demand. Even when there is a positive elasticity of aggregate demand to changes in interest rates, the interest elasticity may be small, so that the magnitude of the changes in interest rate required will be very large, larger than would be politically acceptable, because such large changes will inevitably have large distributive consequences.[40] We have explained too that changes in interest rates, especially large changes, increase uncertainty; and such increases in uncertainty themselves can have adverse aggregate effects. And this is even more so as monetary authorities stretch themselves, seeing that traditional instruments are failing: there is uncertainty associated with these innovative instruments, both even if the policy makers were confident about the effects,

[39] Much of the argument for an independent central bank is based enhancing the ability to make such a commitment. If bankers control the central bank, because they benefit from a low inflation rate, it is more credible that the central bank will act in ways which limit inflation. But the crisis of 2008 showed the flip side risks: a central bank captured by the financial sector will do an inadequate job at financial regulation, exposing the economy to the far greater risks associated with financial instability.

[40] Moreover, such large changes give rise to high levels of uncertainty, with strong adverse effects.

if market participants are not, there are adverse effects on the real economy of these risk perceptions.

We have also explained why, though monetary policy has long been held out as the instrument of choice, it is an instrument with some adverse side effects, both on efficiency and distribution.

Indeed, it seems peculiar—and inadvisable—to attempt to correct a deficiency of aggregate demand arising from "shocks" to the economy arising, say, from an increase in uncertainty or an adverse change in the distribution of income of wealth (because of a deflationary shock which increases the real indebtedness of firms and households[41]) by changing the interest rate (intertemporal prices.) Even if one could do that, it seems preferable to address the underlying problem. If there is an increase in uncertainty, then government can take a more active role in risks mitigation, e.g. issuing income or state contingent loans.[42] If there has been a redistribution of wealth as a result of a large deflationary shock, the government might consider a better system of debt restructuring (e.g. through a homeowners' chapter 11 (Stiglitz (2010)).

To reflect the central refrain of my criticism of the Washington Consensus[43], there are broader goals (not just price stability, but employment, growth, financial stability, and even distribution); and more instruments (including a

[41] The shock does not actually have to be deflationary: all that is required is that the rate of inflation be less than was expected.

[42] Australia has provided income contingent loans for a long time. The US has begun doing so in the case of certain student loans. Stiglitz (2014) and Stiglitz and Yun (2013, 20145, 2016) have proposed doing so for unemployment loans, and Chapman *et al* (2015) present a range of other examples of such loans.

[43] See Stiglitz (1998a, 2016d)

broad set of regulatory tools called macro-prudential instruments) than those seeking to employ monetary policy should use. Managing a complex economic system in the face of uncertainty requires as many tools as one can manage; the single minded focus on short term interest rates narrowly confined what central banks *could* do, just as the single minded focus on inflation narrowly confined what central banks *should* do.

We have attempted to dethrone monetary policy from the pedestal on which it has been placed by some economists seeking to put it at the center of macro-economic management. But at the same time we have shown how we can make monetary policy more effective than those who have focused on the narrow set of instruments which have traditional been assigned to monetary authorities.

The simple empirical results in the Appendix show that *on average* the link between monetary policy and variables and the real economy is very weak—results which are consistent with the numerous schools of thought (such as real business cycle theory) that have argued that the real economy is affected by real variables, and that monetary variables have, at most second order effects. The results of the appendix are especially powerful in discrediting standard formulations, e.g. where there is a simple Keynesian demand curve for money which plays a central role in interest rate determination, and this itself is at the center of the transmission mechanism for monetary policy.

But even if monetary policy *on average* has little impact, that is not what monetary authorities care about: they want to know whether *under the particular circumstances being confronted at this particular moment, monetary policy can be used to stabilize the economy, to stimulate the economy when there is excess capacity and to constrain aggregate demand*

when there are inflationary pressure. It should be clear that there have been particular moments in history when monetary policy has mattered. Hopefully, the analysis of this paper helps us understand better when monetary policy matters, and when it does not.

In the next section of the paper, we argue that there are more fundamental reforms to the monetary architecture of the economy—to the system of credit and transactions—making use of 21st century technology, which will enable monetary authorities in the future to do a far better job of macro-economic management.

Part II. Creating a New Electronic Credit/Financial System[44]

The 2008 global financial crisis and the subsequent discussion of financial sector reforms highlighted the failures of financial markets and the enormous consequences of these failures for the economic system. These included excessive volatility in credit creation, with a misallocation of capital and a mismanagement of risk; more credit going to the purchase of fixed assets rather than to the creation of productive assets; excessive and volatile cross-border flows of short-term capital, leading to volatility in exchange rates and trade flows; excessive charges for the running of the payments mechanisms; and an array of socially unproductive practices, from

[44] This section is adapted from Stiglitz (2016)

market manipulation to insider trading to predatory lending.[45] Around the world, these financial market dysfunctions have had serious macroeconomic consequences. In the case of Europe, misguided credit flows to the periphery countries created the imbalances from which Europe is suffering still. In the case of the US, predatory lending, securitization (often based on fraudulent practices), and derivatives led to the deepest downturn since the Great Depression.

Modern technology provides the basis of a *new* and more efficient financial system, one which would simultaneously lead to better macro-economic regulation of the economy. The following sections describe briefly the key elements of such a system—a low-cost "medium of exchange" for facilitating transactions and a system of credit creation focused on the *real economy*, managed in a way far more conducive to macroeconomic stability than the current system.

2.1. Creating a 21st Century Financial Transactions System

The banking and monetary system serves multiple purposes. One of them is as a medium of exchange. The world has several times made a change in the prevailing medium of exchange. Gold was once used as a medium of exchange; then, at least in the United States, there was a move to the bimetallic standard, where gold and silver were used, and finally we moved to paper (or "fiat") money. For years, it is has been recognized that it would

[45] Regulators, legislatures, and courts in antitrust actions have finally begun intervening to curtail the high fees and abusive practices, but the fees remain far higher than what they should be.

be far more efficient to move to e-money, away from currency. Our payments mechanism has already changed dramatically. We have gone a long way towards an electronic payments mechanism, and in most of the world we could go far further, with an even more efficient one, if it were taken out of the hands of the monopolistic financial system. Electronic transfers are extraordinarily cheap, but banks and credit card companies charge exorbitantly for the service, reaping monopoly profits as a result.[46] Electronic money is more convenient for people on both sides of the transaction, which is why it has become the dominant form of payment. It saves the costs of printing money, which has increased as the sophistication of counterfeiters has increased. It has a further advantage, especially in countries where small businesses predominate—it significantly curtails the extent of tax avoidance.[47]

With electronic money, the money *inside* a country's banking system can, in effect, be easily "locked in" simply by not allowing the transfer of money out of the country's banking system. But anybody could transfer the money in his bank account to that of anyone else. Thus everybody has, in effect, almost full use of his money.[48] Money inside the country's banking system (which for convenience, we will call the G-euro) would be just like any other currency, with a well-defined value relative to any other currency.

[46] Regulators, legislatures, and courts in antitrust actions have finally begun intervening to curtail the high fees and abusive practices, but the fees remain far higher than what they should be.

[47] Cyber security is one of the key problems faced in modern electronic payments mechanisms. The advantages of electronic transactions are, nonetheless, overwhelming, which is why even with monopoly pricing, there has been a shift toward this system.

[48] The major exception, for the purchase of goods and services from abroad, is discussed later.

Most individuals today have accounts; only the very poor are “unbanked,” and in recent years governments and NGOs, like the Gates Foundation, have been making great efforts to bank the unbanked. In most countries, government pension payments are now transferred through bank accounts, partly to reduce the risk of stolen checks, partly to reduce the outrageous charges that are sometimes charged by check-cashing services. Thus, the task of implementing an electronic banking system today is clearly manageable.

2.2. Credit: Creating a Banking System That Serves Society

A big advantage of the use of fiat money was that one could regulate the supply. When gold was used as the medium of exchange, when there was a large discovery of gold—or when the gold supply increased as Spain conquered the new world—there would be inflation, as the price of gold would rise relative to other goods; if there were few gold discoveries, then there would be deflation. Both caused problems. Deflation, for instance, would redistribute income from debtors to creditors, increasing inequality and imposing hardship. America’s election of 1896 was fought on the issue of the money supply. The debtors wanted to increase the money supply by moving from gold to gold and silver, a bimetallic standard.

While the modern financial system based on fiat money doesn’t suffer from the vagaries of gold discoveries, it has sometimes suffered from something else: volatility in the creation of money and credit by the banking system, giving rise to the booms and busts that have characterized the capitalist system.

Banks effectively increase the supply of money by increasing the supply of credit. In a modern economy, central banks regulate, typically indirectly, banks' creation of money and credit. They are supposed to do it *in just the right amount*, so there is a Goldilocks economy, neither under- or overheated but "just right." It is apparent that they have often failed to do so. This has partly to do with the often noted "long and variable lags" associated with monetary policy, with monetary authorities having to base their actions on predictions concerning the future course of the economy. But more importantly, for our purpose, is "instrument uncertainty," the weak link between what monetary authorities do and the impacts on GDP, since the increased liquidity may go for many uses other than stimulating the economy, as our earlier discussion emphasized.

The traditional view of banking was based on a primitive agriculture economy. Farmers with excess seed—with harvests greater than they wanted to consume or plant the next season—could bring the seed to the bank, which would lend, at interest, the seed to some farmer who wanted more seed than he had, either for consumption (say, because he had a bad harvest that year) or planting. The bank had to have seed deposits in order to lend.[49]

[49] The evolution of the banking system from the primitive corn economy toward its modern form is interesting and informative. Early banks were really based more on gold deposits than on corn deposits. Those with more gold than they wanted to spend put it in the bank, and the bank lent it out to others. Soon, banks discovered that they could create pieces of paper, claims on gold, that others would accept, and that they could produce more of such pieces of paper than they had gold, in the knowledge that not all holders of these pieces of paper would ask for their money simultaneously. As it gave gold to some who asked for it, it would receive gold from others.

Occasionally, there would be a panic when holders of these pieces of paper worried whether the bank could fulfill its promises, and, of course, when they panicked and all went to the bank to demand their gold, there was not enough to satisfy their demands. The banks would go bankrupt, and the economy could be thrown into a depression.

Markets on their own equilibrate the demand and supply of seeds, so there was really little need for government intervention[50]. But if, for some reason, there was, the interest rate provided the natural mechanism: if for some reason, savings (at full employment)—the supply of seeds—exceeded investment (the demand for seed), by lowering interest rates, the supply of seeds would fall and the demand for seeds would increase, until the two were equilibrated.

But this reasoning again totally misses the nature of credit in the 21st century. In a modern economy, banks effectively create credit out of thin air, backed by general confidence in government, including its ability and

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Deposit insurance was invented to prevent these panics: the government explicitly stood behind the banks' promises. This gave greater faith that the promises would be honored (so long as there was faith in the government), and this in turn reduced the likelihood of a panic. But if the government was to provide these guarantees, this insurance, it had to make sure that the bank was acting responsibly—for example, lending out money to people who could actually pay it back, and not lending to the owners of the bank and his friends. Gerry Caprio, with whom I worked at the World Bank and who studied government rescues around the world, was fond of saying that there are two kinds of countries—those who have deposit insurance and know it, and those who have deposit insurance and don't know it. Sweden, before its financial crisis in the 1990s, had no deposit insurance, but it rescued its banks nonetheless. In the 2008 crisis, suddenly deposit insurance was extended to accounts that had not been fully insured before.

One can understand government taking on this new role, partially as a result of the magnitude and frequency of the panics and downturns in the market economy in the 19th and early 20th centuries. Moreover, as advanced countries, like the United States, transformed themselves from agricultural economies to industrial economies, with an increasing fraction of the population dependent on manufacturing and other nonagricultural jobs, these economic fluctuations took a toll. So long as ordinary citizens had little voice in what government did, so what if so many suffered so much? But with the extension of the franchise and increasing democratic engagement, it became increasingly difficult for government to ignore these mega-failures of the market.

[50] The theory of credit rationing based on information asymmetries provided an explanation for why markets on their own might fail.

willingness to bail out the banks, which is based in part on its power to tax and borrow.[51]

Targeted regulation of credit creation

There is a problem in our current system: because the central banks' control mechanisms are typically very indirect, the economy is often over- or under heated. Sometimes there is too much credit creation, leading to an excess of aggregate demand, and prices rise; there is inflation. Sometimes there is a lack of demand, and prices fall; there is deflation.

The first part of this paper has explained some of the key reasons for this failure: while central banks can regulate the supply of credit reasonably well, they can't (or more accurately don't) regulate the *use* to which the credit is put. Much of the credit goes to buying preexisting assets, like land. Some of the credit goes to providing margin for bets (e.g. in futures markets.) What determines whether the economy is over- or under heated is the purchase of new goods and services (whether for consumption or investment). Thus, after the 2008 crisis, there was a massive increase in liquidity, as the Fed pumped money into the economy. But relatively little of this went to buy goods and services in the United States, so in spite of the huge expansion of the money supply as conventionally measured, the economy remained weak.[52]

[51] See J. E. Stiglitz (2015c), Greenwald and Stiglitz (2003).

[52] There are several other "slips between the cup and the lips" discussed more fully in Part I of this paper.

In short, even with fiat money, there may still be a deficiency of domestic aggregate demand—a deficiency that could be easily corrected: there are individuals and firms who would like to spend but cannot get access to credit. A near-zero interest rate does not mean businesses can get access to credit at such a rate—or at any rate.

Restoring domestic control over credit creation

The electronic payments mechanism allows a country to assert control over the supply of credit and the uses to which it can be put in a way which is far better than the current system. Think of this most directly as occurring through a government bank. It can add "money" to the payments mechanism by lending money to a small enterprise with a proven reputation that wants to make an investment. The government simply puts more "money" into the bank account of the enterprise, which the enterprise can then use to pay contractors. Of course, in providing credit there is always a risk of nonrepayment, and standards have to be established for evaluating the likelihood of repayment.

In recent decades, faith in government's ability to make such evaluations has diminished, and confidence has been placed in the private financial system. The 2008 crisis, as well as other frequent crises that have marked the last third of a century, have shown that that confidence has been misplaced. Not only didn't the banks make good judgments—as evidenced by the massive, repeated bailouts—but they systematically failed to fulfill what they should have seen as their major responsibility, providing credit to businesses to create new jobs. By some accounts, their "real" lending amounts to just 3

percent of their activities; by others, to some 15 percent. But by any account, bank finance has been absorbed in other directions.[53]

There were always obvious problems in delegating the power of credit creation, backed by government, to private institutions: they could use their power to benefit their owners, through connected *lending*. Regulations circumscribed this, motivated by the experience of *bad* lending, perhaps more than by the implicit corruption and inequality to which such lending gives rise.

Circumscribing connected lending didn't address one of the key underlying problems: credit is scarce; giving private banks the right to create credit with government backing gave them enormous "economic rents." Even with connected lending circumscribed, bankers use their economic power to enrich themselves and their friends. Russia provides the quintessential example: those with banking licenses could use that power to buy enormously valuable state assets, especially in natural resources. It was through the banking system that the Russian oligarchs were largely created. In Western countries, matters are done more subtly—but the net result in creating enormous inequality remains (though not of the magnitude of Russia). In many cases, the banks lend money to those whom they "trust" and judge creditworthy, with collateral that they value: in short, the bankers lend money to those who are similar to themselves. Even if banker A can't lend to himself or his relatives, banker A can lend to the relatives of banker B, and banker B can lend to the relatives of banker A. The fallibility of their judgments has been demonstrated repeatedly: over-lending to fiber optics at one moment, to fracking at another, to housing in a third.

[53] See, for example, Kay (2015); and Turner, (2015).

There is a second danger to the delegation of the power of credit creation to private banks. Throughout history, moneylenders have had a bad reputation, because of the ruthlessness with which they exploit the poor, especially at moments of extreme need, where without money they, their children, or their parents might die. As such times, there is an enormous asymmetry in bargaining power, which the moneylenders sweep in to exploit. Virtually every religion has tried to proscribe such exploitation, prohibiting usury, and in some cases, even interest. Somehow, in the magic of neoliberalism, this long history was forgotten: bankers not only didn't suffer from the stigma of being called moneylenders, they were elevated to being the paragons of capitalism. In the enthusiasm over their new virtues, as linchpins in the workings of the capitalist system itself, it was simply assumed that such exploitation would not occur, perhaps in the belief that competition would ensure it *couldn't* happen, perhaps in the belief that with the new prosperity of workers, ordinary citizens wouldn't let it happen.

All of this was wishful thinking. Freed of constraints, 21st-century moneylenders have shown themselves every bit as ruthless as the moneylenders of the past; in fact, they are in some ways worse, because they have discovered new ways of exploiting both the poor and investors.[54] The financial sector has enriched itself on the back of the government's credibility, without performing the societal functions that banks were

[54] More broadly, it has been shown that much of the increase in inequality in the advanced countries in recent decades is related to finance. See, in particular, Galbraith (2012), and Stiglitz (2012).

supposed to perform. In doing so, the financial sector has become one of the major sources of the increased inequality around the world.

Even given this history, the government may want to delegate responsibility for making credit decisions to private enterprises, but if so, it should develop strong systems of incentives and accountability, such that the financial system actually focuses on lending for job and enterprise creation and so that it does not make excessive profits as it performs these functions[55] and so the government should be adequately compensated for its backing. In effect, in the current system all the "value" of the underlying government credit guarantee is captured by the private sector.[56]

Credit auctions

Here is one possibility for addressing this issue and providing for greater economic stability First, the central bank (government) auctions off the rights to issue new credit. The amounts would be added to the "money" that is within the financial system. The magnitude of net credit that it allows to be added each month will be determined by the country's central bank on the basis of its assessment of the macroeconomic situation—that is, if the economy is weaker, it will provide more credit to stimulate the economy. The winners of the credit auction then allocate this "money" to borrowers,

[55] See Akerlof and Shiller (2016).

[56] This is especially so, through the privatization of gains and the socialization of losses that has become a regular feature in economies with too-big-to-fail banks. (See Stiglitz (2010).)

on the basis of *their* judgments about repayment capacity, within the constraints that the central bank may impose (described below).[57]

Note that in this system, banks cannot create credit out of thin air, and the amount of money being created each month is known with considerable precision. The winners of the credit auction can only transfer money from their account to the borrowers' accounts.

Conditions would attach to selling the "rights to lend" to the banks. Minimum percentages of the loans would go to small and medium-size enterprises and to new enterprises or to underserved communities; a maximum would go to real estate lending (perhaps apportioned by location, on the basis of local changes in prices), to purchases of other existing assets, or to those engaged in speculative activities, like hedge funds. None would be allocated to socially proscribed activities, like those contributing to global warming or associated with the promotion of death, such as cigarettes. In short, there would be minimum standards for social responsibility. There would be limits on the interest rates charged. Discriminatory lending practices and other abusive practices by credit card companies would be proscribed. So, too, would connected lending. There would be further restrictions to ensure that the loan portfolio of the bank is safe and sound, and there would be strict supervision by government regulators to ensure compliance with the regulations governing any such program.

[57] The system is symmetric. The central bank may decide that there is too much money in the economic system—that is, the banks are lending too much, using "money" that they receive in repayment. In that case, the government can buy back rights to issue credit: they buy back the money that they have allowed the banks to effectively manage on their behalf. Again, there can be an open auction for those most willing to give up rights to issue credit. This would literally drain money out of the banking system.

If it wished, the monetary authority could target credit even more narrowly, to be used to purchase goods which are in excess supply, or which use labor of types which confront high levels of unemployment. There is always a trade-off: such targeted lending may be subject to political pressure, in ways that more broad based measures may not be.

In a 21st-century banking system, a bank's ability to lend is, in a sense, given only temporarily. It is conditional on compliance with the rules and standards established. The government would allow for entry into the banking system; indeed, separating the depository and lending functions and the open auction of rights to issue credit should make entry easier, and thus competition more vigorous than under current arrangements.

Still, since lending is an information-based activity, and the gathering of information is a fixed cost, one would like stability in the new banking system, and this will require that banks not live on the edge—that is, they be sufficiently well capitalized and sufficiently profitable. By saying "sufficiently profitable," I do not mean the 25 percent return on equity that one of the European banks, Deutsche Bank, famously came to expect as normal. Hence, entry of enterprises with sufficient capital and who also satisfy other conditions that enhance the presumption that they would be responsible lenders, would be encouraged.[58] The system of auctioning of credit would ensure that banks not earn excessive returns; most of the value of the public's backing to the creation of money/credit would be captured by

[58] Entry would presumably occur to the point where the before-tax return to capital (measured over the business cycle) would be slightly in excess of the normal return to capital. Some excess return may be necessary to induce more responsible social behavior on the part of bankers.

the public, rather than as now by the bankers. At the same time, the new system of credit creation ensures that the social functions of finance are more likely fulfilled, at least better than under current arrangements.

This is an example of how to create a 21st-century banking system, responding to the advantages of electronic technology, doing things that would have been far harder to accomplish in earlier decades—a banking system more likely to ensure responsible lending and macroeconomic stability than the current system, and without the huge rents and exploitation that have contributed so much to the inequality that has stalked advanced countries around the world.

But this reform is about more than curbing bankers' exploitation. It is about enhancing macroeconomic stability. One of the major contributors to macroeconomic instability is the instability in credit supply, and, in particular, to the supply of credit for the purchase of *produced* goods and services. The 2008 crisis demonstrated that all the advances in markets and our understanding of markets has *not* lead to greater stability in this crucial variable—in fact, quite the opposite. The electronic banking system described here not only enhances stability in this critical variable, it provides the basis of a virtuous circle leading to an increase in overall stability of the economy. One of the most important reasons that small businesses don't repay loans is macroeconomic fluctuation: loans simply can't be repaid when an economy is in depression. Ensuring greater macro-stability (than under the current regime) would do more than anything else to ensure the viability of the banking system and to encourage a more competitive economy.

Whence bank capital?

The beauty of the modern credit system is it doesn't really require the same kind of capital as required by banking systems of the past. Recapitalizing a destroyed banking system would not require gold or borrowing to buy seeds as it did in the old days. As we have seen, the government itself can simply create credit.[59]

The fact that the money created by the government can be used to pay the taxes that are owed to the government, and that the government has the power to levy taxes, ensures the value of the credit it has created. Indeed, because the credit that has been created is electronic money, the movement of which can easily be monitored, the government has not only the ability to levy taxes; it also enhances the ability to collect taxes.

The only reason for bank capital in this world is as a partial guarantee that the bank has the capacity to repay the credit—the bank's "purchases" from the government of the right to issue credit are only temporary, and the credit thus created has to be repaid to the government. (The fact that the bank will lose its own capital has, in addition, strong incentive effects, incentivizing the bank to make good decisions about to whom to give the credit and to monitor the loan well.) But if the government is doing an adequate job of bank supervision and has imposed appropriate regulations (for example, on connected and excessively risky lending), the amount of capital required will be limited. And that fact alone should lead to more competition in the market for the provision of credit—reducing the excessive returns currently received.

[59] Either through a government bank) or through the auction mechanism just described.

Macro-stability and income (state) contingent loans

To achieve full employment may entail an auction of credit at which the price is negative, i.e. the only terms at which potential lenders are willing to "accept" the temporary use of funds, to be repaid later, entail a negative interest rate. The auction may entail a provision (unlike the current system) where a negative "bank rate" has to be passed on (at least partially) to borrowers, in the form of a negative lending rate. Presumably there is some negative rate at which the desired credit creation –that viewed as necessary to ensure full employment--related to new spending (investment or consumption) is achieved. But it may be a very negative rate, and the distributive and even allocative consequences of that negative rate may be adverse. Accordingly, it makes sense to look for more effective ways of stimulating the economy. One such way—ensuring a trade surplus--is discussed in the next section. Here we consider another way—state contingent loans, whereby the amount the borrower has to repay depends on the state of the economy.

There is a widespread consensus that one of the reasons that consumption and investment are depressed in a deep economic downturn is "lack of confidence," or slightly more precisely, uncertainty about the future. Consumers are not sure of their future wages; retirees of the future return on their savings; and producers of the returns on their investment. They worry that if the downturn persists, unemployment may be high, wages low, interest rates low, and sales poor. Traditional monetary policy has tried to compensate for the absence of insurance markets by which individuals might mitigate these risks by changing the intertemporal price. It is, to say the least, a peculiar response: it makes far more sense to try to address the

market failure directly, than to increase one distortion in response to another.[60] As we noted in Part I, it is not even clear that lowering the interest rate is even an *effective* response, not just because of the distributive and distortionary effects, but because as the interest rate is lowered, risk perceptions may increase, and the adverse risk effects could overwhelm the intertemporal price effects.

2.3. Managing the Current Account Deficit

The analysis so far has been for a closed economy. Extending the analysis to an open economy is at least conceptually easy. When a firm exports some good, say a widget, it receives dollars. The dollars could be kept out of the country, say in a dollar account in New York. But the exporter may want to bring the dollars into the country, depositing them into the country's electronic banking system. The number of, say, G-euro's that the exporter would receive in return for the dollars would be market determined; that is, importers may want dollars to buy goods from the US. They thus transfer money in their bank account to the exporter. By the same token, an individual in the country wanting to make an investment abroad, say in the US, might want dollars, and be willing to transfer G- euros in his electronic banking system to someone who is willing to sell him dollars.

These capital flows may, however, be very destabilizing—leading to large fluctuations in exports and imports as the exchange rate changes,

[60] It should be clear that the generalized Ricardian equivalence theorem (which holds that government financial risk has no effect (Stiglitz, (1988)) does not hold and that there are real benefits to this socialization of risk. In particular, the firms and consumers who are effectively "buying" this state insurance are engaging in bets which increases their expected wealth, so that there is a pseudo-wealth effect; there is also a "substitution" effect. Both increase investment, consumption, and production.

leading in turn to macro-economic instability. The central bank can attempt to offset these effects through the system of credit creation (auctions) described earlier. But there is another way of regulating trade flows that may be more effective.

Managing the Current Account Deficit through Trade Chits

In this proposal government would provide to any exporter a chit, a "token" (in this case, electronically recorded) (alternatively called trade chits or Buffett chits[61]), the number in proportion to the value of what was exported; to import a G-euro worth of goods, there would be a requirement to pay, in addition, a G-euro's worth of chits or "trade tokens." There would be a free market in chits, so the demand and supply of chits would be equal; and by equating the demand and supply of chits, one would automatically balance the current account.

In practice, the value of the chit might normally be very small, at least for a country with a small trade deficit.

This system would be a way of managing the high level of volatility in market economies associated with short term capital flows. With the free flow of capital, the exchange rate is determined by the vagaries of the market. And those capricious changes in exchange rate then drive exports, imports, the trade deficit, and borrowing, and in doing so, give rise to macroeconomic instability. With the system of trading chits, the trade deficit can be controlled, enhancing overall stability.[62]

[61] See Buffet (2003).

[62] To prevent the buildup of chits—speculators might buy them on the bet that a chit is more valuable some years into the future—the chits should be date-stamped; they would have to be

In the analysis above, where every import needs a chit, there is neither a trade surplus or trade balance. The government could use this system to limit the size of the deficit or surplus as well. For instance, if it wants to limit imports to be no more than 20 percent greater than exports, it can issue 1.2 import chits for every G- euro of exports. When there would be an excessive surplus, every import would be granted an "export" chit. Then every export would require a chit. This would automatically bring exports down to the level of imports. By issuing both import and export chits, the trade balance can be kept within any pre-specified bounds.

The fact that the country could thus stabilize the size of the trade deficit or surplus has an enormous macroeconomic advantage: it facilitates macroeconomic stabilization itself. It means, for instance, that a small country doesn't have to suffer from the vagaries of its "external balance," its net export position. These fluctuations impose enormous costs on society, of which the market, in generating them, takes no account.[63]

But ensuring stability in the trade deficit also engenders longer-term stability, for national indebtedness, built up over many years, can suddenly become unsustainable. The market sees the world through very myopic lenses. It is willing to lend year after year—until it suddenly changes its

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used, for example, within a period of one year. (It's possible that some international rules, such as those currently stipulated by the WTO, would need to be changed to accommodate the system of chits, which could be viewed as a system of multiple exchange rates.

[63] These are an example of macro-economic externalities, such as discussed by Anton Korinek, themselves a generalization of the pervasive pecuniary externalities to which Greenwald and Stiglitz (1986) called attention.

mind.[64] By limiting the trade deficit, a country is in effect limiting national borrowing; this framework thus reduces a key source of instability.[65]

Moreover, we can see how this system would help strengthen the G-euro. In the absence of the chit system, an increase in the demand by Greeks for imports (that is, for, say, dollars to buy American cars) would lead to a fall in the price of the Greek-euro. But now, with imports discouraged by the necessity of also paying to purchase a chit, the increased demand for imports would be reflected in an increased price of a chit, rather than a decrease in the value of the Greek-euro. The Greek-euro will be stronger than it otherwise would be.

2.4. Economic Theory and Macro-stability

Some might complain: Aren't we interfering with the market? Of course, all monetary policy represents an interference with the market: Few believe that interest rate determination should simply be left to the market.

This proposal entails minimal intervention in the market, and even in doing so, uses market mechanisms. It corrects for a well-recognized externality, the market externality associated with external imbalances. Markets exhibit enormous volatility in both prices and quantities: interest rates demanded of

[64] See Calvo (1998) for a discussion of sudden stops.

[65] The experience of Europe and elsewhere has shown that it is not so much government borrowing that gives rise to crises, but national borrowing. In some cases, the national borrowing was government borrowing (Greece), but in many other cases (Ireland and Spain) it was private borrowing. When a crisis hits, the debt quickly moves from the private balance sheet to the public's.

borrowers from different countries have moved violently in different directions, and capital and credit flows have fluctuated in ways that are virtually uncontrollable under current arrangements.

Workers are told that they should simply accept being buffeted by these maelstroms that are not acts of nature but the creations of irrational and inefficient markets. Workers should accept wage cuts and the undercutting of social protections, in order for the capital markets to enjoy their "freedom." The electronic payment system, with credit auctions and trade chits, is intended to bring a modicum of order to this chaos, which has not even produced the higher growth in GDP that was promised—let alone the social benefits that were supposed to accompany this higher GDP.

In the Arrow Debreu world with perfect markets, prices play a critical role in ensuring economic efficiency. But in the real world in which we live, as Marty Weitzman (1974) explained long ago, it is often better not to just rely on prices—to try, as our proposed framework does, to control the *quantity* of credit and net exports, and to regulate the uses to which credit is put. There is a large literature showing under a variety of conditions when there is a departure from the first best world that such quantity controls are a better way of regulating the economy.[66] The management of the economy in our proposed framework relies, however, heavily on the use of prices, but not fully so; there is no micro-management, but more macro-management than exists today.

Decades ago, we learned that one could not let a market economy manage itself. That is why, for instance, every country has a central bank

[66] See also Dasgupta and Stiglitz (1977).

determining interest rates and regulatory authorities overseeing banking. Some would like to roll back the clock, to a world without central banks and with free banking, with no restraints. Anyone who has read his economic history knows what a disaster that would likely be.

But anyone observing macroeconomic performance in recent years will see that things have not gone well in many countries around the world, even in advanced countries, in Europe and the United States, with supposedly well-functioning markets and institutions and well-educated individuals to manage the economy. The framework provided here provides a way of improving matters. These are modest reforms that would not upend the system. But they systematically address some of the major weaknesses of current economic arrangements, some of the major instabilities that have proven so costly to our economies and our societies.

There are, of course, a large number of details to be worked out. The system is surely not perfect. It is not intended to eliminate all speculative activity, and it will not do so: but by restraining the uses of newly issued credit it will curb such activities. But almost as surely, it is better than the current system. This framework could lead to greater economic stability and growth.

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