

Monetary Policy in a Multi-Polar World¹

Joseph E. Stiglitz²

That monetary policy in an open economy is markedly different from that in a closed economy has long been recognized—but typically, discussions have focused on small economies, where the effects are mediated largely through the exchange rate.³ After all, with perfect capital markets, a small country takes the global real interest rate as given. An increase in the supply of its currency naturally leads to a decrease in its price. Dynamics can be complicated, since the cost of holding on to a currency entail capital gains and losses as well as foregone earnings.

This paper focuses, by contrast, on a global economy with two (or more) large countries, where the action of each has a non-negligible effect on the global equilibrium, in a context in which the market equilibrium, in the absence of government action, would not itself be Pareto optimal.⁴

It is motivated in part by looking at the consequences of the US policy of quantitative easing. In a closed economy, Central Bank (CB) purchases of long term government bonds would drive up the price, lowering long term interest rates, encouraging long term investments, like housing. Banks, rather than investing in long term government bonds (the value of which may well fall) are induced to lend, making funds more available, on better terms.

The chain of reasoning linking expansionary monetary policy in, say, the US with increased activity in the United States is complicated. Several questions have to be answered: (a) Why should CB purchases of long term bonds lower long term interest rates? (b) Why should the lowering of long term government rates actually lead to more lending, at more favorable terms? (c) Why, in a globalized world, should the increased liquidity lead to increased investment in the United States (or more generally, the country making available the increased liquidity)? (d) Why, in a globalized world, shouldn't the effect of the increased liquidity be offset (at least partially) by counteractions on the part of other central banks?

(There are, of course, a number of other mechanisms through which the effects of QE are allegedly felt, which we discuss later in this paper. Even if present, they are likely to be small, and indeed, some of the effects are likely to be adverse.)

Thus critics of the US QE2 and QE3 claim: (a) the effects on long term government interest rates have been small; (b) the effects on rates at which private parties can borrow has been even smaller;⁵ (c) it

¹ Paper to be presented to an IEA conference on capital flows at Izmir, Turkey on November 1-2, 2012, with the support of the Bank of Turkey. I wish to thank, Bruce Greenwald and Anton Korinek with whom I have discussed extensively many of the subjects raised in this paper and INET for support. I also wish to thank Laurence Wilse-Samson for research assistance

² University Professor, Columbia University

³ See, e.g., papers by McCallum and Nelson (2000) and Smets and Wouters (2002)

⁴ A similar analysis applies to a large economy with a large competitive fringe that responds in a similar way to any action by the large economy, except in that case, it is more natural to describe the equilibrium as a Stackleberg equilibrium than as a (symmetric) Nash equilibrium.

has not led to substantial increases in lending to the only sector which is really constrained, small and medium sized enterprises⁶; (d) the major impact of the increased liquidity has been to increase demand in emerging markets (and perhaps to support asset price increases globally); and (d) in response to the overheating to which it has contributed in the emerging markets, the central banks there have engaged in “currency wars,” trying to undo the effects of what they view as the US competitive devaluation and have constructed impediments to the free flow of capital. In effect, they have tried to offset, in their country, the expansionary effect of US Fed policy. In short, money has been going where it’s not needed, and not going where it’s needed. Why should an investor with access to funds invest them in the United States or Europe, where there is excess capacity and a long term slump, rather than in the high return booming emerging markets? In the older, closed economy models, they had no choice: but in a globalized world with free capital markets, they do.

This analysis has three broad implications: First, in a world of truly free capital mobility, the effects of monetary policy may be markedly different—and typically weaker-- than in a closed economy. Secondly, restrictions on the free flow of capital may therefore have an advantage, in that they may enhance the ability of the government to maintain the economy near full employment, possibly more than offsetting any disadvantages of such controls.⁷ And thirdly, it emphasizes the imperative of coordination among monetary authorities. Not surprisingly, the uncoordinated Nash equilibrium is Pareto inferior to a coordinated equilibrium.

I. A Limiting Case

Consider, for a moment, a large closed economy sharing a single currency; but suppose it decided to create two independent central banks, one providing liquidity to the East and the other to the West. It should be obvious—at least in the standard model—that something was awry. There would be no reason that the money (we’ll call them dollars) created in the East would remain there. Since M_E and M_W are perfect substitutes, all that matters (in the standard model) is $M_E + M_W = M$, the total money supply. Surely, one might argue, the two monetary authorities would understand that, and act in together. But assume that the two monetary authorities have different utility functions, each representing the interests of their part of the country. While each knows that what matters is the total money supply, each knows that it can influence that by its own actions, which might not be in accord with what the other monetary authority wished. For simplicity, we assume that there is a simple relationship between the level of aggregate activity in each region and the aggregate money supply.

⁵ The most sizeable impacts are found by Krishnamurthy and Vissing-Jorgensen (2011) who argue, using an event study method, for a “significant drop in nominal interest rates on long-term safe assets”, but a much smaller impact on less safe assets such as corporate Baa rates. They also find expected inflation impacts, implying lower real rates. However in contrast, Chen et al (2011) find “moderate” effect: GDP growth of less than half a percentage point; and a “very small” effect on inflation.

⁶ Large enterprises are sitting on large amounts of cash. It is not the availability of finance that is constraining investment, and it is unlikely that reductions in interest rates will likely lead to more investment. The effects on consumption are taken up more directly below.

⁷ This has, of course, been a longstanding argument of advocates of capital account management. See, for instance, Stiglitz *et al* 2006 and the references cited there.

The two utility functions are $V^i(M, T)$ where T is the net transfer received (paid) by one region to the other. If there is no cooperation (and no transfers) the outcome is a Nash equilibrium described by:

$$(1) \quad V^E(M_E + M_W, 0) = 0, \quad V^W(M_E + M_W, 0) = 0$$

The two equations define two reaction functions, and the equilibrium is at the intersection of the two.

Each central bank, in setting its monetary policy, focuses only on the effects in its own region, ignoring the spill-overs. But there are important spill overs from the West to the East and vice-versa. If some of the firms in the West are national firms, they can use the greater availability of finance in the West to undertake projects in the booming East, or to speculate through a “carry trade”. Some of the firms receiving money may in fact be financial intermediaries (arbitrageurs), taking advantage of the low interest rates in the West to finance (or to provide finance for) projects in the East. And higher growth in the West will increase demand for imports from the East. Through all three mechanisms, expansionary monetary policy in the West exacerbates inflationary pressures in the East. The East would prefer that the West be less expansionary, and the West might prefer that the East be more expansionary.

The intuition for what is happening in this case is clear: if the East Coast is experiencing a boom, it will want to contract the money supply; but if the West is in recession, it will want to expand the money supply. The money supply, in this model, is publicly determined; it is like a public good, in that what matters is the total value of M , not how much is supplied by any particular CB; and as in the case of any public good, there can be different views about the optimal supply of the public good. What is best for one group may not be for another.

(Of course, within even a closed economy with a single monetary authority, the same issue arises, which our macro-models typically slide over by assuming a representative agent. One of the criticisms of unrepresentative central banks, where the voices of workers is not heard, while that of the financial community is over-represented, is that the collective decision represents more the interests and perspectives of the financial community. The problems would not be so bad if those who benefitted from the particular choice of a monetary policy could compensate the losers. The issue would only not arise if it could be shown that a particular monetary policy Pareto dominated all others, which is obviously not the case.)⁸

Assume, on the other hand, that it is possible for the two regions to provide lump sum transfers to each other. Social welfare (or Pareto efficiency) is achieved by

$$(2) \quad \text{Max } V^E(M, T) + V^W(M, -T)$$

⁸ For a broader discussion of these issues, see Stiglitz [1998b, 2012 chapter 9]

So

$$(3a) V_M^E + V_M^W = 0$$

$$(3b) V_T^E = V_T^W$$

Equation (3a) makes it clear that the Nash equilibrium is not in general Pareto optimal: the sum of the marginal returns to an increase in the money supply should be zero, not each individually. Achieving this cooperative solution may not be easy, or even possible, in the absence of compensating payments.

The creation of an independent central bank, not part of a broader political process, exacerbates the problems, because it makes it more difficult to design Pareto improving compensations, i.e. to offset the distributional consequences of monetary policy. This cost has to be offset against any putative benefit associated with any improvement in monetary policy from independence associated with either a better ability to make time consistent commitments or with less “politicization” of monetary policy.

Using other instruments

Matters are not quite as bad as I just described, because monetary authorities may have access to a range of other instruments, the effects of which may have lower spill-overs outside the particular region concerned. A long standing criticism of the standard model is that it does not describe and analyze clearly the process of credit creation through the banking system, and the ability of regulators to affect this credit creation. Much of the effect of monetary policy is mediated through the supply of bank lending—both the availability of credit and the terms on which it is available. Even in the absence of credit rationing, the terms at which credit is made available do not necessarily move in close tandem with T bill rates. The spread (between lending rate(s) and the T bill rate) is an endogenous variable, which has to be explained, and which can be affected by policy.⁹

For simplicity, we assume that there is a vector of policy variables, α^i under the control of each monetary authority, societal welfare is a function of M , α^W , and α^E and that each of the monetary authorities chooses α to maximize its own welfare:

$$V_{\alpha^i}^i = 0$$

Again, a coordinated solution would be preferable:

$$V_{\alpha^i}^E + V_{\alpha^i}^W = 0$$

For instance, by lowering reserve requirements, the CB in the West can encourage more lending by its banks, needed given its weak economy. Western banks have an informational advantage concerning

⁹ For a further elaboration of the ideas presented here, see Greenwald and Stiglitz, 2003.

Western firms, and thus the bulk of their lending is to Western firms, and thus the direct beneficiary of their lending is to the economy of the West. , though the extent to which it does so can be limited by regulatory mechanisms.

Again, we can describe the Nash equilibrium, and if compensatory payments are allowed, a Pareto superior outcome can be attained. Even if compensatory payments are not allowed, cooperative agreements can be reached, i.e. denoting the Nash equilibrium by $\{M^{i*}, \alpha^{i*}\}$, there exists an alternative policy vector $\{M^{i**}, \alpha^{i**}\}$ which is Pareto Superior, where each party shifts more of its policy agenda towards variables that have smaller spillovers.

Thus, if the Western region takes regulatory policy the effect of which is to expand lending mostly to SME's, the financial spillovers to the East will be smaller, and similarly if the Eastern region undertakes policies aimed at contracting lending to the SME's.

One of the criticisms of the Fed in the current crisis is that it has failed to pay attention to precisely these concerns. Its bailout strategy was focused on the larger, international banks, which disproportionately lend to large, multinational enterprises, not SME's; indeed large numbers of local, community, and regional banks that are central to SME lending remain weak.¹⁰ As a result, the cross-border spill overs are larger than they otherwise would have been.

II. Variable exchange rate

In the simple model of a single country, with a single currency, the conclusion that problems arise when there are multiple central banks might seem so obvious that it does not need even to be mentioned, let alone modeled. But in a globalized world, where there might be, for instance, multiple currencies that are strong enough to serve as reserve currencies, then the cross elasticities of currencies—the extent to which they can serve as substitutes for each other—may be sufficiently large that the model just described provides a good approximation to what is happening. As the Central Bank increases liquidity (money) in its country, there are large spill overs to other countries, through the financial and trade mechanisms described above; and what is optimal for one country is not for another. Without cooperation, the Nash equilibrium will be Pareto inferior to what could have been achieved with cooperation; but full cooperation is hard to achieve without compensatory payments, and even more so, if the set of instruments that are focused on is excessively narrowed (which has been the case in discussions of the conduct of monetary policy in recent decades, where the focus has been on using interest rates.¹¹)

When the currencies of the two countries are not perfect substitutes, then one of the channels through which monetary policy affects the country, and which at the same time generates spill overs on others is

¹⁰ The number of insured institutions on the FDIC's "Problem List" was 772 during the first Quarter of 2012. 140 banks failed in 2009, 157 in 2010 and 92 in 2011. FDIC Failed Bank List, at 22 October 2012.

¹¹ For a broader critique of the excessive reliance on interest rates by central banks, see Greenwald and Stiglitz, 2003, Stiglitz *et al* 2008 and Stiglitz, 2010.

the exchange rate. At this highly reduced form analysis, we do not need to model specifically how an increase in “ M^i ” or α^i affects the exchange rate. But if, say, an increase in M^i leads to a lower exchange rate for country i , then its exports will increase, and other countries imports will increase, i.e. some of the gains to country i are at the expense of others.¹²

There are policies that each country individually, and the countries collectively, can undertake to reduce the adverse externalities. Such policies may, at the same time, have positive benefits to the countries undertaking them. If there are costs, for instance, to engaging in expansionary monetary policy (increasing money supply by a given amount), then if more of the “liquidity” is directed at the home country, and less elsewhere, then the magnitude of the expansion of the monetary supply necessary to achieve a given expansion of domestic credit will be smaller. At the same time, such policies that limit the spill overs will mean that the country that is already experiencing a boom will not suffer from further expansion of its credit.

We denote these externality controlling actions by β . They have both costs and benefits. Country i 's (expected) utility is given by

$$V^i(M^i, M^j, \alpha^i, \alpha^j, \beta^i, \beta^j, T)$$

And it maximizes this by setting

$$V_{M^i}^i = V_{\alpha^i}^i = V_{\beta^i}^i = 0$$

Again, cooperation could achieve Pareto superior outcomes, especially if cross border lump sum transfers were allowed, but also even if they weren't. And again, we can observe that restricting the policy set may make achieving cooperation more difficult.

But this is what the international community has been doing for almost three decades, as they have erected prohibitions against barriers to the free flow of capital, barriers which could, if appropriately designed, mitigate some of the cross border externalities.

Ironically, the presumptive reason for imposing constraints on such policies is that such policies exert an adverse effect on others, even if they exert a positive effect on the country imposing them. Efforts at financial market liberalization were influenced by the earlier efforts at trade liberalization, where there was a compelling argument behind reciprocity of mutual trade liberalization: if all countries removed their trade barriers, under certain conditions, all countries could be better off (though literature over the last quarter century has shown the severe limitations under which that conclusion was valid.)¹³

¹² An increase in M^i can have other externalities on country j , e.g. as a result of the expansion of income in country i which increases imports.

¹³ See, e.g. Newbery and Stiglitz [1984]

One could perhaps make a corresponding argument for allowing free mobility of all factors; but the factor market liberalization agenda has never gone in that direction—it has focused on eliminating all barriers to the movement of capital, while retaining extensive movements to the barriers of labor. In this world, there is no “exchange.” Capital and financial market liberalization provide an opportunity of countries with high endowments of capital to earn a higher return on their abundant factor by investing it in other countries. There may be benefits that accrue to the recipient country, e.g. expanded output, higher wages, etc. But if these benefits do exist, there would presumably be no reason that the recipient country would impose the barrier, i.e. there is a presumption that forcing countries to liberalize lowers their welfare at the expense of the country opening its markets. (The same argument goes for “forcing” labor market liberalization. Allowing free mobility of labor has greater efficiency benefits than allowing the free mobility of capital, given the larger disparities in wages than in returns to capital. But even given the seeming benefits to labor immigration, that parallel those associated with capital inflows, most countries impose restrictions, partly because of the significant distributive consequences than cannot easily be offset.)

Indeed, recent years has produced a plethora of theoretical and empirical analyses explaining why full financial and capital market liberalization may be welfare decreasing, going well beyond the concern raised here that such liberalization undermines the ability to have “targeted” monetary policies with diminished spillovers to other countries.¹⁴

Liberalization in a world of credit constraints

In standard neoclassical models, investment is determined by the real rate of interest; thus controlling the real rate of interest provides the central channel for controlling the level of economic activity. (It is also the case in standard models of utility maximization over an infinite lifetime, changes in interest rates also can, but need not, have a powerful effect on current consumption.) There is, in fact, scant direct empirical evidence in support of either hypothesis; only in models in which there are strong prior constraints (where the effects of say, changes in nominal interest rates are constrained to be zero) can the effects of the real interest rate be detected, and this is especially true both when the country is experiencing a real estate boom/bubble and when it is in deep recession. In the latter case, there is typically large excess capacity; one should not expect that, just because one can obtain capital at a lower interest rate, firms would be willing to invest in more excess capacity. Indeed, real interest rates are already negative, and yet investment in real estate (and consumption) remains constrained.¹⁵ So too in

¹⁴ For a survey and discussion of the debate over capital market liberalization, see Stiglitz and Ocampo (2008), Stiglitz (2000, 2002). For an analysis explaining why capital market liberalization can lead to more volatility, see Stiglitz 2003. For a discussion of why financial market integration can lead to poorer global economic performance as a result of contagion, see Stiglitz 2010b, 2010c. For a discussion of why financial market liberalization may lead to lower growth and more instability and empirical evidence, see Rashid, 2011.

¹⁵ That is why the focus by some monetary economists on the zero lower bound to interest rates is misplaced, and why the analogy sometimes given to the Keynesian liquidity trap is also misconceived. See the discussion below.

a real estate bubble. If markets (often irrationally) expect returns on real estate of say 25% per year, then raising interest rates from 4% to 6% won't dampen investment much.¹⁶

What matters more, especially in such times, is the availability of credit. For more than thirty years, there has been a well-established literature explaining why, in the presence of imperfect and asymmetric information, markets are often characterized by credit rationing. Central bank doctrine in many countries at various times has focused on credit availability, though in the more recent dominance of neoclassical doctrines, such perspectives were put aside.

Consider a simple Greenwald-Stiglitz model [2003] where lending is mediated through the banking system, where the lending rate r^l is a function of the T-bill rate, r , where the monetary authority controls the T-bill rate, but where the monetary authority does not control the inflow of funds, and thus the availability of credit. Assume lending L is constrained not by demand, but by the supply of funds (as it is in a world of credit rationing), that higher interest rates attract an inflow of foreign capital, which in turn leads to more lending, and a higher level of lending leads to a higher level of aggregate demand, Y^d . For simplicity, we assume aggregate supply is fixed at Y^* , and that the optimal level of aggregate demand is Y^* . Thus, in this model national "welfare" is given by¹⁷

$$V(Y(L(r))),$$

with $V' > 0$ or < 0 as $Y < 0$ or $> Y^*$,

with the optimal value of r given by

$$V'Y'L' = 0,$$

i.e. by the solution to

$$Y(L(r^*)) = Y^*.$$

What is driving monetary policy (defined here as setting the interest rate) is the impact on the flow of funds into the country, not the creation of domestic credit. (We will come to the more general case shortly.)

Consider now a perturbation to the economy that results in an exogenous increase in aggregate demand, i.e.

¹⁶ Between 30 June 2004 and 29 June 2006, the Federal Funds rate was raised from 1% to 5.25% but this curbed the real estate bubble fairly little.

¹⁷ In a more general version of this model, government might be concerned with the distribution of income (e.g. between banks, firms, and consumers, which is affected directly by r and r^l). We can then write $V(Y, r, r^l(r))$. An increase in the T bill rate may affect not only the level of aggregate demand (through the level of lending activity) but also impact welfare through impacts on the distribution of income.

$$Y^d = Y^d(L(r), \varepsilon).$$

The standard “inflation targeting” remedy to the resulting inflation (as Y^d at the old r exceeds Y^*) is to increase r . But increasing r leads to an inflow of capital, and exacerbates the inflation. A recipe based on the neoclassical model provides precisely the wrong advice for an economy confronting credit rationing. It is easy to show that the optimal response is to lower interest rates, not raise them.

Of course, governments have additional instruments, and these should be employed. Assume, for instance, that there is a regulatory instrument (reserve or capital requirements), denoted generically by α . Assume now, for simplicity, that α and r also affect social welfare directly (e.g. as a result of distributional consequences or costs of implementing a regulation):

$$V(Y^d(L(r, \alpha)), \alpha, r)$$

Then optimal policy entails

$$V_Y Y_L L_r + V_r = 0$$

$$V_Y Y_L L_\alpha + V_\alpha = 0$$

The first equation says that in setting the interest rate, we don't just target the level of aggregate supply, but we take into account the effect of a change in the interest rate on welfare. If higher interest rates, for instance, represent an adverse distribution from (on average poor) debtors to creditors, then we choose an interest rate that is lower than the rate which would entail aggregate demand equaling supply. The second equation says, in effect, that we can improve upon the equilibrium so attained by adjusting other regulations. For instance, loosening capital or reserve requirements might lead to more lending at any given level of r , and so even if there is some cost to such an adjustment, it would be optimal to do so.

The desirability of using regulatory instruments is even stronger when there is a concern about the composition of output. (One might, for instance, be concerned about the composition of output if some sector, such as real estate, is systematically associated with instability, as a result of credit bubbles, or some other sector, such as high tech export sector, is systematically associated with learning spillovers¹⁸; or some sector, such as SME's, is systematically more closely linked to job creation, and the country faces a severe and persistent problem of unemployment.¹⁹)

Assume, for instance, a social welfare function of the form

¹⁸ See, e.g. Greenwald Stiglitz (2006, forthcoming) and Stiglitz(2012).

¹⁹ Note that the persistence of unemployment is, itself, evidence that the standard neoclassical model provides an inadequate description of the economy.

$$V(Y^{d1}(\beta L^1(r, \alpha), r), Y^{d2}(L^2(r, \alpha), r), \alpha, \beta, r)$$

Social welfare is a function of the demand for (output of) goods of type 1 and 2, each of which is a function of the interest rate and/or credit availability. But the credit availability functions differ, and in particular, good 1 (which we can think of as “unproductive” real estate) credit availability depends on foreign capital inflows, so $L^1_r > 0$, and a tightening of cross border capital flows (reflected in a reduction in β) reduces credit availability; while loan supply to sector 2 (which we can think of as local SME’s, information about which is not readily available to international investors, so they shun the sector) depends just on domestic sources, so $L^2_r < 0$ (when returns on government bonds increase, banks find it less attractive to lend²⁰), and lending does not depend on restrictions on cross border flows.

This leads to the first order conditions

$$V_{Y1} Y^{d1}_L L^1 + V_\beta = 0$$

$$V_{Y1} Y^{d1}_L \beta L^1_\alpha + V_{Y2} Y^{d2}_L L^2_\alpha + V_\alpha = 0$$

$$V_{Y1} [Y^{d1}_L \beta L^1_r + Y^{d1}_r] + V_{Y2} [Y^{d2}_L L^2_r + Y^{d2}_r] + V_r = 0.$$

The last equation emphasizes that in setting the interest rate, we pay attention to the direct distribution effects (V_r), as well as the effects on the composition of output. Assume that an increase in interest rates leads to an expansion of the “unproductive” sector 1 and a contraction of sector 2²¹ (i.e. $Y^{d1}_L \beta L^1_r + Y^{d1}_r > 0$ while $Y^{d2}_L L^2_r + Y^{d2}_r < 0$), then we will set the interest rate at a lower rate than we would otherwise (e.g. we might be more tolerant of moderate inflation, realizing that, at the margin, the cost of a slight increase in inflation is less than the cost of the “distortion” in the composition of output.)

But if we can restrict capital inflows, by lowering β , then the adverse compositional effects can be reduced.²² With two additional regulatory instruments, α and β , we can obtain still better outcomes. For instance, assume that inflationary pressures are related to the sum of demands for the two goods (in more realistic models, composition will matter as well). Then, we can choose $\{\alpha, \beta, r\}$ such that $Y^{d1} + Y^{d2} = Y^*$,

And then among the non-inflationary policies, choose the one which maximizes welfare, taking into account compositional and distributional concerns.

In this model, without the use of regulatory constraints, even moderate changes in the interest rate may not be able to dampen demand significantly, when a country faces inflationary pressures, because of countervailing effects of increases in interest rates on Y^1 and Y^2 : higher interest rates may dampen sector 2, but lead to an expansion of sector 1. By the same token, if the country faces unemployment,

²⁰ For an analysis of the theory of loan supply, see Greenwald and Stiglitz, 2003.

²¹ While the higher cost of capital might by itself lead to the contraction of the sector, the effect is more than offset by the greater availability of credit.

²² Though the optimal interest rate may still be lower than it would have been without the capital inflow, since inflationary pressures emanating from sector 1 would have been reduced.

and a shortage of aggregate demand, lowering interest rates may be ineffective, because while (if the financial system is working well) it may lead to an expansion of the second sector, it may lead to a flow of funds abroad (or reduced inflows of funds), weakening the first sector.

While the above discussion described policy using highly reduced form equations representing the welfare effects of changes in interest rates and regulations, it should be clear that there are well developed micro-foundations underlying the analysis. While we do not fully articulate these micro-foundations here, it may be worth clarifying the channels/mechanisms through which the effects are felt.

For instance, there is a large literature, growing out of the work of Stiglitz and Weiss (1981, 1986), on credit rationing, where the amount that, say, those in the SME sector can borrow depends on the value of their collateral (Kiyotaki-Moore, 1997). Greenwald-Stiglitz (1986) had shown that the effects of changes in prices (interest rates, wages) from say competitive levels had a second order direct effect on utility, but a first order effect on selection, incentive compatibility, participation, credit rationing constraints, or other constraints arising out of imperfect and asymmetric information and/or imperfect and incomplete risk markets. Accordingly, markets are essentially never (constrained) Pareto efficient, taking into account the costs of information and of creating markets; there essentially always exists government interventions that are welfare enhancing. This provides the fundamental critique of the neo-liberal position that begins with the presumption that one should not interfere with market allocations. This presumption simply has no basis in economic theory.

In this context, an increase in interest rates, to offset an inflow of say capital going into one sector (say the real estate sector) reduces the value of assets (like land) that are used for collateral. They therefore tighten credit constraints in the SME sector, which may be the employment and technology driving sector. Hence, while the increase in interest rates might dampen inflation arising from shortages in some non-traded good sectors, it has an adverse effect on the composition of output—and on welfare. A tightening on the constraints on capital inflows (e.g. a tax on short term capital inflows) might, by lowering inflow of funds to the real estate sector, decrease aggregate demands arising there, thereby allowing lower interest rates, increasing the value of collateral, increasing lending to the SME sector, and thereby increasing welfare. There can be further benefits: as Jeanne and Korinek point out, in the absence of government intervention, those who have access to international capital (like, perhaps, large real estate projects) borrow excessively from abroad. Looking forward, they do not take into account the effect of higher borrowing on the future exchange rate, say in the event of an adverse shock. Each borrower takes the probability distribution of exchange rates as given, but when they all borrow more in foreign denominated currency, in the event of an adverse shock, the exchange rate will fall more, with adverse effects on all those who owe money in foreign exchange.²³ Thus, imposing constraints on the

²³ This kind of argument, that in a world with incomplete risk markets, each investor takes the price distribution as given, but when they all invest more in, say, the risky asset, the price distribution changes, was first developed in Stiglitz (1982). More recently, it has been used to explore a wide variety of macroeconomic failures, e.g. associated with fire sales. See e.g. Korinek (2010, 2011) and Jeanne and Korinek (2011). See also Korinek, Roitman, and Vegh, 2010 and Diamond and Rajan (2009).

free flow of capital yields a direct benefit today (allowing a lower interest rate), and a future benefit, in terms of a more stable exchange rate.

So too, a policy of increasing the reserve requirements and lowering interest rates (or increasing them less than they would otherwise be increased) may be preferable to just raising the interest rates—but it is ambiguous whether such a policy is preferable to a policy of imposing direct constraints on the inflow of capital, if it is feasible to impose such constraints. Both policies have the benefit of reducing excessive inflows of capital, the short run distortions that result (as the foreign capital inflows go disproportionately into one sector, one associated either with less positive externalities or more negative externalities than the other sector), and the long run instability associated with these “excessive” capital inflows.

However, the higher reserve requirement combined with the lower T-bill interest rate can have a differential effect on the availability of domestic credit to SME’s, and the terms on which it is made available. Comparing two policies which have analogous effects on inflation, it is not easy to ascertain the differential compositional effects. These will depend on the supply elasticities of foreign capital and the response functions of banks (which in turn depends on their risk aversion and their risk positions and perceptions.) But there is some presumption that if the Central Bank can use a set of instruments to “steer” credit towards the desired sector, either through hard constraints—a requirement that at least a certain fraction of lending go to SME’s, or softer constraints—differential reserve requirements or deposit insurance rates, depending on the composition of lending). Even better outcomes can be obtained by employing such policies in combination with a policy of capital inflow constraints (β) (with endogenous adjustments in the interest rate to hit, say, the target levels of inflation). Such policies are, not surprisingly superior to the employment of a single regulatory constraint, and that in turn is superior to the employment of no regulatory constraint.

There is in this an important lesson: some central banks have shown a predilection for using only one instrument, the interest rate (typically adjusted through open market operations). This is predicated on the belief that price instruments are superior to other forms of intervention, based on some variant of a neo-classical model. But underlying such analyses is a fundamental cognitive dissonance: government control of a fundamental price is a massive intervention in the market, only justifiable because of major (macro-economic) market failures. There is no theorem that says, in general, that when there are such market failures, optimal interventions should be through a single instrument, or that that instrument should be a price instrument (the interest rate), or that the adjustment in that instrument should be simply related to a single signal of market disequilibrium, the inflation rate (the Taylor rule), regardless of the source of the perturbation to the economy, though there may be highly idealized circumstances in which that may be true.²⁴ In general, given the pervasiveness of market imperfections and the multitude of disturbances that can throw an economy off kilter (disturbances on the demand and supply side, disturbances originating within the domestic economy or from abroad, and if from abroad, from trade or from finance) it is desirable to have at one’s disposal a large panoply of instruments. Monetary

²⁴ In the context of taxation, that was the major insight of Frank Ramsey. See also Stiglitz *et al* 2008.

authorities do have multiple instruments. Not using this full panoply has resulted in self-inflicted wounds. Such self-imposed constraints arise out of incomplete and, to a large extent, incoherent views about market failures and the role and scope for government intervention.

Neo-liberal policy doctrines are flawed not just in constraining unnecessarily the set of instruments, but in not identifying the full range of market failures. Here, we have modeled one sector as having more positive externalities, or fewer negative externalities, than the other. But there are other market failures which a broader analysis would take into account: relying on interest rate adjustments imposes greater costs of adjustment for macro-economic disturbances on sectors and firms that are more interest sensitive, and even more so, when credit availability is mediated through the banking system (as it typically is) on those sectors and firms that are more reliant on bank finance (such as the SME sector). If firms are risk (volatility) averse, an hypothesis for which there are both strong theoretical and empirical foundations (Greenwald-Stiglitz, 1990, 1993), then the economic structure is distorted, away from such sectors.

III Why Monetary Policy has *Any* Effect

Before concluding, I want to say a few words about how the most important theorem in finance, the Modigliani Miller theorem, should affect our thinking, both about monetary policy and bank regulation.

The Modigliani Miller (MM) Theorem and the (almost) irrelevance of monetary policy

Some years ago, I proved a generalization of the MM theorem for the public sector, which argued that, under the idealized conditions under which the MM theorem held, public financial operations, such as a change in the maturity structure of government debt, should have no effect. (Stiglitz, 1981, 1983) (The result could also be thought of as a generalization of the Barro-Ricardo theorem, suggesting that government debt itself had no effect.)²⁵ In a simple model with infinitely lived individuals, putting aside any distributive effects, we owe money to ourselves, so government debt is simultaneously a liability and an asset. That that is so provides an important critique to those excessively worried about government debt, at least when it is internally held (it's another matter when the debt is held by foreigners, because then the debt amounts to a diminution in the country's "net worth".)

The intuition, of course, is simple, and it is the same that underlies the Barro-Ricardo analysis (in its general equilibrium form): if the government borrows more now (say, instead of paying for current expenses by raising taxes), to be repaid at some later date, the effect can and will (in general equilibrium) be precisely offset by the representative consumer saving more, and using the funds to repay the government debt later. But in the general equilibrium formulation, there can be multiple heterogeneous individuals, and the result holds, assuming, of course, that those who would have paid the taxes now pay the "equivalent" amount later, i.e. that there are no distributive consequences to the postponement of the taxes. And the same holds if the government decides to raise more funds by a sequence of short term borrowings, rather than by long term debt.

²⁵ That work itself was based on my generalization of the MM theorem (Stiglitz, 1969, 1974), work which itself, together with Stiglitz (1982b), explained the limitations on the theorem.

The empirical evidence is overwhelming that the Barro-Ricardo theorem, and my generalization of it, are wrong.²⁶ The question is not the validity of the proposition, but why it fails. And what insights does this provide us into capital markets and the workings of monetary policy?

Distributive effects, capital constraints, and seeing through the public veil

It should be obvious, from the start, that it is hard to avoid distributive effects and political economy considerations (the absence of which are essential to the validity of the Barro-Ricardo result). In the limiting case, with an overlapping generations model, the decision to postpone financing for current expenditures through taxes has potentially important intergenerational effects. To be sure, there may be partially offset through changes in intergenerational transfers, but the fact is that most individuals do not leave any significant bequests to their children²⁷, in which case there can't and won't be such offsetting bequests.

A variety of capital market imperfections provide the basis of the strongest theoretical critique. If individuals would, for instance, want to have borrowed more, but are constrained from doing so, the existence of an incremental future liability will not induce them to start saving. The borrowing constraint will simply be less binding than it was before. By the same token, were the government to decide to tax more and borrow less, the individual facing a borrowing constraint won't be able to offset the effect through increased borrowing.

In reality, most individuals do not fully incorporate future tax liabilities into their budget constraints—and even less so, do they incorporate the “risk pattern,” so that changes in the risk pattern, as a result of a change in say the maturity structure of debt (or a shift from unindexed debt to indexed debt) are not offset by corresponding changes in their portfolios. (As another example: as the Fed bought long term bonds, there was the obvious risk that should it reverse the purchases as the economy recovers, there would be a capital loss.²⁸ The expectation of such a capital loss, with full integration of the public and private budget constraints, should have had a contractionary effect on consumption, offsetting the intended expansionary effect. The Fed suggested it might hold the bonds to maturity, using other ways of tightening credit, e.g. by paying interest on deposits at the Federal Reserve, in effect enabling it never to realize the capital losses. But these only mask the reality that (the present discounted value of)

²⁶ See for example, Johnson, Parker and Souleles (2006). Anecdotally, when Bush cut taxes dramatically in 2001 and 2003 the average savings rate fell to near zero—it did not increase as the Barro-Ricardo analysis would have suggested. Of course, there were many other things going on, and defenders of the theory might argue that were it not for the tax cut, savings would have been even lower, i.e. minus 2 or 3% of GDP. But with credit constraints already binding for so many individuals—and with the bottom 80% of America already consuming 110% of their income—it is hard to believe that in the absence of the tax cuts, the savings rate would have been that low.

²⁷ In fact, most individuals have almost no wealth—and hence no bequests of significance. See, for example, Wolff and Gittelman (2011), who find that between “1989 to 2007, 21 percent of American households at a given point of time received a wealth transfer and these accounted for 23 percent of their net worth.”

²⁸ The general point that it is hard to explain why temporary interventions (such as associated with IMF short term loans to a country) should have long term effects in models with rational expectations was made in Stiglitz [1999]

government revenues are less than they otherwise would have been; they don't change the predicted adverse effect on consumption, assuming full integration and rationality.²⁹)

Monetary policy in a world of interest bearing money

It is clear that the idealized world of Modigliani-Miller provides an inadequate description of the economy.³⁰ There is a widespread assumption that monetary policy—even quantitative easing—has some effects. But modern monetary theory lives in a half-way house of incompletely articulated assumptions of imprecisely defined market imperfections and distributive effects, leading to speculative observations about possible channels through which monetary policy might yield effects, with ambiguous quantitative significance .

Today, for instance, with cash management accounts, T-bills can, in effect, be used as money for purposes of transactions. In the standard model in which interest rates are determined by the demand and supply for money, an open market operation entailing an exchange of T-bills for, say, “money”, doesn't change the effective supply of money, since T bills themselves can be used for transactions, and so such an exchange (open market operations) shouldn't have any effects on interest rates. And this is especially so in a world in which T-bills are yielding close to zero nominal interest rates.

Institutional constraints, Credit availability, profit maximizing risk-averse firms, and the liquidity trap

But it is possible in a world of banks with institutional rigidities that such open market operations could have an effect. For an increase in deposits held by the banking system in the Federal Reserve (“base money”) can, through the credit multiplier, lead to increased lending. I say, *can*, not necessarily *will*. For banks are (for the most part) profit maximizing risk averse firms³¹, and they may decide the best way to allocate their portfolios is not to issue new loans to, say, SME's, but to buy government bonds from the household sector or from abroad, or simply to hold the excess liquidity at the Fed. This can give rise to a liquidity trap, though one that is distinctly different from that discussed by Keynes and some more recent commentators focusing on the zero lower bound on the interest rate.

The distinction is important: Keynes was confronting a situation where prices were falling at 10% a year, so real interest rates remained in excess of 10%, so it was plausible that the inability to lower real interest rates represented a constraint on the ability of monetary authorities to ignite the economy. Today, however, there is moderate inflation, of say 2%, so that real (t bill) interest rates are negative.

²⁹ The irony is that government insists that banks use mark to market accounting, but the Central Bank doesn't do so for itself.

³⁰ My own earlier work on asymmetric information and stressing the importance of bankruptcy provided part of the critique. Higher debt ratios may entail higher (expected) losses from bankruptcy and may have signaling/screening effects. (Stiglitz, 1969, 1982). But these “limitations” are not relevant, at least for countries like the United States, where there is essentially no risk of default.

³¹ I should be more cautious: given the agency issues that were revealed so vividly in the crisis, they might be better described as managerial enterprises, maximizing the well-being of the managers, subject to certain constraints on the access to credit. In either case, we have to describe the *behavioral* responses to a change in, say, base money or T-bill interest rates.

To be sure, at a sufficiently negative real interest rate, individuals might be spurred to consume more and firms to invest more, but within reasonable ranges, changes further lowering of (expected) real interest rates, to say -4%—even were they feasible— are unlikely to spur much further investment or consumption.

For many smaller businesses, the real constraint is the lack of availability of credit (a problem that simply cannot be analyzed in a model with perfect capital markets). Providing more liquidity to banks does not necessarily lead either to more lending or to lower lending rates (Greenwald-Stiglitz, 2003).

The ineffectiveness of temporary interventions

Or consider, for instance, a temporary intervention—buying long term bonds now, under the presumption that the economy will recover in say a couple of years, in which case the action will be reversed. Apart from slight changes in endowments (increases in the levels of state variables like human and financial capital) that might have been induced by the temporary intervention, at $t + 2$, asset prices will be the same as they would have been before the intervention. Knowing this, it is hard to see why there should be large changes in asset prices (share prices) at t and $t + 1$. With lifetime budget constraints essentially unchanged, it is hard to see why there should be any significant changes in consumption at t and $t + 1$, even if there should be some changes in asset prices.

Of course, in models with less than perfect rationality and high degrees of risk aversion, such temporary interventions can have some effects: individuals focusing on cash flows that had much of their wealth in say bonds that roll over see cash reductions in cash flows. As the financial press continually describes the response to low interest rates, it leads to a “drive for yield.” (There is no general theory that would suggest that as yields go down, individuals act in a less risk-averse manner; quite the contrary, the adverse wealth effects might more plausibly lead to more risk-averse behavior.) That in turn leads to an increase in the price of stocks—even if “rationally” they realize that the forces leading to this increase (above what the prices would otherwise be) are just temporary. The standard wisdom from the advocates of QE are that the higher stock prices will lead to more consumption. We have questioned whether that is so, if they rationally expect the intervention to be temporary.

But there is a more fundamental problem: if the reason for the increase in stock prices is the “drive for yield,” then it reflects a worsening of the life-time budget constraint as a result of lower interest rates, and net that should have ambiguous effects on consumption, with wealth and substitution effects operating in opposite directions.

But there is another set of effects that may be operating. The standard model ignores the effects of “overlapping generations”: those that go into retirement at t and $t + 1$, and had been planning to sell their assets, will now receive more from them than they otherwise would have received, and this group may consume more than they otherwise would have. But once we start focusing on distributive effects, we need to take into account those associated with the lowering of interest rates: those prudent older people who had invested in say government bonds will find their incomes lowered as interest rates are reduced, and for many of these, a lowering of income translates quickly into a lowering of consumption.

It is at least conceivable in a situation where there is excess capacity in industry and real estate and excess leverage in households, that this adverse consumption effect among the elderly could outweigh any inducement towards more investment or consumption among firms or households, and so lowering interest rates could have an adverse effect on aggregate demand.

Other adverse effects of QE

There are many other potentially significant effects that are typically ruled out in the “standard” model: lower interest rates lead to more capital intensive technologies, laying the seeds for a “jobless” recovery; lower interest rates can lead to asset price booms, increasing the prices of oil and other commodities which act much like a tax on consumers.

Here, I do not wish to argue for the quantitative importance of any of these effects. What I do contend is that once one moves away from the “perfect markets” model, or the “almost perfect markets model” in which we know that monetary policy should have no (or negligible) effects, we have to be careful in thinking through the source of “imperfections.” Too much reasoning has been based on an almost incoherent pastiche of analyses based on “rationality,” “rational expectations,” and “well functioning markets” overlaying a variety of forms of imprecisely specified and explained market imperfections. I’ve alluded to some examples already: while there is ample discussion of markets “discounting” future actions, temporary measures, it is still believed, can have significant effects.³²

Some of the disappointments with QEII and QEIII would not have come as a surprise, if monetary authorities had grasped better the nature of market imperfections *as they existed at the time of the implementation of these policies*. Given the role that local (community) and regional banks play in the provision of credit to SME’s, given the weaknesses that persist in these banks, given the role that collateral plays for such lending, given that real estate is the predominant form of collateral, and given that real estate prices remain persistently and markedly below the level before the crisis, it should be no surprise that QE would have limited effects on SME lending. Given that large firms were sitting on large amounts of cash, it should be no surprise that QE might have little effect on lending to large firms and/or investment by these firms.

One of the hoped for effects was that lower long term interest rates would lead to lower mortgage rates, which in turn would lead to large numbers of Americans refinancing their mortgages, and the lower interest rates would effectively put cash in the pockets of households, leading to more consumption. Note that underlying this analysis are implicit assumptions about distributive effects of interest rate changes. Lower interest payments by households corresponds to lower receipts of interest by lenders. In representative agent models, the effect would be a wash. In models focusing on capital and institutional constraints, the effects are more complex and ambiguous. In the absence of either constraint, the redistribution from creditor to debtor should increase consumption (as the advocates of

³² They can, but typically only through substitution effects (a temporary investment tax credit or VAT tax), or through redistributive effects (e.g. the recapitalizations of the banking system, transferring, often in a non-transparent way, resources to the banks at the expense of others.)

QE hoped.) In the presence of capital constraints (limiting borrowing by households), the effect is even stronger.

But in the presence of institutional constraints on banks, lower revenues/profits for the banks translates into less lending, an effect which could be stronger than that generated by differences in marginal propensities to consume.

But that conclusion would itself be incorrect, for it fails to take on board the many and growing imperfections in the mortgage market. There has been increasing concentration³³--to the point where no one would describe the market as a competitive one. Without precisely specifying the appropriate model of tacit collusion or oligopoly, it is certainly conceivable that the banks would not increase the supply of mortgages so much as to increase their spread, their profit margins. Thus, some analysts have claimed that the consumer benefits (and thus the increase in aggregate demand through that channel) are less than had been touted, and that, like so many of the Fed's programs, the real beneficiaries are the banks, especially the large banks that control the lion's share of the mortgage market. If that is the case, the short run benefit to the economy, at least through this channel, will be limited.

Another market imperfection may have reduced the benefits derived from QEIII even more. Mortgages that could easily be refinanced have already been refinanced; borrowers who have not have either insufficient income or are "underwater." The mortgage could be refinanced only if there were a principal write down. In a standard model with rationality, it would pay both lenders and borrowers to engage in debt restructuring. Foreclosures are expensive for everyone involved, including the communities in which they occur. There is enormous dead weight loss. But principal writedowns entail a recognition of losses faster than would otherwise be the case, especially since the change in accounting regulations in 2009 that allowed even impaired mortgages *not* to be written down. That would make the *seeming* profits in the short run lower, even if it would make long run profits higher. But agency problems pervade the banking system, and bank management has incentives to focus on the short run. Moreover, some banks may face high costs in raising funds (a natural capital market constraint, arising from the high level of non-transparency of the banks.) In short, the level of refinancing may be far smaller than would be the case if financial markets were perfect, but analyzing the extent to which there will be refinancing, and the impact on banks and aggregate demand, entails a

³³ William C. Dudley, President of the Federal Reserve Bank of New York, noted in a recent speech, "Federal Reserve MBS purchases have succeeded in driving down mortgage rates to historically low levels. But these purchases would have had still more effect on the economy if pass-through rates from the secondary market to the primary market had been higher [...]The incomplete pass-through from agency MBS yields into primary mortgage rates is due to several factors—including a concentration of mortgage origination volumes at a few key financial institutions and mortgage rep and warranty requirements that discourage lending for home purchases and make financial institutions reluctant to refinance mortgages that have been originated elsewhere." William C. Dudley, "The Recovery and Monetary Policy", Remarks at the National Association for Business Economics Annual Meeting, New York City, 15 October 2012, available at <http://www.newyorkfed.org/newsevents/speeches/2012/dud121015.html>

complex analysis of institutional constraints and imperfections.³⁴ Monetary policy ignores these at its peril.

Liquidity versus solvency

Much is made of the distinction between lack of liquidity and insolvency, and while this distinction is central to decisions of central banks about which banks to support, and which to let die, the distinction itself is questionable, and illustrates prevalent inadequacies in the analysis of market imperfections.

Typically, if everyone agreed that, say, a bank is solvent, it would have access to funds; it would be liquid. The problem arises because bankers, those who have borrowed too much and put too much of their money into risky assets, believe that the asset prices will recover, and that their “fundamentals” are strong. The fact that other market participants don’t agree should give government pause. But the bankers worked hard to convince the government that—in this particular instance—the market is wrong. But when the market is irrationally exuberant, they fought equally hard to ensure that the government took at face value asset prices; it would have been viewed as unacceptable to question the market, to take 20 or 30% off market prices, in assessing bank balance sheets, on the grounds that prices were inflated by a bubble.

IV Concluding Comments

There are three essential insights of the Greenwald-Stiglitz [2003] approach to monetary theory and policy: (a) One of the main channels through which monetary policy affects the economy is through impacts on credit availability; (b) if that is the case, then the analysis of credit availability should be front and center in monetary policy; (c) in most countries, banks play a dominant role in the provision of credit, and for good reason³⁵, and if that is the case, then the analysis of bank behavior should be front and center in monetary policy; and (d) one cannot and should not separate out regulatory instruments from the conventional instruments of macro-economic policy, e.g. open market operations.

The Greenwald-Stiglitz analysis is based on a critique of traditional models in which the effects of monetary policy are mediated just through interest rates, and interest rates reflect the balancing of the

³⁴ The list of imperfections in the mortgage market is not meant to be exhaustive. Institutional arrangements, for instance, make it difficult for lender A to refinance a mortgage held by lender B, and lender A often has little incentive to refinance the mortgage—it will simply lower his revenues. More broadly, the mortgage servicers have little incentive to facilitate mortgage restructurings. There is Congressional legislation under consideration as this paper goes to press attempting to deal with some aspects of these issues.

³⁵ Which are beyond the scope of this paper, except to note that they relate to problems of imperfect and asymmetric information. Securitization undermines incentives to select good mortgages and monitor; it creates enormous moral hazard problems; and credit rating agencies—the purported “solution” are inherently inadequate. Securitization makes information (about the quality of, say, the mortgages included in the securitization package a public good, and there is no efficient and effective way by which that information can be provided privately. (The problem is similar to that discussed by Grossman-Stiglitz, 1980). The performance of securities markets in the years before and after the crisis illustrates all of these points.

demand and supply of money. They point out that with most “money” being interest bearing, the traditional view that the interest rate is the opportunity cost of holding money is just wrong; furthermore, most transactions are not income generating, but rather than exchange of assets, so if money were required for transactions, there would be no simple and stable relationship between money and the level of economic activity (since the ratio of asset transactions to income can be highly variable.) Further, most transactions do not require money; credit is typically an effective substitute, and when it is not, one needs to explain why not. (Cash-in-advance models simply *assume* that it is not an effective substitute.)

In the 1930’s there was an active debate between two approaches to the determination of the interest rate, the Keynesian approach, based on the demand for money used for transactions purposes, and that of Robertson³⁶, on the demand and supply of loanable funds. In some ways, our approach represents a further development of the work of Robertson, with two important changes. In his model, the supply of loanable funds was based just on savings. In ours, there is a critical role for banks, who make assessments of the credit worthiness of potential borrowers. Imperfect and asymmetric information is central. Such information tends to be local and specialized; foreign lenders (suppliers) of funds have different information than domestic lenders, so that their allocation of funds is markedly different.

Secondly, in both Keynes and Robertson, demand always equals supply; yet in models with imperfect and asymmetric information, there can exist rationing equilibrium. Indeed, such equilibria are pervasive.

Thus, traditional models (of both the Keynesian and Robertsonian version) have little to say about the determination of the spread, the difference between the T-bill rate and the lending rate. If there is a difference, it only reflects a difference in (objectively determined) risk. With risk neutral lenders, the expected payments are the same.

But in the Greenwald-Stiglitz models, monetary policy is largely mediated through the banking system. The lowering of interest rates may (or may not) be reflected in a commensurate lowering of lending rates or a commensurate increase in credit availability. Indeed, there is a new version of a liquidity trap—not caused (as Keynes suggested) by a high elasticity of the demand for money, but by a low responsiveness of banking sector lending, even as the central bank provides the banking sector with more liquidity. This is precisely what has been happening in the United States and Europe; and the theory developed by Greenwald and Stiglitz anticipated and predicted this kind of liquidity trap well before it became evidence in the aftermath of this crisis.

This paper has focused on a “global” model of monetary policy and credit creation, where the actions of monetary policies in one jurisdiction can and do have effects on the level of macro-economic activity in other jurisdictions.

The analysis has shown (a) the desirability of cooperation among monetary authorities; (b) cooperation can be achieved more easily if there are a multiplicity of instruments, because it is easier to achieve

³⁶ See, for instance, Robertson (1951).

outcomes that Pareto dominate the Nash equilibrium; (c) there are instruments (like restrictions on cross border capital flows) that reduce externalities and increase the effectiveness of monetary policy on the domestic economy; it was wrong for these policies to be eschewed for so long; (d) there are good reasons for monetary authorities to be concerned about the structure of the economy and the distribution of income, and if they are, it is important for them to make use of a multitude of instruments; and (e) in particular, seemingly unconventional policies, like responding to an influx of capital by simultaneously lowering interest rates, raising reserve requirements, and restricting capital inflows may be highly desirable.

While the analysis of this paper has focused on equilibrium models, market responses to perturbations, especially in models with credit rationing and unemployment, may be unstable: unemployment may, for instance, lead to a lower share of wages, lowering aggregate demand, increasing unemployment still further. Standard policy prescriptions may make matters worse: a supply side shock, part of which gets passed on in the form of higher prices, under inflation targeting will lead to higher interest rates, exacerbating the adverse effects of the supply shock on the macro-economy. To these instabilities, we have now added a third: with long and variable effects of actions, especially as the effects are felt on distant shores, in the absence of cooperation among monetary authorities the global economy may not converge quickly or smoothly even to the (inefficient) equilibrium. But this is a topic for a later paper.

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