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SUMMARY

Credit ceilings

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Credit ceilings have been adopted by many OECD countries in the belief that they allow rapid and precise control of activity, inflation and the balance of payments. This paper addresses three key issues. First, are credit ceilings effective when there exist sizeable non-bank financial intermediaries? The answer is clearly more a matter of degree than kind; evidence from Italy suggests that ceilings were initially very powerful but progressively lost their effectiveness as new financial markets developed during the 1970s and the 1980s. However, they remained important as a tool for influencing capital flows. Second, it is often suggested that credit ceilings are effective because they reduce the money supply in addition to constraining spending. We argue they are more likely to affect the *demand* rather than the supply of money and this may imply a perverse effect through the financial markets. However such an effect is empirically very small in the case of Italy. Finally the paper investigates the costs of controls. Italian evidence indicates that they significantly reduced competition between banks. Ceilings also constrained borrowers to grow at more uniform rates, thus affecting the allocation of resources.

Monetary policy through ceilings on bank lending

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1. Introduction

Controls on bank lending are one of the main tools to which the authorities of many countries have resorted whenever inflation and the balance of payments have become priority concerns. Among OECD countries, Japan, France, Italy, the Netherlands, Australia, Sweden, Denmark, Norway and Ireland have had ceilings most of the time since the early 1970s, while in the United Kingdom they were in place continuously from 1964 to 1972. Austria, Belgium and Switzerland have used them in special circumstances, and Finland, Spain, Luxembourg, Portugal and Turkey at least once since the 1960s. The main exceptions are Canada and Germany, which have never used them, and the United States, which applied them only very briefly in 1980 to curb the expansion of consumer credit.

Generally credit ceilings have been adopted in the belief that they would help to control inflation and the balance of payments more *quickly* and *precisely* than with conventional methods of monetary policy, with respect to which they were seen as supplementary instruments to be used for relatively short periods (see Bank for International Settlements, 1971; Bingham, 1985). In some instances they have been used selectively to protect sectors of national priority or certain groups of borrowers, such as small firms, deemed too exposed to the consequences of credit restrictions. Because credit ceilings are typically designed to direct available savings towards long term uses, such as housing and investment,

* We thank the management of the Research Department of the Bank of Italy for permission to use a preliminary version of the financial sector of the econometric model presently being developed at the Bank. The opinions expressed in this paper are those of the authors and do not necessarily reflect those of the Bank. Among our early readers, we want to thank C. Caranza, I. Visco and our discussants, G. Basevi and J. Melitz. C. Wyplosz was of great help throughout. A. P. Caprari has provided excellent secretarial assistance. The remaining errors are obviously the authors' responsibility.

Editors' note: this paper was held over from issue 2 due to lack of space.

and to moderate fluctuations in long term rates of interest, they were usually applied to deposit banks and not to other intermediaries.

The single most pervasive feature of the prototype country using credit ceilings appears to be a high degree of openness to international trade. In small, very open, countries, accuracy and timeliness in the regulation of the level of activity – the main alleged advantage of credit ceilings – becomes critical since external deficits can become very large in relation to GDP and financing problems may arise in a very short time. This is also why several small open economies exert tight controls over the acquisition of foreign assets by residents, while the acquisition of foreign liabilities is usually subject to more flexible forms of surveillance. In these circumstances the main linkage between domestic and foreign markets is provided by the credit market, where firms can choose between loans denominated in foreign and domestic currency. A ceiling on loans in domestic currency obliges firms to borrow in foreign currency: the final effect on official reserves is essentially the same as a minimum requirement on foreign borrowing, a measure that, in various forms, has also been adopted in several countries.

The size of the banking system, relative to the total flow of funds also bears on the likelihood of credit ceilings. Despite exceptions such as Germany, credit ceilings are considered effective in countries like Japan, France and Italy where alternative capital markets are relatively unimportant. Indeed, the ratio of deposit flows to net increases in financial assets, cumulated from 1970 to 1982, was 0.67 in Japan, 0.64 in France and 0.54 in Italy, as compared to 0.43 in the US and 0.49 in the UK.

Interestingly there is no cross-country evidence that the use of credit ceilings is correlated with the size of the borrowing requirement of the public sector. Indeed a number of countries lifted credit ceilings when the budget deficit was at or near its historical peak: the UK in 1972, Belgium in 1978, the Netherlands in 1981, and Italy in 1983. A possible explanation is that the instruments of monetary policy evolve in response to the budgetary position. In times of surplus, the central bank creates liquidity, for instance by making use of the discount window, rather than absorbing it. In times of rising deficits, it may take time to develop the instruments required to maintain control over liquidity. For instance open market operations require a sufficiently thick money market. As the market and the instruments of policy develop the need for credit ceilings becomes smaller.[1]

[1] This issue is the subject of a wide literature in France drawing on the distinction, originated by Hicks (1974), between 'market economies' and 'overdraft economies': in the latter the intermediation of funds is dominated by oligopolistic banks and is more responsive to administrative measures than to interest rates. See Maarek (1978) ;Levy-Garboua and Maarek (1979); Levy-Garboua (1982); Maricic (1985).

In recent years a number of countries have either lifted the ceilings, taken steps in that direction or, at the very least, announced their intention to do so in the near future (notably Denmark, the Netherlands, Australia, Austria, Norway, Sweden, France and Italy). While this is not surprising when the ceilings are no longer binding, more fundamental forces may be at work. These are; increased evidence of the market's ability to circumvent the controls and to develop new forms of financing; growing concern about potential distortions in financial markets particularly with regard to competition in banking; and increased effectiveness of indirect methods of control as the authorities prepare for the transition to more market-oriented methods of monetary control.

In this paper we discuss how credit ceilings were expected to work in theory, provide evidence, mostly Italian, on their effects in practice, and assess their implications for the efficiency of the financial system. First, Section 2 discusses macroeconomic issues. Four main views on the functioning of credit ceilings are singled out and compared: the 'credit' and the 'credit-money' views (both of which conclude that credit ceilings are effective in reducing demand, although for different reasons), the 'general equilibrium' view (according to which credit ceilings may even be expansionary) and the monetarist view (which suggests they are ineffective). Section 3 provides empirical evidence concerning the effects of credit ceilings on key macroeconomic variables, on the process of financial innovation and on the development of alternative channels of finance. Sections 4 and 5 turn to microeconomic questions. In Section 4, cross section data are used to evaluate the effect of credit ceilings on bank competition. Section 5 addresses the question of whether constraining the loans of all banks to grow at the same rate implies that the debts of all categories of borrower also grow at the same rate. In Section 6 the main policy implications are drawn together in the light of present trends in methods of monetary control in the OECD.

2. Standard monetary policy and credit ceilings

2.1. Limits on standard monetary policy

Open market operations are effective only when thick and competitive markets react swiftly to signals coming from the top and transmit them to the real sector. When banks are virtually the only participants in the market these conditions are unlikely to be met. To examine this point, consider a simplified balance sheet of the banks:

Assets	Liabilities
Reserves (monetary base)	Central Bank advances
Credit to firms	Deposits
Bonds	

An open market operation is a sale of bonds to the banks in exchange for a reduction in their holdings of the monetary base. With a given reserve ratio on deposits, this induces the banks to reduce their deposit liabilities, and therefore the volume of credit granted to firms, thus depressing investment and total demand.

There are two reasons why such a reduction in demand may not be achieved. First, the open market operation will increase the interest rate on bonds. The higher yield on bonds will encourage banks to reduce their excess reserves, so that the overall reduction in deposits will be less than proportional to the size of the open market operation. Second, if it is banks' practice to hold a given proportion of bonds and firms' credit, and if this proportion is insensitive to the interest rate on bonds, an open market operation which increases the banks' holdings of bonds will lead them to partially offset the reduction in credit. As is shown in Appendix A, there are plausible conditions under which both effects combined will leave total credit and income unaffected although the interest rate on bonds has risen.

Numerous studies in the period around the first introduction of credit ceilings in Italy in 1974 focussed on these two factors, evaluating the linkage between the monetary base and credit. Overall it was believed that, in the face of the rising demand for credit induced by the rise in inflation, banks would try to accommodate their customers, selling bonds and reducing reserves, thus largely neutralizing the restrictive impulses coming from central bank operations. Of course, in such a case, the authorities could reduce the monetary base by lowering the volume of advances. This was in fact the principal instrument used by the authorities to regulate the level of activity. As argued by Padoa-Schioppa (1985), rudimentary open market operations were instead used to stabilize the level of the bond rate. The burden of the public debt was not yet a problem, but concern about the level of interest rates stemmed from evidence that capital losses associated with increases in rates induced massive flights away from the bond market. Also, the bond rate was relevant for the financing of housing and capital spending; inventories, part of which were imported and were a relevant component of the short-run volatility of the balance of trade, were mainly financed through bank credit. In practice, this led to the

following assignment rule (which is shown to be dynamically stable in Appendix A); Central Bank advances are targeted on income while open market purchases (buying bonds with base money) are targeted at the bond rate. In the 1970s, as public deficits started to appear, liquidity was absorbed through reductions in central bank advances, which gradually became only a small fraction of total credit available to the banks. Thus monetary restraint based on advances progressively became less feasible during the seventies prompting an interest in credit ceilings.[2]

2.2. Principles and limits of credit ceilings

While there is little controversy about the mechanisms through which credit ceilings can affect the allocation of credit, very different views have been expressed about their effectiveness. Among those who claim that they work, there is no consensus as to *how* they work. Schematically, four views can be distinguished. First, there is the *credit view*, according to which credit ceilings are effective because credit directly affects the level of activity. If a large share of firms' spending is financed through bank credit and if the substitutability with other forms of finance is limited, the ceiling forces a reduction of spending on inventories and capital goods. Second, there is the *credit-money view*, which stresses the role of money and views credit ceilings as means to control money rather than credit. Focusing on the balance sheet of banks, a forced reduction of their assets will reduce their liabilities, primarily deposits, as well. Third, there is the *general equilibrium view* which stresses the substitutability of various financial instruments. According to this view, there is no guarantee that credit ceilings are effective and indeed they may even be expansionary. An implication of this approach is that the fall in the money stock, which is stressed in the credit-money view, does not necessarily have restrictive effects on the level of activity. Finally, there is the *monetarist view*, which focuses on the monetary base. Credit ceilings are a dike on a river whose source is the monetary base. They may reduce the flow of water for some time, but have no lasting effect on the level of activity. They do however drive the cost of funds for the public sector below the level determined by market forces; hence their main role is that of a hidden (and highly distortionary) tax on the financial system.

[2] See, among others, Fazio (1969); Fazio, Caligiuri, Cotula and Savona (1970); Cotula and Padoa-Schioppa (1971); Masera (1971); Caligiuri, Fazio and Padoa-Schioppa (1974). An overview of the problem is in Caranza *et al.* (1979).

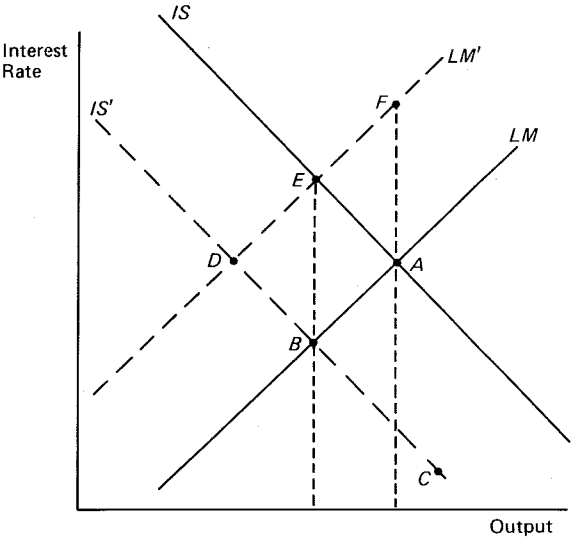

Figure 1. The effect of credit ceilings

2.2.1. The credit view. This view is best adapted to a situation where markets for private securities are not well developed and banks intermediate most of the funds from surplus to deficit sectors. In such a situation, credit ceilings work well almost by definition as they directly affect spending. This can be seen by reference to the traditional *IS–LM* framework of Figure 1. The *IS* schedule shows the level of demand corresponding to a given level of the interest rate on bonds. The *LM* schedule describes the combinations of interest rates and incomes for which the demand for money remains equal to the supply (for a given quantity of base money). In this framework, credit ceilings directly shift the *IS* schedule to the left as credit-financed spending is reduced (this is the effect described by Caranza and Fazio, 1983; Blinder and Stiglitz, 1983; and Blinder, 1984). The *IS* curve is not vertical as long as *some* spending is financed by direct borrowing on the bond market. For the *LM* curve to remain unaffected, two important assumptions are required, and will be dropped in Section 2.2.3. below. First, ceilings must apply to loans only and banks must react by purchasing bonds rather than by reducing their deposits. Second, neither the rate on credit nor the quantity of it enters the demand for money, i.e., there is no substitutability between money and credit.

In that case, credit ceilings are unambiguously effective in reducing income. Moving from point *A* to point *B*, the interest rate on bonds also declines, contrary to the widely held belief that it should rise because banks increase their purchases of bonds. The reason is that we now have an excess of saving over investment which is eliminated by the fall

in income. In the end, banks will have purchased the securities made available by the lower saving and the higher market financed investment of the private sector.

With a traditional monetary contraction, the *LM* schedule shifts leftward: the equilibrium bond rate (at point *E* in Figure 1), which is necessary to reduce the level of activity by the same amount as credit ceilings did, is obviously higher than at point *A*. Perhaps more important is the issue of lags. If the monetary base is reduced through open market operations (or, at any rate, without resorting to rationing), the bond rate rises immediately to equate supply and demand. Income however is reduced only slowly for two reasons; first the cost of credit responds sluggishly to changes in money market conditions; and second, spending reacts with a lag to interest rates. Graphically, the bond rate jumps to a point like *F*, and then slowly moves towards equilibrium at point *E*.

Clearly, in this world, credit ceilings are an independent instrument of policy: if the interest-sensitive component of demand is relatively small, they may work nicely because the 'long and variable lags' of monetary policy become short and predictable. In addition they make it possible to pursue a restrictive policy without increasing the interest burden on the Treasury.

They have a cost. When they are in place, standard market instruments of policy are likely to be less effective: credit ceilings tend to segment financial markets and interfere with the chain of asset substitutions that is critical for the effectiveness of monetary base management (see Angeloni and Galli, 1985). Without credit ceilings the rate on credit would react, although with a lag, to changes in the bond rate or the monetary base. Thus the credit financed component of demand would be affected indirectly. Credit ceilings break this linkage; in graphical terms, credit ceilings make *IS* steeper, and hence reduce the final effect of a given change in the bond rate.

2.2.2. The credit-money and the Tobin–Davis views. We now relax the two crucial hypotheses made earlier. First, banks may react to credit ceilings by reducing their deposits, either because the ceiling also applies to bonds (in which case banks have essentially no alternative to reducing their size) or because the differential between the bond rate and the deposit rate is not sufficient to justify staying in the business. In this view, credit ceilings help control the money supply (the credit-money view). Second, the public may substitute bonds for money so that the demand for money is sensitive to the difference between the rate paid by banks on deposits, and the yield on alternative assets. Graphically, all this means that the *LM* schedule will also shift when credit ceilings are imposed or tightened.

If, as a result, the *LM* schedule moves leftward, the effect of credit ceilings is strengthened. A closer look at the issue suggests, however, that this need not be the case and that the interaction with money may reduce rather than increase the effectiveness of credit ceilings. This is the point stressed by Davis (1971). His argument closely replicates Tobin's criticism of deposit rate ceilings (Regulation Q) in the US (Tobin, 1970). Like credit ceilings Regulation Q reduced bank intermediation and was thought to have restrictive effects on final spending. Tobin showed that such a belief was unfounded, except under certain assumptions which he saw no particular reason to underwrite.

In the case of credit ceilings, the reason why things may go wrong is as follows. As stated above, we now envision a situation where banks react to credit ceilings by attempting to reduce their deposits through a reduction in the rate they offer on these liabilities. What will this do to the monetary base, the sum of currency in circulation and banks' reserves? These two components will move in opposite directions: deposits are reduced partly because the public now holds more currency as its opportunity cost has declined; and as deposits are reduced so are the banks' reserves.

Tobin therefore distinguishes two cases. The first one, which he describes as gross substitutability between the monetary base and deposits, arises when the demand for the monetary base actually increases because the rise in currency holdings more than offsets the banks' reserves contraction (presumably because the reserve ratios are small). The second case, gross complementarity, corresponds to the situation where the reduction in banks' reserves dominates and the demand for the monetary base is lowered.

What then is the overall effect of credit ceilings? First, by reducing total credit, they reduce the supply of money. The demand for money will be adjusted downward either through an increase in its opportunity cost, i.e. in the bond rate, or a reduction in the yield on deposits, or both. But, let us now add the effect of the banks' decision to lower their deposit rates. This move clearly contributes towards bringing down money demand, but it also interferes with the monetary base market. In the case of gross substitutability, we have seen that this means a rise in the demand for the monetary base,which will be offset by the opposite effect of an increase in the bond rate: the overall effect of credit ceilings is a reduction in the deposit rate, an increase in the bond rate and therefore an unambiguously contractionary effect as investment declines because of both the ceilings and the higher costs of borrowing in the bond market.

In the gross complementarity case, however, the demand for the monetary base declines. Equilibrium now requires a compensating

decline in the bond rate so as to prompt a stronger demand for both currency and bank deposits. The overall effect of credit ceilings now is a decline in the deposit rate, and in the bond rate as well. This latter effect opens up the possibility that total investment rises, as firms increase their borrowings on the bond market, possibly more than offsetting the effect of the credit ceilings.

In terms of the *IS–LM* model, complementarity means that banks demand less monetary base and the resulting excess supply can be eliminated by a fall in the bond rate (at any level of income): the *LM* curve shifts to the right. The final equilibrium of the system could be at a point like *C* in Figure 1 where income is higher than in the initial situation. The same may happen if credit ceilings induce the private sector to economise on money holdings. For example the scarcity of credit may induce firms to exercise tighter control on their money balances, rather than reducing their real assets.

2.2.3. The Monetarist View. In this view the demand for money is not responsive to interest rates and the *LM* schedule is vertical. The shift in the *IS* curve caused by credit ceilings has no effect on the level of activity. Moreover if the *LM* schedule is not affected by credit ceilings (under the assumptions of Section 2.2.1), the excess demand for bonds by banks causes a fall in the bond rate that induces firms to increase their supply of bonds by the full amount of the reduction in bank credit. The end result is a mere shift in the form of bank lending from loans to bonds. What is left is a reduction of the cost of funds to the public sector below the level that would equilibrate the market given the PSBR and the monetary base. In this view credit celings are essentially a way to finance the deficit. They are however more distortionary than most other forms of taxation (mainly because they freeze competition in the banking industry) and, just as importantly, their role as an instrument of fiscal policy is not explicitly recognised. If the real issue is the deficit, then the monetary authorities should act so as to either impose discipline on the fiscal authorities (by abiding to a predefined monetary rule) or, should this prove infeasible, let the burden of the deficit be explicitly recognized. They should then push for explicit taxes or, at the very least replace the ceiling with a regulation requiring banks to purchase public sector bonds.

3. Some evidence from Italy

3.1. Effects on final demand

Figure 2 reports the annual growth rates of real GDP and the real rates of interest on bank loans and on Treasury bills (computed using survey

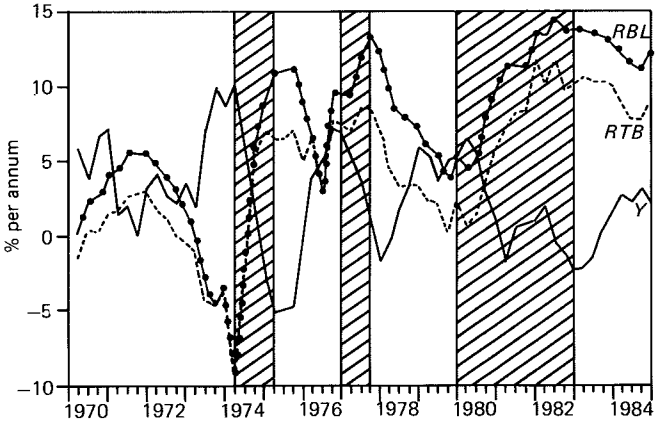

Figure 2. Output growth and real interest rates

Y = Growth rate of GNP at 1970 prices; RBL = interest rate on bank loans in lire deflated by expected inflation of wholesale prices; RTB = interest rate on T-bills (average of 3, 6 and 12 months) deflated by expected inflation of wholesale prices. *Note*: Shaded areas mark the periods when ceilings were binding.

information on 6 months ahead expectations about wholesale prices, as in Visco, 1979); shaded areas mark the quarters in which credit ceilings are considered to have been binding (from 1974Q2 to 1975Q1, the first three quarters of 1977 and the 1980–82 period) on the basis of gross infringements of the ceiling. The figure shows that ceilings were imposed in periods when output was growing very fast. While real interest rates also rose, in the first two episodes the Treasury bill rate rose considerably less (about 4 percentage points) than the loan rate, as would be expected from the analysis of Section 2. In 1980, the spread again increased, but by a smaller amount. During the three periods of restriction, GDP contracted quite sharply. During each recession the shares of inventory investment and investment in machinery in GDP fell.

We document and interpret the link from credit ceilings to output via inventory and fixed investment by simulating an econometric model. The model, whose main features are presented in Appendix B, is in the *IS–LM* tradition of Section 2. The financial sector encompasses the four views discussed above, allowing credit ceilings to act both through rationing and through a change in bank lending rates, while standard monetary policy affects various components of demand via interest rates. The results, reported in Table 1, show that if credit ceilings had not been used in 1974 and in 1980–82, and holding constant exports and public consumption, the other components of GDP would have been higher. The simulation confirms that inventories and investment are strongly affected by credit ceilings. Imports react rather slowly, so

Table 1. Effects of credit ceilings (as % of GDP)

	1974	1975	1980	1981	1982
Fixed investment	1.1	2.4	0.7	0.9	0.3
Inventories	1.7	1.9	1.2	0.7	0.1
Consumption	0.2	1.1	0.2	0.5	0.6
Imports	0.2	0.7	0.2	0.4	0.3
GDP	2.8	4.7	2.0	1.7	0.7
Loan rate	−2.4	−3.5	−1.5	−1.2	−0.4

Note: Differences between simulated and actual figures expressed as percentage of actual GDP; for the loan rate differences between simulated and actual values (%) are reported.

that in the very short run the main benefit of credit ceilings for the balance of payments seems to come from the capital account (see Section 3.2). The overall impact of credit ceilings on GDP was significant: without ceilings, the level of GDP would have been 3% higher in 1974 and 4.7% higher in 1975.

The simulation for 1980–82 confirms the previous results: without credit ceilings, GDP would have been 2% higher in 1980 (on top of a historical growth of 3.9% between 1979 and 1980). Most of the fall in output observed by the end of 1982 can be attributed to interest rates; in that year, GDP would have been 0.7% higher if credit ceilings had never been used. We also note that the effects of credit ceilings were much stronger in the first phase than in the second, even though in 1980–82 credit ceilings were progressively extended to virtually all bank loans. In Section 3.3 we will argue that the difference can be attributed to the wider substitutability between different credit instruments observed over 1980–82.

As pointed out in Section 2, one of the main arguments in favour of credit ceilings is that they do not require large changes in interest rates which would weigh heavily on the public debt and possibly destabilize financial markets. The model was therefore used to evaluate the once and for all increase in the Treasury bill and discount rate in 1980Q1 which would have led to the same level of GDP in 1981 without credit ceilings.[3] The results depend critically on the reaction of the authorities to the increase in interest payments on the debt (they matter because they enter disposable income and affect consumption). Had they been neutralized through increases in taxes, the GDP target for 1981 would have been attained with a 3.3 percentage points increase in the Treasury

[3] This experiment neglects the issue of uncertainty in assuming that the central bank in 1980Q1 knew the structure and future development of the economy. This is not too critical as ceilings eliminate a large part of the uncertainty concerning the linkage between open market operations and credit.

bill and discount rates starting in 1980Q1. Without neutralization, the required increase would have amounted to 5.4 points.

3.2. Effects on the financial sector

In this section, we provide evidence on the effects of credit ceilings on the main monetary and financial aggregates, holding real variables constant. There are two points of interest. The first is the possibility that credit ceilings provoke a contraction of the monetary base. In the credit-money view, this is a desirable effect, indeed the channel of effectiveness of credit ceilings (as the *LM* curve shifts to the left). On the other hand, the Tobin–Davis view is that such a demand-driven fall in the base may well result in an expansionary effect (as the *LM* curve shifts to the right). The other point of interest concerns potential substitution with the foreign sector. A distinct possibility, often sought by the monetary authorities, is that credit ceilings result in increased borrowing abroad, thus building up exchange reserves. In order to investigate these issues, we have simulated the sub-model of the Italian financial sector for 1980 taking the real side of the economy as given. This allows us to concentrate on the first round financial effects of credit ceilings.

The main finding of the experiment is that the ceiling left the monetary base virtually unaffected in 1980: without credit ceilings it would have risen by 13.2% against an actual increase of 13.7%. This essentially negligible saving on currency and required reserves can be traced back to the banks' reactions to credit ceilings: instead of lowering their deposit rates, they chose to acquire Treasury bills. The possibility of a potentially, albeit small, expansionary Tobin–Davis effect was prevented by the monetary authorities by introducing in March 1980 a penalty on banks which did not respect their ceilings. This penalty, which took the form of non-interest bearing deposits with the central bank, both discouraged banks from exceeding the ceilings and absorbed excess reserves.

The other component of the base, foreign reserves, grew by 5.2% while our simulation indicates that it would have fallen by 17.2% in the absence of credit ceilings. This result confirms the effectiveness of credit ceilings in substituting foreign borrowings for domestic credit, which actually grew by 16.6% instead of an expected 20.1% in the absence of ceilings.

3.3. Credit ceilings and financial innovation

Our analysis of Section 2 suggested that financial innovation alleviates the dependence of total borrowing and investment on the rationed

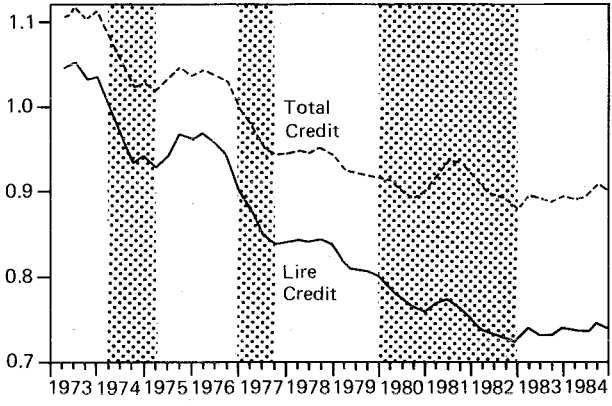

Figure 3. The ratio of total credit to output

Note: Shaded areas mark periods when ceilings were binding.

components of credit (the leftward shift of the *IS* curve is reduced).[4] Financial innovation may imply a permanent fall in the share of bank credit, due to the rise of new markets, or a greater flexibility of the system in finding temporary substitutes for the controlled aggregate. The first possibility arises if the birth of new markets had previously been prevented by the existence of fixed costs, now worth facing as bank credit turns exceptionally scarce or expensive. In the second case, ceilings impose a temporary cost by forcing the system into non-competitive forms of intermediation. In the Italian case, we note three main facts. First, the ratio of total credit of the private sector to value added has fallen significantly between 1973 and 1983. Second, banks have maintained their share of total external financing of the private sector. Finally, the variability of this share in periods of credit ceilings has significantly increased in the last decade.

The first point is brought out by Figure 3: the periods in which credit fell as a proportion of output correspond to periods of binding ceilings and tight monetary policy. After each restriction the ratio stabilized at the new lower level. It is clear that the monetary restraints of the 1970s and the 1980s have induced the system to save credit, especially lire credit.

[4] The possible substitution of bank credit with other forms of credit has always represented a central issue in the analysis of credit ceilings; for Great Britain see Davis (1970) and Revell (1972), for Japan see Bank for International Settlements (1971), for France see Laudy and Lombard (1983).

Table 2. Composition of total financial flows to the private sector (%)

Year	Bank loans in lire	Bank loans in foreign currency	Special Credit Institutions loans	Private debentures* and shares	Foreign loans and trade credit
1974	51.0	3.0	25.6	5.0	15.4
1975	49.4	−2.9	35.5	14.0	4.0
1976	47.0	10.8	22.4	9.2	10.6
1977	43.3	20.3	26.7	11.2	−1.5
1978	46.4	−3.2	30.5	13.2	13.1
1979	58.5	5.4	18.0	5.3	12.8
1980	41.2	14.6	21.9	8.7	13.6
1981	35.8	−3.8	28.9	10.0	29.1
1982	40.3	−2.6	35.6	20.1	6.6
1983	53.2	8.2	23.3	11.7	3.6
1984	47.1	15.0	21.2	11.6	5.1
average	46.7	5.9	26.3	11.0	10.1

* This item includes bonds, bankers' acceptances and other instruments of credit issued by the private sector.

How much of this can be attributed to credit ceilings and how much to interest rates? The fact that banks have maintained their share in total external financing of the private sector (see Table 2) strongly suggests that this process was mainly due to interest rates. In 1984 the flow of bank credit as a proportion of total financing was above the 1974–84 average. In terms of *stocks*, the ratio of bank credit to private liabilities (external financing net of shares) was 52.5% in 1975 and 48.8% in 1984.

The system has learned to save on bank loans as well as on other forms of credit. Various factors (the analysis of which is beyond the scope of this paper) may have made this possible: reductions in inventories and liquid assets, government transfers to firms, higher productivity of the real assets which were financed with credit, and increased profits. Whatever the reason, the trend fall of the ratio of credit to value added indicates that the leverage of monetary policy through credit ceilings has been reduced. Table 2 also shows that the short run ability to circumvent credit ceilings has increased over time. In 1974 and 1975 the share of banks' credit was above the period average; in 1977, it went slightly below; in 1980–82 it was pushed to the lowest values in the sample. Most of the flexibility was provided by forms of financing which did not imply direct recourse to the market and were

still largely centred around financial intermediaries[5]: small loans which were exempted from the ceiling, bankers' acceptances, and bank loans in foreign currency. Direct foreign loans became of paramount importance in 1981 when bank loans in foreign currency also became subject to the ceiling. The share of Special Credit Institutions increased in 1981 and especially in 1982 when it reached an unusually high level.

Overall the degree of substitution between bank credits in lire and other financial flows appears higher than a decade before. While some erosion of the effectiveness of the ceiling could have been avoided by further extending its coverage, the cost would have been a decrease in efficiency, a reduction in the degree of competitiveness of the markets and, possibly, the birth of pathological forms of finance which had characterized the previous ceiling phase.

4. The costs: competition in the banking industry

The freezing of market shares due to credit ceilings adversely affects competition in the banking industry. This is not a necessary consequence of credit ceilings, however. In principle, one could envision a system of marketable quotas that would largely eliminate this disadvantage. Similarly the aggregate subject to the ceiling could include both loans to the non-bank sector and net interbank assets, allowing the more dynamic banks to lend out the funds borrowed on the interbank market. In practice, largely for surveillance reasons, most countries have adopted less ambitious forms of flexibility. In Italy, market shares were not completely frozen because of unutilized margins and infringements and, until 1981, as a result of exemptions.

Even then, the effects of credit ceilings on competition should not be taken for granted. First, we have already mentioned the many margins of flexibility achievable through substitution and innovation. Second, because of cartel agreements and regulations concerning the opening of new branches, the banking industry in Italy has been functioning as a collusive oligopoly, with a quota system even in the absence of credit ceilings. The question therefore is whether credit ceilings have further reduced the extent of competition.

We first note that after the lifting of the ceilings in 1983, the variability of loan market shares, as measured by the sum of the absolute values

[5] Table 2 shows that the issue of private debentures and shares remained low in periods of binding ceilings. Such issues were prevented, in Italy as well as in other countries, by unfavourable tax treatment or other legal restraints (Revell, 1972). The issue of bonds boomed only in 1982; most of the increase was, however, due to the issues of two publicly owned firms, and to a temporary tax exemption scheme ending in 1982.

of market share changes, has increased by 50%. In line with a wide empirical literature that, following Stigler (1964), has found a positive correlation between competition and mobility, this fact may signal an increase in competitive pressures in the market for bank loans. Another indicator of intensified competition is provided by the lower dispersion of the interest rates charged to comparable classes of borrowers. Between the second quarter of 1983 and the end of 1984, the range of minimum lending rates charged by the various legal categories of banks narrowed from 1.7 to 0.8 percentage points.

A more precise measure of the effects of credit ceilings on competition can be obtained by applying the market structure and performance approach to the behaviour of financial industries (Heggestad, 1979; Gilbert, 1984). This approach hinges upon the assumption that the structure of the industry (the number of firms and their size distribution) influences the intensity of competition and thus the performance of the firms operating in the market, as measured by profits or output prices. Thus, for example, a positive correlation is expected between the degree of concentration and profits (or prices) of firms operating in specific markets. This correlation should be significantly reduced in a period of credit ceilings if they can be viewed as a national cartel that overrides all possible preexisting agreements and is effective independently of the structure of local markets. The effect of credit ceilings may then be quantified by computing the change in the market structure that would produce the same effect on the performance of the banking industry.

The chosen measure of local market concentration is the Herfindahl index (Herfindahl, 1950). This index, widely used in the market structure-performance literature (Heggestad and Mingo, 1976, Hannan, 1979, Kwast and Rose, 1982, and for Italy, Conigliani and Lanciotti, 1984), takes the value of one in the case of a monopoly and tends to zero as the market moves towards perfect competition (i.e., as the number of firms becomes large and all firms become small relative to the market).

The exact procedure is detailed in Appendix C. We have computed Herfindahl concentration indices for 1,500 local markets. Then, for each of 87 Italian banks, we have defined an index of competitive pressure by averaging the 1,500 market concentration indices, using as weights the share of each local market in the bank's total deposits. Market performance is measured by the difference between loans and deposit rates offered by each bank. Presumably, this indicator should depend upon a variety of factors, some bank-specific (such as the relative importance of bad loans), some regional, some regulatory and

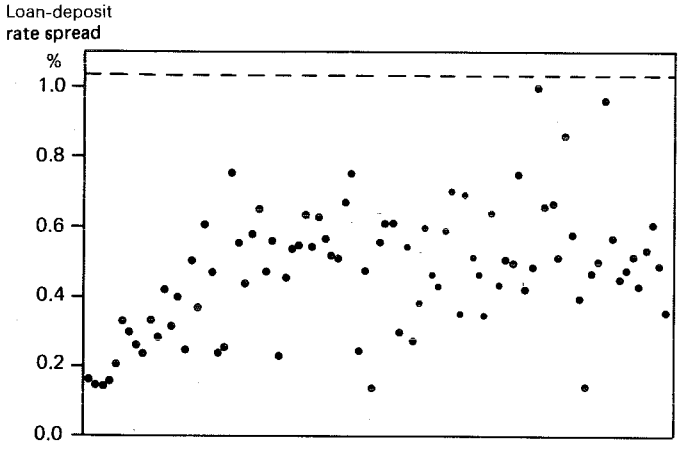

Figure 4. Loan-deposit rate spreads for sample banks (percentage points)

Note: Under perfect competition the spread would be zero. Credit ceilings raise the interest rate differential to 1.03 percentage points. This is indicated by the dashed line.

finally some reflecting the competitive environment. A cross-section regression, also presented in Appendix C, allows us to measure separately the effects of bank-specific factors and credit ceilings on banks' performance.

The main finding is that, in the absence of credit ceilings, there is indeed a correlation between market concentration and market performance: as the degree of competition falls, the spread between loan and deposit rates increases. The effect of these deviations from perfect competition on each of the 87 banks in our sample is shown on Figure 4, the spread increases ranging from 10 to 100 basis points (with no particular ordering for the individual banks).

In a period of credit ceilings, however, our statistical analysis shows that the link between market structure and performance breaks down. We find that, irrespective of the particular market structure in which a bank operates, the ceiling pushes up the spread by 1.03 percentage points relative to perfect competition. This is the top horizontal line on Figure 4.

The Herfindahl competition index which would lead to such a spread of 1.03 percentage points is 0.545: such an index would describe, for example, the case of a duopoly where the two firms have market shares of 65 and 35%, respectively. As a matter of comparison, even the most concentrated area, in the absence of credit ceilings, yields a lower index: credit ceilings reduce competition more than any existing local market concentration.

Table 3. Infringements and unused margins, January–June 1983 (as % of the ceiling)

Regions	Non-complying banks		Banks with unused margins		Other banks
	Number of banks	Average infringement	Number of banks	Average unused margin	
Lombardy	17	9.1	11	6.8	19
Piedmont	7	6.3	6	4.4	4
Tuscany	9	7.4	2	4.9	1
Emilia-Romagna	19	6.8	9	3.7	11
Lazio	7	7.9	6	5.3	5

Note: Banks whose loans differed from the ceiling by at least 1% in one or more months are classified as either 'non-complying' or 'with margins' according to the sign of discrepancy.

5. The costs: borrowers' mobility and the allocation of resources

Customers' mobility may be another important factor bearing on the efficiency of the credit market. It becomes critical when credit ceilings are in place, because it determines not only the strength of competitive forces, but also whether the freezing of market shares of banks also freezes the shares of financial flows accruing to different sectors of the economy. Indeed, the ceiling does not necessarily oblige individual borrowers to grow at the same rate as their lenders; if there is high mobility in the market, high growth sectors may be able to obtain credit from banks with which they were not previously doing business. In the process, the traditional and less dynamic customers of these banks will be displaced, as would occur if the credit restriction was achieved with standard instruments of monetary policy via interest rates and bank liquidity. Both low mobility and the ceiling reduce the degree of competition in the market. Resource allocation is likely to be adversely affected by low mobility only when there is a ceiling; in the no-ceiling case the market mechanism can normally, although not always, be expected to select 'good' borrowers, by allowing the banks which do business with them to grow at faster than average rates. The sizeable coexistence in the same area of banks' infringements on the ceilings and of unused margins, documented in Table 3, suggests low mobility. For instance in Lombardy 17 banks (out of 47) exceeded the ceiling by 9.1% on average while 11 banks had margins amounting to 6.8% of the allowed quantity.

The distribution across banks of deviations from the ceiling tends to be rather stable over time: 15% of the banks exceeded the ceiling less

Table 4. Distribution of customers according to changes in business relationships with commercial banks

Type of variation	Number of customers as % of total customers					
	1978–79	1979–80	1980–81	1981–82	1982–83	1984–85
Increase without substitution	18.8	20.3	14.8	12.5	13.4	15.3
Increase with substitution	0.9	1.0	0.8	0.9	0.7	1.0
Decrease without substitution	17.7	16.9	19.8	19.8	18.7	18.4
Decrease with substitution	0.4	0.4	0.5	0.5	0.4	0.5
Substitution without increase or decrease	2.5	2.6	2.7	2.9	2.4	2.6
No variation	59.6	58.9	61.4	63.4	64.4	62.2

Source: Central Risks Office data on about 350,000 individual borrowers based on loan account headings. Updating of Table 10.1, in Ciocca *et al.* (1984). All the data is based on a year running from end-September to end-September except 1984–85 which runs from end-March to end-March.
Note: The fall in 1981 of the frequency of increases without substitution (customers that in the period established relations with new banks without interrupting those that preexisted) is due to the removal of the exemption of small size loans that had previously been used as a means of bypassing the ceiling through the practice of multiple credit facilities (see Section 3.3).

than 6 times (out of the 25 control dates from April 1981 to April 1983), while 35% of the banks exceeded it more than 20 times. These numbers suggest that many banks preferred to pay a penalty rather than to lose a customer or that many customers preferred to pay higher interest (inclusive of the penalty if the latter was transferred forward) rather than shopping for a new bank.

Another way to study the degree of mobility of borrowers is to consider the pattern of changes in their relationships with their banks. Table 4, an update of Ciocca *et al.* (1984), considers five cases depending on whether the borrower had in a certain period of time: either established at least one business relation with another bank, without interrupting the previous ones (increase without substitution); or established a number of new relations exceeding the number of relations which were interrupted (increase with substitution); or interrupted at least one relation, without establishing new ones (decrease without substitution); or interrupted a number of relations exceeding the number of new relations established (decrease with substitution); or, finally, substituted old with new relations (substitution without increase or decrease).

Given the lack of similar estimates for other countries, it is difficult to judge these numbers. It should however be noted that most of the

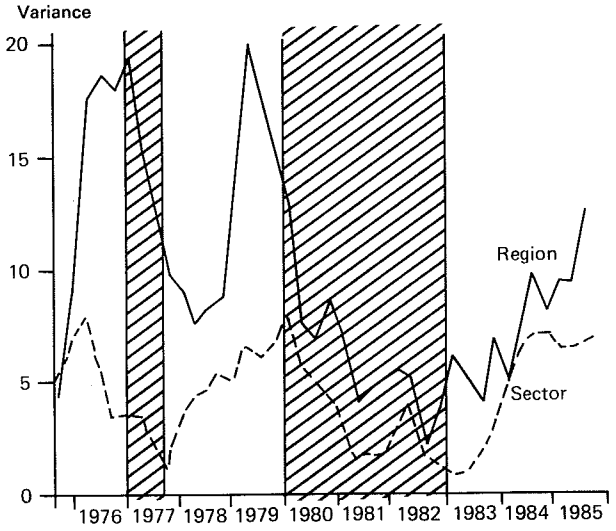

Figure 5. Credit ceilings and resource allocation (variances of the annual rates of growth, of bank lending by sector and by region)

Note: Shaded areas indicate periods when credit ceilings were binding.

changes occur without substitution and that their frequency is affected by cyclical conditions; favourable conditions occurred in 1979 and 1980 and at the end of the sample when the proportions of customers who increased the number of relationships without substitution and who decreased the number of relationships without substitution were respectively above and below the mean. This suggests that mobility is less affected by search for better financial arrangements than by the borrowing needs generated by changing business conditions. In that case, with limited mobility, it becomes quite likely that credit ceilings may have distorted the allocation of credit. To examine this, we turn to Figure 5 which traces the dispersion across sectors and regions of the growth in bank lending (measured by the variances of the annual rates of growth of bank lending to particular sectors and to geographical regions). In the periods when credit ceilings were binding both indicators decreased, suggesting that growth tended to become more uniform across both sectors and regions. In the remaining quarters they rose, although some exceptions (1976 by regions, first semester of 1978 and 1979 by sectors) indicate that other factors were at work. Attempts to eliminate systematic factors (cycle and trend) from the individual variables did not change this basic picture, suggesting the

presence of incidental factors, such as industrial crises (which may also affect the regional distribution of lending), administrative measures affecting the asset composition of individual banks, etc. This leads us to conclude that borrowers' mobility was not sufficient to prevent ceilings from having some effects on the allocation of credit, but that the magnitude of these effects was not overwhelming.

6. Conclusions

Although several countries have recently taken steps towards deregulating their domestic credit markets, it is clear that liberalization is not around the corner. In most cases the lifting of credit ceilings has been gradual and the authorities have avoided a strong commitment against the possible reintroduction of controls. In France, the ceiling has been replaced by a system in which loans to the private sector net of 'stable resources' (own funds and bonds) are subject to reserve requirements which are proportional up to a certain point and become highly progressive thereafter. In Japan, in 1983, the central bank 'maintained a flexible guidance with respect to the autonomous lending schedule of each bank'. In the Netherlands, in the same year, the authorites and the banks reached an agreement on credit expansion, while in Sweden the Riksbank 'used recommendations to regulate bank lending for non-priority purposes'. In Denmark the central bank issued collective guidelines to commercial, saving and cooperative banks. In Italy credit ceilings were suspended in 1983, were followed by a period of transition in which the central bank 'monitored' the growth of lending to the private sector and were again introduced in January 1986 as an emergency measure in the face of an exceptional outflow of official reserves.

In many cases, the timing of the removal of credit ceilings may be related to slackening activity. But the principle itself has been advocated on the basis of the perception that the costs of credit ceilings may come to outweigh their benefits. The present study has shown that credit ceilings have a significant impact on bank competition and the allocation of resources. They are both less effective and less needed because of financial innovations. However, in Italy in the 1980s, credit ceilings still made it possible to curb the expansion of credit and the level of activity without substantial swings in interest rates. Summing up, there may be situations in which the duration of the imposition of credit ceilings ought to be strictly limited on both effectiveness and efficiency grounds.

Discussion

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The authors examine two main questions. First, how can credit ceilings be expected to work in theory? Second, what have been the practical effects of credit ceilings, at both a macroeconomic and microeconomic level, in Italy? A third question, namely why have ceilings currently fallen into disfavour in Italy and is their future readoption possible, is touched on only tangentially.

The first question – how are credit ceilings expected to work in theory – is dealt with only at the macroeconomic level, with the help of a stylized model of the financial and real sectors. No comparable theoretical model is presented at the microeconomic level to support the discussion of the side-effects of credit ceilings on competition and resource allocation in the banking industry. The theoretical macroeconomic model is simplified to focus on the main characteristics of the problem, yet a disturbing feature of it – given the subsequent application to Italy and to the historical periods examined – is the fact that it is a closed economy model, and hence no theoretical analysis of the interrelationship between credit ceilings and exchange rate policy is provided in it. This is the more surprising as one of the authors has elsewhere provided an elegant analysis of monetary policy and exchange rate dynamics in a disequilibrium model of the credit market (Angeloni and Galli, 1985).

Turning next to the empirical part of the paper, the authors assess the quantitative impact of ceilings on the Italian economy by first identifying three periods when credit ceilings were binding – 1974Q2–75Q1, 1977Q1–77Q3, and 1980Q1–82Q4 – and then estimate equations for fixed investment and inventories in which the effects of credit ceilings appear both directly and indirectly. They also estimate an equation describing the behaviour of the interest rate on bank loans during periods in which credit ceilings were not binding and simulate it through the periods in which ceilings were binding. The resulting predictions of the interest rate are then used, together with the investment and inventory accumulation equations, to construct an estimate of what investment and inventory accumulation would have been without ceilings.

I have a number of reservations about this methodology. First the simulations assume that the effect of the ceilings on investment ceases as soon as they are removed. This is inconsistent with the estimated lags on the capital-output ratio in the investment equation.

Secondly, I believe their estimates of the effect of ceilings – which suggest a reduction in GNP of around 3% in 1974 and 2% in 1981 –

are excessive. The authors' model assumes a production technology in which value added is a function of capital and labour alone. The implicit assumption that technology is separable between capital and labour on the one hand and energy and raw material inputs on the other is not supported by other work for the Italian economy. That research suggests that labour is separable from capital and energy. As a consequence energy prices should affect investment, with a rise in energy prices leading to a movement away from capital-intensive techniques towards more labour-intensive ones. The omission of energy prices from the investment equations means that the effects of the two oil price shocks are incorrectly attributed to the interest rate which rose at the same time.

In the light of this it is surprising that, of the three periods when credit ceilings were binding, the only one that the authors do *not* use for their simulation exercise is precisely the one (1977) during which there was no oil shock and for which – being a period of stabilization subsequent to an internally generated exchange rate crisis – measurement of the effectiveness of credit ceilings without consideration of external shocks would have been more appropriate; even then, however, the bias due to the misspecified equations would have affected the results.

Consideration of the 1977 period leads to another reservation about the authors' model and estimates. As I just recalled, the 1977 stabilization came in the aftermath of a major foreign exchange crisis. The authors' analysis of the impact on the financial sector shows important effects of the ceilings on capital movements and the balance of payments, yet the interaction of these with the real economy is not spelt out. Thus the interesting question of how the ceilings interact with exchange rate determination is not dealt with. This is an especially interesting issue since the imposition of ceilings in each case coincided with a different exchange rate regime – fully flexible in the first two periods, coupled with an exchange rate crisis in the second, and a constrained regime within the EMS in the most recent episode. In view of the historical richness of these periods, the reader is left wondering why only the 1980–82 period is selected for an examination of the effects on the financial sector. Again, the 1977 period, being one in which monetary and fiscal tools are generally considered to have been particularly well utilized in stabilizing the Italian economy, would have been at least as interesting to analyse as the 1980–82 period.

My final reservation with the macroeconomic part of the paper concerns the lack of consideration of other quantitative controls that interacted with the ceilings, such as minimum portfolio investment requirement by banks in government bonds, quantitative bounds on

the net foreign exchange position of banks, and quantitative constraints on the foreign financing of international trade. The first two of these directly constrain the balance sheets of the banking sector and the third indirectly. Thus the effects of controls are numerous and diverse if considered alongside the imposition of credit ceilings.

How did credit ceilings affect the competitive position of banks and resource allocation? I do not feel well qualified to discuss the micro-economic section of the paper, where answers to this question are presented. I will therefore limit myself to pointing out two difficulties with the regression of Table C1 in Appendix C. First, the authors use the differential between the interest rate on bank loans and that on bank deposits as a measure of banks' performance. It should be pointed out that credit ceilings may have ambiguous effects on banks' profits even when their effect on interest rates is unambiguous. The differential is also affected by other quantitative controls, such as the minimum requirements on government bonds portfolios cited above. Second the coefficient on the discount rate in the regressions may be biased due to the fact that in an imperfectly competitive market like the Italian banking market, increases in the discount rate affect the rate on bank loans faster than the rate on bank deposits, while the contrary has generally been true for decreases in the discount rate. In other words, when the discount rate is reduced, the rates on demand deposits are reduced immediately, while loan rates fall only at a later stage.

Let me now turn to the third issue; namely, why have ceilings fallen into disfavour in Italy and are they likely to be reintroduced in the future? First, if my criticism of the authors' estimates is correct, then the effect of ceilings has not only been declining, but also has been much smaller than they claim. Second, the ceilings are likely to reduce the effectiveness of the Treasury bill rate as an instrument for influencing the level of foreign exchange reserves. This implies that, in the presence of ceilings, a higher Treasury bill rate will be necessary to maintain a given global balance on the external account. In the presence of a large and growing fiscal deficit this imposes significant real economic and political costs. Ceilings also reduce the effectiveness of exchange rate depreciation as a means of maintaining reserves. A greater depreciation will therefore be necessary to defend a given external position, thus exacerbating domestic inflation. I believe these theoretical arguments have much to do with a change in the preferences of the authorities, in addition to the microeconomic inefficiency arguments advanced by the authors.

Let me end on a provocative note by suggesting two further reasons for the change in attitude of the monetary authorities. The first is the general international movement towards deregulation. The second,

which is more interesting, is the result of changes in Italian institutional arrangements, which give the Bank of Italy greater independence from the Treasury. The Bank has pursued a policy of no longer disguising the consequences of the growing public deficit for interest rates and the exchange rate. This has helped to place the burden of the responsibility for Italy's economic performance on other government agencies and the unions in their respective roles as sources of public spending and inflationary wage and price movements. The dismantling of quantitative controls, seen in this light, is part of a tough political game in which the monetary authorities aim at forcing other players in the game to openly bear their share of the responsibility for the performance of the economy.

This interpretation suggests that credit ceilings may be reintroduced if the Government and other pressure groups call the bluff of the monetary authorities and the latter are compelled to bow to a lack of political resolve to pursue appropriate fiscal policies. Credit ceilings might also be reintroduced, perhaps accompanied by more efficient controls on capital movements, if the Lira and the EMS should reenter a turbulent phase.

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In the light of this informative and ambitious paper, it may be interesting to compare the experiences with credit ceilings in Italy and France. Such ceilings have been in force intermittently in Italy but continuously in France since 1972. Furthermore, they were considerably tightened in France in 1976. Fiscal deficits are evidently a fundamental factor underlying the ceilings in Italy, but in France budget deficits have been irrelevant. The ceilings stem from a problem of monetary control. French banks traditionally rely heavily on the central bank for credit, which makes the money supply difficult to regulate without direct controls. As a result, the French authorities came to adopt credit ceilings as a sort of safeguard in 1972 after a period of liberalization, and this instrument has been a fixture ever since. The tightening of the controls in 1976 was an immediate consequence of the adoption of money growth targets. It is true that quite recently, in late 1984, Beregovoy, the economics Minister at the time, announced the dismantling of the credit ceilings (the *encadrement du credit*). But this simply meant that violation of the ceilings was now permitted. Nevertheless, the same punitive penalty schedule for exceeding the limits remained in force. In other words, the so-called dismantling of the system simply meant a shift toward the Italian version that Cottarelli, Galli, Marullo, and Pittaluga

(CGMP) describe, where transgressions are regarded as acceptable so long as banks are willing to pay the price. Furthermore, the frequency of the transgressions in Italy (see their Section 5) indicates that this penalty price is much smaller across the Southern Alps than it is in France. France also tolerates no opportunities for evasion such as Special Credit Institutions that are not subject to the ceilings, or small loans that do not count toward the ceilings. Except for recourse to the capital market for funds, the only qualifications to the ceilings is that they become somewhat less binding in the case of certain privileged forms of credit, which are still covered nonetheless. It is also true that there is now a lot of talk in France about doing away with the encadrement altogether and relying exclusively on a textbook combination of open market operations and legal reserve requirements. But however significant this may be, French banks still have an incentive today to borrow funds on the capital market rather than to exceed the ceilings even marginally.

Another significant aspect of the credit ceilings in France is that they have involved little tightness in the market for bank credit since the second oil shock. The Bank of France's indicator of the 'bite' of the ceilings (*l'indicateur de morsure de l'encadrement du credit*) has steadily shown only a moderate pinch on bank clients. Indeed, the Beregovoy reform at the end of 1984 was largely motivated by the fact that banks had acquired such large reserves of unused rights to expand credit at the time that the encadrement was judged to have become irrelevant in the event of a boom in the demand for credit. Accordingly, the announcement of the end of the encadrement was accompanied by a confiscation of the banks' accumulated rights to expand credit. As can be imagined, the banks exulted at this news of their coming liberties.

Perhaps the most important parallel between the French and Italian experiences concerns the damaging effect of credit ceilings on bank competition. This harm is probably more extensive in France, where the controls are more rigorous and have been continuously present. There is clear official awareness of the problem in France. CGMP make the interesting suggestion that credit ceilings need not inhibit bank competition, but do so only because of the way they are administered. This can be questioned, however. The authors' argument is that competition will not be hindered if unexploited rights to expand credit can be traded. This suggestion has been adopted in France; but the measure, while possibly alleviating matters, has hardly resolved the problem. Even if one bank can buy another's right to expand credit, the latter still receives a rent for this right, which then protects its market share. Indeed, what we have witnessed in France under the system is the example of certain banks who use the possibility of trade in rights to

extend credit in order to diminish their efforts to select credit applicants themselves. (This is why the *marche du desencadrement*, which is now almost lifeless, has come under strong official criticism.) The most important factor underlying movements in market shares in France since 1976 has been the greater access of certain banks to privileged forms of credit than others – hardly a competitive influence.

I will close with two observations. First, CGMP strongly suggest that credit ceilings are a useful device for protecting a currency against exchange rate depreciation. But this would seem to be true only in the case of strong capital controls on asset transactions, such as exist in Italy. Of course, credit ceilings induce firms to borrow abroad, thereby protecting the currency. However, the ceilings also induce an outflow of assets abroad, since they keep home interest rates lower than they would otherwise be. This outflow would certainly take place if capital controls were absent.

Finally, the authors give considerable attention to Richard Davis' view that credit ceilings may lead to easier monetary policy. But this paradoxical view depends entirely on an exogenous monetary base. If the authorities simply allowed the monetary base to adjust passively to the demand for it, the problem could not arise. Davis' argument requires a combination of a constant monetary base and a lower demand for base money stemming from lower bank efforts to attract deposits and a consequent fall in the complementary demand for currency. It can be argued, however, that such constancy of the base would be gross monetary mismanagement. If the authorities want to use credit controls in order to tighten monetary policy, they have no business trying to keep the base constant. This could be interpreted as an attempt to increase their share of the market in the issue of money. But if base money and bank deposits are perfectly complementary, as the argument suggests, this effort is nugatory: only higher legal reserve requirements can achieve the result.

General Discussion

David Hendry also believed that the authors' estimates of the impact of credit ceilings were likely to be biased upwards, but for reasons other than those suggested by Basevi. The decision to impose credit ceilings was not taken independently of developments in the economy. Rather they were likely to be imposed when the economy was already growing rapidly. It was therefore likely that the credit ceilings variable in the estimated equations for fixed investment and inventory investment would be negatively related to the error in those equations, producing an overestimate of their impact. Much the same argument applied to

the use of incomes policy dummies in the estimation of equations for wages.

Patrick Minford questioned the conclusion that credit ceilings had important allocative effects. Their periodic imposition seemed to be endemic to the Italian economy. If that was the case banks and borrowers would surely anticipate the possibility of a future reintroduction of ceilings and plan ways to circumvent them in advance. The effect of ceilings would then be largely nominal with very few real effects. They could only have significant real effects if their introduction was largely unanticipated, but in that cast they could not be used regularly as a tool of macroeconomic management!

Appendix A: Properties of the model underlying Section 2

The model has the following equations:

$CR = I(r)$	demand for credit; $I' < 0$	(A1)
$CR = C(r-i) \cdot (D+A-MB)$	supply of credit by banks; $C' > 0$	(A2)
$D = S(y)$	(flow) demand for deposits; $S' > 0$	(A3)
$D = MB/K(i)$	(flow) supply of deposits[1]; $K' < 0$	(A4)
$S(y) = I(r)+G$	goods market equilibrium	(A5)
$G+A = B+MB$	consolidated budget identity of the central bank and the public sector	(A6)

where CR, $I(r)$, r, i, D, A, MB, $S(y)$, y and G are respectively bank credit to the private sector, firms' spending, rate on credit, rate on bonds, bank deposits, central bank advances, bank reserves (monetary base), households' saving, disposable income, and the public sector deficit. G, B, and MB are exogenous while CR, D, r, i, y, and A are endogenous.

Combining (A1), (A3), (A5) and (A6), we get the banks' budget constraint ($D+A = CR+B+MB$) which can be substituted into (A2), yielding:

$$CR = C(r-i) \cdot (CR+B) \qquad \text{(A7)}$$

[1] In the Italian system, reserve requirements used to be applied to the flow of deposits. Stock considerations, which may be relevant for both the $K(\cdot)$ and the $C(\cdot)$ functions, are neglected for simplicity.

or:

$$CR = c(r-i) \cdot B \quad \text{where } c(\cdot) = C(\cdot)/[1-C(\cdot)] \tag{A8}$$

Hence:

$$c(r-i) \cdot B - I(r) = 0 \tag{A9}$$

or:

$$r = f(B, i) \tag{A10}$$

where $df/di = Bc'/(Bc'-I') > 0$, and $df/dB = -c/(Bc'-I) < 0$.

The effect of an open market operation ($dMB = -dB$) on income is:

$$dy/dMB = I'(df/di - SK' \cdot df/dB)/(KS'I' \cdot df/di + SS'K') \tag{A11}$$

This expression is positive if and only if;

$$Bc' > -SK'c \tag{A12}$$

A priori, the case $dy/dMB = 0$, cannot be ruled out. Note that in this case, from equation (A5), it would also be true that dr/dMB is zero, while di/dMB is always positive.

The dynamic assignment rule discussed in the text is

$$\dot{A} = g_1(y - y^*) \qquad g_1' < 0 \tag{A13}$$

$$\dot{MB} = g_2(i - i^*) \qquad g_2' > 0 \tag{A14}$$

Its stability can be checked by first solving the system (A1)–(A6) for y and i as functions of A and MB, i.e.

$$\begin{bmatrix} y \\ i \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} A \\ MB \end{bmatrix} \tag{A15}$$

It is easily checked that a_{11}, $a_{21} > 0$, $a_{22} < 0$ and that $a_{12} > 0$ under condition (A12). Substituting into (A13) and (A14) and using the standard conditions for stability, we find

$$\text{Trace} = g_1'a_{11} + g_2'a_{22} < 0 \tag{A16}$$

$$\text{Determinant} = g_1'g_2'(a_{11}a_{22} - a_{21}a_{12}) > 0 \tag{A17}$$

It can be checked that the reverse assignment leads to one unstable root.

Appendix B. Key equations of the model of Section 3

The model consists of a real sector in which, given fiscal variables and interest rates, nominal GDP is determined as the sum of demand components, and a monetary sector determining interest rates and the stock of different financial assets and liabilities held by households and

firms and by financial intermediaries. The equations of the financial block draw on preliminary work done at the Bank of Italy for the construction of an econometric model of the Italian economy (Bank of Italy, 1985). Due to currency controls, capital movements are included mainly in the form of trade credit and foreign borrowing by banks.

Monetary policy acts in the model primarily via interest rates and credit ceilings; by setting the Treasury bill rate through open market operations and by administratively regulating the discount rate the monetary authorities induce changes in the bond rate and in the rates set by financial intermediaries on credit and deposits. This affects aggregate demand and leads to a reallocation of private assets and liabilities, thus initiating standard monetary feedbacks on the real sector. Monetary policy acts also via credit ceilings, both through rationing and the increase in bank lending rates.

Throughout the model rationing is introduced via a credit ceilings variable (CC) defined as

$$CC = (\Delta LR - b\,\Delta DR)DUIMP \tag{B1}$$

where LR = bank loan rate; DR = discount rate; $DUIMP$ = dummy variable equal to unity in periods of binding ceilings. Δ indicates the first difference of a variable, $(\Delta x = x_t - x_{t-1})$.

Following Fair–Jaffee (1972), this method is based on the assumption that in periods in which credit ceilings are binding the dynamics of the loan rate is described by the following equation

$$\Delta LR = a[(L^d - \bar{L})/\bar{L}] + b\,\Delta DR \tag{B2}$$

with L^d and $\bar{L}$ representing respectively the notional and the constrained quantities of bank loans. From this equation, the percentage excess demand is given by:

$$(L^d - \bar{L})/\bar{L} = (\Delta LR - b\,\Delta DR)/a \tag{B3}$$

from which (B1) is obtained.

In the real sector the main demand components affected directly by credit ceilings are fixed investment and inventories. Fixed investment of the private sector (excluding housing) is modelled following a putty-clay approach. In the equations t-statistics are shown in brackets under each estimated coefficient; when Almon distributed lags are used the number of lags followed by the order of the polynomial is presented after the variable name; the sum of the coefficients is reported in the equation. The following symbols are used: SE (standard error), DW (Durbin–Watson), H (Durbin's H). The list of variables is provided at

the end of this appendix.

$$I = \underset{(15.5)}{-0.42}\ VACRD + \underset{(22.3)}{4.80}\ Kq_{-1} \cdot VACRD - \underset{(21.5)}{4.27}\ Kq_{-1} \cdot VACRD_{-1}$$
$$\underset{(5.2)}{-0.0033}\ CC - \underset{(3.5)}{69.5}\ DU80 \qquad \text{(B4)}$$

$R^2 = 0.99$, $SE = 24.3$, $DW = 1.85$, 1974Q1–83Q4, OLS

Polynomial distributed lags:

$(Kq_{-1} \cdot VACRD)$, 11, 3; $(Kq_{-1} \cdot VACRD_{-1})$, 11, 3; CC, 4, 1

The optimal capital output ratio is derived from a CES production function with Harrod neutral technical progress. The user cost of capital depends on the average interest rate on firms' liabilities (net of long term expected inflation), on fiscal incentives to invest, and on the tax rate on corporate profits. The weight with which the rate on bank loans enters the average interest rate fluctuated in the last 15 years between 51 and 57%.

The inventories equation is a stock adjustment model in which the desired stock depends on the level of demand and on the rate on bank loans in lire deflated by the expected change in the wholesale price index, derived from survey data. When credit ceilings are binding the stock of inventories is kept below its normal level.

$$\ln ST = \underset{(2.0)}{-0.56} + \underset{(1.9)}{0.10} \ln (C + I + EX) + \underset{(37.4)}{0.96} \ln ST_{-1} - \underset{(7.8)}{0.22}\ REALR$$
$$\underset{(3.7)}{-0.015}\ CC \qquad \text{(B5)}$$

$R^2 = 0.99$, $SE = 0.0085$, $DW = 1.91$, $H = 0.35$, 1971Q2–84Q4, OLS

Polynomial distributed lags: $REALR$, 5, 1; CC, 3, 1

Consumption and imports are mainly a function of disposable income and of aggregate demand and relative prices respectively. Credit ceilings do not directly influence these demand components.

In the financial sector credit ceilings primarily affect the demand for total domestic credit; the notional demand for credit is a function of total borrowing requirement of firms (defined as investment net of internally generated funds) and of interest rate differentials:

$$\ln\left(\frac{CR}{FAB}\right) = \underset{(6.4)}{0.64}\ln\left(\frac{CR}{FAB}\right)_{-1} + \underset{(3.1)}{0.29}\ln\left(\frac{CR}{FAB}\right)_{-2} \underset{(7.0)}{-0.0076}\,DIF1$$

$$\underset{(3.0)}{-0.0011}\,DIF2 \underset{(3.0)}{-0.0004}\,DIF3 \underset{(5.0)}{-0.012}\,CC \qquad \text{(B6)}$$

$R^2 = 0.99$, $DW = 2.03$, $SE = 0.008$, OLS, 1971Q4–83Q4

Polynomial distributed lags; $DIF1$, 4, 1

Credit ceilings also influence the composition of total domestic credit, increasing the share of all non-rationed forms of credit. Indeed, the credit ceiling variable enters with the expected sign in the equations for Special Credit Institutions' loans, bank loans in foreign currency and three foreign trade credits equations (short term trade credit on imports and on exports and advanced import payments).

The demand for financial assets is indirectly affected by credit ceilings through the balance sheet of the private sector:

financial assets = credit + PSBR + balance of payments (B7)

This is relevant because an evaluation of the Tobin-Davis effect (Section 2) depends on the response of the demand for financial assets, specifically money, to credit ceilings. The demand for money is estimated in the following form:

$$\ln M2R = \underset{(5.4)}{-0.07} + \underset{(18.2)}{0.70}\ln M2R_{-1} + \underset{(7.8)}{0.3}\ln FAR \underset{(10.3)}{-0.023}\,DIF4$$

$$\underset{(2.1)}{-0.0004}\,DIF5 \underset{(3.0)}{-0.0006}\,DIF6 + \underset{(8.2)}{0.54}\,SH + \underset{(4.8)}{4.6}\,VAR \qquad \text{(B8)}$$

$R^2 = 0.99$, $SE = 0.007$, $DW = 1.86$, OLS, 1967Q2–83Q4

Polynomial distributed lags: $DIF6$, 4, 1

A second element that determines the quantitative relevance of the Tobin–Davis effect is the deposit rate response to credit ceilings; the deposit rate is determined as a mark down of the average yield of total bank assets:

$$RBD = \underset{(4.9)}{-1.86} + \underset{(44.1)}{1.04}\,RBA \underset{(4.4)}{-0.66}\,OC + \underset{(3.2)}{0.002}\,GRAL \qquad \text{(B9)}$$

$R^2 = 0.99$, $SE = 0.23$, $DW = 1.95$, OLS, 1971Q2–83Q4

Polynomial distributed lags; RBA, 6, 2; OC, 3, 1

In the simulations of Section 3 the average yield of bank assets, and thus the deposit rate, is not greatly affected by credit ceilings because

the higher rate on bank loans compensates the increased share of lower yielding assets in bank portfolios.

The results of Section 3 are derived by simulating the model with estimated residuals and setting to zero the rationing variable; the effects of credit ceilings are evaluated comparing simulation results with historical data. This exercise required the specification of the loan rate behaviour without credit ceilings, since in the model the Fair–Jaffee hypothesis hold only when rationing is exogenously introduced. Without rationing the loan rate behaviour is described by:

$$\begin{matrix} LR = 1.70 + 0.71\ LR_{-1} + 0.17\ \Delta DR + 0.34\ DR_{-1} + 0.01\ GRAL \\ \quad (1.9)\ (14.9) \qquad (2.2) \qquad (5.6) \qquad (7.7) \\ \quad -2.95\ COMP \\ \quad (1.58) \end{matrix} \qquad \text{(B10)}$$

$R^2 = 0.99$, $SE = 0.32$, $H = 1.01$, 1970Q4–83Q4, OLS

Polynomial distributed lags: *COMP*, 5, 1

This equation implies that, apart from liquidity effects, which become relevant only in the case of intense monetary squeezes, the loan rate response to money market rates is sluggish (50 basis points in the first quarter in response to 100 basis points of the discount rate), thus slowing down the transmission mechanism of monetary policy.

List of variables

C	consumption
COMP	index of competition in the banking industry (ratio between number of branches and total loans)
CR	total domestic credit to the private sector (bank loans in lire and in foreign currency + loans of Special Credit Institutions + bonds)
*DIF*1	differential between average cost of domestic credit and average yield of financial assets
*DIF*2	differential between average cost of domestic credit and three month eurodollar rate
*DIF*3	differential between average cost of domestic credit and the anticipated devaluation rate
*DIF*4	differential between money market interest rate and deposit rate
*DIF*5	differential between bond rate and deposit rate
*DIF*6	differential between 3 month eurodollar rate, corrected for anticipated devaluation and the deposit rate
DR	discount rate

DUIMP	dummy variable for the periods of binding ceilings
DU80	dummy variable for the two central quarters of 1980
EX	exports
FAB	cumulative sum of fixed investment and inventories net of profits (borrowing requirement of the firms sector)
FAR	total financial assets of the private sector deflated by the GNP deflator
GRAL	index of illiquidity of bank assets
I	total private investment excluding housing
Kq	optimal capital-output ratio (Bank of Italy elaboration based on Marotta–Schiantarelli, 1983)
LR	rate on bank loans in lire
M2R	money in the *M2* definition deflated by the GNP deflator
OC	ratio of bank variable costs to deposits
RBA	average yield on bank assets
RBD	rate on bank deposits
REALR	rate on bank loans in lire deflated by expected rate of inflation on wholesale prices
SH	unanticipated changes in total financial assets
ST	stock of inventories
VACRD	value added at factor cost of the private sector
VAR	variance of bond prices

Appendix C. Econometric estimates of the structure-performance model of Section 4

The measure of bank performance used to estimate the market structure-performance relation is the differential between the interest rate on bank loans and the interest rate on bank deposits. The use of the loan rate alone would have neglected the fact that the deposit and loan rates are often part of a unique agreement with the customer. Moreover, the deposit market itself may have been affected by the imposition of credit ceilings. Using data concerning a panel of 87 banks observed from 1975 to 1983, the rate differential was regressed on a set of exogenous[2] variables, among which was the Herfindahl index (Herfindahl, 1950) defined as:

$$H_j = \sum_{i=1}^{N_j} \left(\frac{X_{ij}}{X_j}\right)^2 \qquad \text{(C1)}$$

[2] Since the estimated equation must be considered as a reduced form stemming from demand and supply equations for bank loans and deposits (Heggestad, 1979), the regressors must be exogenous to the bank and the customer decision set.

Table C1. Differential between the rate on bank loans in lire and on bank deposits 1975–83 – 87 observations (banks) per year

	Constant	Discount rate	Bad loans/ total assets	Regional GNP	Ceiling[1] Dummy
1	1.49	0.46	13.4	−0.02	0.99
	(11.2)	(22.7)	(1.8)	(−2.8)	(3.9)
2	1.59	0.47	12.6	−0.02	1.03
	(18.3)	(11.8)	(1.7)	(−2.9)	(4.2)

	Herfindahl Index when ceiling is not binding	Herfindahl Index when ceiling is binding	PS^2	Regional Dummy[3]	R^2	SE
1	3.69	1.99	−6.2	0.77	0.76	1.17
	(1.7)	(0.9)	(−6.2)	(1.4)		
2	1.89		−6.21	0.86	0.76	1.17
	(2.2)		(−6.2)	(1.6)		

Notes: (1) *CC* dummy takes the value of unity in 1977, and 1980–1982 and zero elsewhere. (2) *PS* = public sector loans over total loans plus public sector deposits over total deposits. (3) Regional dummy *D* takes the value of unity for banks operating only in Central and Southern Italy and zero otherwise.

where X_{ij} represents the deposits at bank i in the jth market and X_j, N_j and H_j are total deposits, the number of banks and the Herfindahl index in the jth market. The index was first computed for the 1,500 areas of the 1982 Branch Distribution Plan. Bank-specific indexes were then derived as weighted averages from the local indexes with weights reflecting the share of each local market in the bank's total deposits. The equation was estimated with the Balestra–Nerlove GLS estimator (Balestra–Nerlove, 1966) which is efficient under the usual assumptions on the distribution of individual effects (Wallace and Hussain, 1969; Taylor, 1980) and the additional hypothesis of independence from the regressors. This hypothesis of independence was tested (see Hausman, 1978) and not rejected (chi square = 3.43 for equation 2 of table C1). The variance components were estimated as in Nerlove (1971).

The results in Table C1 show that the main variable explaining the level of the rate differential is the discount rate. Its positive sign is probably due to different speeds of adjustment between deposit rates and loan rates, the latter reacting faster to discount rate changes. Also since a large share of bank assets (long term bonds) reacts slowly to

changes in the level of rates, bank profits would be squeezed if the deposit rate kept pace with the loan rate.

Variations of the rate differential across banks are explained by the ratio of bad debts to total assets, the average growth rate of regional GDP, the public sector loan to deposit ratio, a North–South dummy, and the Herfindahl index. The signs of the first two variables reflect the effect of higher riskiness on loans likely to increase during recessions. The coefficient of the public sector loan and deposit ratio has a negative sign because the public sector maintains privileged relationship with some categories of banks. Finally the North–South dummy takes a positive sign reflecting both higher riskiness of loans and lower competition in Southern regions.

Credit ceilings enter both through the dummy *CC* and the Herfindahl index. The estimates reported in the table give statistical support to the hypothesis that competition among banks is significantly altered by credit ceilings. Indeed, the Herfindahl index enters significantly only when credit ceilings are not binding.

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