

Content Articles in Economics

In this section, the *Journal of Economic Education* publishes articles concerned with substantive issues, new ideas, and research findings in economics that may influence or can be incorporated into the teaching of economics.

HIRSCHEL KASPER, Section Editor

Credit Cards, Economization of Money, and Interest Rates

Frank G. Steindl

An interesting, standard exercise in monetary-macroeconomics inquires into the effects of a reduction in the demand for money. One purpose is to demonstrate that such effects are qualitatively identical to those associated with an increase in the money supply, that is, each occasions an excess supply of money. In those exercises, the avenue through which the reduced money demand occurs is generally left unspecified, principally because it appears to be irrelevant.

In this article, I deal with the issue of the effect on interest rates of increased use of credit cards, say, by households. This is not a purely hypothetical concern; in recent years, there has been a marked shift to credit instruments, particularly credit cards, to finance consumption. The question is what are the effects? The corollary to increased credit card usage is a reduction in the demand for money, specifically checkable deposits, a phenomenon in accord with Duca and Whitesell's finding that "for every 10 percent increase in the probability of owning a credit card, checking balances are reduced by 9 percent" (1995, 621). As an empirical matter, checkable deposits fell 22 percent—a 5.4 percentage annual rate—from the first quarter of 1994 through the third quarter of 1998.¹

At first glance, the answer seems straightforward. The first round effect of economization of money balances because of increased use of credit cards is a reduction in the interest rate, a result identical with the liquidity effect of an increase in the stock of money, inasmuch as each gives rise to an excess supply of money.² But there is something wrong here. Greater credit card usage is one manifestation of an increase in the demand for credit, which increases the

Frank G. Steindl is Regents Professor of Economics and Ardmore Professor of Business Administration at Oklahoma State University (e-mail: steindl@okstate.edu.). The author thanks Scott Weir and Ron Moomaw for comments in the departmental workshop, where an earlier version of this article was read.

interest rate. Surely, the interest rate cannot be going up and down at the same time!³

The two preferred money demand approaches of the nineties—the cash-in-advance (CIA) and the overlapping-generations (OLG) models—do not appear directly useful for dealing with the credit card issue. The constant velocity implication of the CIA model rules it out as a vehicle for investigating a phenomenon that increases velocity. In addition, the model takes as given the payments period and money holdings as it relates agents’ planning periods to the time period with respect to which velocity is measured. Patinkin (1989, xxx–xxx) emphasizes these concerns when he points out that the CIA framework

is therefore a most unrealistic model to describe a world in which the statement “only credit cards can buy goods” is an increasingly more accurate description than the Clower dictum that “only money can buy goods.” Similarly, this [CIA] approach most unrealistically implies that the velocity of circulation is constant.

As for the OLG approach, its emphasis on money’s role as a store of value dictates against it being used to investigate switches between transactions technologies. Accordingly, I use several well-traveled models of a few decades past to demonstrate that the interest rate *must* rise.

THREE MODELS

The first model is an augmented price flexibility Patinkin (1965) framework in which the bond (i.e., credit) and money markets are highlighted. Use of credit cards is captured by a shift parameter β such that increases in β increase the supply of bonds and reduce the demand for money, thereby generating excess supply in each market. This of course implies that there must be excess demand in the commodity market. The formal equations for the money and bond markets thus are

$$L(Y_0, r, m, \beta) = m; \quad L_2, L_4 < 0 < L_3 < 1$$

$$B = Y_0 \frac{1}{r}, m, \beta; \quad B_2, B_4 < 0 < B_3 < 1,$$

where m is initial real balances M_0/p , r is the interest rate, and Y is income (output). With price flexibility, output is at full employment Y_0 ; hence there is no need to specify partial derivatives with respect to income.

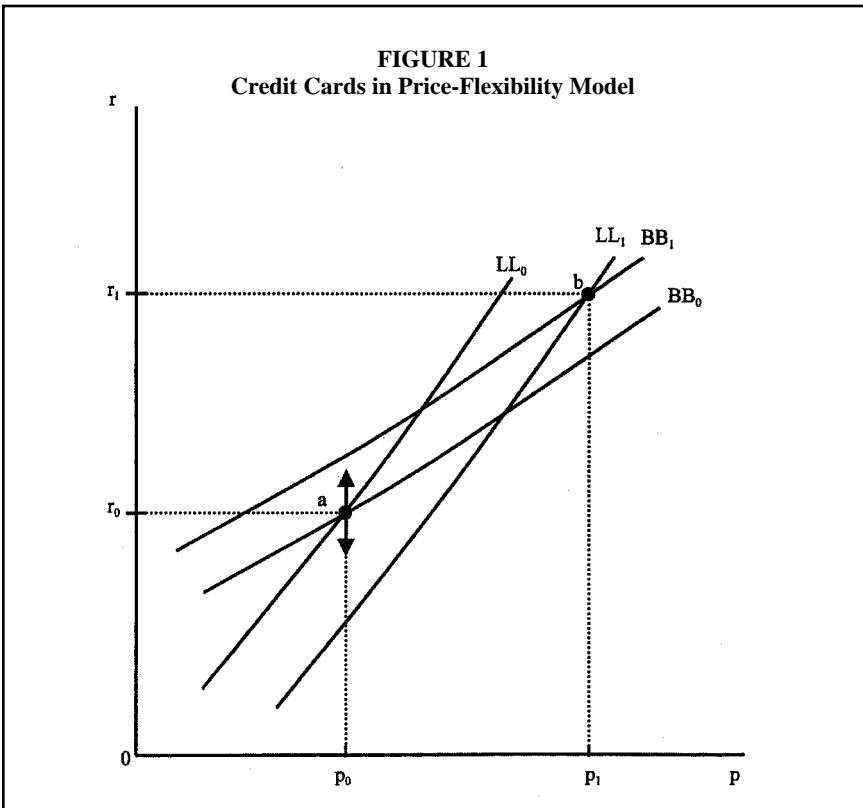
These two markets are used because it is in those that the disparate (partial equilibrium) interest rate conclusions are reached, that is, when each is used in a partial equilibrium approach to understanding the behavior of the interest rate. The model’s solution is

$$\frac{dr}{d\beta} = \frac{r^2[B_4(1 - L_3) + B_3L_4]}{B_2(1 - L_3) - r^2B_3L_2} > 0. \quad (1)$$

Figure 1 shows the adjustment. The initial equilibrium, given by the intersection of the BB_0 and LL_0 curves at a , establishes the interest rate r_0 and price level p_0 . An increase in the use of credit cards reduces the demand for money, thereby shifting LL down to LL_1 . Increased borrowing via credit cards increases the supply of bonds, shifting the bond equilibrium curve up to BB_1 . These shifts are the manifestation of interpreting interest rate movements in the partial equilibrium terms, respectively, of money and credit markets. As the figure makes clear, the result must be that the interest rate increases, with the new equilibrium at b .

If the commodity market (CC curve) had been formally considered, the respective excess supplies in the bond and money markets would imply an excess demand for commodities. The CC relation in Figure 1 accordingly shifts to the right, as a result of which it intersects the bond and money equilibrium schedules at b .⁴

The rightward shift of the commodity equilibrium curve, hence an increased price level, is a logical implication of the model. Interestingly, noneconomists would likely surmise that one of the principal benefits of credit cards is as a vehicle to increase current consumption; hence a rightward shift is what would be expected. Economists on the other hand are predisposed to interpreting credit cards as simply a way of reducing money demand, with no effect on aggregate demand, perhaps because of the Keynesian-oriented money-bonds as substitutes



framework. Yet, falling money demand is only one element in the credit card story; increases in the supply of bonds is another; together with the consequent excess supplies in the money and bond markets, there must be an excess demand for goods and services.⁵ Analyses of inflation, for instance, typically proceed by underscoring velocity increases resulting from an excess supply of money resulting from inflationary-expectations-induced economization of real balances. They do not similarly emphasize that the corollary is an increased demand for commodities, in addition to increased nominal net indebtedness. See for instance Mundell (1963), whose model is explicitly investigated later.

The increase in aggregate demand, the CC curve, is a general result; it is neither model- nor case-specific. Assume for instance that the increased use of credit does not increase net indebtedness, that is, the increased short-term credit card debt is offset by greater long-term bond holdings. This is equivalent to having the BB curve unchanged. Hence, the increased use of credit cards would not shift the BB curve up. The reduction in money demand because of greater usage of credit cards shifts the LL curve down along the BB_0 curve. And the excess supply of money shifts the CC curve to the right so that it intersects the other curves at a higher interest rate and price level.⁶ That the use of credit cards serves in general to increase consumption, that is, aggregate demand, is the expected result.⁷

The second model is a heuristic $IS-LM$ framework, augmented by a credit market. The goods and money market equations are familiar except that each now includes d , which captures the effect of credit cards. Here, as before, d reduces the demand for money and increases the demand for goods. The bond market is modeled simply as

$$B^d = D^b \frac{1}{r}, Y, \quad D_1^b, D_3^b < 0 < D_2^b < 1$$

$$B^s = S^b \frac{1}{r}, Y, \quad S_1^b, S_3^b > 0, 0 < S_2^b,$$

$$B^d = B^s.$$

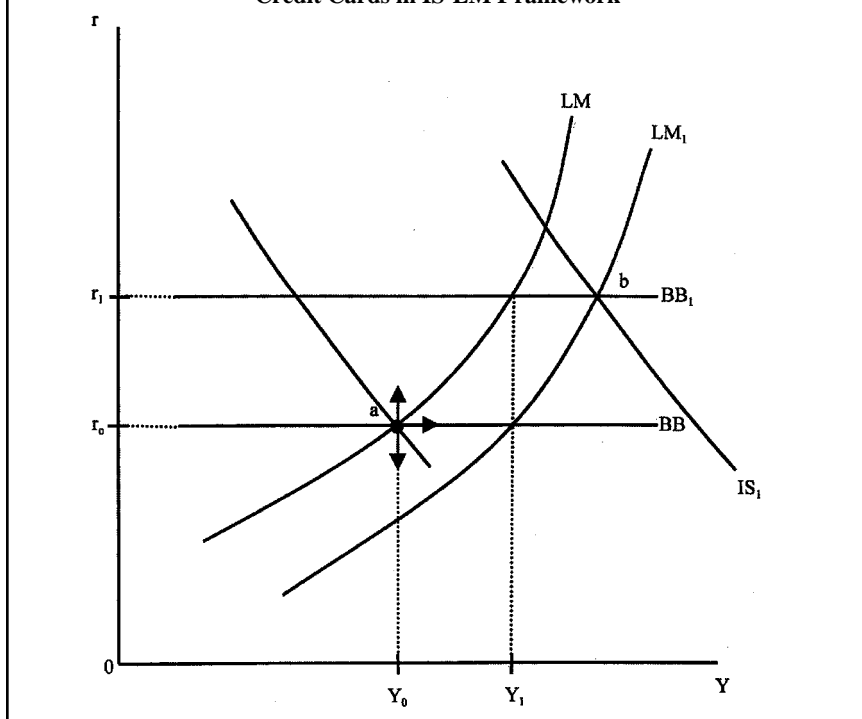
The excess demand for bonds— B^d minus B^s —thus can be written as

$$B \frac{1}{r}, Y, \quad \neq 0 \quad B_1 < 0, B_2 = ?, B_3 < 0.$$

The sign of B_2 depends on the relative strength of income on the respective supply and demand for bonds. Assume for convenience that $B_2 = 0$; increases in income increase the demand and supply of bonds by the same amount.⁸ In the $IS-LM$ quadrant, the bond market equilibrium curve BB would thus be horizontal.⁹

An increase in the use of credit cards, $d > 0$, shifts the bond equilibrium curve up to BB_1 and the LM curve down to LM_1 , as shown in Figure 2. Regardless of the magnitude of the downward shift, the interest rate *must* rise. As for IS , its rightward shift further underscores the increase in the interest rate.¹⁰ Here again,

FIGURE 2
Credit Cards in IS-LM Framework



economization of money resulting from increased use of credit cards occasions an increase in the demand for commodities. This result accords not only with noneconomists' perceptions of the role of credit cards; it also underscores the monetarist transmission channel, the one that stresses the link between an excess supply of money and its direct effect on aggregate demand, regardless of whether the excess supply of money resulted from an increase in the money stock or a decrease in money demand.

The last model in which the influence of a shift to credit cards for financing consumption can be examined originated with Mundell (1963), the basis of the Mundell-Tobin effect in the economic growth literature. His model is an amalgam of the previous models.¹¹ The goods and money markets are considered in the Keynesian framework associated with the *IS-LM* model, but its price stickiness assumption is abandoned. Here the Mundell model follows the price-flexibility full employment framework of the Patinkin model. The specific setup is:

$$I(r, \quad) = S(m, \quad) \quad I_1 < 0 < I_2 : S_1, S_2 < 0$$

$$m = L(r, \quad) \quad L_1, L_2 < 0.$$

The first equation is the *IS* curve in which there is a wealth-saving relationship. Note that \quad plays the same role as previously, namely, that a shift to credit card

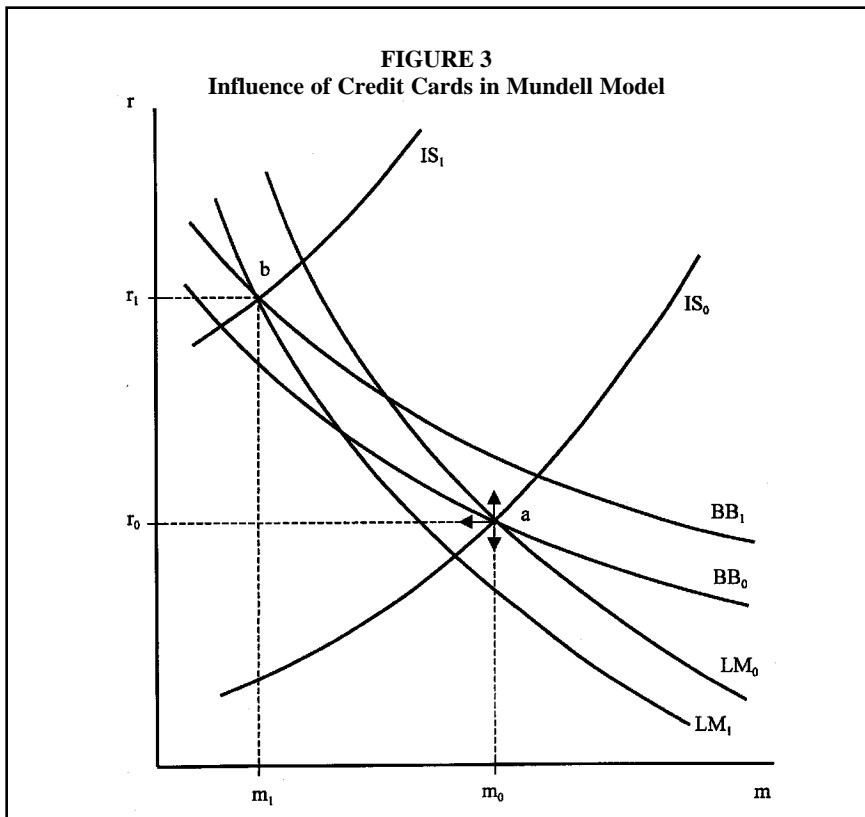
financing of expenditure increases aggregate demand—consumption ($S_2 < 0$) and investment ($I_2 > 0$). That is, the excess supply in the money (and bond) market(s) implies an excess demand for goods and services, this being a consequence of the reduced demand for money. Curiously, Mundell's economization of real money resulting from inflation expectations does not result in increased demands in the commodity market. This is another example of economists treating reductions in the demand for money as not affecting directly the demand for goods and services.

The IS curve is positively sloped in the (m, r) plane—an increase in real balances m reduces saving. For equilibrium, investment must fall, and that occurs if the real interest rate r rises; therefore

$$\left. \frac{dr}{dm} \right|_{IS} = \frac{S_1}{I_1} > 0.$$

The LM curve is negatively sloped— $1/L_1 < 0$ —in the (m, r) plane, as can be seen in Figure 3.

The credit (bond) market can be modeled (Steindl 1986, 258–62) as an excess demand for bonds.



$$B \frac{1}{r}, m, = 0 \quad B_1, B_3 < 0 < B_2,$$

where B_3 represents the increased supply of bonds, that is, the demand for credit, resulting from switching from money to credit cards. In the (m, r) plane, the BB curve is negatively sloped,

$$\left. \frac{dr}{dm} \right|_{BB} = \frac{r^2 B_3}{B_1} < 0.$$

To the left of the equilibrium, it lies below IS and above LM ; there cannot be excess supply in all markets.¹²

From an initial equilibrium point a , the move to credit card financing of expenditures reduces the demand for money, thereby shifting LM down to LM_1 . Similarly, the bond curve shifts up to BB_1 as the demand for credit increases. Increased goods market expenditures push prices higher, thereby reducing the real money stock and, of course, real money holdings m . IS accordingly shifts to the left, to IS_1 , yielding a new equilibrium at point b , at which the interest rate has risen to r_1 . With a fixed stock of money, the rise in the price level reduces real money holdings to m_1 . The rise in the price level can thus be interpreted as owing to an increase in velocity.

CONCLUDING OBSERVATIONS

In this article, I have dealt with the effect on interest rates when households shift to an increasingly popular method of financing current consumption: credit cards. Use of two conventional partial equilibrium frameworks gives disparate answers, that is, the rate rises in one and falls in the other. In an important sense, this situation is homologous to the fractious, petulant liquidity preference-loanable funds controversy that consumed the profession in the decades following the publication of Keynes's *General Theory* in 1936. As Hicks (1946) established in his Walras's Law $n + 1$ equations—with $n + 2$ goods, bonds, and money—setup, the interest rate is a general equilibrium phenomenon, although “determining . . . the rate of interest by the demand and supply of [bonds, i. e.,] loan funds . . . is the most natural course to pursue, and there does not seem to be anything against it” (1946, 161).

Just as that debate was resolved by resorting to general equilibrium considerations, so too can the credit card conundrum be settled using such a framework. The tractable models used here—Patinkin-based price flexibility, heuristic $IS-LM$, and Mundellian—establish that the interest rate must increase when credit cards are increasingly substituted for cash in financing expenditures. Hicks's (1946) dictum concerning loanable funds “as the most natural course to pursue, and there does not seem to be anything against it” holds true.

But the shift from money to credit cards is not a zero-sum game in which the same amount of expenditures is financed. Rather, the models establish that the

credit card induced economization of money also stimulates additional spending as agents reallocate their excess money holdings to increased expenditures, thereby increasing velocity and raising the price level.

NOTES

1. Economization of checkable deposits associated with credit card use may only be a minor factor in their decline. More likely, it is the increasing popularity of "sweep" accounts that underlies the deposit decline as banks seek to avoid the reserve requirement tax.
2. The excess supply of money also generates increased demands for goods and services, thereby increasing the price level, this time via velocity inasmuch as the stock of money is unchanged. A model formally dealing with simultaneous interest and price adjustments is presented in the last part of the next section.
3. In fact, there is a third possibility. If the central bank targets interest rates, the money supply then accommodates changes in money demand, thereby leaving the interest rate unchanged. Targeting of interest rates cannot, however, be a permanent policy because price movements induced by the endogenous money supply changes would be encapsulated in interest rates. In fact, formal modeling of the interest rate targeting strategy results in indeterminacy of the nominal money supply and price level, though real money holdings are determinate. Copies of this result are available from the author.
4. The equation for the commodity market, CC , is $F(Y_0, r, m,) = Y_0$; $F_2 < 0 < F_3 < 1$; $F_4 > 0$. Use of credit cards thus shifts the curve to the right. The analysis could similarly have been done in terms of the commodity and bond markets. In that case, the former shifts right and the latter left, thus definitely increasing the interest rate.
5. In terms of a money-goods model, the interest rate would fall if the commodity market had $F_4 = 0$, the idea being that reduced money demand does not affect the commodity market directly. Even if it did, that is, for $F_4 > 0$, the interest rate movement depends on the relative shift of the money and commodity curves, that is, it is indeterminate. It is only with the formal, explicit consideration of the bond market that the interest rate movement can be definitely signed, and it is positive.
6. Note, however, the basic implausibility of keeping net indebtedness constant. For one, such actions are special cases of the Savings and Loan problem—funding long-term assets with short-term debt. Of more consequence, because rates on credit card debt are higher than even on junk bonds, the constant net indebtedness strategy is equivalent to buying high and selling low.
7. The one case where this does not occur is when credit card debt is used solely to finance acquisition of longer-term bonds. Neither money nor aggregate consumption demand is affected. The basic implausibility of this is discussed in the foregoing note.
8. The procyclicality of interest rates suggests that the supply of bonds increases by more than the demand as income rises, thus resulting in an excess supply, $B_2 < 0$. The bond curve accordingly becomes positively sloped,

$$\left. \frac{dr}{dY} \right|_{BB} = \frac{r^2 B_2}{B_1} > 0.$$

9. Because there cannot be excess demand (supply) in all markets simultaneously, the BB curve lies below the IS and above the LM curves to the left of the equilibrium and below the LM and above the IS curves to the right of the equilibrium. In addition, stability conditions similarly require such a relationship.
10. There are two points here. First, because economization of money increases aggregate demand, the IS relation must include a term (capturing it, so that a typical equation would be $Y = F(Y, r,) < F < 1$, $F_2 < 0 < F_3$). Next, for the case of a positively sloped BB bond curve in conjunction with LM , the argument parallels that in Figure 1 in which the interest rate rises. The increase in the interest rate when the BB curve is negatively sloped can be seen from the goods and bond markets. IS shifts to the right and BB to the left. If, however, the bond and money markets alone are emphasized, the movement of the interest rate appears ambiguous. Imposition of the goods market IS establishes, however, that the rate cannot decline; in fact, it must increase.
11. His concern, as is evident from the title, is with the Fisher distinction between nominal and real interest rates owing to inflationary expectations. That is not a concern of the present article, hence the notation r is taken as pneumatic symbol for both the nominal and real interest rate.
12. Stability requires that the BB curve be less steeply sloped, in absolute value, than the LM curve.

REFERENCES

- Duca, J. V., and W. C. Whitesell. 1995. Credit cards and money demand: A cross-sectional study. *Journal of Money, Credit, and Banking* 27 (May): 604–23.
- Hicks, J. R. 1946. *Value and capital*. 2nd ed. Oxford: Clarendon.
- Mundell, R. 1963. Inflation and real interest. *Journal of Political Economy* 71 (June): 280–83.
- Patinkin, D. 1965. *Money, interest, and prices*. 2nd ed. New York: Harper & Row.
- . 1989. *Money, interest, and prices*. 2nd ed. abridged. Cambridge, Mass.: The MIT Press.
- Steindl, F. G. 1986. General equilibrium models of inflation and interest rates: Specification considerations. *Kredit und Kapital* 19 (Heft 2): 252–70.