
US domestic barter: an empirical investigation

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This paper studies the barter industry developed in North America during the 1950s, pointing out some of its main characteristics. Thus, it examines its two main sectors: (i) corporate barter and (ii) commercial barter. Contrary to expectations, the analysis of official data shows that this phenomenon is essentially pro-cyclical for the commercial barter component. Moreover, commercial barter activity turns out to be complementary to the cash economy. While the two sectors display some differences in their pattern, they both help firms to increase their profits.

I. Introduction

At the beginning of the new millennium, instead of disappearing, barter is gaining new ground in modern economies. While it is estimated that in 1999 US domestic barter volume has reached \$11 billion, economic literature has focused mainly on compensatory practices in international trade, and only occasionally on barter among companies in industrialized countries.

The main aim of this paper is to understand some basic aspects of the role of barter in industrialized economies as well as the main characteristics of the so-called barter industry. Therefore, it presents an empirical analysis of the US barter industry, the first one to develop, with the purpose of determining the macroeconomic variables influencing it.

After a brief description of the barter industry, the paper reviews the main literature on barter, pointing out its salient contributions as well as its limits. In a second part, the paper develops an empirical investigation to check the consistency of some of the beliefs the present literature supports on barter. Therefore, we start the analysis by confronting barter data with a plurality of macroeconomics series to determine the variables that seem to best explain

the US barter. As both the corporate barter time series and the retail barter time series are trending consistently upwards, confirming the importance of barter as a growing phenomenon, we check for the presence of unit root nonstationarity in data in order to avoid spurious regression problems. Therefore, we undertake DF and ADF unit root tests to test the null hypothesis of nonstationarity and determine the order of integration of the different time series previously selected. Finally, we attempt to estimate an error correction model (ECM) for each of the significant explanatory variables previously selected to integrate the dynamics of short-run (changes) with long-run (levels) adjustment processes. Given the limited sample at hand, we have chosen to resort to the one step method indicated by Banerjee *et al.* (1986).

II. Barter at Stake

Originated in the 1950s in the USA, organized barter among companies has recorded a dramatic growth in a few decades, giving rise to a completely new industry. At present, the barter industry is spreading in almost all industrialized countries, attracting an

increasing number of businesses. According to the American Association of Advertising Agencies (AAAA), eight out of ten corporations engage in barter (AAAA, 2003). At present, it is also estimated that in North America there are already approximately a half-million firms and businesses bartering through specialized barter networks (*BarterNews*, 2003).

Basically, it is possible to distinguish two forms of barter; corporate and retail barter, which together constitute the two sectors of the industry. The corporate barter sector is made up of corporate barter companies, which are sort of brokerage houses, helping large companies to exchange their products for other desired services or goods. However, transactions are not settled on a pure barter basis, but usually require part of the payment in cash.

Retail barter or commercial trade exchange on the other hand deals with small and medium businesses. This sector is made up of barter networks, known as trade exchanges, or barter clubs, coordinating barter trade among their members. The technology advances in computer science have given trade exchanges the possibility to organize barter on a multilateral basis since the end of the 1970s, giving birth to what nowadays is known as electronic barter or E-barter (Meyer, 1999a). These multilateral barter networks work via a system of mutual credit. Thanks to the use of a unit of account called 'trade credit' to record the value of transactions, barter does not need to be a direct synchronous bilateral transaction. Thanks to trade credits, trade exchange members swap goods and services without using cash. Indeed, within trade exchanges, the double coincidence of wants is no longer a prerequisite for barter to occur, and sales and purchases can be asynchronous. Trade exchanges act as neutral third record keepers and charge a membership fee and a transaction fee in cash for their services. Usually, a trade credit is equivalent to a unit of the official currency of the country where the network is located. In the barter market, prices are the same as in the cash one: sales are officially made at full retail selling price.

Even if many industrialized countries have developed their own barter industry, such a phenomenon has not attracted the interests of the economic literature yet. The few existing studies essentially focus on marketing and management aspects, and are based on questionnaire surveys of large companies involved in at least a barter deal, either domestic or international, or on direct interviews with representatives of the industry (Neale *et al.*, 1992; Healey, 1996). Besides relying only on managers' perceptions and estimates of the barter phenomenon, these studies do not take into account retail barter. Indeed, they

rather contemplate either bilateral intra-national barter agreements or corporate barter, which, like barter in international trade, are considered a second best solution with respect to the cash trade. In general, it is estimated that the explanations usually adopted for compensatory practices in international trade may apply also to corporate barter. While considered as inefficient, cumbersome and trade restrictive practices (Kostecki, 1987; Hammond, 1990; Verzariu, 2000), both countertrade and offsets – the main forms of compensatory trade – are recognized to allow trade under adverse conditions. Besides being supposed to represent an effective way to overcome almost all financial difficulties and liquidity problems (Hammond, 1990; Verzariu, 2000), countertrade has been adopted to obtain marketing advantages when export market networks are inadequate or simply lacking (Verzariu, 2000). Moreover, in some cases, countertrade has been used as a cost reducing technique (Vogt, 1985a, b; Verzariu, 2000), or simply to maximize long-term profits (Verzariu, 2000), or enter new markets and gain a competitive edge (Weigand, 1979; Hammond, 1990; Slee, 1996; Verzariu, 2000). Like countertrade, offsets happen to be used as a marketing tool (Welt and Wilson, 1998; Verzariu, 2000), but they are also adopted to promote economic development (GAO, 1996), or to develop defence and high technology industries (GAO, 1996; US Department of Commerce, 1999; Verzariu, 2000).

On the other hand, theoretical studies have shown that international bilateral barter deals can represent a second best solution in the context of market incompleteness, imperfect contract enforcement conditions, and incomplete information. Thus, countertrade contracts can help overcome moral hazard as well as incentive problems arising in trade between countries with dissimilar economies (Amann and Marin, 1989, 1994; Choi and Maldoom, 1992; Marin and Schnitzer, 1995). Moreover, the persistent success of barter in international trade is explained also by considering that risk-averse countries facing a tight foreign-exchange constraint can resort to it to restore their creditworthiness (Marin and Schnitzer, 1995). Indeed, by facilitating the enforcement of the contract, the payment in kind seems to be preferable to monetary payments when the importer is a highly indebted country facing import-financing constraints due to sovereign-debt problem (Marin and Schnitzer, 2002a).

However, it is evident that most of these explanations cannot be used to justify the development of a barter industry in industrialized countries for domestic trade. Nevertheless, the idea that corporate companies resort to corporate barter to

overcome liquidity constraints, enter new markets, and gain both marketing and competitive advantages is also supported by specialized publications like BarterNews, promotional materials by corporate barter companies, and official documents by both the International Reciprocal Trade Association (IRTA) – the official spokesman of the industry – and the Corporate Barter Council (CBC).

However, even if it is recognized that under specific unfavourable circumstances barter may bring some advantages, it is unanimously considered an inefficient form of exchange *per se*. Indeed, it is common opinion that, even if barter may result in being profitable, it should be avoided and even banned. This because, although it may represent an effective means to deal with economic imperfection, it is thought not to correct and solve such imperfection. If its appearance during economic slowdown does not surprise, barter, in any of its multiple forms, is not considered a solution to downturns, as it is not expected to bring the economy out of the crisis, for which only drastic political and monetary measures are advocated. Indeed, the resurgence of barter during crisis times contributes to reinforce the inefficiency belief as well as the idea that traders wouldn't yield to barter if it was not for the crisis. Actually, the case of the Russian economy is currently quoted as a concrete additional proof of the inefficiency of barter. Even if it is recognized that Russian firms affected by a severe lack of liquidity and confronted with an imperfect capital market environment may find in barter a way to restore their creditworthiness as indebted countries do, the practice is not expected to help the recovery of the Russian economy (Marin and Schnitzer, 1999, 2002b). Indeed, the International Monetary Fund (IMF) does not hesitate to clearly denounce the negative impact of barter on the Russian economy (IMF, 2000). However, the American Countertrade Association (ACA) has a different opinion on the effect of barter in Russia. Indeed, ACA recognizes barter to have a counter-cyclical effect on the Russian crisis. Indeed, it believes barter to play a major role in avoiding total collapse (ACA, 1999). From the reading of the ACA report, it comes out that the negative effects of barter cannot be ascribed to the presumed intrinsic inefficiency of barter as a form of exchange, but rather to the catastrophic political and institutional situation afflicting the country. In other words, the ACA report indicates the lack of political and institutional order as the main cause making barter inefficient. Indeed, the existence of a well-developed domestic barter industry in the USA reinforces the suspicion that the economic environment influences the role of barter and the way barter may respond to economic

changes. Indeed, the US barter industry questions the belief that barter is intrinsically inefficient. Technology advances have made barter transactions simpler, faster and friendlier than ever so that now, for the first time in history, barter can be preferred to cash transactions even when the latter are affordable. In fact, some US barter networks provide members with a dual credit card, which gives users the possibility to decide if settling payment in kind or in cash. In fact, the card can automatically distinguish between barter and cash transactions, and so correctly note and process them (Meyer, 1999b).

Moreover, the history of the US barter industry shows how political stability together with an effective and efficient legal system may facilitate the spreading of barter. So, for example, by imposing tax payment on barter transactions, the Tax Equity and Fiscal Responsibility Act promulgated by the US Congress in 1982 can be considered as the deciding factor for the development of the barter industry. By clearly regulating on the matter and deciding to treat barter income as equivalent to cash income, the US Congress gave to the barter industry a measure of legitimacy. Moreover, by classifying trade exchanges as third-party record-keepers with the same fiduciary obligations as banks, the 1982 Act legalized the barter industry, allowing it to pursue its growth. Furthermore, as since 1982, barter activity didn't disappear, the promulgation of the Fiscal and Responsibility Act implicitly proved that firms do not engage in barter for tax evasion purposes. Indeed, to avoid the suspicion of barter to be a tax evasion tool, Canada, New Zealand, and Australia have followed the example of the USA, by formally establishing that barter transactions are assessable and deductible to the same extent as similar cash transactions. In this way, these countries have allowed the birth of a domestic barter industry and facilitated its rapid development.

According to the specialized press, the IRTA and CBC official documents, barter is a marketing and financial tool that corporations and businesses adopt to move excess inventories, and exploit under-utilized plant capacity in order to finance the cost of production. However, these explanations do not help understand the role of barter in the US economy and assess the kind of impact it exerts on it. To be precise, it does not help understanding if barter plays a counter-cyclical role, or if it is essentially a pro-cyclical phenomenon. Actually, the presence of a barter industry in the USA, whose economy continued to grow up until the end of the 1990s, seems a contradiction in itself if we consider barter to be a symptom of economic crisis. Indeed, it is clear that

we cannot explain the US domestic barter as we do for Russia.

Moreover, if we consider that the barter industry has developed two different sectors, it seems reasonable to wonder if it is correct to assimilate all modern barter practices, from countertrade to offsets, corporate barter, and commercial E-barter, all together as 'barter', as the literature above mentioned does. In other words, we wonder if corporate and commercial barter play the same role, or respond to different economic needs, thus requiring to be analysed separately.

With the analysis of data for the US barter industry, we aim to elucidate some of the controversial points mentioned above. To sum up, we intend to check if corporate barter and commercial barter have the same pattern, which would allow us to consider them as a unique phenomenon, and if domestic barter presents counter-cyclical features. Moreover, we aim to check if firms resort to barter to get rid of excess inventories and/or exploit underutilized plant capacity as the specialized press claims. This leads us to first consider how barter series behave when confronted with macroeconomic series like GDP and its other components, with series regarding domestic business, or with those concerning the manufacturing industry. Indeed, through a first screening, we select for each group of time series the variables that seem to be more correlated to barter. In a second step, we try to estimate different error correction models capturing some basic features of barter dynamics to finally shed some light on barter.

III. What Data Reveal

The data we used are those released by IRTA on barter volume in North America between 1974 and 1999. As values for 1975 are missing (Table 1), we took the 1974 data as a proxy for 1975. Unfortunately, data are not comprehensive of total barter occurring in the USA, as they concern only the activity of barter organizations affiliated to IRTA. Therefore, for example, they do not include the activity of Atwood Richards¹, one of the oldest barter organizations in the USA and one of the largest barter corporations in terms of annual transactions.

Unfortunately, at present these are the only available data for the American barter industry. Actually, besides not being given on a regular basis, data released by IRTA after 1999 follow different selection criteria and consequently are not comparable with

Table 1. Dollars bartered by North American trade companies (in millions)

Year	Corporate trade companies	Trade exchanges	Total corporate companies & trade exchanges
1974	850	45	895
1976	980	65	1045
1977	1130	80	1210
1978	1300	110	1410
1979	1500	165	1665
1980	1720	200	1920
1981	1980	240	2220
1982	2200	270	2470
1983	2440	300	2740
1984	2680	330	3010
1985	2900	380	3280
1986	3200	440	3640
1987	3470	500	3970
1988	3750	566	4316
1989	4050	636	4686
1990	4550	707	5257
1991	5100	781	5881
1992	5570	858	6428
1993	6050	938	6988
1994	6560	1084	7644
1995	7216	1248	8464
1996	*7749	*1356	*9105
1997	*8205	*1464	*9699
1998	*9265	*1572	*10.837
1999	*9404	*1596	*11.000

Source: IRTA.

Notes: *1996–1999 figures are estimates for retail based upon average increase of the prior 5 years.

Corporate are based on study commissioned by the Corporate Barter Council.

previous figures. Even if since 1982 the Internal Revenue Service (IRS) has introduced a special entry to invoice barter income in its forms for tax payment, it does not release information on the barter activity declared by businesses. Clearly, the lack of more detailed and disaggregated data strongly limits the type of analysis that it is possible to conduct. However, we believe that these data are sufficient to disclose most of the basic features of barter we are interested in.

Macroeconomic time series for the US economy were taken from the Bureau of Economic Analysis (BEA) tables. All series were transformed in real terms using a 1996-chained deflator, as given by BEA.

When considered in level, both corporate and retail barter present a similar pattern, characterized by a strong upward trend component (Fig. 1). However, the graph of the growth rate of both series shows a quite different behaviour of the two forms of barter

¹ Atwood Richard was acquired by the international barter company Argent Trading LLC in 2000.

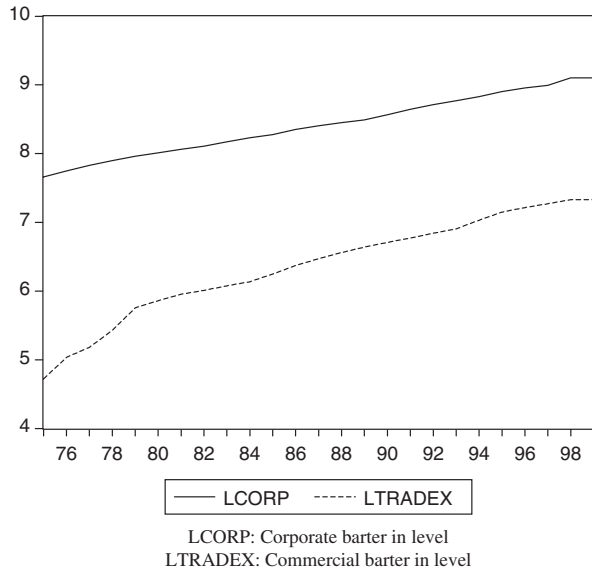


Fig. 1. Corporate barter versus commercial barter (level)

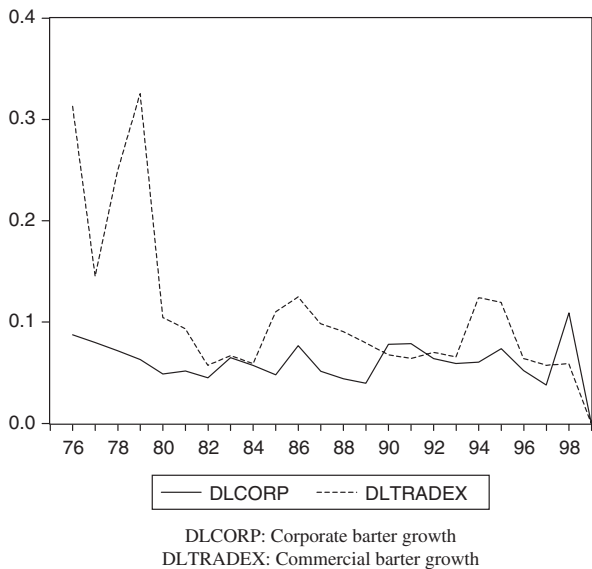


Fig. 2. Corporate barter versus commercial barter

over time (Fig. 2), suggesting the necessity for a differentiated analysis. Indeed, regressions on commercial barter and corporate barter confirmed the different pattern of the two realities.

Therefore, we decided to start the analysis with the commercial barter sector. Indeed, barter through trade exchanges seems to us more interesting as it can be considered more ‘barter’ than that performed through corporate barter companies. In fact, commercial barter consists of true moneyless exchanges, while corporate barter transactions involve also a consistent share of cash.

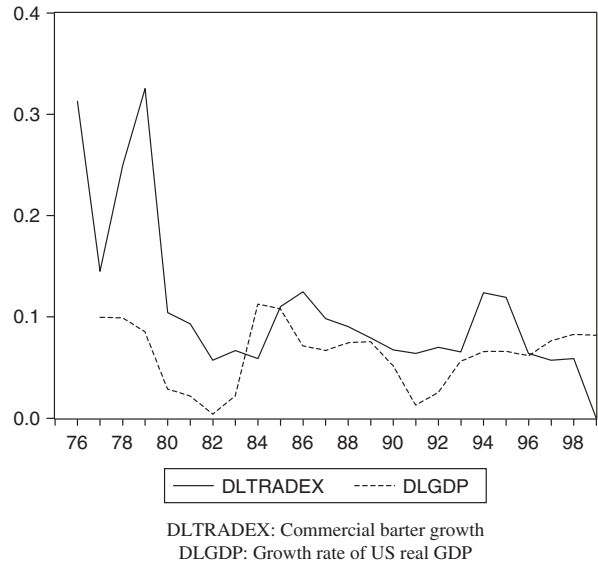


Fig. 3. Commercial barter versus GDP

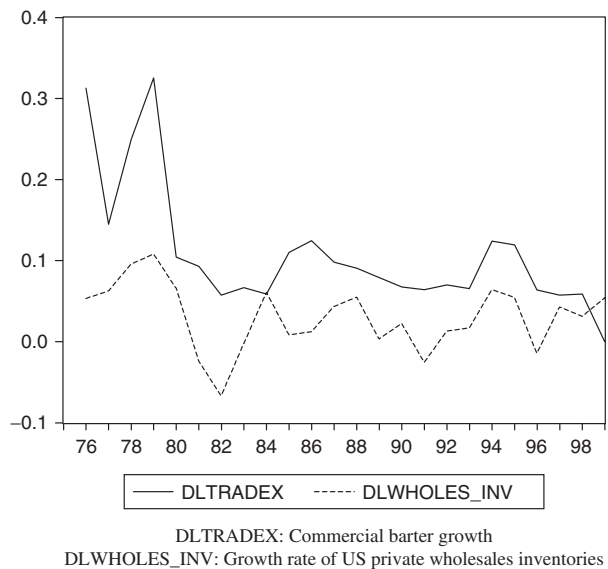


Fig. 4. Commercial barter versus private wholesale inventories

Commercial barter

Graphic analysis indicates commercial barter to be slightly correlated with GDP (Fig. 3) as well as with capacity utilization of the manufacturing sector for durable goods (Fig. 6). On the other hand, a stronger correlation is found with both private wholesale trade and retail trade inventories (Figs. 4 and 5, respectively).

By comparing commercial barter growth with that of GDP, we can easily see that the 1982 Tax Equity and Fiscal Responsibility Act had no effect

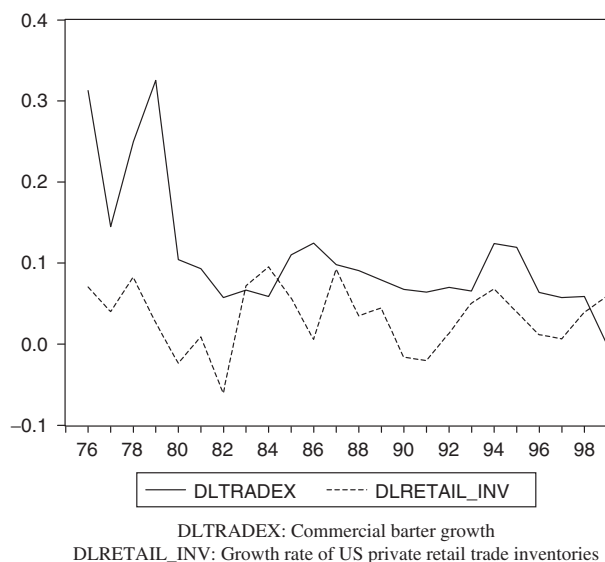


Fig. 5. Commercial barter versus private retail trade inventories

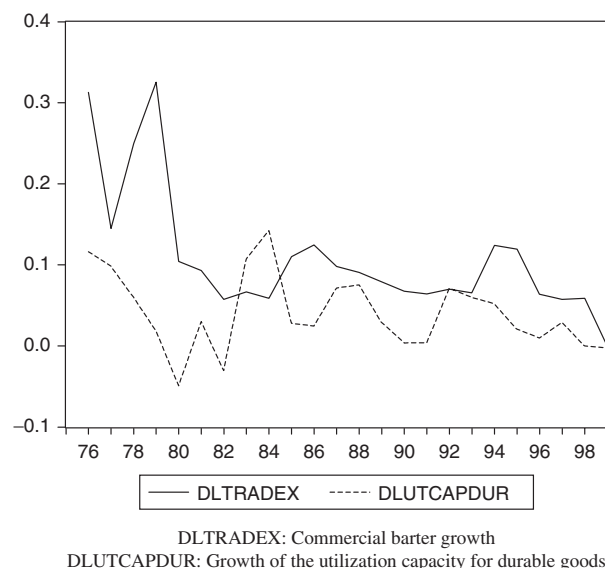


Fig. 6. Commercial barter versus capacity utilization (durable goods)

on trade exchange activity, confirming that the success of present barter does not rely on tax evasion.

As we intended to identify the variables that may influence commercial barter, we decided to confront barter data with other more specific macro-economic series, thus taking also into account single components of GDP, in particular the GNP by the

Table 2. Variables selected to study commercial barter sector

LTRADEX	Logarithm of the volume of barter through trade exchanges
LGDP	Logarithm of US real gross domestic product
LGNPSRV	Logarithm of US real gross national product by services
LWHOLES_INV	Logarithm of total private inventories of wholesale trade sector
LRETAIL_INV	Logarithm of total private inventories of retail trade sector
LUTCAPDUR	Logarithm of capacity utilization rate of manufacturing – durable goods

service sector (Fig. 7). Moreover, we confront barter data also with time series accounting private inventories and final sales of the US domestic business, and time series relative to the capacity utilization rates of the US manufacturing industry. In Table 2 we define the variables selected to study the commercial barter sector.

Graphic analysis leads to suspect that some or all of the variables are nonstationary. Therefore, we performed unit root tests for stationarity on both levels and first differences of all selected variables. Table 3 presents the results of the Augmented Dickey Fuller (ADF) unit root tests and the corresponding McKinnon critical values. The ADF tests were run using a constant and a trend, while the lag length was determined in a general-to-specific modelling strategy. Given the annual nature of the data, lag length was initially set at 4. For the results in the table it is clear that the null hypothesis cannot be rejected for all time series in level form at the 5%, yet it is rejected for all series in growth form. However, for both time series of wholesale and retail trade inventories, the ADF test for the growth form was run without including the trend component. Indeed, also GDP series become stationary when the trend is excluded. This result is supported also by graphical analysis of the growth rate of the series, which does not exhibit any trend tendency. Moreover, the correlogram indicates that the GDP growth series follows an AR(1) process. Therefore, in the light of these elements, we decided for the GDP series to accept the result of the ADF test including the constant but not the trend.² Thus, we conclude that all the variables are integrated

² According to the Phillips–Perron (PP) test, the GDP series is found to be stationary in first differences with constant and trend. However, with larger samples the PP test confirms the ADF test results. Given the results of Leybourne and Newbold (1999a, b), we have decided to rely mainly on the ADF tests for our analysis.

Table 3. ADF unit root tests for stationarity

Variables	Levels†	First differences with constant and trend‡	First differences with constant and without trend‡
LTRADEX	-0.605629	-7.284376**	
LGDP	-2.673761	-3.392931	3.396618*
LGNPSRV	-0.708820	-4.845187**	
LUTCAPDUR	-3.424035	-3.927430*	
LWHOLE_INV	-3.599857		-3.444502*
LRETAIL_INV	-2.591619		-3.034311*

Notes: †The critical value calculated from McKinnon tables for levels with constant and trend at 10% significance is -3.2677, at 5% is -3.6591 and at 1% significance is -4.5000.

‡The critical value calculated from McKinnon tables for levels with constant, but without trend at 10% significance is -2.6502, at 5% is -3.0199 and at 1% significance is -3.8067.

*Indicates rejection of null hypothesis of non-stationarity at 5% level and ** at 1% level.

of order one, or $I(1)$, as they are stationary in first difference.

Given the small sample available on barter data, we have opted for the Banerjee *et al.* (1986) one step method to determine the long-run relationship between retail barter and the selected explanatory variables. Once again, we followed the general-to-specific modelling approach to identify the dynamic regressions that better fit the data.

Even if, in graphics, all series exhibit a trend component, we decided to focus the analysis on the results obtained excluding a trend tendency, as regressions including a trend displayed very unsatisfactory results. Indeed, all variables lose significance if compared with the same regressions without a trend. Moreover, at a level of significance of 5%, the trend itself results to be not significant.

For the same reasons, we decided not to put the series accounting for inventories and that of capacity utilization rate for durable goods in the same regression. When analysed together with either GDP or GNP of the service sector all variables lose significance. Moreover, in these cases, according to the residual based ADF-test for cointegration, residuals of the static regressions are not stationary, indicating that the variables taken as a group of four are not cointegrated. The Johansen test confirmed the result of no cointegration. In contrast, if we restrict the analysis to groups of only three variables, the residual based ADF-test for cointegration indicates that variables of the groups including the GNP of the service sector are cointegrated. However, as the graphical analysis of commercial barter growth led us to suspect, the variables turn out to be cointegrated starting from the year 1978. Indeed, as the commercial barter series begins only in 1974, which is taken as a proxy for 1975 data, adjustments should be expected during the first few years. Results concerning both short- and long-run dynamics are given

in Table 4. Actually, all dynamic regressions in Table 4 are run on a restricted sample ranging from 1978 to 1999. Being particularly interested in the long-run dynamics, the implied long-run relationship from each of the estimated equations has been reported separately, and is presented in Table 5. Clearly, the choice of the group of variables in the regressions displayed in Table 5 has been determined by our interest in assessing the influence of the economic cycle on barter. Therefore, regressions taking into account the GDP series have been included, even if the variables do not turn out to be cointegrated. Besides comparative purposes, it seemed appropriated to include the GDP series in the analysis also because commercial barter and GDP on their own pass the cointegration test.

As Table 5 shows, in the long run, regressions on commercial barter do not indicate any counter-cyclical trend. On the contrary, commercial barter seems to follow the tendency of the economy and to be rather pro-cyclical. Given that the variables analysed in the dynamic regressions (2), (3) and (5) in Table 4 proved to be cointegrated, the coefficient of the error correction term of these regressions is effectively statistically significant, suggesting the validity of the long-run equilibrium relationship. Moreover, the coefficients of these error correction terms are very close, as they vary between 0.28 and 0.34, indicating a low speed of adjustment. Actually, it is worth noting that even the error correction term of the dynamic regressions including the GDP series indicates a similar pattern. Indeed, both error correction terms, which are still very close to those of the other regressions (0.23 and 0.25) indicate an even lower speed of adjustment. Indeed, we believe that such a difference in the speed of adjustment has to be ascribed to the fact that, besides the GNP of the service sector, the GDP variable also incorporates all the other real components of the economy.

Table 4. Error correction model for retail barter

Estimate*	Diagnostic tests**
(1) $\Delta\text{LTRADEX}_t = -4.8 - 0.13 \Delta\text{LGDP}_t + 0.34 \Delta\text{LWHOLE_INV}_t$ (-1.733013) (-0.228559) (1.035669) + $-0.25 \text{LTRADEX}_{t-1} + 0.74 \text{LGDP}_{t-1} - 0.21 \text{LWHOLE_INV}_{t-1}$ (-2.505991) (2.431312) (-0.749413) $R^2 = 0.752642$ Akaike = -3.414939 DW stat = 2.017679	<i>Breusch–Godfrey (1 lag)</i> $\chi^2 = 0.76$ [0.38] <i>ARCH</i> $\chi^2 = 0.57$ [0.44] <i>White</i> $\chi^2 = 17.40$ [0.06] <i>Ramsey's RESET (1)</i> <i>F</i> -stat = 1.90 [0.18] <i>Ramsey's RESET (2)</i> <i>F</i> -stat = 2.37 [0.12]
(2) $\Delta\text{LTRADEX}_t = -3.34 - 1.19 \Delta\text{LGNPSRV}_t + 0.37 \Delta\text{LWHOLE_INV}_t$ (-1.157079) (-1.323466) (1.575045) + $-0.29 \text{LTRADEX}_{t-1} + 0.54 \text{LGNPSRV}_{t-1} - 0.03 \text{LWHOLE_INV}_{t-1}$ (-2.230851) (2.453161) (-0.111520) $R^2 = 0.801349$ Akaike = -3.634226 DW stat = 2.038695	<i>Breusch–Godfrey (1)</i> $\chi^2 = 0.40$ [0.52] <i>ARCH</i> $\chi^2 = 0.64$ [0.48] <i>White</i> $\chi^2 = 16.78$ [0.07] <i>Ramsey's RESET (1)</i> <i>F</i> -stat = 1.17 [0.29] <i>Ramsey's RESET (2)</i> <i>F</i> -stat = 1.82 [0.19]
(3) $\Delta\text{LTRADEX}_t = -4.18 - 1.06 \Delta\text{LGNPSRV}_t + 0.29 \Delta\text{LRETAIL_INV}_t$ (-2.725488) (-1.257854) (1.046092) + $-0.34 \text{LTRADEX}_{t-1} + 0.34 \text{LGNPSRV}_{t-1} + 0.38 \text{LRETAIL_INV}_{t-1}$ (-4.056916) (1.030767) (1.392523) $R^2 = 0.795508$ Akaike = -3.605246 DW stat = 1.928989	<i>Breusch–Godfrey (1)</i> $\chi^2 = 0.13$ [0.70] <i>ARCH</i> $\chi^2 = 0.11$ [0.73] <i>White</i> $\chi^2 = 15.08$ [0.12] <i>Ramsey's RESET (1)</i> <i>F</i> -stat = 0.48 [0.49] <i>Ramsey's RESET (2)</i> <i>F</i> -stat = 2.58 [0.11]
(4) $\Delta\text{LTRADEX}_t = -3.81 - 1.21 \Delta\text{LGDP}_t + 0.96 \Delta\text{LUTCAPDUR}_t$ (-1.168066) (-1.250512) (2.23242) + $-0.23 \text{LTRADEX}_{t-1} + 0.50 \text{15LGDP}_{t-1} + 0.45 \text{LUTCAPDUR}_{t-1}$ (-2.215641) (1.435170) (1.646857) $R^2 = 0.792525$ Akaike = -3.590761 DW stat = 1.989259	<i>Breusch–Godfrey (1)</i> $\chi^2 = 0.12$ [0.72] <i>ARCH</i> $\chi^2 = 0.10$ [0.74] <i>White</i> $\chi^2 = 11.94$ [0.28] <i>Ramsey's RESET (1)</i> <i>F</i> -stat = 4.04 [0.06] <i>Ramsey's RESET (2)</i> <i>F</i> -stat = 2.35 [0.13]
(5) $\Delta\text{LTRADEX}_t = -2.87 - 0.63 \Delta\text{LGNPSRV}_t + 0.34 \Delta\text{LUTCAPDUR}_t$ (-1.584930) (-0.745046) (1.459018) + $-0.28 \text{LTRADEX}_{t-1} + 0.47 \text{LGNPSRV}_{t-1} + 0.37 \text{LUTCAPDUR}_{t-1}$ (-2.919341) (2.049843) (1.658270) $R^2 = 0.806410$ Akaike = -3.660032 DW stat = 2.032860	<i>Breusch–Godfrey (1)</i> $\chi^2 = 0.31$ [0.57] <i>ARCH</i> $\chi^2 = 0.38$ [0.53] <i>White</i> $\chi^2 = 14.62$ [0.14] <i>Ramsey's RESET (1)</i> <i>F</i> -stat = 0.40 [0.53] <i>Ramsey's RESET (2)</i> <i>F</i> -stat = 1.33 [0.29]

*Values in parentheses: *T*-statistic.**Value in squared brackets: *p*-value.

(Further test details available upon request.)

Table 5. Long-run relationship for retail barter

(1)	$LTRADEX = -19 + 2.95 LGDP$ $- 0.85 LWHOLE_INV$
(2)	$LTRADEX = -11.27 + 1.84 LGNPSRV$ $- 0.21 LWHOLE_INV$
(3)	$LTRADEX = -12.06 + 0.99 LGNPSRV$ $+ 1.10 LRETAIL_INV$
(4)	$LTRADEX = -15.95 + 2.12 LGDP$ $+ 1.87 LUTCAPDUR$
(5)	$LTRADEX = -10.13 + 1.67 LGNPSRV$ $+ 1.33 LUTCAPDUR$

The slightly higher error correction terms associated with the GNP of the service sector corroborate that retail barter is effectively particularly sensitive to such component of the GDP. According to us, this result confirms that for small and medium businesses the barter market is complementary to the cash one. Once a firm enrolls itself in a trade exchange, it shows its intention to barter on a regular basis. The membership fee it has to pay deters it from adopting 'hit and run' behaviours. Thus, for a firm the choice of bartering is a long-term decision, which takes time to revert once the economic conditions change.

As Table 5 indicates, the estimated coefficients of the lagged variables in the cointegrating vector present a positive sign with the exception of wholesale inventories. However, it is difficult to assess the effective influence of inventories on commercial barter in the long-run. Being both wholesale and retail inventories not statistically significant (see Table 4), it is difficult to understand which is the correct relation: the positive one by retail inventories or the negative one by wholesales inventories. Therefore, given such indeterminacy, our results do not allow us to conclude that firms resort to barter to move excess inventories, as the specialized press suggests. However, the influence of inventories seems irrelevant with respect to the overall results. On the other hand, our results confirm the influence of GNP of the service sector. We find this outcome particularly interesting and relevant. While the service sector supplies non-storable goods, the manufacturing sector supplies goods for which storage is expensive. Barter seems to be especially suitable for the trade of goods that cannot be stored for goods whose storage involve a positive cost, and the commercial barter industry seems to offer an efficient solution to the needs of the two sectors. Commercial barter seems to arise from a sort of double coincidence of wants, implicitly linking the service and the manufacturing sectors. Indeed, this is precisely the impression one has from the specialized press, according to which, most commercial barter consists of exchanges

of services for goods. The relative importance of both capacity utilization rate and inventories in explaining commercial barter, as attested by the relative high R^2 value, seems to confirm the hypothesis of such a form of double coincidence of wants.

Concerning the capacity utilization rate, the dynamic regressions indicate unequivocally a positive relation with commercial barter both in the short- and the long-run. Clearly, such an outcome goes against the view supported by the specialized press that barter is adopted to exploit underutilized plant capacity. On the contrary, the positive sign of the coefficients of the capacity utilization rate is consistent with our belief that US firms resort to barter to increase their profits and not to overcome trade difficulties, depending on some form of market imperfection or incompleteness. This result supports the hypothesis that barter activity has to be considered as complementary to the cash economy.

The diagnostic test statistics show no evidence of misspecification, no serial correlation, and nor any problem of heteroscedasticity (see Table 4). Moreover, according to the Jarque–Bera statistic, disturbances result to be normally distributed.

The J -test does not help to discern the best model fitting commercial barter data. By comparing the models two by two, the J -test fails to reject any. Indeed, data do not provide enough information to discriminate among models. If all variables considered have some explanatory power, none of them alone is expected to capture the full dynamic of commercial barter activity. In particular, it is clear that both wholesale and retail trade inventories, and capacity utilization rate are all relevant to explain commercial barter and should be both taken into account.

Corporate barter

To analyse corporate barter we proceeded in the same way as for retail barter. As expected, the analysis of corporate barter brought different results.

Unlike retail barter, corporate barter does not show a clear pro-cyclical tendency. Indeed, starting from 1990 corporate barter moves rather in a counter-cyclical fashion, as both the graphics displaying the growth rate of real GDP and that of total private manufacturing inventories show (Figs. 8 and 10, respectively). However, it is worth noting that also for corporate barter the 1982 Tax Equity and Fiscal Responsibility Act had no influence on corporation barter strategy. Unfortunately, we are not able to identify the element that in 1990 might have provoked the change in corporate barter trend pattern.

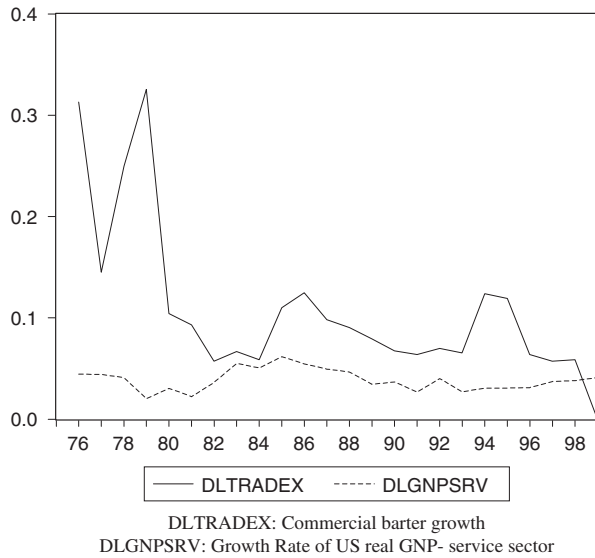


Fig. 7. Commercial barter versus GNP-service sector

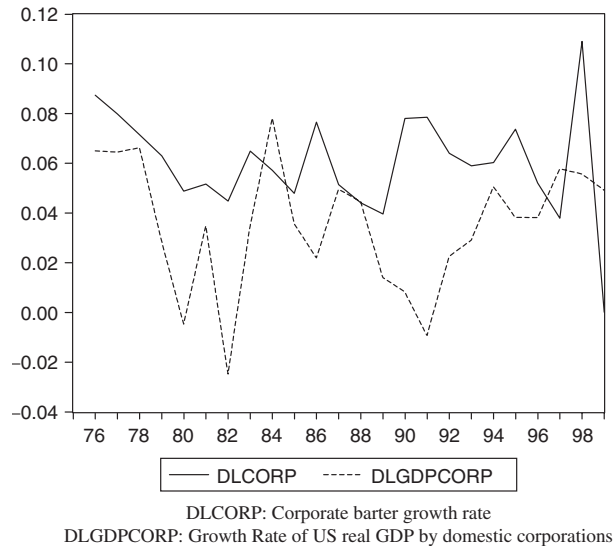


Fig. 9. Corporate barter versus gross national product by domestic corporations

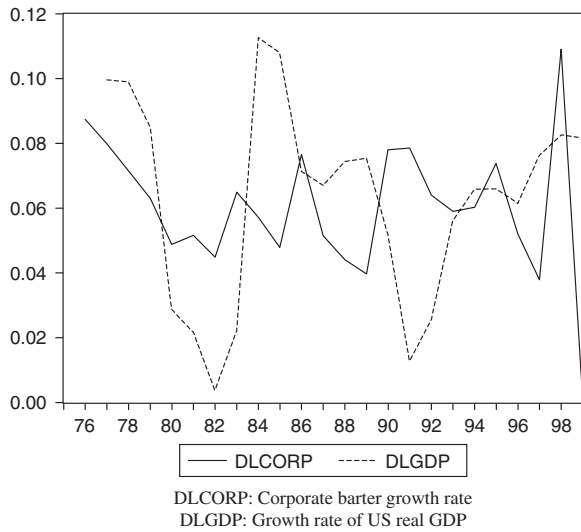


Fig. 8. Corporate barter versus GDP

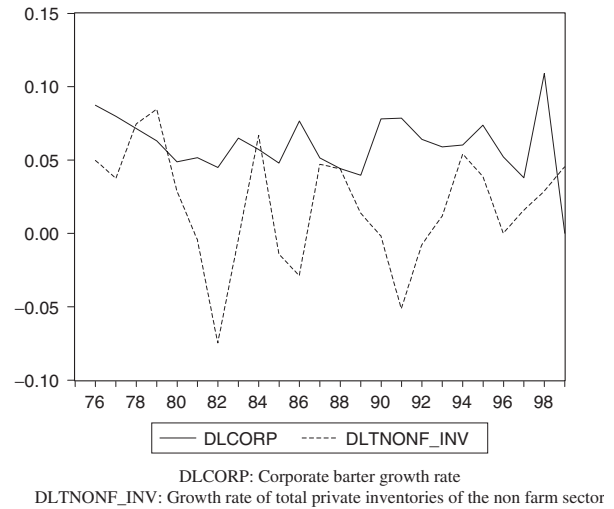


Fig. 10. Corporate barter versus total private inventories of the nonfarm sector

Table 6 contains a description of the new variables introduced in this second part. Indeed, besides the GDP, we found it appropriate to consider as single component of GDP also the GNP by Domestic Corporations (Fig. 9), and in addition the total non-farm inventories series. We still consider the wholesale inventories series and the capacity utilization rates series (Fig. 11 and 12 respectively).

As in the analysis of retail barter, we performed the ADF tests, which indicated that the new variables

now considered are also integrated of order one (Table 7). For the growth of GNP by Domestic Corporations we were confronted with the same problems encountered with the GDP growth series. However, as for GDP, we decided to accept the result of stationarity by the ADF-test with constant, but without trend.³

Unfortunately, in the case of corporate barter, according to the residual based ADF-test for cointegration, variables turned out not to be cointegrated

³This result is confirmed also by the PP test.

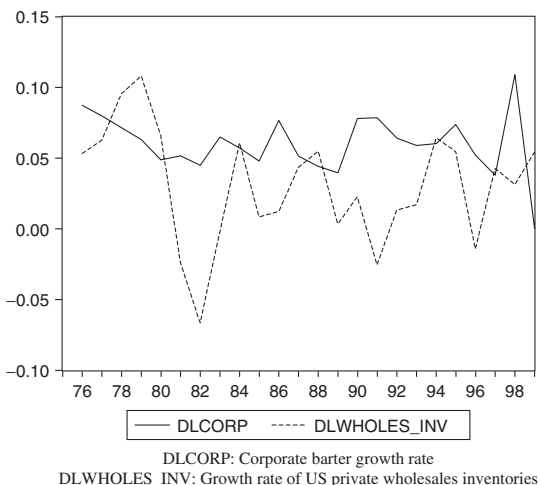


Fig. 11. Corporate barter versus private wholesale inventories

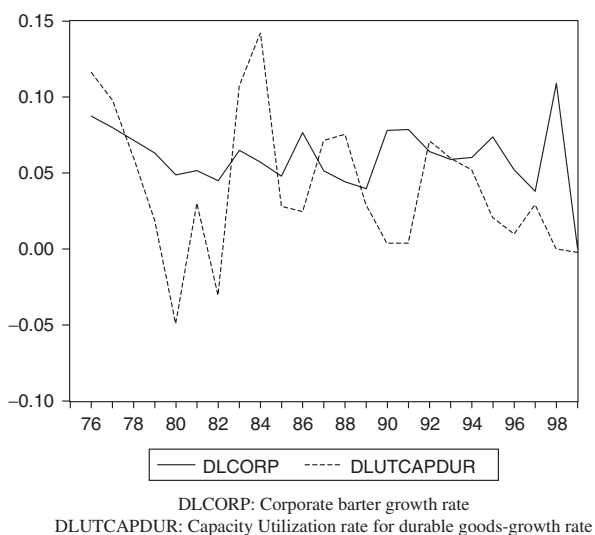


Fig. 12. Corporate barter versus capacity utilization (durable goods)

either in groups of four or in groups of three. Only the group of variable including corporate barter, GDP, and wholesale inventories passed the test at the 10% level, but not at 5%, although very close to it. Nevertheless, we pursue our investigation by analysing the series accounting for inventories separately from capacity utilization rate. Unlike the case of retail barter, the trend tendency proved to be significant and, therefore, it was included in all regressions. Moreover, in the case of corporate barter, we found it appropriate to consider all the years for which data were available.

Table 8 reports the results of the dynamic regressions, which intend to capture both the short- and long-run effects of the chosen explanatory variables

Table 6. Variables selected to study corporate barter sector

LCORP	Logarithm of the volume of corporate barter
LGDPCORP	Logarithm of US real gross national product by domestic corporations
LTNONF_INV	Logarithm of total private inventories of the nonfarm sector

on corporate barter. However, we report the implied long-run relationship from each of the estimated equations, separately, in Table 9.

Unlike the commercial barter case, the coefficients of the error correction term of all regressions are particularly large, ranging from 0.62 to 0.90, thus, indicating a high speed of adjustment (Table 8). However, concerning the corporate barter, it seems that the counter-cyclical pattern is the dominating one. According to us, the results reflect the habit of corporations to resort to barter not on a regular basis. In practice, they confirm that corporations' barter activity is contingent upon their investment plans and, in particular, upon their advertising campaign strategies, which, in turn, deeply rely on the general performance of the economy.

As with commercial barter, the long-run influence of inventories on corporate barter turns out to be not very clear. While in the cointegrating vectors reported in Table 9 the coefficient of total manufacturing inventories has a negative sign, the coefficient of wholesale inventories variable displays a negative sign when considered together with GDP, and a positive one when analysed with GNP by domestic corporations. However, as shown in Table 8, the total manufacturing inventories variable is not statistically significant, while the wholesale inventories variable is significant only in Equation 2. Therefore, by taking into account also the higher R^2 value of the latter equation, we are prone to consider the negative relation as the more plausible. However, such a negative relation remains difficult to interpret. Nevertheless, it suggests that corporate barter is not adopted to move excess inventories, as the specialized press claims.

On the other hand, corporate barter is also particularly sensitive to the capacity utilization of durable goods. As in the retail barter case, for corporate barter the coefficients of the capacity utilization rate variable in the cointegrating vector are positive (see Table 9). Therefore, even in the case of the corporate barter sector, we do not find proof of barter as a tool corporations use to exploit underutilized plant capacity. On the contrary, the results corroborate the hypothesis that also corporations use barter to increase their profitability.

Table 7. ADF unit root tests for stationarity

Variables	Lag	Levels†	First differences with constant and trend†	First differences with constant and without trend‡
LCORP	(-2)	-1.936724	-4.206011*	
LGDP CORP	(-1)	-1.979289	-3.602646	-3.245721*
LTNONF_INV	(-2)	-1.833002	-4.855695**	

Notes: †The critical value calculated from McKinnon tables for levels with constant and trend at 10% significance is -3.2677, at 5% is -3.6591 and at 1% significance is -4.5000.

‡The critical value calculated from McKinnon tables for levels with constant, but without trend at 10% significance is -2.6502, at 5% is -3.0199 and at 1% significance is -3.8067.

*Indicates rejection of null hypothesis of non-stationarity at 5% level and ** for rejection at 1% level.

Unlike the retail barter case, our results show that corporate barter activity tends to increase effectively during economic slowdown, suggesting a counter-cyclical role for this kind of barter. However, such effect is dampened by the positive relation of the capacity utilization rate.

The absence of cointegration and the relatively low R^2 values make the results in general, less satisfactory than those obtained for retail barter. Moreover, the Jarque–Bera test shows normality at a rather low level of significance. In particular, dynamic regression accounting for GNP by domestic corporations and wholesale inventories presents the less satisfactory value. However, we decided to include it for comparative purposes.

Concerning the GNP by the Service sector, deeper investigations did not indicate any long-run relationship with corporate barter. Indeed, we think that for corporate barter it would be necessary to have more detailed data on services, as this form of barter involves almost exclusively only a few services; advertising time and space, and travel.

This idea was corroborated by the J -test. Indeed, as in the case of commercial barter, the J -test fails to reject any model. However, while considering wholesale inventories and capacity utilization as still relevant explanatory variables, we believe them to be not so crucial as for commercial barter.

IV. Conclusions

This empirical investigation has clearly shown that corporate barter and trade exchange barter have different patterns. Moreover, they respond to the economic cycle in a different way. While commercial barter follows the economic cycle, corporate barter presents a counter-cyclical feature. Therefore, it is evident that the two sectors of the barter industry must be studied separately. Indeed, our results show implicitly that considering all forms of barter as equals and, in particular, as equally inefficient

can be misleading. Above all, we find the positive relation between commercial barter and GDP or GNP of the service sector as particularly significant. Such a result shows that it is not correct to link the barter activity exclusively to situation of economic crisis and believe traders yield to barter just to overcome unfavourable economic conditions. The profitability of barter cannot be related and confined only to periods of economic distrust and downturns. Barter cannot be considered only as a counter-cyclical phenomenon. However, our results suggest that, to be profitable during economic growth times, barter may require a certain degree of economic development. The study of the US domestic barter implicitly supports the idea that the economic environment plays a major role in determining the type of barter that can be developed and the way barter can respond to the economic situation.

Moreover, the empirical results indicate that in developed economies barter activity is often complementary to the cash economy. In particular, this seems to be the case of commercial barter.

The results obtained for both US barter sectors do not support the view of the specialized press. In particular, the positive sign of the capacity utilization rate variable in the dynamic regressions shows that neither businesses nor corporations resort to barter to obtain better exploitation of their production capacity. On the contrary, such a positive relation reinforces the idea that barter is adopted to increase profits and, to a greater extent, to gain a competitive edge.

However, besides this common characteristic, we can conclude that in the US economy, barter seems to incorporate two different roles. On the one hand, the inverse relation found between corporate barter and GDP suggests that this kind of barter can help to soften the negative effects of periodical economic slowdowns. On the other hand, the positive relation between commercial barter and GDP suggests that barter may also contribute to strengthen economic growth. Clearly, a more precise indication of the

Table 8. Error correction model for corporate barter

Estimate*	Diagnostic tests**
(1) $\Delta \text{LCORP}_t = 7.75 + 0.04t - 0.37 \Delta \text{LGDP}_t + 0.15 \Delta \text{LTNONF_INV}_t$ (2.350653) (2.517262) (-1.043303) (0.786458) + -0.72 $\text{LCORP}_{t-1} - 0.14 \text{LGDP}_{t-1} - 0.06 \text{LTNONF_INV}_{t-1}$ (-2.736191) (-0.574526) (-0.574310) $R^2 = 0.475192$ Akaike = -4.974659 DW stat = 1.975002	<i>Breusch-Godfrey (1 lag)</i> $\chi^2 = 2.99$ [0.08] <i>ARCH</i> $\chi^2 = 0.95$ [0.32] <i>White</i> $\chi^2 = 16.53$ [0.16] <i>Ramsey's RESET (1)</i> $F\text{-stat} = 1.98$ [0.17] <i>Ramsey's RESET (2)</i> $F\text{-stat} = 1.42$ [0.27]
(2) $\Delta \text{LCORP}_t = 9.8 + 0.05t - 0.4 \Delta \text{LGDP}_t + 0.06 \Delta \text{LWHOLE_INV}_t - 0.4 \Delta \text{LCORP}_{t-1}$ (1.852707) (1.706655) (-1.347417) (0.332204) (-1.083241) - 0.31 $\Delta \text{LGDP}_{t-1} - 0.32 \Delta \text{LWHOLE_INV}_{t-1} - 0.62 \text{LCORP}_{t-1} - 0.30 \text{LGDP}_{t-1}$ (-1.176249) (2.192632) (-1.442772) (-0.880683) - 0.23 LWHOLE_INV_{t-1} (-1.220994) $R^2 = 0.626289$ Akaike = -5.063909 DW stat = 1.975002	<i>Breusch-Godfrey (1)</i> $\chi^2 = 0.01$ [0.92] <i>ARCH</i> $\chi^2 = 0.07$ [0.78] <i>White</i> $\chi^2 = 19.96$ [0.33] <i>Ramsey's RESET (1)</i> $F\text{-stat} = 0.13$ [0.71] <i>Ramsey's RESET (2)</i> $F\text{-stat} = 0.11$ [0.88]
(3) $\Delta \text{LCORP}_t = 7.48 + 0.04t - 0.06 \Delta \text{LGDP}_{\text{CORP}}_t + 0.18 \Delta \text{LWHOLE_INV}_t$ (3.274882) (3.172881) (-0.296557) (1.160551) + -0.76 $\text{LCORP}_{t-1} - 0.21 \text{LGDP}_{\text{CORP}}_{t-1} - 0.07 \text{LWHOLE_INV}_{t-1}$ (-2.879589) (-1.189912) (-0.580765)	<i>Breusch-Godfrey (1)</i> $\chi^2 = 2.95$ [0.08] <i>ARCH</i> $\chi^2 = 0.60$ [0.43] <i>White</i> $\chi^2 = 19.67$ [0.07] <i>Ramsey's RESET (1)</i> $F\text{-stat} = 2.03$ [0.17] <i>Ramsey's RESET (2)</i> $F\text{-stat} = 1.48$ [0.25]
(4) $\Delta \text{LCORP}_t = 14.57 + 0.07t - 0.22 \Delta \text{LGDP}_t + 0.09 \Delta \text{LUTCAPDUR}_t$ (3.525774) (4.187107) (-0.515162) (0.537430) + -0.90 $\text{LCORP}_{t-1} - 0.70 \text{LGDP}_{t-1} + 0.33 \text{LUTCAPDUR}_{t-1}$ (-4.311002) (-2.293383) (-2.445579)	<i>Breusch-Godfrey (1)</i> $\chi^2 = 2.28$ [0.13] <i>ARCH</i> $\chi^2 = 0.06$ [0.43] <i>White</i> $\chi^2 = 16.25$ [0.17] <i>Ramsey's RESET (1)</i> $F\text{-stat} = 1.05$ [0.31] <i>Ramsey's RESET (2)</i> $F\text{-stat} = 1.53$ [0.21]
(5) $\Delta \text{LCORP}_t = 9.7 + 0.05t + 0.33 \Delta \text{LGDP}_{\text{CORP}}_t - 0.16 \Delta \text{LUTCAPDUR}_t$ (4.480403) (4.522444) (-1.176460) (-1.032899) + -0.80 $\text{LCORP}_{t-1} - 0.34 \text{LGDP}_{\text{CORP}}_{t-1} + 0.18 \text{LUTCAPDUR}_{t-1}$ (-3.957931) (-2.186114) (1.928276)	<i>Breusch-Godfrey (1)</i> $\chi^2 = 6.06$ [0.01] <i>ARCH</i> $\chi^2 = 0.85$ [0.35] <i>White</i> $F\text{-stat} = 3.00$ [0.22] <i>Ramsey's RESET (1)</i> $F\text{-stat} = 2.30$ [0.14] <i>Ramsey's RESET (2)</i> $F\text{-stat} = 1.10$ [0.35]

*Values in parentheses: *T*-statistic.

**Value in squared brackets: *p*-value.

(Further test details available upon request.)

Table 9. Long-run relationship for corporate barter

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- (1) $LCORP = 10.76 + 0.06t - 0.19 LGDP - 0.09 LTNONF_INV$
 (2) $LCORP = 15.88 + 0.08t - 0.48 LGDP - 0.37 LWHOLE_INV$
 (3) $LCORP = 9.78 + 0.06t - 0.28 LGDPCORP + 0.10 LWHOLE_INV$
 (4) $LCORP = 16.18 + 0.08t - 0.78 LGDP + 0.36 LUTCAPDUR$
 (5) $LCORP = 12.12 + 0.07t - 0.42 LGDPCORP + 0.22 LUTCAPDUR$
-

role of barter would require a further investigation. Indeed, a possible future analysis could consist in analysing how the results would alter if one took account of the endogeneity of some of the explanatory variables.

Acknowledgements

I am grateful to Fatemeh Shadman for her important suggestions in econometric matters and valuable comments on previous drafts of this paper. I also thank Claude d'Aspremont, Enrico Minelli, Reinilde Veugelers and Hideki Yamawaki for helpful discussions and comments, and Rosella Nicolini for useful hints. Any remaining errors are solely my own responsibility.

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