

U.S. Domestic Barter: an Empirical Investigation ^{*}

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Abstract

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.

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1- Introduction

At the beginning of the new millennium, instead of disappearing, barter is gaining new ground in our modern economies. While it is estimated that in 1999 U.S. 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 U.S. 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 which seem to best explain the U.S. barter. As both the corporate barter time series and the retail barter one 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 variable 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).

2 - Barter at stake

Originated in the 1950s in the United States, organized barter among companies has recorded a dramatic growth in few decades, giving rise to a completely new and still growing industry. At present, the barter industry is spreading in almost all industrialized countries, attracting an increasing number of businesses. According to the International Reciprocal Trade Association (IRTA), the official spokesman of the industry, 65% of the "Fortune 500" engage in barter, among which PepsiCo, Pizza Hut, IBM, Xerox, and Good Year. At present, it is also estimated that in North America there are already approximately a quarter-million firms bartering through specialized barter networks (IRTA 1999).

Basically, it is possible to distinguish two forms of barter, that is, 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 a 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 gave the possibility to trade exchanges to organize barter on a multilateral basis since the end of the 1970s, giving thus birth to what nowadays is known as electronic barter or E-barter. 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 exchanges' members swap goods and services without using cash. Indeed, within trade exchanges, the double coincidence of wants is no more 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 the 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 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 1985; Verzariu 2000), or simply to maximize long term profits (Verzariu 2000), enter new markets and gain a competitive edge (Hammond 1990; Weigand 1979; 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 defense and high-technologies industries (Gao 1996; U.S. 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 a 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. By linking the import to the export, specific compensatory arrangements can help to efficiently handle the risk that information on the quality of the traded commodities could be hidden (Amman and Marin 1989), or can contribute to reduce the incentives for cheating when the difficulties in monitoring agents are increased by the international nature of the transaction (Choi and Maldoom 1992).

Moreover, risk adverse countries facing a tight foreign-exchange constraint can resort to countertrade to overcome the lack of perfect risk and insurance markets (Amman and Marin 1994), or, in the specific case of technology trade, to solve contractual problems in presence of asymmetric information and in the meantime restore their creditworthiness (Marin and Schnitzer 1995). Indeed, this latter advantage of barter is considered sufficient to explain its persistent success in international trade. Moreover, by facilitating the enforcement of the contract, the payment in kind is preferable to monetary payments when the importer is a highly indebted country facing import-financing constraints due to sovereign-debt problem. Indeed, by ranking the goods used as payment according with the level of uncertainty about their quality and of the easiness with which property rights can be defined, it seems even possible to predict the pattern of specialization in barter trade (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 IRTA and the Corporate Barter Council (CBC).

However, even if it is recognized that under specific unfavorable 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, it is just sufficient to look at the Russian economy to find proof of the inefficiency of barter, if any was necessary. 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, and 2002b). Indeed, the International Monetary Found (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 United States reinforces the suspicion that the economic environment influences the role of barter and the way barter may respond to economic changes. Indeed, the U.S. 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 U.S. 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 (BarterNews 1999).

Moreover, the history of the U.S. 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 U.S. 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 U.S. 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 United States, by formally establishing as well 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 U.S. 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 United States, whose economy has continued to grow up until the end of the '90s, 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 U.S. 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 analyzed separately.

With the analysis of data for the U.S. 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 feature. Moreover, we aim to check if firms resort to barter to get rid of excess inventories and/or exploit under-utilized 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.

3 - What data reveal

The data we used are those released by IRTA on barter volume in North America between 1974-1999. As values for 1975 are missing (see Annex I, Tab. A), we took the 1974 ones as a proxy for 1975. Unfortunately, data are not comprehensive of total barter occurring in the United States, 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 United States 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. 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 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 U.S. 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 (Annex II, Fig. 1). However, the graph of the growth rate of both series shows a quite different behaviour of the two forms of barter over time (Annex II, Fig. 2), suggesting the necessity of 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 the one 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.

a) Commercial barter

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

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

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 macroeconomic series, thus taking also into account single components of GDP, in particular the GNP by the service sector. Moreover, we confront barter data also with time series accounting private inventories and final sales of the U.S. domestic business, and time series relative to the capacity utilization rates of the U.S. manufacturing industry. In Annex I-Box 1, we define the variables we selected to study the commercial barter sector.

Tab. 1 - 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	-2.706196		-3.290863*

† 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.

Graphic analysis leads to suspect that some or all of the variables are nonstationary. Therefore, we performed the unit root tests for stationarity on both levels and first differences of all the selected variables. Table 1 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 modeling 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 percent level, 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 the graph 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. Thus, we conclude that all the variables are integrated 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 modeling 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 loose in significance if compared with the same regressions without a trend. Moreover, according to the level of significance at 5 percent, 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 analyzed together with either GDP or GNP of the service sector all variables loose in 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 in group of four are not cointegrated. The Johansen test confirmed the result of no cointegration. On the contrary, if we restrict the analysis to groups of only three variables, the residual based ADF-test for cointegration indicates that the variables of the groups including the GNP of the service sector are cointegrated. However, as the graphic analysis of commercial barter growth led 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 the 1975, adjustments should be expected during the first years. Results concerning both short and long-run dynamics are given in Table 2. Actually, all dynamic regressions in table 2 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 equation has been reported also separately and presented in Table 3. Clearly, the choice of the group of variables in the regressions displayed in table 3 has been determined by our interest in assessing the influence of the economic cycle on barter. Therefore, the regressions taking into account the GDP series have been included, even if the variables do not result 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 3 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 analyzed in the dynamic regressions (2), (3) and (5) in table 2 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 to 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. 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" behaviors. 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 3 puts in evidence, 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 Tab. 2), 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 sustains. Anyway, the influence of inventories seems irrelevant with respect to the overall results. On the other hand, our results confirm the influence of the GNP by the service sector. Actually, we find this outcome particularly interesting and relevant. While the service sector supplies non-storable goods, the manufacturing one supplies goods for which storage is expensive. Now 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. Actually, 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 of the 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 under-utilized plant capacity. On the contrary, the positive sign of the coefficients of the capacity utilization rate is consistent with our belief that U.S. firms resort to barter to increase their profits and not to overcome trade difficulties depending on some form of market imperfection or incompleteness. Therefore, also 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 heteroskedasticity (see Tab.2). Moreover, according to the Jarque-Bera statistic, disturbances result to be normally distributed.

Tab. 2 - Error Correction Model for Retail Barter

	<i>Estimate *</i>	<i>Diagnostic tests **</i>
(1)	$\Delta \text{LTRADEX}_t = -4.8 - 0.13 \Delta \text{LGDP}_t + 0.34 \Delta \text{LWHOLE_INV}_t +$ $-0.25 \text{LTRADEX}_{t-1} + 0.74 \text{LGDP}_{t-1} - 0.21 \text{LWHOLE_INV}_{t-1}$ <p style="text-align: center;"> <i>R</i>² = 0.752642 <i>Akaike</i> = -3.414939 <i>DW</i> = 2.017679 <i>t</i>-statistics: (-1.733013) (-0.228559) (1.035669) (-2.505991) (2.431312) (-0.749413) </p>	<i>Breusch-Godfrey</i> (1 lag) $\chi^2 = 0.76$ [0.38] <i>ARCH</i> $\chi^2 = 0.57$ [0.44] <i>White</i> $\chi^2 = 17.40$ [0.06] <i>Ramsey's RESET</i> (1) <i>F</i> -stat = 1.90 [0.18] <i>Ramsey's RESET</i> (2) <i>F</i> -stat = 2.37 [0.12]
(2)	$\Delta \text{LTRADEX}_t = -3.34 - 1.19 \Delta \text{LGNPSRV}_t + 0.37 \Delta \text{LWHOLE_INV}_t +$ $-0.29 \text{LTRADEX}_{t-1} + 0.54 \text{LGNPSRV}_{t-1} - 0.03 \text{LWHOLE_INV}_{t-1}$ <p style="text-align: center;"> <i>R</i>² = 0.801349 <i>Akaike</i> = -3.634226 <i>DW</i> stat = 2.038695 <i>t</i>-statistics: (-1.157079) (-1.323466) (1.575045) (-2.230851) (2.453161) (-0.111520) </p>	<i>Breusch-Godfrey</i> (1) $\chi^2 = 0.40$ [0.52] <i>ARCH</i> $\chi^2 = 0.64$ [0.48] <i>White</i> $\chi^2 = 16.78$ [0.07] <i>Ramsey's RESET</i> (1) <i>F</i> -stat = 1.17 [0.29] <i>Ramsey's RESET</i> (2) <i>F</i> -stat = 1.82 [0.19]
(3)	$\Delta \text{LTRADEX}_t = -4.18 - 1.06 \Delta \text{LGNPSRV}_t + 0.29 \Delta \text{LRETAIL_INV}_t +$ $-0.34 \text{LTRADEX}_{t-1} + 0.34 \text{LGNPSRV}_{t-1} + 0.38 \text{LRETAIL_INV}_{t-1}$ <p style="text-align: center;"> <i>R</i>² = 0.795508 <i>Akaike</i> = -3.605246 <i>DW</i> stat = 1.928989 <i>t</i>-statistics: (-2.725488) (-1.257854) (1.046092) (-4.056916) (1.030767) (1.392523) </p>	<i>Breusch-Godfrey</i> (1) $\chi^2 = 0.13$ [0.70] <i>ARCH</i> $\chi^2 = 0.11$ [0.73] <i>White</i> $\chi^2 = 15.08$ [0.12] <i>Ramsey's RESET</i> (1) <i>F</i> -stat = 0.48 [0.49] <i>Ramsey's RESET</i> (2) <i>F</i> -stat = 2.58 [0.11]
(4)	$\Delta \text{LTRADEX}_t = -3.81 - 1.21 \Delta \text{LGDP}_t + 0.96 \Delta \text{LUTCAPDUR}_t +$ $-0.23 \text{LTRADEX}_{t-1} + 0.50 \text{L5LGDP}_{t-1} + 0.45 \text{LUTCAPDUR}_{t-1}$ <p style="text-align: center;"> <i>R</i>² = 0.792525 <i>Akaike</i> = -3.590761 <i>DW</i> stat = 1.989259 <i>t</i>-statistics: (-1.168066) (-1.250512) (2.23242) (-2.215641) (1.435170) (1.646857) </p>	<i>Breusch-Godfrey</i> (1) $\chi^2 = 0.12$ [0.72] <i>ARCH</i> $\chi^2 = 0.10$ [0.74] <i>White</i> $\chi^2 = 11.94$ [0.28] <i>Ramsey's RESET</i> (1) <i>F</i> -stat = 4.04 [0.06] <i>Ramsey's RESET</i> (2) <i>F</i> -stat = 2.35 [0.13]
(5)	$\Delta \text{LTRADEX}_t = -2.87 - 0.63 \Delta \text{LGNPSRV}_t + 0.34 \Delta \text{LUTCAPDUR}_t +$ $-0.28 \text{LTRADEX}_{t-1} + 0.47 \text{LGNPSRV}_{t-1} + 0.37 \text{LUTCAPDUR}_{t-1}$ <p style="text-align: center;"> <i>R</i>² = 0.806410 <i>Akaike</i> = -3.660032 <i>DW</i> stat = 2.032860 <i>t</i>-statistics: (-1.584930) (-0.745046) (1.459018) (-2.919341) (2.049843) (1.658270) </p>	<i>Breusch-Godfrey</i> (1) $\chi^2 = 0.31$ [0.57] <i>ARCH</i> $\chi^2 = 0.38$ [0.53] <i>White</i> $\chi^2 = 14.62$ [0.14] <i>Ramsey's RESET</i> (1) <i>F</i> -stat = 0.40 [0.53] <i>Ramsey's RESET</i> (2) <i>F</i> -stat = 1.33 [0.29]

* Values in round brackets: *T*-statistic

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

(Further test details available upon request.)

Tab. 3 – 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 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.

b) Corporate barter

To analyze corporate barter we proceeded in the same way as for the retail one. 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 (Fig.8 and 10 respectively in Annex II). 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.

Box 2 in Annex II contains a description of the new variables we introduced in this second part. Indeed, besides the GDP, we find appropriate to consider as single component of GDP also the GNP by Domestic Corporations, and in addition the total non- farm inventories series.

As in the analysis of retail barter, we performed the ADF tests, which indicated that also the new variables now considered are integrated of order one (Tab. 4). Actually, for the growth of GNP by Domestic Corporations we were confronted with the same problems encountered for the GDP growth series.

However, like for GDP, we decided to accept the result of stationarity by the ADF test with constant, but without trend.

Tab. 4 - 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**	

† 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.

Unfortunately, in the case of corporate barter, according to the residual based ADF-test for cointegration variables turned out not to be cointegrated neither in group of four nor in group of three. Actually, only the group of variable including corporate barter, GDP, and wholesale inventories passed the test at the level of 10 percent, but not that of 5 percent, even if very close to it. Nevertheless, we pursue our investigation by analyzing 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 appropriate to consider all the years for which data are available.

In table 5 are reported the results of the dynamic regressions, which intend to capture both the short and long-run effects of the chosen explanatory variables on corporate barter. However, we reported the implied long-run relationship from each of the estimated equation also separately in table 6.

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 (Tab. 5). 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.

Tab. 5- Error Correction Model for Corporate Barter

<i>Estimate*</i>	<i>Diagnostic tests **</i>
<p>(1) $\Delta \text{LCORP}_t = 7.75 + 0.04 t - 0.37 \Delta \text{LGDP}_t + 0.15 \Delta \text{LTNONF_INV}_t +$ $(2.350653) (2.517262) (-1.043303) (0.786458)$ $-0.72 \text{LCORP}_{t-1} - 0.14 \text{LGDP}_{t-1} - 0.06 \text{LTNONF_INV}_{t-1}$ $(-2.736191) (-0.574526) (-0.574310)$</p> <p>$R^2 = 0.475192$ Akaike = -4.974659 DW stat= 1.975002</p>	<p>Breusch-Godfrey (1lag) $\chi^2 = 2.99$ [0.08] ARCH $\chi^2 = 0.95$ [0.32] White $\chi^2 = 16.53$ [0.16] Ramsey's RESET (1) F-stat = 1.98 [0.17] Ramsey's RESET (2) F-stat = 1.42 [0.27]</p>
<p>(2) $\Delta \text{LCORP}_t = 9.8 + 0.05 t - 0.4 \Delta \text{LGDP}_t + 0.06 \Delta \text{LWHOLE_INV}_t - 0.4 \Delta \text{LCORP}_{t-1}$ $(1.852707) (1.706655) (-1.347417) (0.332204) (-1.083241)$ $-0.31 \Delta \text{LGDP}_{t-1} + 0.32 \Delta \text{LWHOLE_INV}_{t-1} - 0.62 \text{LCORP}_{t-1} - 0.30 \text{LGDP}_{t-1} - 0.23 \text{LWHOLE_INV}_{t-1}$ $(-1.176249) (2.192632) (-1.442772) (-0.880683) (-1.220994)$</p> <p>$R^2 = 0.626289$ Akaike = -5.063909 DW stat= 1.975002</p>	<p>Breusch-Godfrey (1) $\chi^2 = 0.01$ [0.92] ARCH $\chi^2 = 0.07$ [0.78] White $\chi^2 = 19.96$ [0.33] Ramsey's RESET (1) F-stat = 0.13 [0.71] Ramsey's RESET (2) F-stat = 0.11 [0.88]</p>
<p>(3) $\Delta \text{LCORP}_t = 7.48 + 0.04 t - 0.06 \Delta \text{LGDP}_{\text{CORP}_t} + 0.18 \Delta \text{LWHOLE_INV}_t +$ $(3.274882) (3.172881) (-0.296557) (1.160551)$ $-0.76 \text{LCORP}_{t-1} - 0.21 \text{LGDP}_{\text{CORP}_{t-1}} + 0.07 \text{LWHOLEINV}_{t-1}$ $(-2.879589) (-1.189912) (0.580765)$</p> <p>$R^2 = 0.480845$ Akaike = -4.985489 DW stat= 2.233140</p>	<p>Breusch-Godfrey (1) $\chi^2 = 2.95$ [0.08] ARCH $\chi^2 = 0.60$ [0.43] White $\chi^2 = 19.67$ [0.07] Ramsey's RESET (1) F-stat = 2.03 [0.17] Ramsey's RESET (2) F-stat = 1.48 [0.25]</p>
<p>(4) $\Delta \text{LCORP}_t = 14.57 + 0.07 t - 0.22 \Delta \text{LGDP}_t + 0.09 \Delta \text{LUTCAPDUR}_t +$ $(3.525774) (4.187107) (-0.515162) (0.537430)$ $-0.90 \text{LCORP}_{t-1} - 0.70 \text{LGDP}_{t-1} + 0.33 \text{LUTCAPDUR}_{t-1}$ $(-4.311002) (-2.293383) (2.445579)$</p> <p>$R^2 = 0.565447$ Akaike = -5.163373 DW stat= 2.247565</p>	<p>Breusch-Godfrey (1) $\chi^2 = 2.28$ [0.13] ARCH $\chi^2 = 0.06$ [0.79] White $\chi^2 = 16.25$ [0.17] Ramsey's RESET (1) F-stat= 1.05 [0.31] Ramsey's RESET (2) F-stat= 1.53 [0.21]</p>
<p>(5) $\Delta \text{LCORP}_t = 9.7 + 0.05 t + 0.33 \Delta \text{LGDP}_{\text{CORP}_t} - 0.16 \Delta \text{LUTCAPDUR}_t +$ $(4.480403) (4.522444) (1.176460) (-1.032899)$ $-0.80 \text{LCORP}_{t-1} - 0.34 \text{LGDP}_{\text{CORP}_{t-1}} + 0.18 \text{LUTCAPDUR}_{t-1}$ $(-3.957931) (-2.186114) (1.928276)$</p> <p>$R^2 = 0.585138$ Akaike = -5.209746 DW stat= 2.490836</p>	<p>Breusch-Godfrey (1) $\chi^2 = 6.06$ [0.01] ARCH $\chi^2 = 0.85$ [0.35] White $\chi^2 = 3.00$ [0.22] Ramsey's RESET (1) F-stat= 2.30 [0.14] Ramsey's RESET (2) F-stat= 1.10 [0.35]</p>

* Values in round brackets: T-statistic

** Value in squared brackets: p-value

(Further test details available upon request.)

Tab. 6 – Long-run relationship for Corporate Barter

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

As it occurred for 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 6 the coefficient of the total manufacturing inventories presents a negative sign, the coefficient of the wholesale inventories variable displays a negative sign when considered together with GDP, and a positive one when analyzed with GNP by domestic corporations. However, as shown in table 5, the total manufacturing inventories variable is not statistically significant, while the wholesale inventories one is significant only in equation (2). Therefore, by taking into account also the higher R² 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, also for corporate barter the coefficients of the capacity utilization rate variable in the cointegrating vector are positive (see table 6). Therefore, even in the case of the corporate barter sector, we do not find proof of barter as a tool corporations use to exploit under-utilized plant capacity. On the contrary, the results corroborate the hypothesis that also corporations use barter to increase their profitability.

Unlike the retail barter case, our results show that the 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.

However, the absence of cointegration and the relative low R² values make the results in general less satisfactory than those obtained for retail barter. Moreover, the Jarque-Bera test shows normality at 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 decide to include it anyway for comparative purposes.

Concerning the GNP by the Service sector, deeper investigations didn't 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 few kind of services, that is advertising time and space, and travel.

This idea was corroborated by the J-test. Indeed, as it occurred 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 not so crucial as for commercial barter.

4 - Conclusion

The 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 implicitly show 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 the GNP by 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 unfavorable economic conditions. The profitability of barter cannot be related and confined only to period of economic distrust and downturns. Barter cannot be considered only as a counter-cyclical phenomenon. However, our results suggest that barter to be profitable during economic growth times may require a certain degree of economic development. The study of the U.S. domestic barter implicitly supports the idea that the economic environment plays a major role to determine 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 the U.S. 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 show that neither businesses nor corporations resort to barter to obtain a 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 U.S. 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 on barter role would require a further investigation. Indeed, a possible future step of the analysis would consist in analyzing how the results would alter if one took account the endogeneity of some of the explanatory variables.

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Annex I

Tab. A - 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

*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.

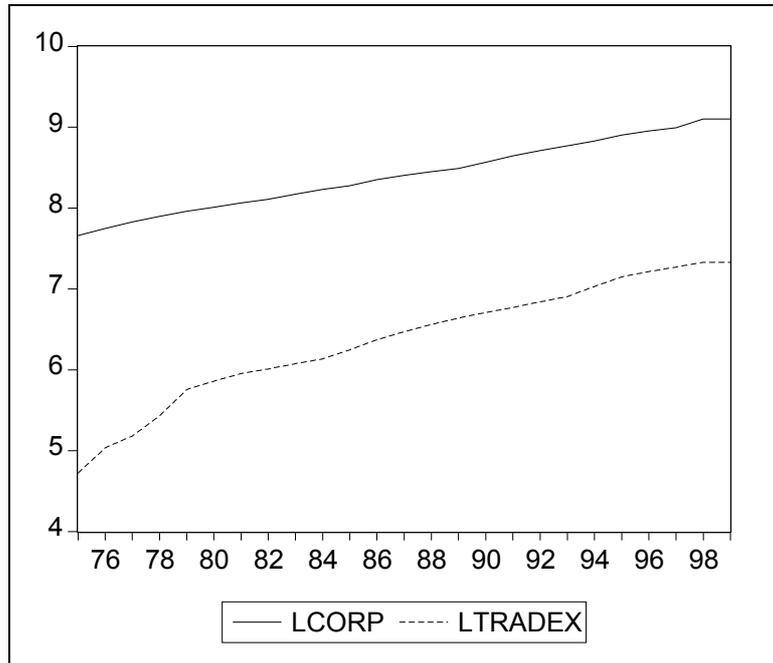
BOX 1

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

BOX 2

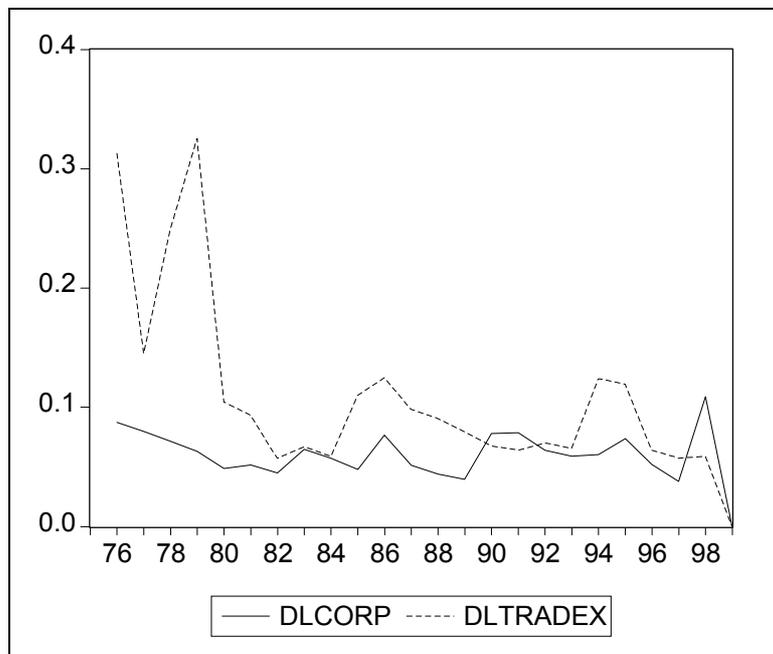
LCORP	Logarithm of the volume of Corporate Barter
LGDPCORP	Logarithm of US Real Gross National Product by Domestic Corporations
LTNONF_INV	Logarithm of Total Private Inventories of the Nonfarm sector

Figure 1 - Corporate Barter versus Commercial barter (level)



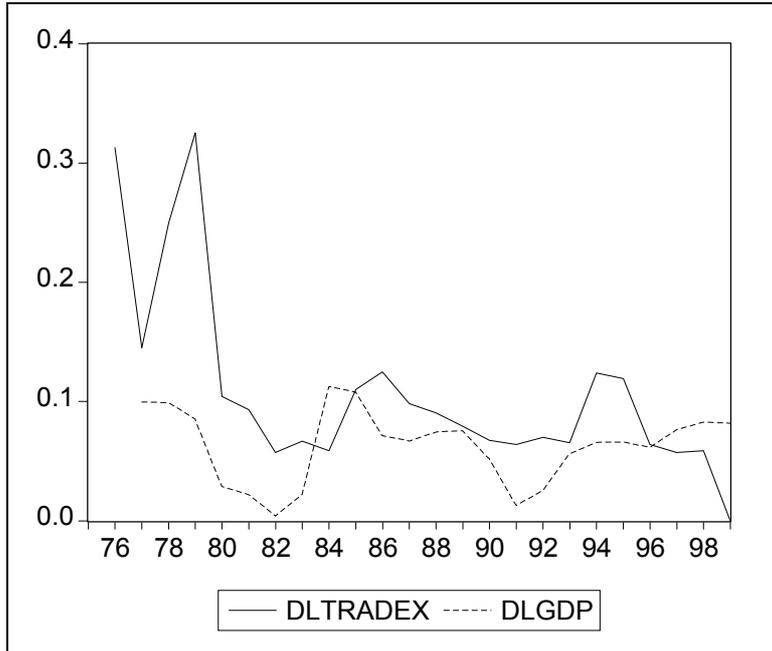
LCORP: corporate barter in level
LTRADEX: commercial barter in level

Figure 2 - Corporate Barter versus Commercial barter



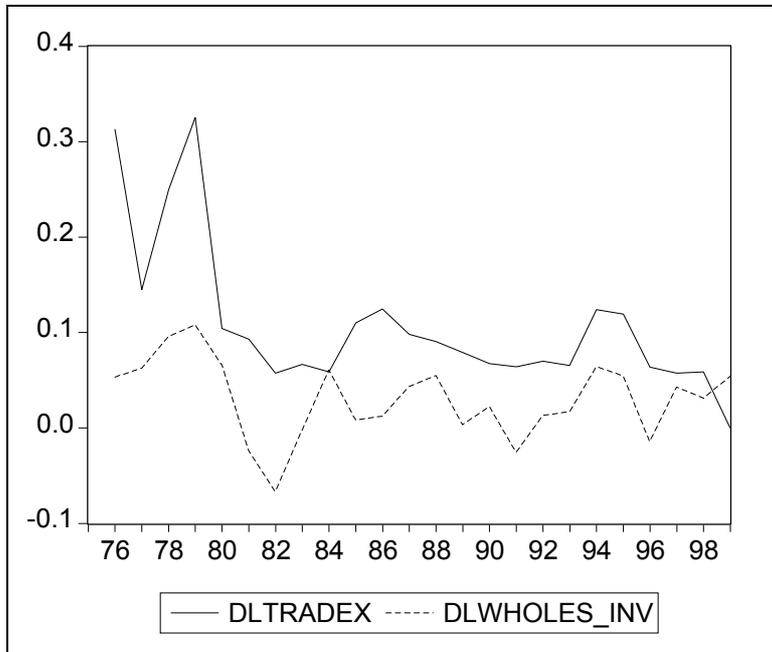
DLCORP: corporate barter growth
DLTRADEX: commercial barter growth

Figure 3 - Commercial barter versus GDP



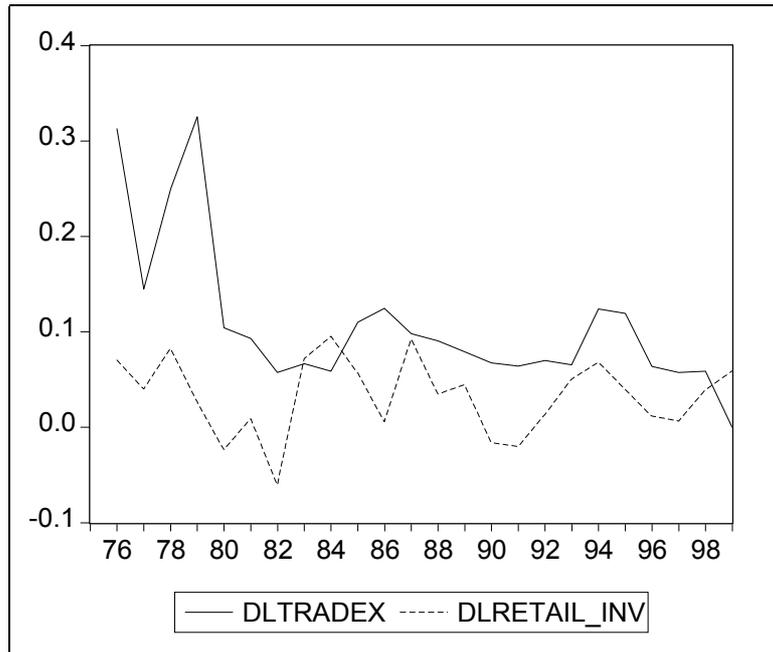
DLTRADEX: commercial barter growth
DLGDP: Growth Rate of U.S. Real GDP.

Figure 4 - Commercial barter versus Private Wholesale Inventories



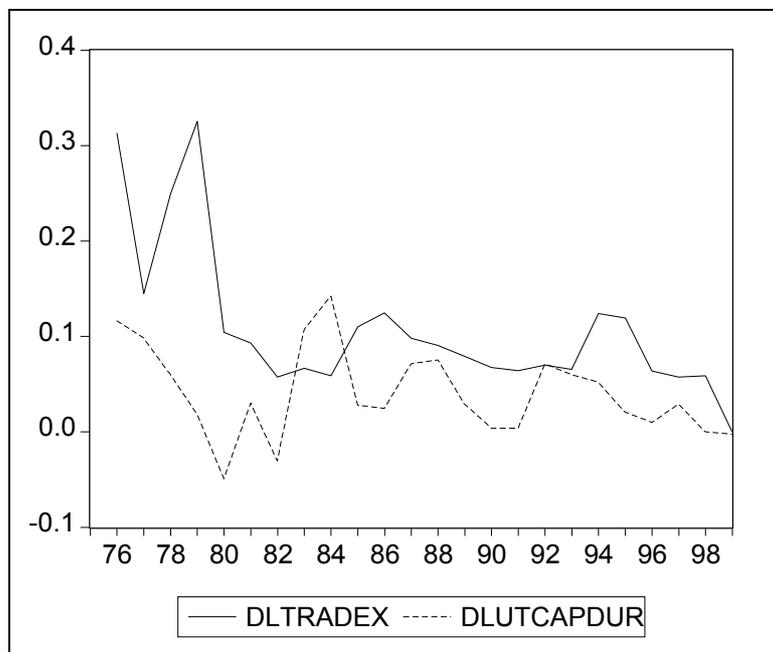
DLTRADEX: commercial barter growth
DLWHOLES_INV: Growth rate of U.S. Private Wholesales Inventories.

Figure 5 - Commercial barter versus Private Retail Trade Inventories



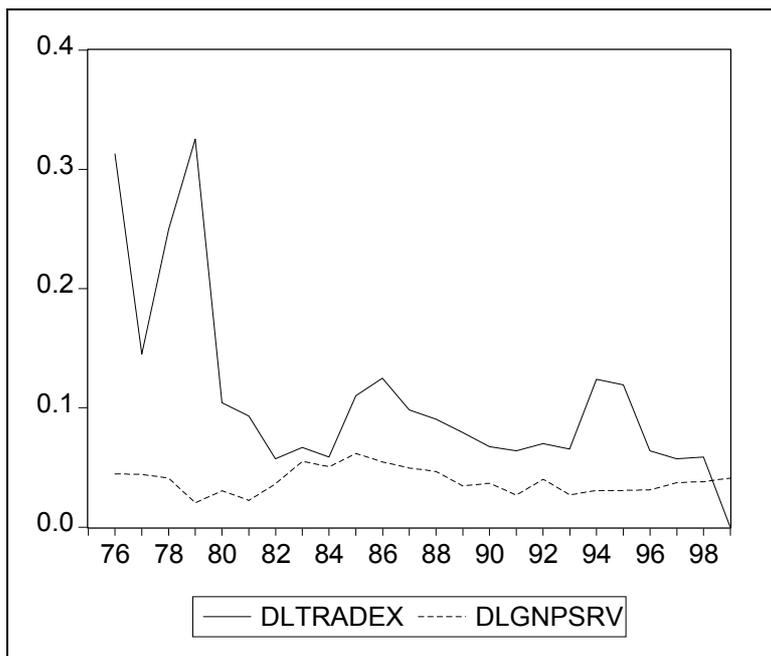
DLTRADEX: commercial barter growth
DLRETAIL_INV: Growth rate of U.S. Private Retail Trade Inventories.

Figure 6 - Commercial barter versus Capacity Utilization (Durable Goods)



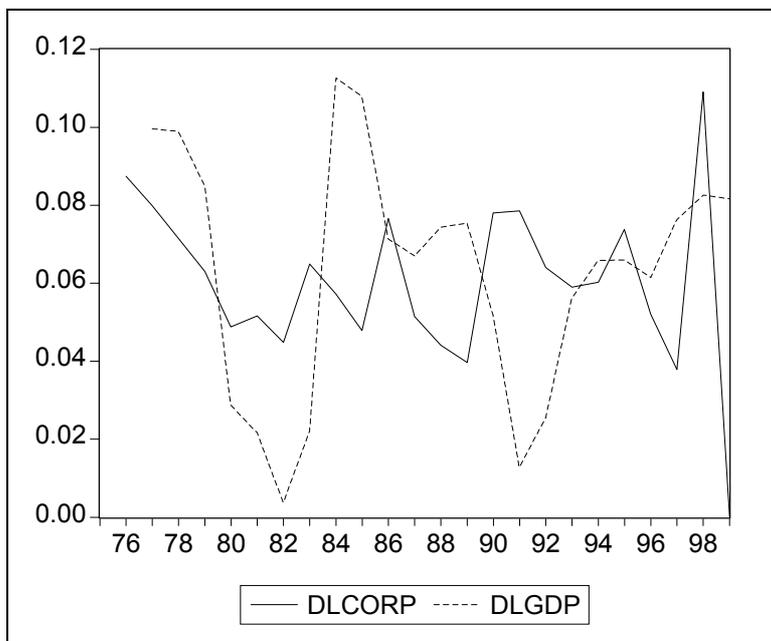
DLTRADEX: commercial barter growth
DLUTCAPDUR: Growth of the utilization capacity for durable goods.

Figure 7 - Commercial barter versus GNP-Service Sector



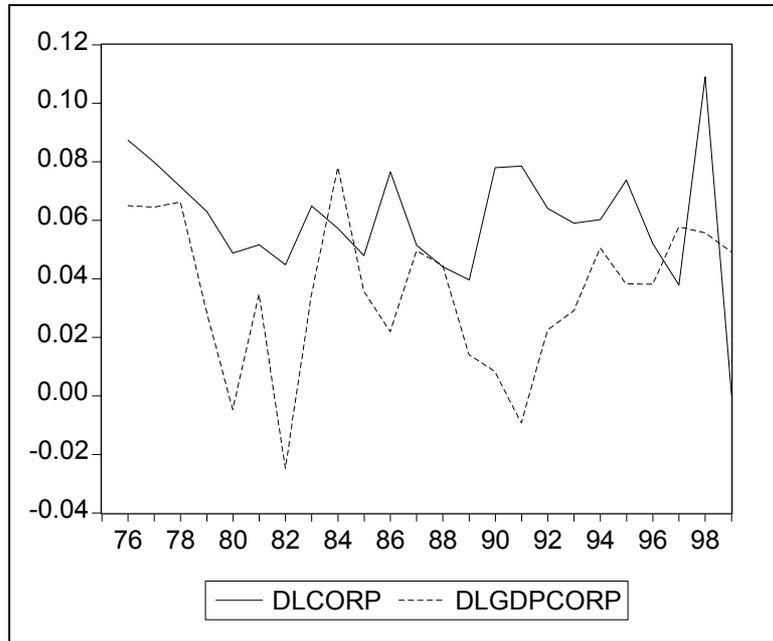
DLTRADEX: commercial barter growth
DLGNPSRV: Growth Rate of U.S. Real GNP- Service Sector.

Figure 8 - Corporate barter versus GDP



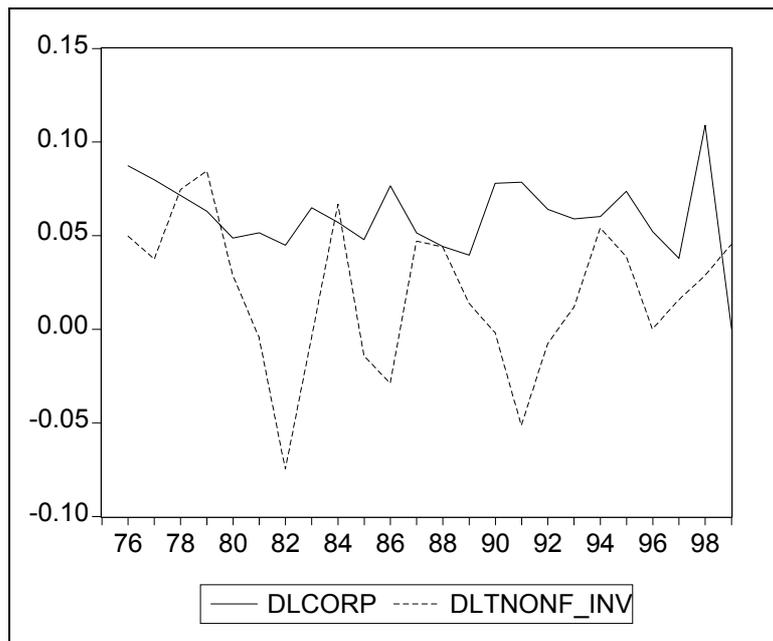
DLCORP: Corporate barter growth rate
DLGDP: Growth Rate of U.S. Real GDP.

Figure 9- Corporate barter versus Gross National Product by Domestic Corporations



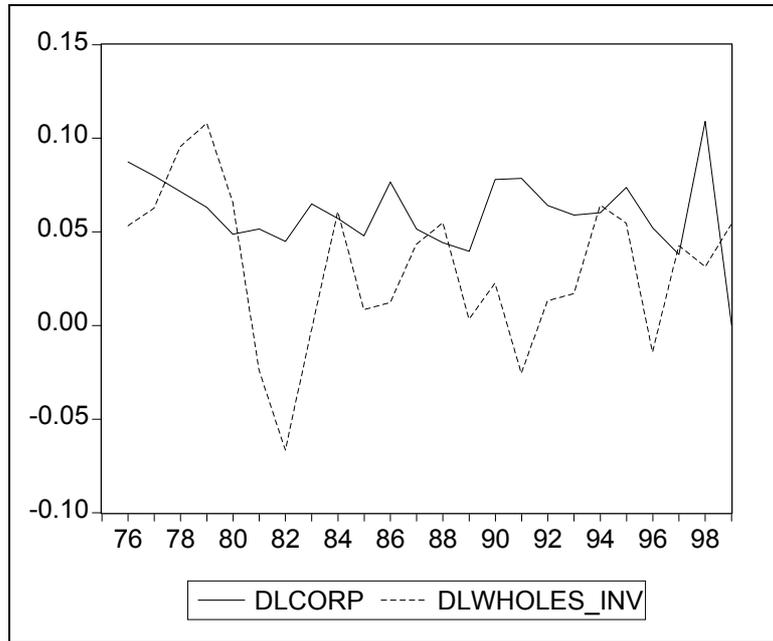
DLCORP: Corporate barter growth rate
DLGDPCORP: Growth Rate of U.S. Real GDP by Domestic Corporations.

Figure 10 - Corporate barter versus total private inventories of the Nonfarm Sector



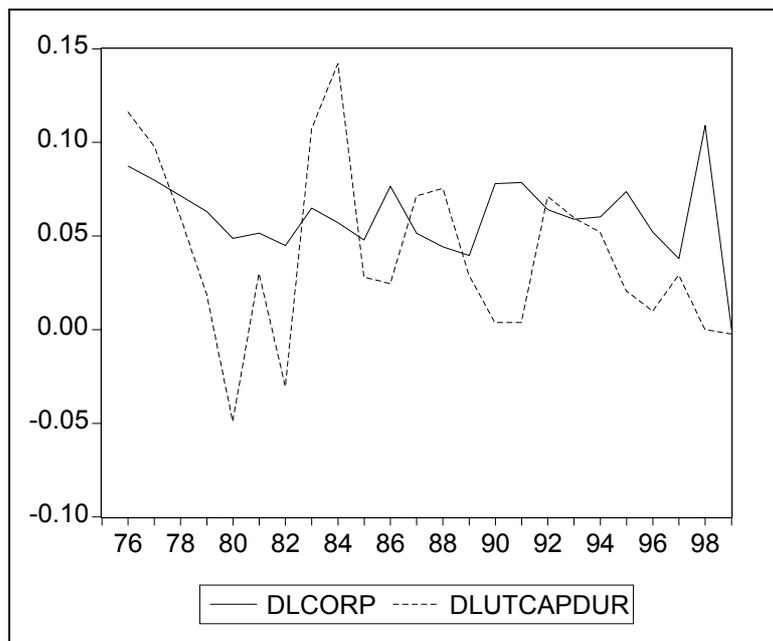
DLCORP: Corporate barter growth rate
DLTNONF_INV: Growth rate of Total Private Inventories of the Non farm Sector

Figure 11 - Corporate barter versus Private Wholesale Inventories



DLCORP: Corporate barter growth rate
DLWHOLES_INV: Growth rate of U.S. Private Wholesales Inventories.

Figure 12 - Corporate barter versus Capacity Utilization (Durable Goods)



DLCORP: Corporate barter growth rate
DLUTCAPDUR: Capacity Utilization Rate for durable goods-growth rate.