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Trade credit and the Meltzer effect:
Evidence from Japanese general trading companies

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Masanori Ono

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Masanori Ono[1]
Faculty of Economics and Business Administration
Fukushima University
1 Kanayagawa
Fukushima-shi, Fukushima 960-1296
Japan

Email: e012@ipc.fukushima-u.ac.jp

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Abstract

This paper explores a financial role of Japanese general trading companies (GTCs), which act as a central position of a distribution network among group firms. The empirical estimation, based on the theoretical arguments, demonstrates that during periods of monetary contraction GTCs have more trade receivables and fewer trade payables on their balance sheets. One may call this the Meltzer (1960) effect when their trade partners are more financially constrained than GTCs.

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1. Introduction

The purpose of this paper is to explore a financial role of Japanese general trading companies (GTCs), called *sogo shosha* in Japanese, which act as a central point of a distribution network among group firms. For example, Flath (2000, p. 351) defines "general trading companies" as "[t]he nine large Japanese companies that broker a significant amount of Japan's international trade, extend a substantial amount of trade credit within Japan itself, and act as intermediaries in a wide variety of business ventures."

Table 1 reports the nine largest GTCs' sales for the year from March 1998 to March 1999, and their trade receivables and trade payables at the end of March 1999.[2] The ratio of total sales to GDP is 14%, indicating the considerable volume of their transactions. In addition, the ratio of their trade receivables to city banks' loans for nonequipment funds is 7.6%, whereas the ratio of their trade payables to those loans is 5.1%. The ratio of net trade receivables is 2.5%. As claimed in Flath, these sizable numbers demonstrate that GTCs act as credit providers thorough their sales activities.

In addition, Sheard (1989, p. 319) argues that "trading companies are functioning as quasi-banks and quasi-insurance agencies in facilitating the provision of trade credit and the diversification of default risks associated with that trade credit."[3] In general, sellers' ability to collect information

[2] In accordance with Sheard (1989) I define these terms as follows: trade receivables = accounts and notes receivables + notes discounted + advance payments made; trade payables = accounts and notes payables + advance payments received.

[3] Similar arguments can be found in the literature on business studies; for example, Sasago (1979) and Furuyama (1998).

about buyers' business conditions can mitigate the costs of extending trade credit. For example, Ono (2001) points out that transactions with buyers enable sellers to assess buyers' default risk more accurately and more promptly than buyers' financial institutions. Therefore, one can predict that the GTC, by extending trade credit to their buyers, acts as a substitute for bank lending. (Although his paper focuses on the trade credit of manufacturing firms, Ono also suggests that it would be interesting to analyze the trade credit of trading companies.)

Many researchers have investigated the Japanese main-bank lending system, which serves as a center of financial *keiretsu* (corporate networks) in Japan.[4] However, there is another type of *keiretsu*, such as corporate distribution networks among nonfinancial companies. Like main banks, the GTCs hold significant shares of many nonfinancial firms whose businesses are closely related to the GTCs' transactions.[5] To my knowledge, few researchers[6] have paid attention to the GTCs' ties with their trade partners. This paper sheds light on this aspect of the GTCs, particularly on their trade credit practices.

Using the data for U.S. firms, Meltzer (1960, p. 429) argues, "when money was tightened, firms with relatively large cash balances increased the average length of time for which credit was extended. And this extension of trade credit appears to have favored those against whom credit

[4] For example, see Hoshi, Kashyap, and Scharfstein (1991) and Hoshi (1994).
[5] See Toyokeizai Data Bank (1996).
[6] Uesugi (2004) examines financial roles of GTCs, using data compiled by the Ministry of Finance and the Small and Medium Enterprise Agency.

rationing is said to discriminate." In other words, the adaptive reaction of trade credit extended by large firms could shield small liquidity-constrained firms from a monetary squeeze and then hinder the restrictive monetary policy. Here, I shall call this "the Meltzer effect," following Marotta (1997), who tested for the effect on trade credit between Italian firms.

If the Meltzer effect works during monetary contractions, it indicates that trade receivables increases at large firms and decreases at small firms, and that trade payables decreases at large firms and increases at small firms. To examine the Meltzer effect, researchers should focus on trade credit flows between firms, rather than on the aggregate quantity of trade credit.[7] Table 2 reports recent empirical studies using microdata or semiaggregated data. Except for Marotta (1997) and Rondi *et al.* (1998), the literature finds evidence favorable to the Meltzer effect. Although Ogawa (2003) does not refer to the Meltzer effect, he finds evidence supportive of the effect in the Japanese data for large and medium-sized firms, but not in those for small firms. Nielsen (2002) divides large U.S. firms into those with a bond rating and those without. He then reports evidence that large firms without a bond rating use trade payables as an alternative to bank loans. This implies that only large firms having a bond rating are free from credit constraints.

In this paper, I will define Japanese GTCs as large firms with access to nonbank funds. In addition, recall that GTCs serve as a center of corporate distribution networks. To test for the Meltzer effect in

[7] Apart from the Meltzer effect, there is also an intensive debate about how the aggregate quantity of gross trade credit reacts to a monetary shock. See Ramey (1992), for example.

Japan, therefore, it is appropriate to use microdata for GTCs.[8] If no evidence is found in the data, one may conclude that other industries in Japan are less likely to act as trade-credit providers during monetary contractions—that is, that the Meltzer effect does not exist in Japan. Section 2 provides the theoretical background and introduces my data. Section 3 reports the empirical results. Section 4 derives quantitative significance from the preceding section. Finally, Section 5 concludes the paper with a suggestion for future research.

2. The Theory and the Data

This section specifies a regression form and introduces the data that I use. Since I focus on the individual level of corporate financing behavior, it is best to examine financial statements reported by each GTC. The following estimation therefore uses the database released annually by the Japan Economic Research Institute. The sample period starts in March 1976 and ends in March 1999.[9] It is best not to extend the sample period beyond 1999, because after this period the GTCs themselves underwent major changes: for example, Kanematsu Corporation carried out a "structural reform" to

[8] Strictly speaking, investigation of the Meltzer effect on trade credit must focus on the relationship between firms that are financially constrained and those that are not. Although the two types of firm are not separable in the data, it is natural to presume that most of the GTCs' trade partners are not as financially *unconstrained* as the GTCs.

[9] Japan's fiscal year starts at the beginning of April and ends at the end of March; therefore, in their financial statements Japanese companies report their flows throughout the fiscal year and stocks as of the end of March. It may be interesting to examine financial statements on a half-year basis. However, mid-year statements do not report the amount of advance payments, which should be included in trade credit as defined by Sheard (1989). Therefore, this paper uses annual statements, which report all the payments to be included in the definition of trade credit.

downsize the firm's business activities, and the Nissho-Iwai and Nichimen companies merged to form a new company.

In fact, the terms of trade credit vary with each transaction. In each case, they depend on the type of commodity, the trade partners, and the business conditions at the micro and macro levels.[10] For commodities, Kaido (2000) reports ten major items traded by GTCs — steel, nonferrous metals, machinery, textile, fuels, chemicals, woods, foods, and construction materials, and information technology. However, the financial statements do not break down a firm's trade credit by individual contracts; thus, at best, one can explore determinants of trade credit on a firm base, but not on a contract base. Due to this limitation, in making a final estimation one has no choice but to apply a firm-level specification to the data.

At the firm level, the amount of trade credit can be influenced by both transactional and financial factors. In the theoretical model, Nadiri (1969) and Van Nieuwkerk (1975) derive a trade credit policy for a firm from the advertising policy model of Nerlove and Arrow (1962).[11] The optimal policy of trade credit demonstrates that the stock of trade receivables increases with an increase in sales and decreases with a rise in interest rates. A rise in interest rates leads to a rise in opportunity costs for granting trade credit. In addition, the trade credit policy proposes that a change in monetary

[10] See Kinyu-Zaisei (1996) for the terms standardized in each industrial sector. See Emery and Ariga (1996) for a survey, conducted by mail, of managers at Japanese trading companies.
[11] Nadiri (1969) and Van Nieuwkerk (1975) point out that trade credit is very analogous to advertising.

policy can influence the level of trade receivables. If the Meltzer hypothesis holds, firms like the GTCs, which have access to capital markets, are supposed to have more trade receivables in order to financially assist their transactional partners during a monetary squeeze.

In sum, the function of a GTC's trade receivables can be hypothesized as follows:

(1) $TR_{i,t} = f(S_{i,t}, r_t, M_t)$, where $\partial TR_{i,t}/\partial S_{i,t} > 0$, $\partial TR_{i,t}/\partial r_t < 0$, and $\partial TR_{i,t}/\partial M_t < 0$.

Table 3 describes all the variables used in this paper. Similarly, the function of its trade payables is postulated as follows:

(2) $TP_{i,t} = g(AMP_{i,t}, r_t, M_t)$, where $\partial TP_{i,t}/\partial AMP_{i,t} > 0$, $\partial TP_{i,t}/\partial r_t > 0$, and $\partial TP_{i,t}/\partial M_t > 0$.

In both equations, r_t and M_t are usually negatively correlated. In this paper, therefore, I will substitute a bank-lending indicator for these two variables and estimate the net effect on trade credit. If $TR_{i,t}$ decreases and $TP_{i,t}$ increases at GTCs when banks become willing to lend to firms—including the GTCs' trade partners—this indicates that the policy effect (that is, the Meltzer effect) is strong enough to offset the interest effect. To trace movements of $TR_{i,t}$ relative to $TP_{i,t}$, I combine (1) and (2) into the following function:

(3) $TR_{i,t}/ TP_{i,t} = h(S_{i,t}/AMP_{i,t}, BA_t)$

where $\partial(TR_{i,t}/ TP_{i,t})/\partial(S_{i,t}/AMP_{i,t}) > 0$ and $\partial(TR_{i,t}/ TP_{i,t})/\partial(BA_t) < 0$. A positive sign of the former derivative produces a transactional factor as predicted by Nadiri (1969) and Van Nieuwkerk (1975). A negative sign of the latter derivative demonstrates the Meltzer effect.

3. Empirical Results

Table 4 displays the panel estimation of (3). To avoid a unit-root problem in the panel estimation, I differentiated $TR_{i,t}/ TP_{i,t}$ and $S_{i,t}/AMP_{i,t}$ in the regression.[12] In the OLS estimation, the LM test discloses the evidence that cross-section heteroskedasticity exists in the residuals, and the Breusch-Pagan LM test also detects the existence of cross-sectional correlation in them. Therefore, column (b) reports the GLS estimation to correct for these two problems. Signs of both coefficients appear as expected in (3). The negative sign on BA_t demonstrates that the Meltzer effect is strong enough to override the interest effect on trade credit, which is theoretically supposed to work in opposition to the Meltzer effect.

To examine a stock adjustment of trade credit, columns (c) and (d) report the panel estimation of (3) with OLS and GLS, respectively, including a lagged-dependent variable in the regressors. The positive value of the estimated coefficient shows the stock adjustment of trade credit over a period of time. However, the size is small and statistically insignificant.

As an alternative estimation, Table 5 examines the panel estimation of (3) with measuring ($TR_{i,t}/$

[12] To test for unit roots in variables in (3), I use the Dickey-Fuller test. The AR(1) regression with constant does not reject the hypothesis of a unit root in $TR_{i,t}/ TP_{i,t}$ for all firms and a unit root in $S_{i,t}/AMP_{i,t}$ for all but one firm (Mitsui). To test for stationarity of the differences, the AR(1) model with constant rejects a unit root in $\Delta(TR_{i,t}/ TP_{i,t})$ for all but two firms (Mitsui and Mitsubishi) and a unit root in $\Delta(S_{i,t}/AMP_{i,t})$ for all but two firms (Sumitomo and Tomen). I find no evidence that a unit root exists in BA_t.

$TP_{i,t}$) and ($S_{i,t}/AMP_{i,t}$) in logs. To avoid a unit-root problem in the panel estimation, I differentiated $\ln(TR_{i,t}/ TP_{i,t})$ and $\ln(S_{i,t}/AMP_{i,t})$ in the regression.[13] This estimation reveals results similar to those in Table 4. In column (b), signs of both coefficients appear as expected in (3) with statistical significance. In column (d), the stock adjustment of trade credit is quantitatively and statistically insignificant. Therefore, the following section will use the results of Table 4 to explore quantitative implications of the qualitative evidence discovered in this section.

4. Quantitative Significance

Table 6 reports quantitative impacts of transactional and financial factors on trade credit, using estimated values in column (b) of Table 4. It should be noted that the quantitative value of the Meltzer effect is the same for all GTCs because BA_t is a macroeconomic indicator (see columns [b], [d], and [g] in Table 6). To examine the quantitative significance of fluctuations, columns (c) and (d) display the standard deviations of the two effects at each GTC for the time period from 1977 to 1999. For each GTC, the standard deviation of the transaction effect (column [c]) is the same as that of the Meltzer effect (column [d]) except for Ito-Chu, Sumitomo, and Marubeni. For the exceptional three

[13] To test for unit roots in variables in (3), I use the Dickey-Fuller test. The AR(1) regression with constant does not reject the hypothesis of a unit root in $\ln(TR_{i,t}/ TP_{i,t})$ for all firms and a unit root in $\ln(S_{i,t}/AMP_{i,t})$ for all but two firms (Mitsui and Kanematsu). To test for stationarity of the differences, the AR(1) model with constant rejects a unit root in $\Delta\ln(TR_{i,t}/ TP_{i,t})$ for all but two firms (Nichimen and Mitsubishi) and a unit root in $\Delta\ln(S_{i,t}/AMP_{i,t})$ for all but one firm (Sumitomo). I find no evidence that a unit root exists in BA_t.

firms, in column (e), the F test rejects a null hypothesis that the value of column (c) is equal to that of (d).[14] As reported in the bottom rows of columns (c) and (d), the average of (c) is a little smaller than that of (d). In sum, the Meltzer effect is quantitatively large.

In the late 1990s, a financial crisis hit Japan. Yamaichi Securities and Hokkaido Takushoku Bank collapsed at the end of 1997. After these incidents, the banks' unwillingness to lend intensified in Japanese financial markets.[15] For example, the index of BA_t fell to –21 at the end of 1998 from a level of 4 just one year before. To illustrate each GTC's reaction to this crisis, columns (f) and (g) report the distance from the 1999 value to the time-series average (that is, 0.00020 for the transaction effect and –0.0156 for the Meltzer effect, respectively). On a cross-sectional average of firms, the Meltzer effect (0.03778) is nearly twice as large as the transaction effect (0.02128) for this year. Figure 1 illustrates that the Meltzer effect became exceptionally large in 1999. The distance from the time-series average stretched to over twice the standard deviation.

Hayashi and Prescott (2002) use an aggregate *production* function to simulate the Japanese macroeconomy in 1990s. They attribute much of the decade's economic stagnation to low productivity and limit the acceptance of a credit-crunch hypothesis only to the financial crisis occurred in the late 1990s.

[14] Strictly speaking, the F test examines the equivalence between the variances of the two effects, not between the standard deviations of the two effects.
[15] For example, Takahashi (2002) reports the change in banks' attitude on lending to small and medium-sized enterprises during that period of time.

Similarly, Motonishi and Yoshikawa (1999) discover empirical evidence that a downturn of real profitability mainly explains the 1990s stagnation of Japanese corporate *investment*. They conclude that the credit crunch appeared in 1997 and then lowered the growth rate of GDP.

Compared to the previous studies, this paper reaffirms, by examining *trade credit*, the view that a financial crisis negatively influenced Japanese corporate finance at the end of the 1990s. In addition, this paper offers two new points. One is that the Meltzer effect has as much impact on GTCs' trade credit as the transaction effect. The other one is that, to large extent, GTCs increased trade receivables relative to trade payables during the financial crisis. Many firms may have experienced severe financial distress at the end of the 1990s. However, the negative impact was mitigated at least among trade partners of GTCs.

5. Concluding Remarks

Many researchers have argued how negatively the financial crisis influenced the Japanese economy.[16] This paper sheds light on the crisis from another viewpoint, one on which few researchers have focused. In the financial situation, GTCs granted more trade credit to their buyers and refrained from receiving trade credit from their sellers. One can say that the Meltzer effect worked and mitigated the negative impact on the Japanese economy, at least on many GTCs' trading

[16] For example, see Hoshi and Kashyap (2004).

partners.

For future research, the Meltzer effect must be examined in the comparison between trade credit lending and bank lending. If the former has an informational advantage over the latter in any industry, trade credit should draw more attention from macroeconomists and monetary policy makers.

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Table 1. Analysis of General Trading Companies bill. yen

Company name	Sales for 1998/4-3	Trade Receivables at 1999/3	Trade payables at 1999/3	Net Trade Receivables at 1999/3
Mitsui	11,180	1,837	1,268	570
Mitsubishi	10,500	2,143	1,665	478
Itochu	12,373	1,047	694	354
Sumitomo	10,461	1,372	859	513
Marubeni	10,917	1,197	822	375
Nissho-Iwai	7,783	877	575	302
Tomen	3,501	528	289	239
Nichimen	2,681	433	220	214
Kanematsu	1,743	382	220	162
Total	71,138	9,816	6,611	3,205
Total/GDP for 1998/4-3	14.0%	1.9%	1.3%	0.6%
Total/City banks' loans[a] for nonequipment funds at 1999/03		7.6%	5.1%	2.5%

Source. financial statements and Bank of Japan

[a] Borrowers include corporations, governments, and individuals.

Table 2. Empirical Studies on the Meltzer Effect

Article	Country	Data Frequency	Time Period	Data Type and Grouping	Evidence to the Meltzer effect
Marotta (1997)	Italy	annual	1982-1993	aggregation by size and sector	unfavorable
Rondi *et al.* (1998)	Italy	annual	1968-1991	aggregation by size	unfavorable
Ogawa (2003)	Japan	quarterly	1975:Q1-1998:Q1	aggregation by size	partly favorable
Kohler *et al.* (2000)	U.K.	annual	1983-1996	individual quoted firms	favorable
Nielsen (2002)	USA	quarterly annual	1959-1992 1973-1992	aggregation by size aggregation by bond rating	favorable

Table 3. Data Description

Variable	Description	Data sources
$TR_{i,t}$	Trade receivables of firm *i* at the end of March of year *t*	financial statements
$TP_{i,t}$	Trade payables of firm *i* at the end of March of year *t*	financial statements
$S_{i,t}$	Amount sold by firm *i* from March of year *t-1* to March of year *t*	financial statements
$AMP_{i,t}$	Amount purchased by firm *i* from March of year *t-1* to March of year *t*	financial statements
r_t	Interest rate at year *t*	used only for theoretical arguments
M_t	Monetary policy indicator at year *t:* An increase in M_t indicates an ease-money policy	used only for theoretical arguments
BA_t	Percentage index for banks' willingness to lend to firms for all industries at the forth quarter of year *t-1:* See Ono (2001) for details	Short-Term Economic Survey of All Enterprises (by Bank of Japan)

Table 4. Panel Estimation using differenced variables [a]

		(a)	(b)	(c)	(d)
Sample period		1977-1999	1977-1999	1977-1999	1977-1999
Number of firms		9	9	9	9
Number of observations		207	207	207	207
Estimation Method		OLS	GLS	OLS	GLS
Dependent variable		Δ(TRi,t/TPi,t)	Δ(TRi,t/TPi,t)	Δ(TRi,t/TPi,t)	Δ(TRi,t/TPi,t)
	Exp. sign	Δ(trade receivables/trade payables)	Δ(trade receivables/trade payables)	Δ(trade receivables/trade payables)	Δ(trade receivables/trade payables)
Δ(Si,t/AMPi,t) Δ(sales/amount purchased)	+	4.866 ** (1.909)	2.916 *** (0.9794)	4.838 *** (1.843)	2.936 *** (1.033)
BAi,t/100 (banks' lending willingness, %)	−	-0.168 * (0.087)	-0.106 ** (0.051)	-0.180 ** (0.084)	-0.110 * (0.056)
Δ(TRi,t-1/TPi,t-1) (lagged dependent variable)	+			0.182 (0.127)	0.089 (0.102)
R-square		0.171		0.202	
BUSE R-square			0.131		0.134
Durbin-Watson		1.733	1.840	2.006	1.879
LM test for cross-section heteroskedasticity		36.87		33.133	
P-value		0.00001		0.00006	
Breusch-Pagan LM test for diagonal covariance matrix		191.93		175.52	
P-value		0		0	

Note. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively. Fixed firm effects are not reported.

[a] Standard errors are in parentheses. For OLS, panel-corrected standard errors are reported.

Table 5. Panel Estimation using differenced variables in logs [a]

		(a)	(b)	(c)	(d)
Sample period		1977-1999	1977-1999	1977-1999	1977-1999
Number of firms		9	9	9	9
Number of observations		207	207	207	207
Estimation Method		OLS	GLS	OLS	GLS
Dependent variable		Δln(TRi,t/TPi,t)	Δln(TRi,t/TPi,t)	Δln(TRi,t/TPi,t)	Δln(TRi,t/TPi,t)
	Exp. sign	Δln(trade receivables/trade payables)	Δln(trade receivables/trade payables)	Δln(trade receivables/trade payables)	Δln(trade receivables/trade payables)
Δln(Si,t/AMPi,t) Δln(sales/amount purchased)	+	3.253 ** (1.449)	1.994 *** (0.6903)	3.249 ** (1.397)	1.979 *** (0.7245)
BAi,t/100 (banks' lending willingness, %)	−	-0.122 * (0.066)	-0.075 * (0.038)	-0.131 ** (0.063)	-0.079 * (0.043)
Δln(TRi,t-1/TPi,t-1) (lagged dependent variable)	+			0.195 (0.136)	0.097 (0.100)
R-square		0.1468		0.183	
BUSE R-square			0.121		0.125
Durbin-Watson		1.704	1.838	1.961	1.893
LM test for cross-section heteroskedasticity		63.919		58.759	
P-value		0		0	
Breusch-Pagan LM test for diagonal covariance matrix		209.96		190.45	
P-value		0		0	

Note. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively. Fixed firm effects are not reported.

[a] Standard errors are in parentheses. For OLS, panel-corrected standard errors are reported.

Table 6. Quantitative Impacts on Trade Credit using estimated values in column (b) of Table 4

	avg. for 1977-99		s.d. for 1977-99			The value at 1999 - avg.	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	transaction effect	Meltzer effect	transaction effect	Meltzer effect	F test[a]	transaction effect	Meltzer effect
Company Name	2.916* d(S/AMP)	-0.106 *BA/100	2.916 *d(S/AMP)	-0.106 *BA/100	Conclusion	2.916 *d(S/AMP)	-0.106 *BA/100
Mitsui	0.00076	-0.0156	0.0146	0.0172	(c) = (d)	0.01414	0.03778
Ito-Chu	0.00034	-0.0156	0.0095	0.0172	(c) < (d)	0.00820	0.03778
Kanematsu	0.00136	-0.0156	0.0175	0.0172	(c) = (d)	0.00666	0.03778
Sumitomo	-0.00011	-0.0156	0.0099	0.0172	(c) < (d)	0.01505	0.03778
Tomen	0.00056	-0.0156	0.0199	0.0172	(c) = (d)	0.02561	0.03778
Nissho-Iwai	-0.00001	-0.0156	0.0137	0.0172	(c) = (d)	0.01736	0.03778
Nichimen	-0.00230	-0.0156	0.0227	0.0172	(c) = (d)	0.05809	0.03778
Marubeni	0.00051	-0.0156	0.0105	0.0172	(c) < (d)	0.03158	0.03778
Mitsubishi	0.00064	-0.0156	0.0178	0.0172	(c) = (d)	0.01482	0.03778
Ave.	0.00020	-0.0156	0.0151	0.0172		0.02128	0.03778

[a] Statistical significance is tested with two tails at the 5 % level.